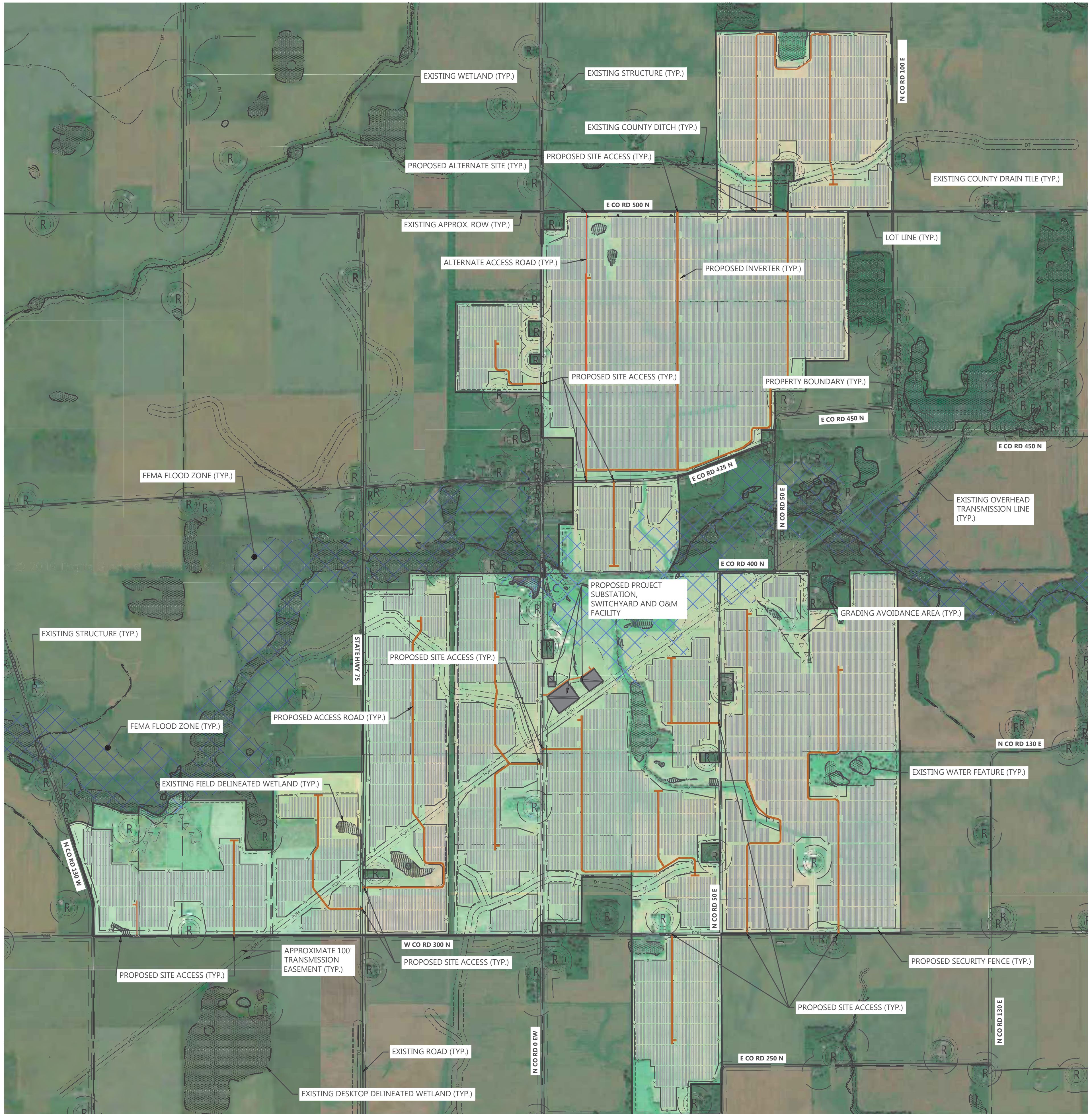
ATTACHMENT KS-1

Hardy Hills Solar Energy LLC

Cause No. 45490



LEGEND:

- UNLEASED LAND
- LOT LINES
- EX. RIGHT OF WAY
- EX. APPROX. EASEMENT LINES
- EX. APPROX. OVERHEAD POWER
- EX. ROAD
- EX. WATER FEATURE
- EX. COUNTY DRAINAGE DITCH
- EX. COUNTY DRAIN TILE
- EX. WETLAND (DESKTOP DELINEATED)
- EX. WETLAND (FIELD DELINEATED)
- FEMA FLOOD ZONE
- EX. CEMETERY
- EX. HISTORIC STRUCTURE
- EX. STRUCTURE
- PROPOSED SOLAR ARRAY
- PROPOSED ACCESS ROAD
- PROPOSED ALTERNATE ACCESS ROAD
- PROPOSED SECURITY FENCE
- PROPOSED ELECTRICAL EQUIPMENT
- PROPOSED SUBSTATION/SWITCHYARD
- GRADING AVOIDANCE AREA

LAND USE	
LEASED LAND	1778 AC
FENCED AREA	1194 AC

SETBACK TABLE	
NON-PARTICIPATING PROPERTY LINE	50 FT
TYPICAL ROAD RIGHT OF WAY*	50 FT
INDIANA HIGHWAY 75 RIGHT OF WAY*	50 FT
NON-PARTICIPATING RESIDENCE	200 FT
PARTICIPATING RESIDENCE	200 FT
COUNTY DRAIN TILE AND DITCHES**	75 FT EITHER SIDE
WETLAND	50 FT
FEMA FLOODPLAIN	50 FT
CEMETERY	200 FT
HISTORIC STRUCTURE	200 FT
TRANSMISSION LINE***	60 FT

* BASED ON CLIENT PROVIDED RIGHT OF WAY WIDTH
** BASED ON 150FT TOTAL WIDTH
*** BASED ON 120 FT TOTAL EASEMENT WIDTH
NOTE: TRANSMISSION LINE AND COUNTY DRAIN LINE SETBACKS ARE APPLIED TO THE PROJECT SECURITY FENCE

GENERAL NOTES:

1. APPROXIMATELY 581,594 SOLAR PANELS ON SITE

0' 800' 1600' 2400'

Westwood

Phone (608) 821-6600 8401 Greenway Blvd., Suite 400
Middleton, WI 53562
westwoodps.com

Westwood Professional Services, Inc.

SUBJECT TO FINAL DESIGN

PREPARED FOR:

Invenergy

One South Wacker Drive Suite 1800
Chicago, IL 60606

REVISIONS:

#	DATE	COMMENT
A	01/17/2020	CONCEPTUAL PV LAYOUT
R	10/02/2020	DEVELOPMENT PLAN
S	10/05/2020	DEVELOPMENT PLAN
T	10/08/2020	DEVELOPMENT PLAN
U	10/09/2020	DEVELOPMENT PLAN

Hardy Hills Solar Project

Clinton County, Indiana

Overall Site Plan

PRELIMINARY
NOT FOR CONSTRUCTION

DATE: 10/09/2020

SHEET: C.200

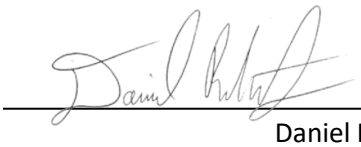
Tiers 1-2 Site Characterization Survey

Hardy Hills Solar Energy Project
Clinton County, Indiana
June 2020

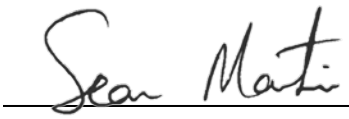
Prepared for:
Invenergy Solar Project Development LLC
One South Wacker Drive, Suite 1800
Chicago, Illinois 60606

Prepared by:
Energy Renewal Partners, LLC
1221 S. MoPac Expressway, Suite 225
Austin, Texas 78746

June 11, 2020



Daniel Roberts, PWS
Senior Biologist



Sean Martin
Project Manager

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Tables

Figures

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Appendices

1.0 Introduction

Energy Renewal Partners, LLC (ERP) has prepared the following assessment for Invenergy Solar Project Development LLC (Invenergy) for the proposed Hardy Hills Solar Energy Project (the "Project") which consists of approximately 1,770 acres (the "Project area"). The Project area is located in the north-central portion of Clinton County approximately 1.5 miles north of the city of Frankfort (Figure 1). The Project is being developed as a solar energy facility with an installed capacity of up to 195 megawatts (MW), and Invenergy proposes that the Project will obtain a commercial operation date (COD) of 2023. Although the final design of the solar facility has not been completed, the Project will likely entail the installation of photovoltaic (PV) modules, inverters, an underground electrical collection system, internal project roads, security fencing, operation and maintenance (O&M) structures, as well as temporary parking and laydown areas.

ERP initially completed tasks in August of 2019 under the June 19, 2019 Request for Proposal (RFP), at which time the Project consisted of an area encompassing approximately 6,430 acres. On February 7, 2020, Invenergy requested ERP update the studies to reflect the final leased parcels, which total approximately 1,770 acres and which are within the larger, previously studied area. For this assessment, ERP has performed a desktop review analyzing land cover, protected species' habitats, designated sensitive or critical areas, federal and state managed lands, and the potential for waters of the U.S., including wetlands, within the Project area and vicinity in compliance with Tiers 1-2 of the U.S. Fish and Wildlife Service's (USFWS) Land-based Wind Energy Guidelines (WEG) (USFWS 2012). The results of the desktop assessment and subsequent field reconnaissance are presented in the following Tiers 1-2 Site Characterization Survey (SCS) report.

2.0 Methodology

2.1 Literature and Database Review

ERP scientists conducted a literature and database review to characterize land cover, protected areas, land use, and aquatic resources and whether habitat for federal and state protected species has the potential to exist within the Project area and areas within a 2-mile Study Area. ERP scientists reviewed available literature and relevant, supporting, publicly available information, including but not limited to:

- U.S. Geological Survey (USGS) National Map (Figure 2);
- Representative aerial imagery (Figure 3);
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Clinton County Web Soil Survey (Appendix E, Attachment B);
- USGS National Land Cover Database (NLCD) 2016 (Yang 2018) (Figure 4);
- USFWS National Wetlands Inventory (NWI) (see Appendix D, Attachment A, Figure 3);
- USGS National Hydrography Dataset (NHD) (see Appendix D, Attachment A, Figure 4);
- Federal Emergency Management Agency (FEMA) Flood Hazard Index (see Appendix D, Attachment A, Figure 5);
- Indiana Department of Natural Resources (IDNR) Best Available Flood Hazard Data (see Appendix D, Attachment A, Figure 5);
- The Nature Conservancy Wind Right Tool (Figures 8 and 9);
- USFWS Information for Planning and Consultation (IPaC) (Appendix A);
- IDNR County List of Endangered, Threatened, and Rare Species (Appendix B); and
- Indiana Natural Heritage Data Center (NHDC) Elements of Special Concern (Figure 7, Appendix C).

State or federally managed lands within the Project area and a 10-mile buffer were reviewed by desktop from the following publicly available databases:

- USGS Protected Areas Database of the United States (PADUS) (Figure 5);
- National Conservation Easement Database (NCED) (Figure 5);
- The Nature Conservancy (TNC) Conservation Priority Areas and Land (Figure 5);
- TNC Site Wind Right Mapping Tool (Figures 8 and 9);
- IDNR's Managed Lands (Figure 5);
- Audubon Society's Important Bird Areas (IBA) (Figure 5); and
- The Bureau of Land Management's (BLM) U.S. Forest Service Land (Figure 5).

Additionally, ERP reviewed the following protected species and habitats that were listed in Appendix A of the Request for Proposal from Invenergy. ERP determined that the current extent and known range of the following protected species or sensitive resources does not occur within ten (10) miles of the Project area and are therefore considered not applicable to the Project and are not discussed further:

- American Burying Beetle Range
- Whooping Crane Corridor
- Whooping Crane Stopover Data
- Grassland Easements
- Townsend's (Virginia) Big-Eared Bat

ERP used available resources to evaluate if suitable habitat characteristics for federal and state protected species occurs within the 2-mile Study Area to assess the likeliness of presence of protected species. ERP utilized the USFWS IPaC to initiate USFWS consultation for the Project area and generate an Official Species List of federally listed species and designated critical habitats that should be considered in an effects analysis for the Project area (Appendix A). Additionally, to provide broader information on USFWS-managed resources in the vicinity of the Project, ERP utilized the USFWS IPaC system to generate an unofficial species list of federally listed species and designated critical habitats with a known or expected range within the 2-mile Study Area (Appendix A). Federally listed species considered in this SCS include those characterized by the USFWS under the protection of the Endangered Species Act (ESA) as threatened or endangered in addition to species with a candidate listing or proposed listing which have the potential to become listed under the ESA at a later date. 'Protected species' refers to all species with regulatory implications as it relates to solar development which includes all federally listed species, all species protected under the Migratory Bird Treaty Act (MBTA), raptors protected under the Bald and Golden Eagle Protection Act (BGEPA), and species protected under the Indiana Nongame and Endangered Species Conservation Act (Indiana Code [IC] 14-22-34).

The IDNR maintains a list of species protected under the Indiana Nongame and Endangered Species Conservation Act, which includes wildlife species, including nests, eggs, or parts, that have been classified as endangered by the State of Indiana or listed on the federal list of endangered wildlife (50 CFR 17.11). Prohibited acts to protected wildlife species include taking, possessing, transportation, exportation, process, sell or offer for sale, and shipment of endangered or nongame wildlife species in need of management. Plants and insects are not protected by this Act.

The IDNR does not maintain a geographic information system database of the known or expected range of protected state listed species; therefore, a query for specific species whose range occurs within the Project area and 2-mile Study Area could not be conducted. The most specific dataset based on the range of state protected species maintained by IDNR is the List of Endangered, Threatened, and Rare Species by County. The IDNR Clinton County List of Endangered, Threatened, and Rare Species (Appendix B) was reviewed and this county-wide list was utilized to evaluate the potential for state listed species to occur within the Project area and 2-mile Study Area.

The IDNR maintains the NHDC database which has the most comprehensive and up-to-date information regarding element occurrence data for federal and state endangered, threatened, and rare species, high-quality natural communities, and significant natural areas in Indiana. On March 6, 2020, ERP initiated a written data request with the NHDC for information regarding endangered, threatened, or rare species, high quality natural communities, and natural areas that have a known occurrence within the 2-mile Study Area and for known bald eagle (*Haliaeetus leucocephalus*) nests, bat hibernacula, and bat maternity roosts within five (5) miles of the Project area (Appendix C) to provide additional resolution for which sub-set of the species identified in county list(s) might be known in close proximity to the Project. On March 10, 2020, the NHDC's Taylor Davis responded in writing with the results of the NHDC query which identifies the element occurrences of federal and state listed species and state recognized sensitive or critical areas, including managed lands, within the 2-mile Study Area as well as bald eagles nests, bat hibernacula, and bat maternity colonies within the 5-mile Study Area (Appendix C).

By analyzing the preferred habitat requirements, known occurrences, migration patterns, and known or expected range of federal and state listed species, ERP determined by season which of these wildlife species are known, likely, have potential, or are unlikely to occur within the Project area (Table 2). For the purposes of this report, determinations are defined as follows: 'known' are species identified by NHDC as having occurrences within the 2-mile Study Area; 'likely' are species whose known or anticipated range are within the 2-mile Study Area and supporting habitat occurs within the Project area; 'possible' are species whose known or anticipated range are within the 2-mile Study Area, but no supporting habitat occurs within the Project area; 'unlikely' are species that occur within the county but whose known or anticipated range are not within the Project area. Unlikely species includes federally listed species that occur within the County but are not within the IPaC Official Species List. State listed plant and insect species were not included in this analysis as they are not protected by state law regarding incidental take (IC 14-22-34-6).

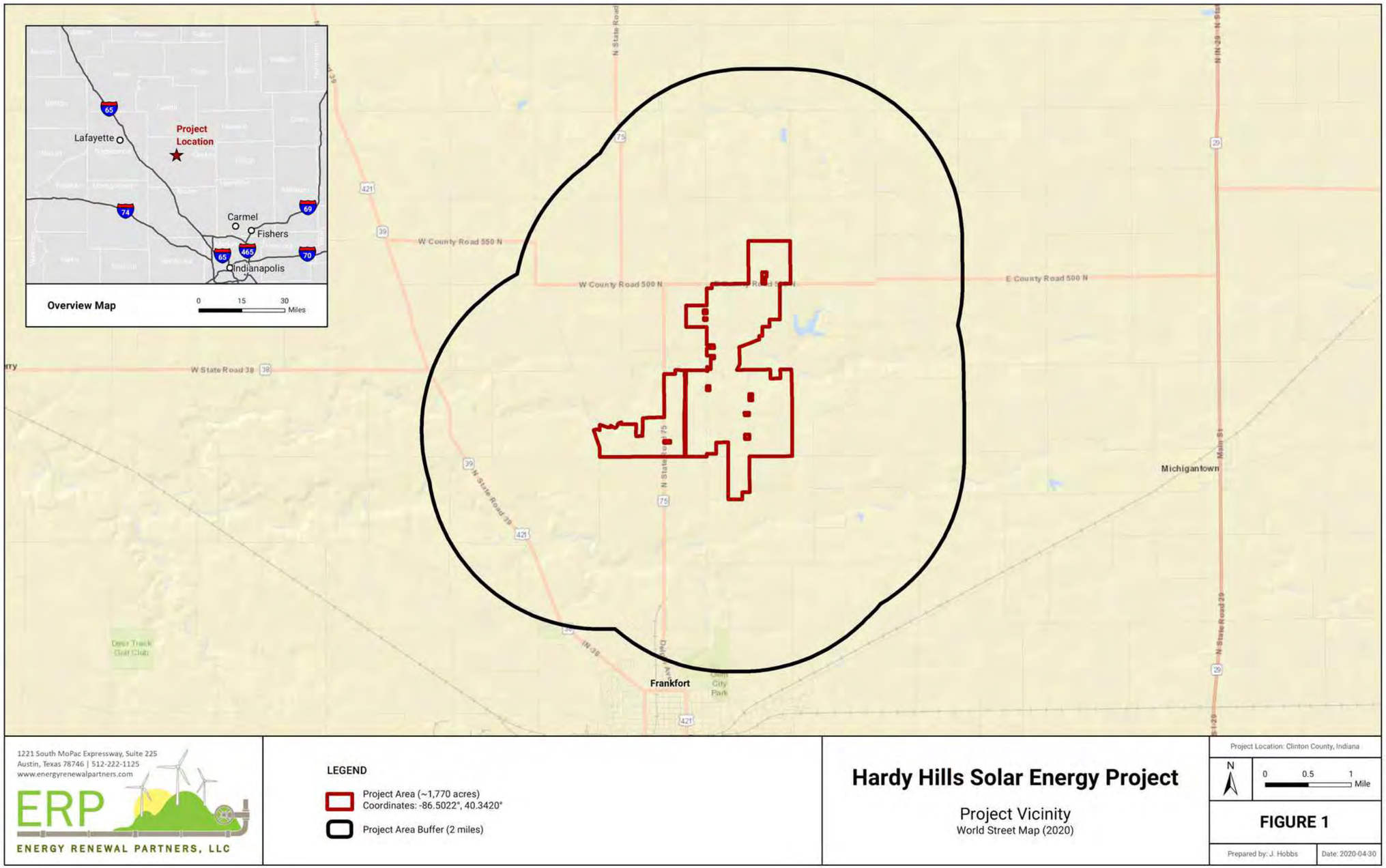
ERP scientist Daniel Roberts, Professional Wetland Scientist (PWS), also conducted a desktop review of the Project area for aquatic resources that could potentially be regulated by the U.S. Army Corps of Engineers (USACE) under the Clean Water Act (CWA) (Appendix D).

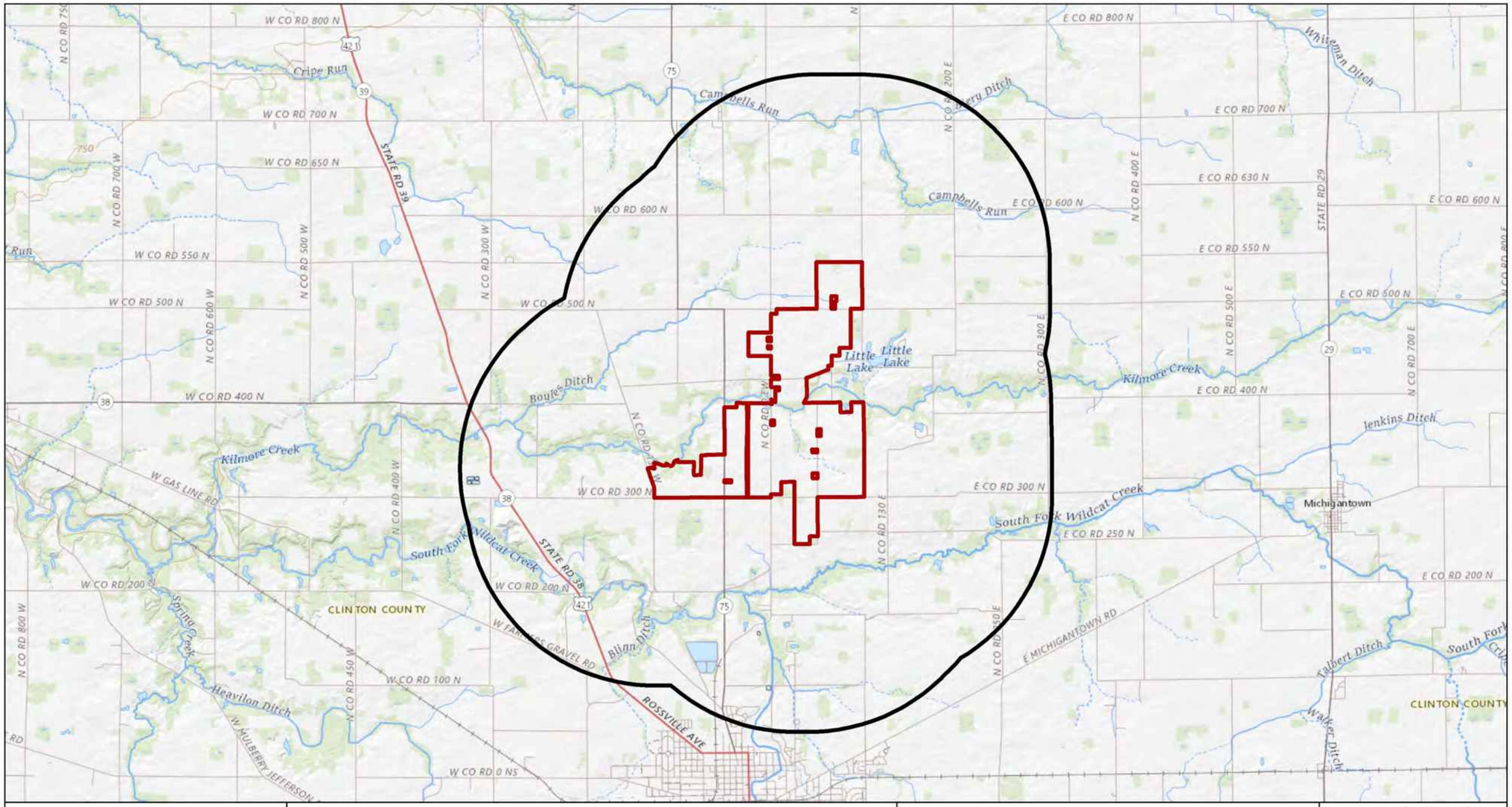
2.2 Field Reconnaissance

An initial field assessment was conducted by qualified biologists Daniel Roberts, Professional Wetland Scientist (PWS), and Felicia Sawyers for the original Project area of 6,430 acres on July 23-24, 2019 to confirm land cover and land use of the Project area and provide a detailed description of onsite habitat conditions including a characterization of vegetation community and structure, general topography, surface hydrology, and anthropogenic disturbance within the Project area. The final leased parcels that comprise of the current 1,770-acre Project area were encompassed within the initial field visit and a subsequent field visit was not conducted. During the July 2019 field reconnaissance, a combination of vehicular and walking reconnaissance was utilized throughout parcels leased by Invenergy to evaluate the Project area. For the 2-mile Study Area, a general vehicular reconnaissance was conducted from public roadways. This 2-mile Study Area reconnaissance was conducted to collect generalized land cover data and site observations for the surrounding area to support the database review and contextualize the Project area results.

Additionally, within a five (5) mile buffer of the Project area, ERP completed a visual survey in July 2019 using plain sight and binoculars within suitable substrates for raptor species of concern nests, which are those that fall under "protected species" as defined in Section 2.1, above (e.g., eagles). Prior to the raptor species of concern nest assessment, ERP conducted an initial desktop review of known eagle nest locations using public information sources, landowner interview and a NHDC data request. The NHDC data request was updated for this current assessment.

ERP biologists used the ArcGIS Collector Application to navigate within the Project area and 2-mile Study Area, collect photographic data, and log notable findings by Global Positioning System (GPS). Additionally, during the field reconnaissance ERP evaluated aquatic resources within the Project area and field verified results of the desktop review, providing a desktop and onsite synthesis (Appendix D). This synthesis is not considered a formal Waters of the U.S. delineation. Representative photographs of the Project area and 2-mile Study Area were collected during the July 2019 field reconnaissance (Appendix E).


Overview Map
Lafayette
Project Location
Carmel
Fishers
Indianapolis
0 15 30 Miles
W County Road 550 N
W County Road 500 N
E County Road 500 N
W State Road 38
N State Road 75
N State Road 39
IN-38
Frankfort
Michigantown
N State Road 29
Deer Track Golf Club
1221 South MoPac Expressway, Suite 225
Austin, Texas 78746 | 512-222-1125
www.energyrenewalpartners.com
ENERGY RENEWAL PARTNERS, LLC
LEGEND
Project Area (~1,770 acres)
Coordinates: -86.5022°, 40.3420°
Project Area Buffer (2 miles)
Hardy Hills Solar Energy Project
Project Vicinity
World Street Map (2020)
Project Location: Clinton County, Indiana
N
0 0.5 1 Mile
FIGURE 1
Prepared by: J. Hobbs
Date: 2020-04-30



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LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)

Hardy Hills Solar Energy Project

Regional Topography
USGS National Map (2020)

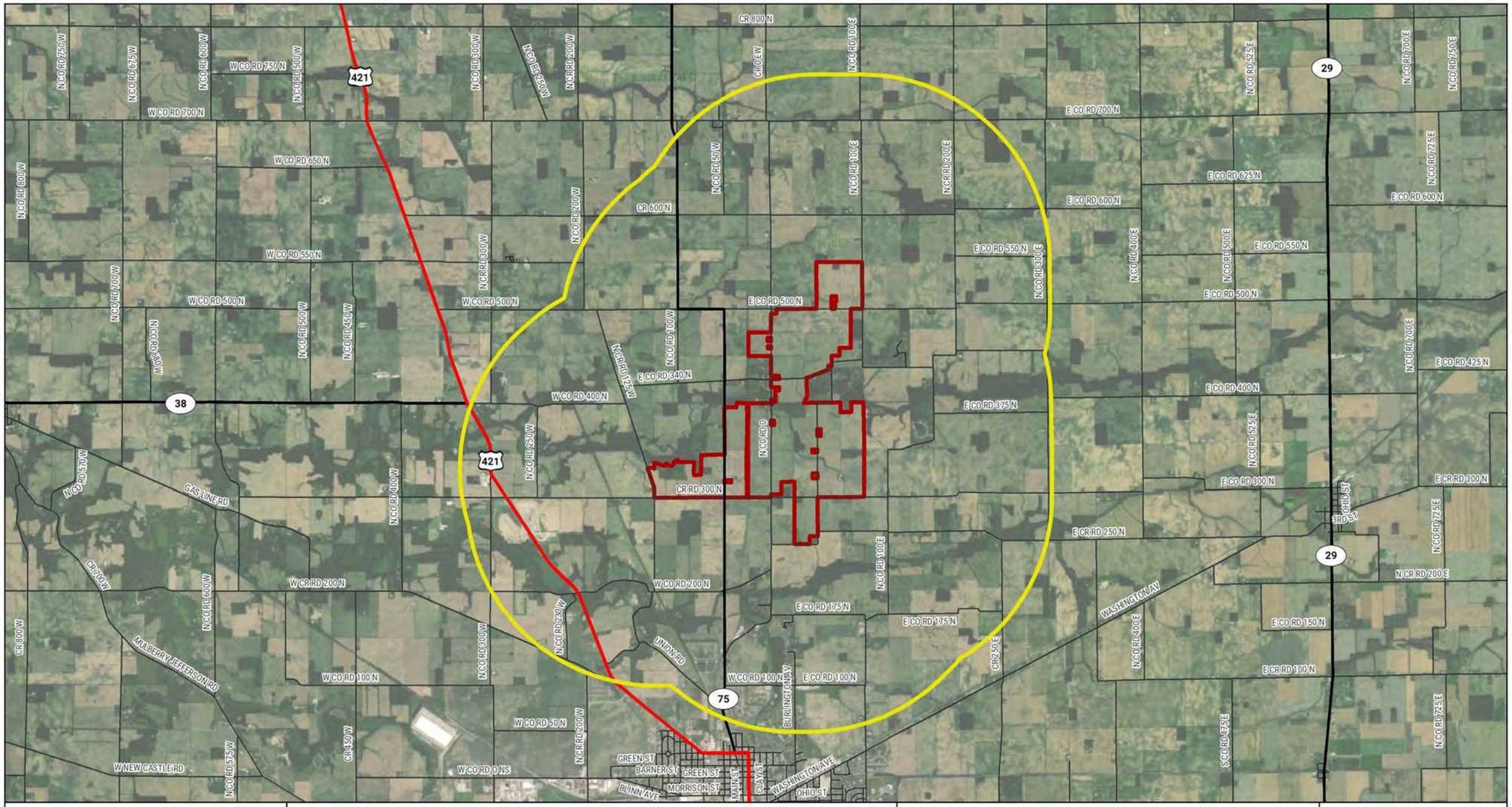
Project Location: Clinton County, Indiana

N

0 0.5 1 Mile

FIGURE 2

Prepared by: J. Hobbs | Date: 2020-04-30



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ENERGY RENEWAL PARTNERS, LLC

LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)

Hardy Hills Solar Energy Project

Aerial Imagery
Maxar (2018)

Project Location: Clinton County, Indiana

N

0 0.5 1 Mile

FIGURE 3

Prepared by: J. Hobbs | Date: 2020-04-30

3.0 Results

3.1 General Project Area Description

The approximately 1,770-acre Project area is located in north-central Clinton County, Indiana approximately 1.5 miles north of the city of Frankfort (Figure 1) with the unincorporated town of Kilmore. Kilmore is located within and adjacent to the western portion of the Project area. Onsite elevation ranges from approximately 800 to 870 feet above mean-sea-level (AMSL), and the topography within the Project area is generally flat with areas having the steepest slopes located generally along Kilmore Creek, Boyles Ditch, and their tributaries onsite (Figure 2). The Project area consists primarily of cultivated crops with scattered forested areas and rural residential areas (Figures 3 and 4). The 2-mile Study Area consists primarily of agricultural land, scattered trees, and pasture with several additional single-family rural residences and structures within close proximity (Figures 3 and 4). Several small man-made lakes including Little Lake are scattered throughout the 2-mile Study Area (Figure 2).

According to the USDA Web Soil Survey, soils within the Project area are generally comprised of silty loam or silty clay loam (Appendix E, Attachment B). Kilmore Creek bisects the central portion of the Project area, oriented approximately east-west; additional drainage features, including Boyles Ditch, are located throughout the Project area (Figure 2). Residential development within the unincorporated town of Kilmore is located along the western portion of the Project area along N County Road 0 EW. FEMA 100-year floodplain and Best Available Data from the IDNR depicts approximately 81 acres of floodplains within the Project area. While no FEMA floodway is depicted within the Project area, IDNR Best Available Data depicts approximately 35 acres of floodway within the Project area (Appendix D, Attachment A, Figure 5).

The climate of Clinton County can be characterized by humid hot summers and cold winters with snowfall common (Indiana State Climate Office 2002). For the nearby town of Frankfort, Indiana, the average annual rainfall is 41.09 inches (U.S. Climate Data 2020). During ERP's site survey in July 2019, weather conditions consisted of temperatures between 63˚ Fahrenheit (F) and 83˚F with no precipitation between July 23-24, 2019.

3.2 Land Cover Types

According to the NLCD, land cover consists of 11 distinct classifications within the Project area and consists of 15 distinct classifications within the 2-mile Study Area (Figure 4). The July 2019 field reconnaissance and recent aerial imagery review found the NLCD data to be relatively accurate and representative of the Project area and 2-mile Study Area (Figures 3 and 4). ERP concluded the 11 NLCD land cover types are representative of the typical land cover within the Project area (Table 1; Figure 4). Based on the July 2019 field reconnaissance and recent aerial imagery, the largest land cover classification within the Project area is cultivated crops, consisting of approximately 91.4 percent of the total land cover (Table 1). Developed, open space is the next most prominent land cover classification comprising approximately 3.8 percent of the Project area and consisting of well-maintained lawns and roadside rights-of-way. Both the NLCD and ERP calculates each of the remaining land cover classifications to comprise of less than three (3) percent of the total land area. ERP's observations during the field reconnaissance and review of recent available aerial imagery for onsite land cover is summarized in Table 1 and the attached photographic log (Appendix E).

Table 1: Field-Confirmed NLCD Land Cover Types within the Project Area During Field Reconnaissance for the Hardy Hills Solar Energy Project, Clinton County, Indiana, 2020.

Land Cover Classification	Site Observations	
	~ Acres within Project area	Percent of Total Site Acreage
Cultivated Crops	1,615.3	91.4
Developed, Open Space	66.6	3.8
Deciduous Forest	47.0	2.7
Woody Wetlands	11.6	0.7
Herbaceous	9.7	0.6
Developed, Low Intensity	7.2	0.4
Hay/Pasture	5.1	0.3
Emergent Herbaceous Wetlands	2.2	0.1
Mixed Forest	1.9	0.1
Open Water	0.7	<0.0
Developed, Medium Intensity	0.5	<0.0
Total	**1,767.8**	**100**

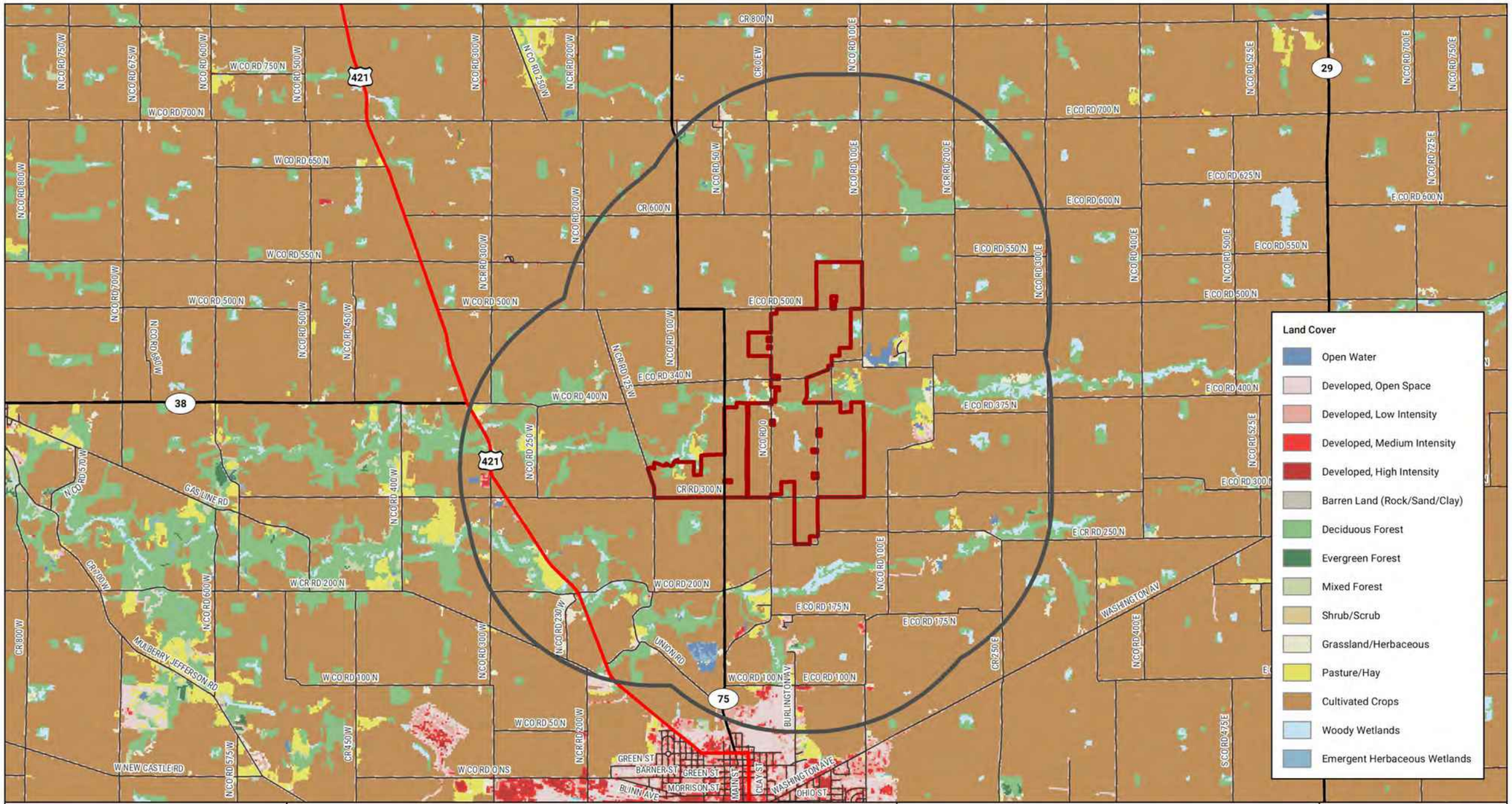
The July 2019 field reconnaissance confirmed that land cover generally matches NLCD land cover within the Project area. Cultivated crops consist primarily of corn with occasional soy fields. Areas classified as herbaceous generally consist of volunteer vegetation and woody vegetation, if present, is less than four (4) feet tall. Areas classified as hay/pasture are fields with non-cash crop vegetation. Maintained fields, yards, and unpaved roads are classified as developed, open space, while paved roads, single-family homes, and farming structures are classified as developed, low intensity by the NLCD.

The dominant land cover identified during the July 2019 vehicular reconnaissance within the 2-mile Study Area consists of cultivated crops, deciduous forest, woody wetlands, and developed, low intensity areas (Figure 4).

Plant species commonly observed within the Project area are listed in Appendix F.

3.3 Waters of the U.S. and Wetlands

The results of a detailed synthesis of a desktop analysis of NHD, NWI, hydric soils, aerial imagery of historic water features, other relevant databases, and the results of an onsite limited field reconnaissance are presented in the attached *Water Resources Analysis* (Appendix D). A formal delineation has not been conducted at the time of this report.


Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land (Rock/Sand/Clay)
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
421
29
38
75
W CO RD 750 N
W CO RD 700 N
W CO RD 650 N
W CO RD 550 N
W CO RD 500 N
W CO RD 400 N
W CR RD 200 N
W CO RD 100 N
W CO RD 50 N
W NEW CASTLE RD
E CO RD 700 N
E CO RD 625 N
E CO RD 600 N
E CO RD 550 N
E CO RD 500 N
E CO RD 400 N
E CO RD 375 N
E CO RD 340 N
E CR RD 250 N
E CO RD 175 N
E CO RD 100 N
CR 600 N
CR RD 300 N
CR 100 N
CR 800 W
N CO RD 750 W
N CO RD 675 W
N CO RD 600 W
N CO RD 500 W
N CO RD 800 W
N CO RD 700 W
N CO RD 570 W
N CO RD 450 W
N CO RD 400 W
N CO RD 575 W
N CO RD 250 W
N CO RD 200 W
N CO RD 100 W
N CR RD 300 W
N CR RD 200 W
N CR RD 125 W
N CO RD 250 W
N CO RD 50 W
N CO RD 0
N CO RD 100 E
N CO RD 200 E
N CO RD 300 E
N CO RD 400 E
N CO RD 500 E
N CO RD 525 E
N CO RD 625 E
N CO RD 700 E
N CO RD 725 E
N CO RD 750 E
E CR RD 300 N
E CO RD 550 N
E CO RD 500 N
E CO RD 600 N
E CO RD 625 N
E CO RD 700 N
E CO RD 525 E
E CO RD 400 E
E CO RD 300 N
E CO RD 250 N
E CO RD 175 N
E CO RD 100 N
S CO RD 475 E
GR 250 E
GASLINE RD
MULBERRY JEFFERSON RD
UNION RD
WASHINGTON AV
BURLINGTON AV
GREEN ST
BARNER ST
MORRISON ST
BLUNN AVE
MAIN ST
CLAY ST
OHIO ST
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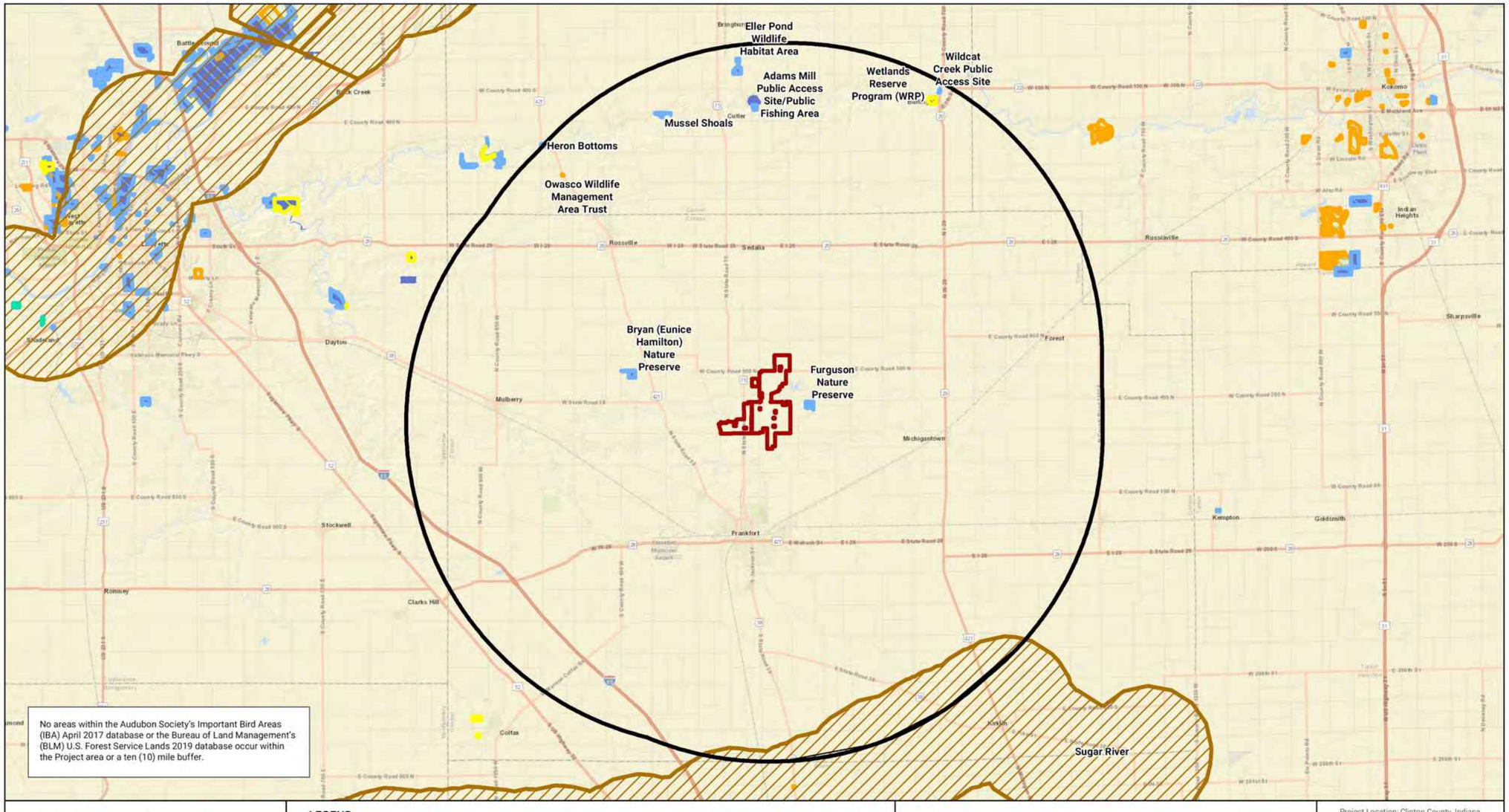
ENERGY RENEWAL PARTNERS, LLC
LEGEND
Project Area (~1,770 acres)
Project Area Buffer (2 miles)
Hardy Hills Solar Energy Project
Land Cover
MRLC National Land Cover Database (2016)
Project Location: Clinton County, Indiana
N
0
0.5
1
Mile
FIGURE 4
Prepared by: J. Hobbs
Date: 2020-04-30



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ENERGY RENEWAL PARTNERS, LLC

LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (10 miles)
- National Conservation Easement (NCED 2018)
- The Nature Conservancy Land (TNC 2019)
- The Nature Conservancy Area (TNC 2011)
- Managed Lands (IDNR 2019)
- Protected Area (PADUS 2019)
- Protected/Managed Lands (TNC Wind Right Wildlife Layers 2019)

Hardy Hills Solar Energy Project

Federal and State Managed Lands

Project Location: Clinton County, Indiana

N

0 1.5 3 Miles

FIGURE 5

Prepared by: J. Hobbs | Date: 2020-04-30

3.4 Special Management Areas

A desktop evaluation was conducted using multiple publicly available databases to document special biological resource management areas, such as conservation easements and state or federal lands managed for biodiversity, within the Project area and a 10-mile buffer (Figure 5). These databases are listed in Section 2.1. No federal or state managed lands are located within the Project area.

Results of this effort indicate that 11 protected areas are within ten (10) miles of the Project area, including seven (7) Managed Lands from IDNR, one (1) management area trust identified on PADUS, one (1) wetland reserve program area identified on NCED, one (1) public fishing area identified on TNC Wind Right Tool, and one (1) Nature Conservancy area (Figure 5). While no federal or state managed lands are within the Project area, the Ferguson Nature Preserve and Bryan Nature Preserve are the closest state or federally managed lands to the Project area. The NHDC identified the Phil and Joan Ferguson Nature Preserve, which is owned and managed by the Niches Land Trust and located within half a mile of the Project area, as the only high quality natural community within the 2-mile Study Area (Figure 5; Appendix C). The Bryan (Eunice Hamilton) Nature Preserve, an IDNR Managed Land, is a deciduous hardwood forest approximately three (3) miles west of the Project area surrounded by farmland. All other state and federally managed lands are approximately eight (8) to ten (10) miles north of the Project area located along Wildcat Creek in Carroll County, Indiana. No high-quality natural areas, critical areas, or state areas of importance were identified by NHDC to occur within the Project area. Little Lake is a local reservoir located approximately 0.47 miles east of the Project area that is managed by local entities.

3.5 Federal- and State-Protected Species

3.5.1 Federally Protected Species

An Official Species List and unofficial Resource List was obtained from the USFWS utilizing the IPaC regulatory review process. According to the IPaC Official Species List for the Project area and the IPaC Resource List for the 2-mile Study Area, a total of two (2) federally listed species should be considered in an effects analysis for the Project area and 2-mile Study Area (Appendix A). Federally listed species identified in the IPaC Official Species List include the federally and state endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*). According to the IPaC Official Species List for the Project area and the IPaC Resource List for the 2-mile Study Area, there is no critical habitat for federally listed species within the Project area or 2-mile Study Area.

3.5.1.1 Indiana Bat (*Myotis sodalis*)

The state and federally endangered Indiana bat roosts and forages in wooded riparian stream corridors and in bottomland and upland forests within one (1) to three (3) miles of small to medium rivers and hibernates in caves and abandoned mines (USFWS 2019b). Roosting takes place during the summer months, approximately May 15 to August 15. Final critical habitat is designated for Indiana bats as they hibernate in large numbers in only a few known caves. Final critical habitat within the state of Indiana occurs approximately 72 miles south of the Project area and includes Big Wyandotte Cave in Crawford County, Indiana and Ray's Cave in Greene County, Indiana (USFWS Midwest Region 2019).

According to the NHDC, there is record of one (1) summer capture of the Indiana bat within the Project area or 2-mile Study Area. This element occurrence is documented by NHDC as occurring at Brack Survey

Site G in 1991, though the exact location of the survey site was not released (Appendix C). No known maternity roosts or hibernacula occur within five (5) miles of the Project area (IDNR NHDC). Land cover classified as woody wetlands, mixed forest, or forested areas within the Project area and 2-mile Study Area constitutes suitable foraging and roosting habitat for the Indiana bat. Approximately 60.5 acres of suitable foraging and roosting habitat occurs within the Project area, and approximately 2,040 acres of suitable foraging and roosting habitat occurs within the 2-mile Study Area (Figure 6). Based on the presence of suitable habitat, this species has potential to occur within the Project area and 2-mile Study Area.

3.5.1.2 Northern Long-Eared Bat (*Myotis septentrionalis*)

The northern long-eared bat is federally threatened with a final 4(d) rule under Section 7 of the ESA. The 4(d) rule of the ESA allows the USFWS to issue regulations for threatened species that provide flexibility to ESA consultation requirements by focusing regulations on prohibited actions such as take while allowing certain activities to continue that do not harm the species. For the northern long-eared bat, the final 4(d) rule, issued in January of 2016, targets this bat's most sensitive life stages of summer roosting and winter hibernacula while minimizing regulatory requirements for landowners, land managers, government agencies, and others within the species' range (USFWS 2019c). For the northern long-eared bat, incidental take is not prohibited within the Project area; the IPaC Official Species List specifically states that the northern long-eared bat only needs to be considered by federal agencies. Federal agencies may consult using the 4(d)-rule streamlined process while transportation projects may consult using the programmatic process (Appendix A).

In the summer, the northern long-eared bat forages in upland forested areas and roosts in dead tree snags, large trees with shaggy bark, bridges, and sometimes old or abandoned buildings. Similar to the Indiana bat, roosting takes place during the summer months, approximately May 15 to August 15. As these habitats are not in short supply, the USFWS determined that no summer critical habitat should be designated. In the winter, the northern long-eared bat uses caves and abandoned mines as hibernacula (USFWS 2019c). Because the spread of white-nose syndrome in caves and mines provides the most threat to the species, the USFWS determined that no critical habitat should be designated in order to protect the caves from vandalism and disturbance that could further spread white-nose syndrome.

Known locations of northern long-eared bat maternity roosts and hibernacula are not publicly available within Indiana outside of project-specific occurrence records provided by the IDNR NHDC and USFWS IPaC system. The USFWS IPaC Official Species List for the Project area and Resource List for the 2-mile Study Area did not reveal records of maternity roosts or hibernacula occurring within the Project area or 2-mile Study Area. Based on the desktop and field reconnaissance, land cover designated as woody wetlands, mixed forest, or deciduous forest within the Project area and 2-mile Study Area constitutes suitable summer foraging and roosting habitat for the northern long-eared bat. Approximately 60.5 acres of suitable foraging and roosting habitat occurs within the Project area and approximately 2,040 acres of suitable foraging and roosting habitat occurs within the 2-mile Study Area (Figure 6). Based on the presence of suitable habitat, this species has potential to occur within the Project area and 2-mile Study Area.

3.5.1.3 Eagles and Migratory Birds

Although no longer protected under the ESA, bald eagles and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c) which prohibits the take of eagles, including their parts, nests, or eggs (USFWS 2013). The bald eagle utilizes large, super canopy trees located in close proximity to rivers, lakes, and marshes and other large waterbodies where fish, their primary prey, are abundant. The golden eagle prefers habitat consisting of grassland, forested habitat, woodland brushland, and arid deserts and will build nests on cliffs or in super canopy trees (USFWS 2016).

Although ERP observed several raptor species including black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), red-tailed tail hawks (*Buteo jamaicensis*), and American kestrels (*Falco sparverius*) during the field reconnaissance, ERP did not observe protected raptor species nests or protected raptor species individuals onsite or within the 2-mile Study Area (Appendix F). The NHDC eagle nest review indicates that no known bald eagle nests are within a five (5)-mile buffer of the Project area (Appendix C; Figure 7). The eBird database recognizes several locations within five (5) miles of the Project area with bald eagle sightings; however, none of these are within the Project area. The closest bald eagle sighting on the eBird database is within the Frankfort lagoons approximately 0.5 miles south of the Project area. While suitable nesting and foraging habitat occurs within two (2) and five (5) miles of the Project area for the bald eagle, only marginal foraging habitat located along Kilmore Creek occurs within the Project area. In early 2020, Invenergy was made aware that a potential bald eagle nest is located in the vicinity of Little Lake which is approximately 0.47 miles east of the Project area. At the time of this report, this potential bald eagle nest has not been confirmed by regulatory agencies or other qualified individuals.

Golden eagles are known to occur in Indiana over winter and during the spring/fall migration periods. Forested areas abutting open farmland within the Project area and within two (2) and five (5) miles of the Project area provides marginal foraging habitat for the golden eagle.

Details about additional birds of conservation concern including those protected under the Migratory Bird Treaty Act (MBTA) and their probability of presence can be found in the IPaC Resource List (Appendix A).

3.5.2 State Protected Species

Under the Indiana Nongame and Endangered Species Conservation Act, legal protection to state listed species within the state of Indiana is limited to state endangered wildlife species. Of the approximately 150 state endangered wildlife species in Indiana, the NHDC lists five (5) state endangered wildlife species as occurring within Clinton County (Table 2; Appendix B). Of the five (5) state endangered wildlife species within Clinton County, two (2) have a federal listing status – the Indiana bat and the clubshell (*Pleurobema clava*) mussel (Table 2). Because the Indiana bat was reported by USFWS in IPaC, it has been discussed in Section 3.5.1.1, above. The five (5) state endangered wildlife species listed within Clinton County were evaluated for the likeliness of occurrence within the 2-mile Study Area. On March 10, 2020, the NHDC's Taylor Davis responded in writing with the results of the NHDC element occurrence query which identified an elemental occurrence of the Indiana bat, which is discussed in Section 3.5.1.1, above, in 1991 as the only state endangered wildlife species observation occurring within the 2-mile Study Area (Appendix C).

While there are not current take or regulatory restrictions on state species of special concern, their status could change at any time. The federal Candidate and state species of special concern purple lilliput

(*Toxolasma lividus*) and salamander mussel (*Simpsonaias ambigua*) both occur within the county but were not included in the IPaC Official Species List for the Project area or the IPaC Resource List for the 2-mile Study Area. The NHDC element occurrence data indicates that a dead and weathered purple lilliput was found in Kilmore Creek within the 2-mile Study Area in 2014 (Appendix C). Four (4) other state species of special concern have element occurrences within the 2-mile Study Area including the American badger (*Taxidea taxus*), wavyrayed lampmussel (*Lampsilis fasciola*), kidneyshell (*Ptychobranchus fasciolaris*), and the rainbow mollusk (*Villosa iris*) (Appendix C). No site information is provided for the American badger but the mollusk species were found in Kilmore Creek and South Fork Wildcat Creek.

Because there are no state regulations prohibiting incidental take of state listed plant or insect species and no violations for any incidental take as a result of other activities, state listed plants and insects were not included in this analysis.

3.5.2.1 Mollusks and Fish

There is one (1) state endangered mollusk species listed in the IDNR List of Endangered, Threatened and Rare Species for Clinton County, (Appendix B). The state and federal endangered clubshell (*Pleurobema clava*) prefers habitat consisting of small- to medium-sized streams, with clean, loose sand and gravel substrates (USFWS 2019a). According to the USFWS Fact Sheet, the clubshell occurs only in portions of 12 streams throughout the U.S. (USFWS 2019a). Although the IDNR lists the clubshell as occurring within Clinton County, this species is not included in the IPaC Official Species List which, according to the USFWS, indicates which ESA-listed species should be considered in an effects analysis for the Project area based on known and expected range. While the specific streams that the clubshell inhabit were not released as a part of this study, based on the absence of the clubshell from the IPaC Official Species List, for the Project area and the IPaC Resource List for the 2-mile Study Area, the species is unlikely to occur within the Project area.

3.5.2.2 Birds

There are three (3) bird species that are included in the IDNR County List of Endangered, Threatened, and Rare Species for Clinton County (Appendix B). The state endangered sedge wren (*Cistothorus platensis*) overwinters in the Gulf Coast states; nests in shrubs during spring in local wetlands and hayfields; forages in local wetlands, tall grasslands, and wet meadows; and departs in the fall (Nature Serve 2020). Review of publicly available data revealed no sightings of the sedge wren within the Project area or 2-mile Study Area (eBird 2020). Potential foraging habitat and spring nesting habitat for the sedge wren occurs within the Project area (Figure 4). Based on available habitat and known or anticipated range, this species is likely to occur within the Project area in the spring, summer, and fall.

The state endangered loggerhead shrike (*Lanius ludovicianus*) overwinters in the southern portions of the U.S. and Central America; nests in trees during the spring in local herbaceous habitats; forages in pastures, cultivated crops, and riparian areas; and departs in late summer (Nature Serve 2020). Review of publicly available data revealed no sightings of the Loggerhead shrike within the Project area or Project are buffer (eBird 2020). Preferred foraging habitat and spring nesting habitat for the loggerhead shrike occurs within the Project area (Figure 4). Based on the available habitat and its known or anticipated range, this species is likely to occur within the Project area in the spring, summer, and fall.

The state endangered black-crowned night-heron (*Nycticorax nycticorax*) overwinters in Central America; nests in trees during spring in local woody wetlands; forages in open water, wetlands, and large stream/rivers; and departs in the fall (Nature Serve 2020). Review of publicly available data revealed the closest black-crowned night-heron sighting was within the Frankfort lagoons approximately 0.5 miles south of the Project area (eBird 2020). No other sightings are recorded within the 2-mile Study Area. Potential foraging habitat and spring nesting habitat for the black-crowned night-heron occurs within the Project area and 2-mile Study Area (Figure 4). Based on the available habitat and its known or anticipated range, this species is likely to occur within the Project area in the spring, summer, and fall.

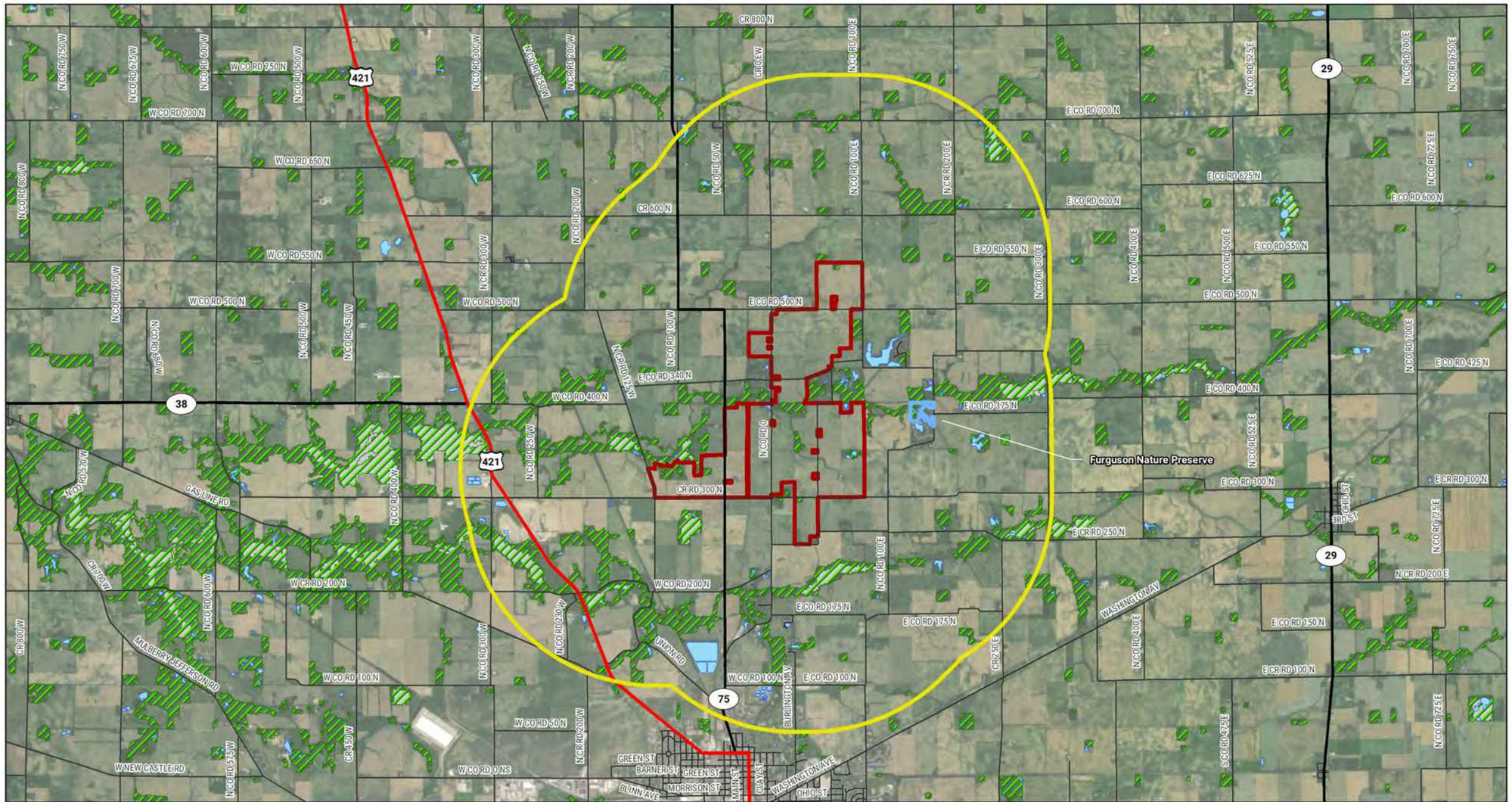
Table 2: Protected Species Habitat Requirements and Investigation Findings for the Hardy Hills Solar Energy Project, Clinton County, Indiana, 2020.

Common Name	Scientific Name	Status	Habitat by season/ NLCD and Equivalent Land Cover Types	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project Area			
				Spring	Summer	Fall	Winter
Birds							
Sedge Wren	*Cistothorus platensis*	SE	Overwinters in the Gulf Coast states; nests in shrubs during spring in local wetlands and hayfields; forages in local wetlands, tall grasslands, and wet meadows; departs in fall. Grassland/herbaceous, emergent herbaceous wetlands, open water, cultivated crops.	Likely	Likely	Likely	Unlikely
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA	Year-round resident; nests in large trees during spring and summer; forages near water and herbaceous habitats in spring, summer, fall, and winter. Deciduous forest, evergreen forest, mixed forest, shrub/scrub.	Likely	Likely	Likely	Likely
Golden Eagle	*Aquila chrysaetos*	BGEPA	Occurs in Indiana during migration and winter seasons. Grassland, forested habitat, woodland brushland, and arid deserts and will build nests on cliffs or in super canopy trees.	Unlikely	Unlikely	Possible	Possible
Loggerhead Shrike	*Lanius ludovicianus*	SE	Overwinters in the southern portions of the U.S. and Central America; nests in trees during the spring in local herbaceous habitats; forages in pastures, cultivated crops, and riparian areas; departs in late summer. Shrub-scrub, grassland/herbaceous, pasture/hay, mixed forest.	Likely	Likely	Likely	Unlikely
Black-crowned Night-heron	*Nycticorax nycticorax*	SE	Overwinters in Central America; nests in trees during spring in local woody wetlands; forages in open water, wetlands, and large stream/rivers; departs in fall. Emergent herbaceous wetlands, open waters.	Likely	Likely	Likely	Unlikely

Common Name	Scientific Name	Status	Habitat by season/ NLCD and Equivalent Land Cover Types	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project Area			
				Spring	Summer	Fall	Winter
Mammals							
Indiana Bat	*Myotis sodalis*	LE SE	Hibernates in caves or mines during winter; roosts in spring under loose tree bark on dead or dying trees; forages in or along edges of forested areas during spring, summer, and fall. Deciduous forest, cultivated crops, streams.	Likely	Likely	Likely	Unlikely
Northern Long-Eared Bat	*Myotis septentrionalis*	LT	In the summer, the northern long-eared bat forages in upland forested areas and roosts in dead tree snags, large trees with shaggy bark, bridges, and sometimes old or abandoned building. In the winter, the northern long-eared bat uses caves and abandoned mines as hibernacula.	Likely	Likely	Likely	Unlikely
Mollusk							
Clubshell	*Pleurobema clava*	LE SE	The clubshell is usually found in small- to medium-sized streams and rivers, and prefers clean, loose sand and gravel substrates. This mussel will bury itself in the substrate up to four (4) inches. It is known to occur in portions of only 12 streams.	Unlikely	Unlikely	Unlikely	Unlikely

Note: SE = State Endangered; LE = Federally Listed Endangered; LT = Federally Listed Threatened; C = Federal Candidate Species; BGEPA = Bald and Golden Eagle Protection Act

Known are species identified by NHDC as having element occurrences within the 2-mile Study Area.
Likely are species whose known or anticipated range are within the 2-mile Study Area and supporting habitat occurs within the Project area.
Possible are species whose known or anticipated range are within the 2-mile Study Area, but no supporting habitat occurs within the Project area.
Unlikely are species that occur within the county but whose known or anticipated range are not within the Project area. This includes federally listed species that do not appear in the IPaC Official Species List.



1221 South MoPac Expressway, Suite 225
Austin, Texas 78746 | 512-222-1125
www.energyrenewalpartners.com

ENERGY RENEWAL PARTNERS, LLC

LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)
- Water Body
- Forest / Woody Wetland (NLCD 2016)

TNC Wind Right Wildlife Layers (2019)

- Whooping Crane Stopover Site
- Intact Natural Habitat

Hardy Hills Solar Energy Project

Natural Communities of Potential Concern

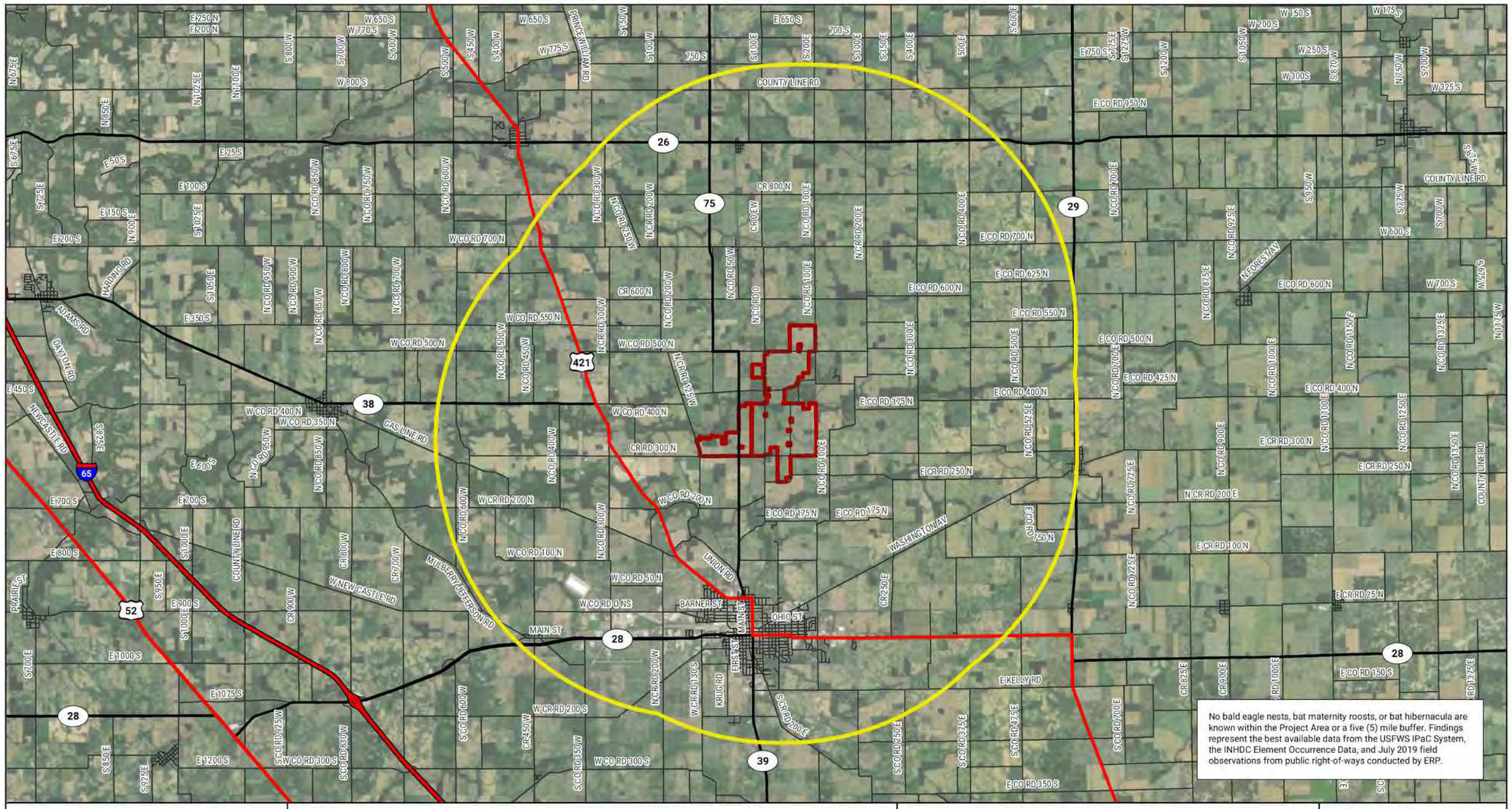
Project Location: Clinton County, Indiana

N

0 0.5 1 Mile

FIGURE 6

Prepared by: J. Hobbs | Date: 2020-04-30



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Austin, Texas 78746 | 512-222-1125
www.energyrenewalpartners.com
ENERGY RENEWAL PARTNERS, LLC

LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (5 miles)

Hardy Hills Solar Energy Project

Known Species Occurrences

Project Location: Clinton County, Indiana

N

0 0.9 1.8 Mile

FIGURE 7

Prepared by: J. Hobbs | Date: 2020-04-30

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Appendix A

USFWS Information for Planning and Consultation Official Species List and Resource List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Indiana Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273
http://www.fws.gov/midwest/Endangered/section7/s7process/step1.html

In Reply Refer To: March 25, 2020
Consultation Code: 03E12000-2020-SLI-1129
Event Code: 03E12000-2020-E-05101
Project Name: Hardy Hills

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

To Whom It May Concern:

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.

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 Service if they determine their project “may affect” listed species or critical habitat.

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. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation and completing the same process you used to receive the attached list. As an alternative, you may contact this Ecological Services Field Office for updates.

Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at - http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions which will help you

determine if your project will have an adverse effect on listed species and will help lead you through the Section 7 process.

For all **wind energy projects** and **projects that include installing towers that use guy wires or are over 200 feet in height**, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project or may be affected by your proposed project.

Although no longer protected under the Endangered Species Act, be aware that bald eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*) and Migratory Bird Treaty Act *(*16 U.S.C. 703 *et seq*), as are golden eagles. Projects affecting these species may require measures to avoid harming eagles or may require a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at http://www.fws.gov/midwest/midwestbird/EaglePermits/index.html to help you determine if you can avoid impacting eagles or if a permit may be necessary.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

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:

Indiana Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
(812) 334-4261

Project Summary

Consultation Code: 03E12000-2020-SLI-1129

Event Code: 03E12000-2020-E-05101

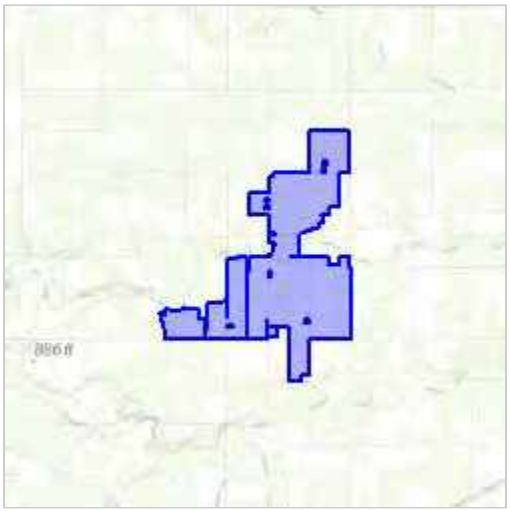
Project Name: Hardy Hills

Project Type: POWER GENERATION

Project Description: Potential solar farm construction.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.343990640000044N86.49875946852684W



Counties: Clinton, IN

Endangered Species Act Species

There is a total of 2 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 1 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.

---

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 is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/1/office/31440.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Incidental take of the NLEB is not prohibited here. Federal agencies may consult using the 4(d) rule streamlined process. Transportation projects may consult using the programmatic process. See www.fws.gov/midwest/endangered/mammals/nleb/index.html Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

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

IPaC **U.S. Fish & Wildlife Service**

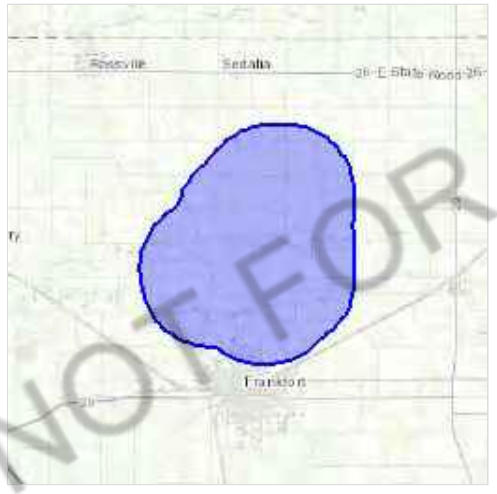
IPaC resource list

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.

Location

Clinton County, Indiana



Local office

Indiana Ecological Services Field Office

(812) 334-4261
(812) 334-4273

620 South Walker Street
Bloomington, IN 47403-2121

http://www.fws.gov/midwest/Endangered/section7/s7process/step1.html

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. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. 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 Fisheries[2]).

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.

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 Myotis sodalis — Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5949

Northern Long-eared Bat Myotis septentrionalis — Threatened

This species only needs to be considered if the following condition applies:

- Incidental take of the NLEB is not prohibited here. Federal agencies may consult using the 4(d) rule streamlined process. Transportation projects may consult using the programmatic process. See www.fws.gov/midwest/endangered/mammals/nleb/index.html

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9045

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 Act[2].

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.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

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 (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

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 and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

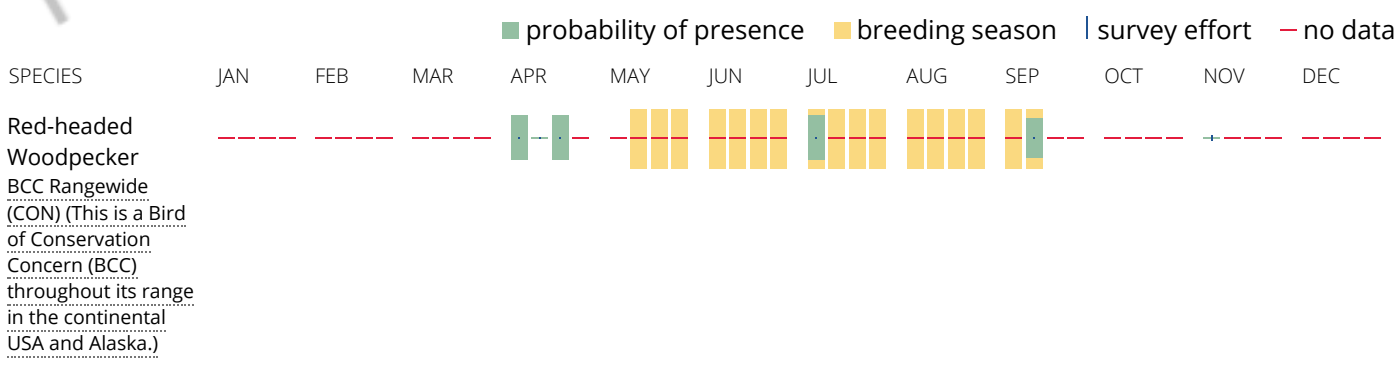
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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 AKN Phenology 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 POND
Palustrine

LAKE
Lacustrine

RIVERINE
Riverine

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 tuberficid 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.

Appendix B
IDNR County List of Endangered, Threatened, and Rare Species

Indiana County Endangered, Threatened and Rare Species List

County: Clinton

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
Alasmidonta viridis	Slippershell Mussel		SSC	G4G5	S3
Eurynia dilatata	Spike		SSC	G5	S4
Lampsilis fasciola	Wavyrayed Lampmussel		SSC	G5	S3
Pleurobema clava	Clubshell	LE	SE	G1G2	S1
Ptychobranchus fasciolaris	Kidneyshell		SSC	G4G5	S2
Simpsonaias ambigua	Salamander Mussel	C	SSC	G3	S2
Toxolasma lividus	Purple Lilliput	C	SSC	G3Q	S2
Villosa iris	Rainbow		SSC	G5	S3
Bird					
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Haliaeetus leucocephalus	Bald Eagle		SSC	G5	S2
Lanius ludovicianus	Loggerhead Shrike		SE	G4	S3B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Mammal					
Myotis sodalis	Indiana Bat	LE	SE	G2	S1
Taxidea taxus	American Badger		SSC	G5	S2
High Quality Natural Community					
Forest - flatwoods central till plain	Central Till Plain Flatwoods		SG	G3	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2

Appendix C
Indiana Natural Heritage Data Center Response Letter

Division of Nature Preserves
402 W. Washington St., Rm W267
Indianapolis, IN 46204-2739

March 10, 2020

Sean Martin
Energy Renewal Partners, LLC
127 W Worthington Ave, Suite 270
Charlotte, North Carolina 28203

Dear Sean Martin:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas for Hardy Hills a Utility-scale Solar Energy Facility located in Clinton County, Indiana. The Indiana Natural Heritage Data Center has been checked and included you will find a datasheet with information on the ETR species and high quality natural communities documented within 2 miles of the project area. There were no bald eagle nests or bat maternity roots documented within 5 miles of the project area.

Within a half mile of the project location is the Phil and Joan Ferguson Nature Preserve which is owned and managed by Niches Land Trust. For more information about this property please contact Niches Land Trust, niches@nicheslandtrust.org or (765) 423 – 1605.

For more information on the animal species mentioned, please contact Christie Stanifer, Environmental Coordinator, Division of Fish and Wildlife, 402 W. Washington Room W273, Indianapolis, Indiana, 46204, (317)232-8163.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. If you have concerns about potential Endangered Species Act issues you should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service
620 South Walker St.
Bloomington, Indiana 47403-2121
812-334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal. For more information, please contact:

Department of Natural Resources
Attn: Christie Stanifer
Environmental Coordinator
Division of Fish and Wildlife
402 W. Washington Street, Room W273
Indianapolis, IN 46204
(317)232-8163

Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)233-2558 if you have any questions or need additional information.

Sincerely,

Taylor Davis

Taylor Davis
Indiana Natural Heritage Data Center

Enclosure: invoice
datasheet

March 10, 2020

INDIANA HERITAGE DATA WITHIN 2.0 MILES OF:

Hardy Hills - Utility-scale Solar Energy Facility, Clinton County

Sci. Name	Com. Name	State	Fed.	Date	Site	Comments
Mammal						
Myotis sodalis	Indiana Bat	SE	LE	1991	1991 BRACK SURVEY SITE G	BAT SUMMER CAPTURE
Taxidea taxus	American Badger	SSC		1985		
Mollusk						
Lampsilis fasciola	Wavyrayed Lampmussel	SSC		2014	KILMORE CREEK	2014: LIVE (FISHER)
Ptychobranchus fasciolaris	Kidneyshell	SSC		2004	SOUTH FORK WILDCAT CREEK	HISTORICAL; WEATHERED DEAD. (FISHER AND BRIGGS, 2004).
Toxolasma lividus	Purple Lilliput	SSC	C	2014	KILMORE CREEK	2014: WEATHERED DEAD (FISHER)
Villosa iris	Rainbow	SSC		2018	KILMORE CREEK	WEATHERED DEAD (FISHER, 2018)

Fed: LE= Listed Federal endangered; C = Federal candidate species

State: SE = State endangered; ST= State threatened; SR = State rare; SSC = State species of special concern; SG = State significant; WL = watch list; no rank - not ranked but tracked to monitor status

Appendix D
Water Resources Analysis

Water Resources Analysis

Hardy Hills Solar Energy Project

Clinton County, Indiana

June 2020

Prepared for:
Invenergy Solar Project Development LLC
One South Wacker Drive, Suite 1800
Chicago, Illinois 60606

Prepared by:
Energy Renewal Partners, LLC
1221 South MoPac Expressway, Suite 225
Austin, Texas 78746

June 11, 2020

Daniel Roberts, PWS
Senior Biologist

Sean Martin
Project Manager

Table of Contents

Tables

Attachments

1.0 Project Background

Invenergy Solar Project Development LLC (Invenergy) is proposing to develop the Hardy Hills Solar Energy Project (the "Project") in Clinton County, Indiana (Attachment A, Figure 1). ERP initially completed tasks in July and August of 2019 under the June 19, 2019 Request for Proposal (RFP), at which time the Project consisted of an area encompassing approximately 6,430 acres. On February 7, 2020, Invenergy requested ERP update the studies to reflect the final leased parcels, which total approximately 1,770 acres (the "Project area") within the larger, previously studied area. The Project area is in the north-central portion of Clinton County approximately 1.5 miles north of the city of Frankfort. The Project is being developed as a solar energy facility with an installed capacity of up to 195 megawatts (MW), and Invenergy proposes that the Project will obtain a commercial operation date (COD) of 2023. Although the final design of the solar facility has not been completed, the Project will likely entail the installation of photovoltaic (PV) modules, inverters, an underground electrical collection system, internal project roads, security fencing, operation and maintenance (O&M) structures, as well as temporary parking and laydown areas.

At the request of Invenergy, ERP has prepared this detailed, stand-alone report of the findings of a desktop review of potential aquatic resources within the Project area supplemented with the July 2019 site reconnaissance. This Water Resources Analysis included conducting a desktop review of relevant literature, database sources, and subsequent limited field study (detailed in Sections 3.1 and 3.2, below). At the time of this report, a formal Waters of the U.S. delineation of the Project area has not been conducted.

1.1 Project Location and Preliminary Description

The approximately 1,770-acre Project area is located in north-central Clinton County, Indiana approximately 1.5 miles north of the city of Frankfort (Attachment A, Figure 1). Onsite elevation ranges from approximately 800 to 870 feet above mean sea level (AMSL) and the topography is similar throughout the Project area with steeper areas occurring along Kilmore Creek and Boyles Ditch (Attachment A, Figure 1). The Project area consists primarily of cultivated crops with scattered forested areas and rural residential areas (Attachment A, Figure 2). The Project area buffer consists primarily of cultivated crops scattered trees, and pasture with several additional single-family rural residences and structures within close proximity. Several small man-made lakes including Little Lake are scattered throughout the Project area buffer (Attachment A, Figure 2).

The climate of Clinton County can be characterized by humid hot summers and cold winters with snowfall common (Indiana State Climate Office 2002). For the nearby town of Frankfort, Indiana, the average annual rainfall is 41.09 inches (U.S. Climate Data 2019). During ERP's site survey, weather conditions consisted of temperatures between 63˚ Fahrenheit (F) and 83˚F with no precipitation between July 23-24, 2019.

1.2 Regulatory Considerations

The federal Clean Water Act (CWA) affords protections to waters of the U.S. (WoUS), as defined in 40 CFR 230.3 and hereinafter referred to as jurisdictional waters. Pursuant to Section 404 of the CWA and subsequent judicial review, jurisdictional waters are surface water features that are or have a connection

to a Relatively Permanent Water (RPW) or a Traditional Navigable Water (TNW). Such surface waters can include lakes and ponds, linear features such as streams, agricultural ditches and canals, and wetlands.

Linear water features are assessed for the evidence of a continuous bed and bank and an ordinary high water mark (OHWM), in accordance with the U.S. Army Corps of Engineers (USACE) Regulatory Guidance Letter No. 05-05, Ordinary High Water Mark Identification, and the 2011 EPA Draft Guidance on Identifying Waters Protected by the CWA. Wetlands are assessed according to a three (3)-parameter approach that requires positive evidence of 1) wetland hydrology; 2) hydrophytic vegetation; and, 3) hydric soils. Standard federal practice for assessing the possible presence of wetlands is to follow the guidance of the Routine Onsite Determination Method, as defined in the USACE Wetlands Delineation Manual (1987) and appropriate regional supplemental guides. The Northcentral and Northeast Regional Supplement Guide (USACE 2012) applies for the Project location. Implementation of federal regulatory authority over jurisdictional waters is administered by the USACE.

The USACE regulates the discharge of dredged or fill materials into WoUS, including wetlands. Should impacts to WoUS be proposed a Section 404 permit from the USACE may be required. The duration, volume, type, and location of specific proposed impacts will determine what permit type may be required.

Section 401 of the CWA extends regulatory authority to individual states and the pertinent regulatory agency so designated by each state. The Indiana Department of Environmental Management (IDEM) serves as the Section 401 Certification program for federal Section 404 permits issued under the CWA in Indiana. A Section 401 Water Quality Certification (WQC) from IDEM must be issued within any Section 404 permit. Additionally, IDEM regulates isolated waters, which are not regulated under Section 404, under Indiana's State Isolated Wetlands law (Indiana Code 13-18-22). Impacts to isolated wetlands require State Isolated Wetland Permits from IDEM.

2.0 Methodology

During the desktop review, ERP personnel reviewed relevant, supporting information including the U.S. Geological Survey (USGS) Topographic National Map (Attachment A, Figure 1), representative aerial imagery (Attachment A, Figure 2), the USGS National Hydrography Dataset (NHD) (Attachment A, Figure 3), the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (Attachment A, Figure 3), the Federal Emergency Management Agency (FEMA) Flood Hazard Index (Attachment A, Figure 3), the Indiana Department of Natural Resources (IDNR) Best Available Flood Data (Attachment A, Figure 3), and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Clinton County Web Soil Survey (NRCS 2019) and USDA publication Hydric Soils of the U.S. (Attachment B).

ERP scientists utilized these resources to evaluate the Project area for potential surface waters, wetland features, and drainage areas that could be considered jurisdictional WoUS by the USACE or isolated waters of the State by IDEM. These desktop resources were also used to evaluate the general watershed within the 2-mile Study Area to provide context of potential aquatic resource patterns within the Project area.

In July 2019, ERP conducted an onsite field reconnaissance within parcels leased as of the date of the previous assessment approximate the presence of aquatic resources within the Project area and assist in the characterization of field conditions present within the Project area. Results of the desktop study and field reconnaissance are presented in two (2) formats in Section 3 of the report. Publicly available data consists of data obtained from desktop resources mentioned above. Synthesized data consists of ERP estimated areas likely to be considered potential jurisdictional waters based on the USGS, NWI, NHD, aerial imagery, and the field reconnaissance. Synthesized data is depicted on Figure 6.

At the time of this report, a formal onsite investigation and delineation of aquatic resources within the Project area has not been conducted. As such, the use of desktop resources has allowed ERP to only positively identify aquatic resources which have the potential to be considered WoUS by the USACE or waters of the State. An assessment of whether an aquatic resource would not be regulated by the USACE or IDEM cannot be made at this time.

3.0 Results

3.1 Publicly Available Data

The desktop analysis indicates that potential jurisdictional waters are prevalent throughout the Project area. Onsite waters depicted within the NHD and NWI datasets include approximately 18.6 miles of stream channel and approximately 25 acres of wetlands and ponds (Attachment A, Figures 3 and 4). Two (2) named streams are within the Project area; Kilmore Creek flows east to west along the central portion of the Project area and Boyles Ditch flows east to west in the northern Project area (Attachment A, Figure 1). Floodplains and floodways are located in the central portion of the Project area along Kilmore Creek (Attachment A, Figure 5). While there is no FEMA floodway within the Project area, there are approximately 81.2 acres of FEMA 100-year floodplain located along Kilmore Creek which bisects the Project area (Attachment A, Figure 5). Best Available Data from IDNR depicts approximately 12.6 acres of floodplain fringe and approximately 35 acres of floodway within the Project area (Attachment A, Figure 5).

According to USDA Web Soil Survey, soils within the Project area are generally comprised of silt loam or silty clay loam (Attachment B). The USDA Web Soil Survey revealed 26 soil types with the Project area (Attachment B, pages 10-13). Of the on-site soils, 15 are considered hydric or contain hydric inclusions (Attachment B, pages 77 to 80). These 15 soils comprise of approximately 90.6 percent of the total landcover of the Project area. Site-specific soils information is provided in Attachment B.

3.2 Synthesized Data

Based on the site reconnaissance and aerial imagery, wetlands depicted on NWI were generally found to be present throughout the current Project area (Attachment A, Figure 6). Estimated wetlands within the Project area generally included NWI wetlands and non-NWI-mapped areas where ERP observed evidence of surface hydrogeology and/or vegetation typical of wetland areas (Attachment A, Figure 6; Table 1).

Of the approximately 18.6 miles of stream channels depicted on NHD, ERP estimates approximately 4.9 miles are present within the Project area (Attachment A, Figure 6). Areas depicted on USGS topographic map and NWI as streams were found to be generally accurate. Estimated streams within the Project area include named streams, streams depicted on USGS National Map, and drainages identified in the field as having stream-like characteristics such as OHWM or bed and banks (Attachment A, Figure 6; Table 1).

Potential aquatic resources identified within the Project area are areas mapped as streams on NHD which could be present seasonally or in response to precipitation events (Attachment A, Figure 6; Table 1). While potential aquatic resources did not exhibit stream-like characteristics of an OHWM and bed and bank at the time of the field reconnaissance, evidence of regular flow is present based on these areas not being utilized by farmers for crop production and the presence of culverts along county or state roads.

In summary, based on the results of the desktop assessment and subsequent limited field reconnaissance in July 2019, there are an estimated 48 likely jurisdictional WoUS located partially or wholly within the Project area, totaling an estimated 31.6 acres with an estimated 4.9 miles of channelized streams (Table 1). Kilmore Creek and Boyle's Ditch are the only named systems that occur within the Project area (Attachment A, Figures 1; and Attachment C). Additional potential aquatic resource areas identified during

the field reconnaissance were generally located within cultivated croplands near areas depicted as streams on the NHD (Attachment A, Figures 3 and 4).

Table 1: Synthesized Water Resources Identified in Aerial Imagery and Field Reconnaissance for the Hardy Hills Solar Energy Project, Clinton County, Indiana, 2020

Water Classification	Estimated Area (Acres)	Estimated Length (Miles)
Estimated Wetlands	31.6	N/A
Estimated Streams	N/A	4.9
Potential Aquatic Resource	N/A	13.7
Total	**31.6**	**18.6**

4.0 Conclusion

This report reflects the findings of ERP's desktop synthesis and preliminary field evaluation of water resources, performed on behalf of Invenergy for the Hardy Hills Solar Project. ERP synthesized the preliminary review of potential jurisdictional waters within the proposed boundaries of the Project, pursuant to the CWA. During this preliminary analysis, ERP identified an estimated 48 likely jurisdictional WoUS, totaling an estimated 31.6 acres with an estimated 4.9 miles of stream channels within the Project area. Additionally, approximately 13.7 miles of streams depicted on NHD which have been tiled or buried within agricultural fields should be considered potential aquatic resources and need to be further evaluated for jurisdictional stream and/or wetland characteristics. Generally, water features depicted within the NWI were found to be present, while features depicted within then cultivated crop land appear to have been plowed, buried, or tiled resulting in potentially aquatic areas.

The findings of this report are preliminary and for planning purposes only. A formal Waters of the U.S. delineation of the Project area has not been conducted. The findings of this study do not reflect the official findings or opinion of the USACE or IDEM and are not to be interpreted as such prior to receiving USACE and IDEM verification.

5.0 References

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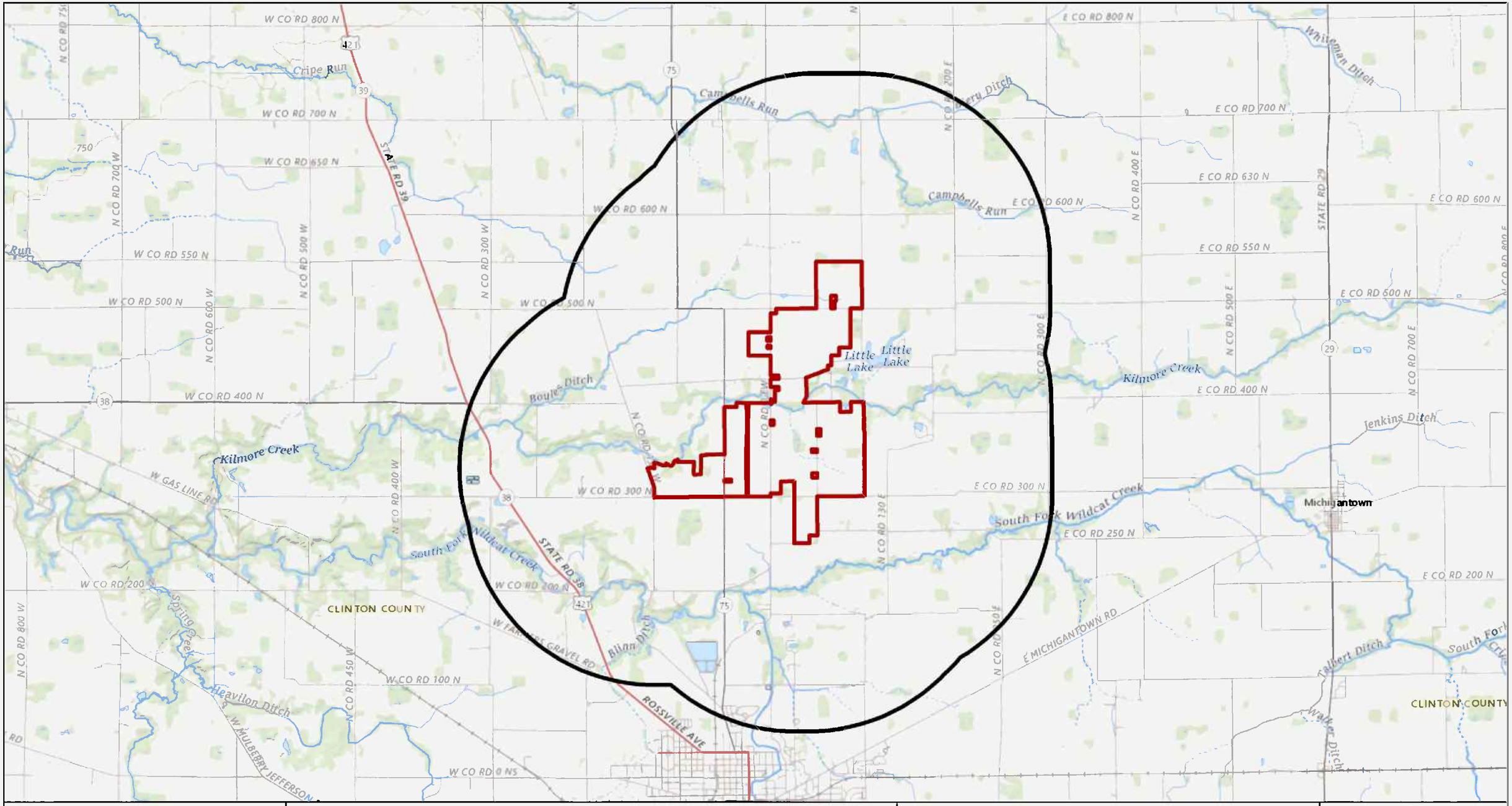
Attachment A
Figures 1-6



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LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)

Hardy Hills Solar Energy Project

Regional Topography
USGS National Map (2020)

Project Location: Clinton County, Indiana

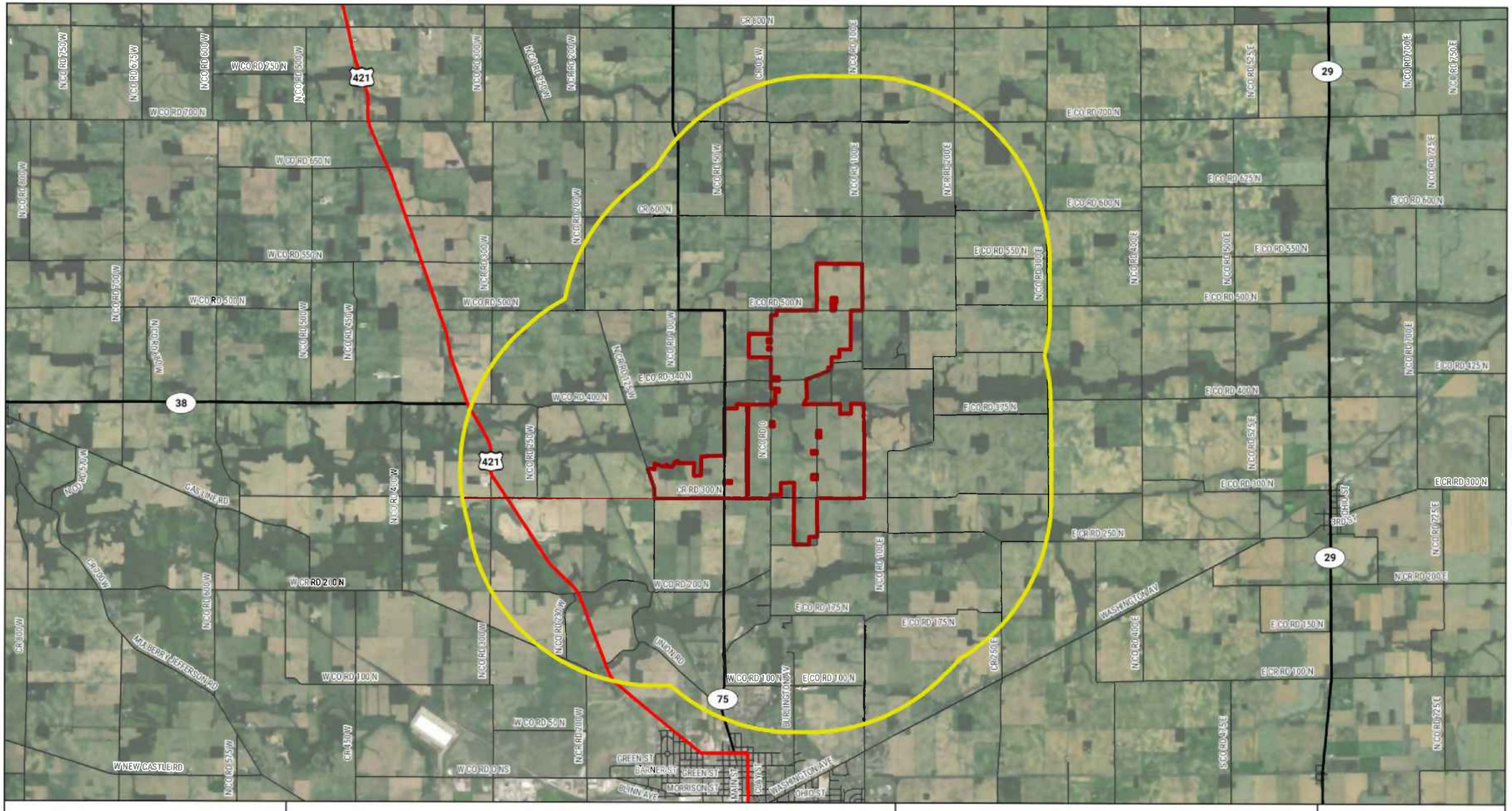
N

0 0.5 1 Mile

FIGURE 1

Prepared by: J. Hobbs

Date: 2020-04-30



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- Project Area Buffer (2 miles)

Hardy Hills Solar Energy Project

Aerial Imagery
Maxar (2018)

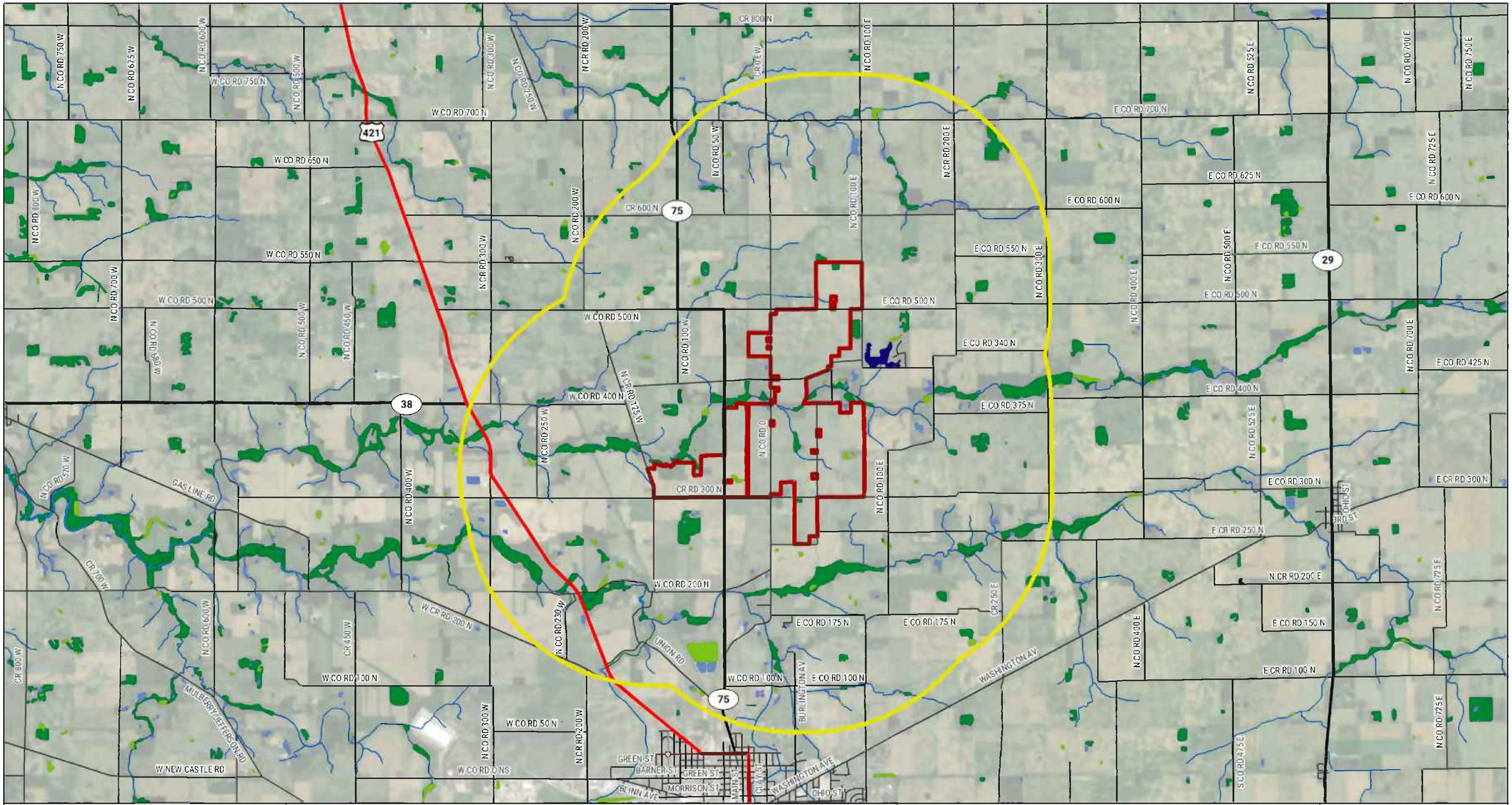
Project Location: Clinton County, Indiana

N

0 0.5 1 Mile

FIGURE 2

Prepared by: J. Hobbs | Date: 2020-04-30



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- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Hardy Hills Solar Energy Project

National Wetland Inventory Waters

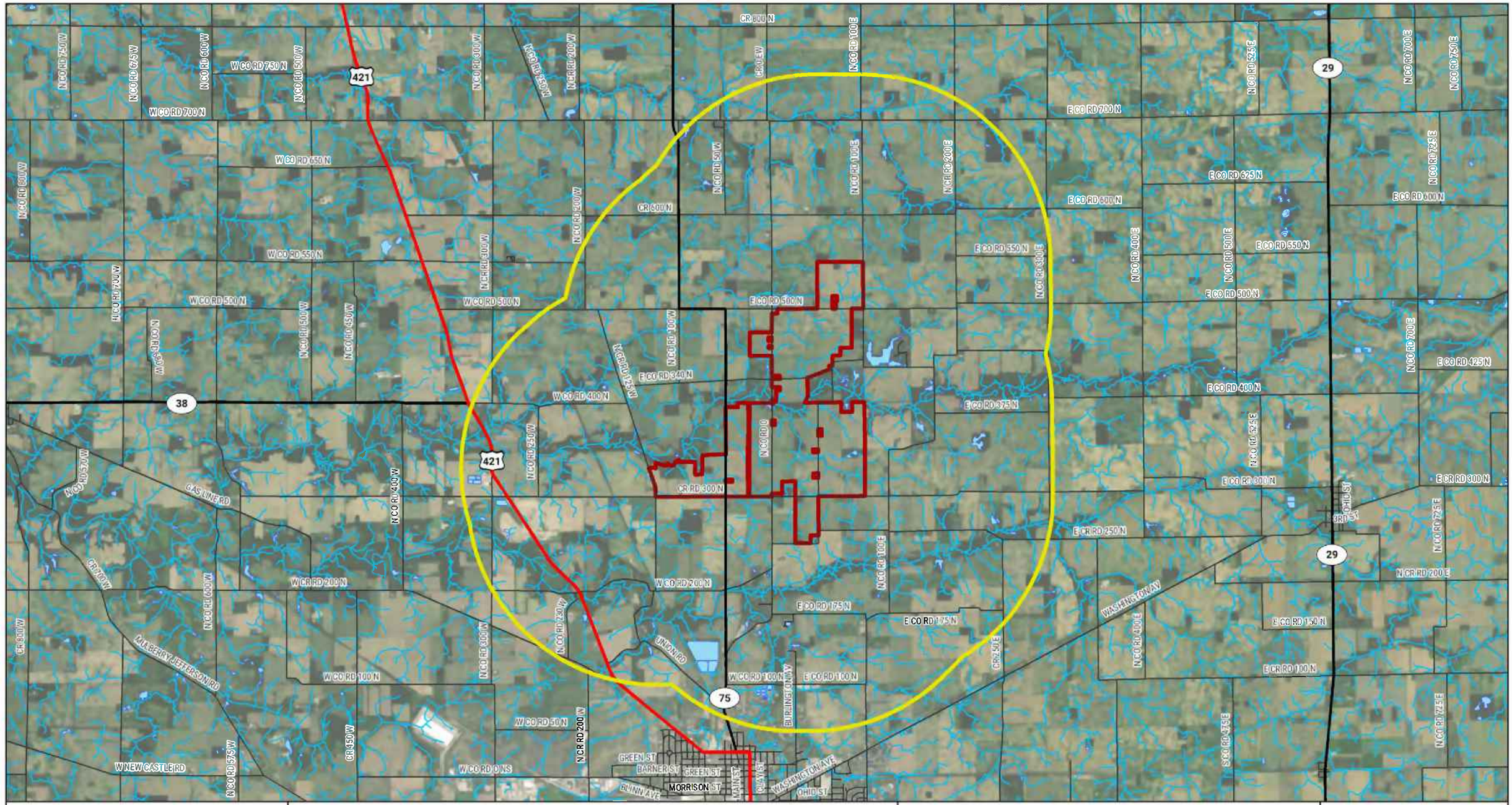
Project Location: Clinton County, Indiana

N

0 0.5 1 Mile

FIGURE 3

Prepared by: J. Hobbs | Date: 2020 04 30



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LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)
- Stream/Drainage
- Water Body

Hardy Hills Solar Energy Project

National Hydrography Dataset Waters

Project Location: Clinton County, Indiana

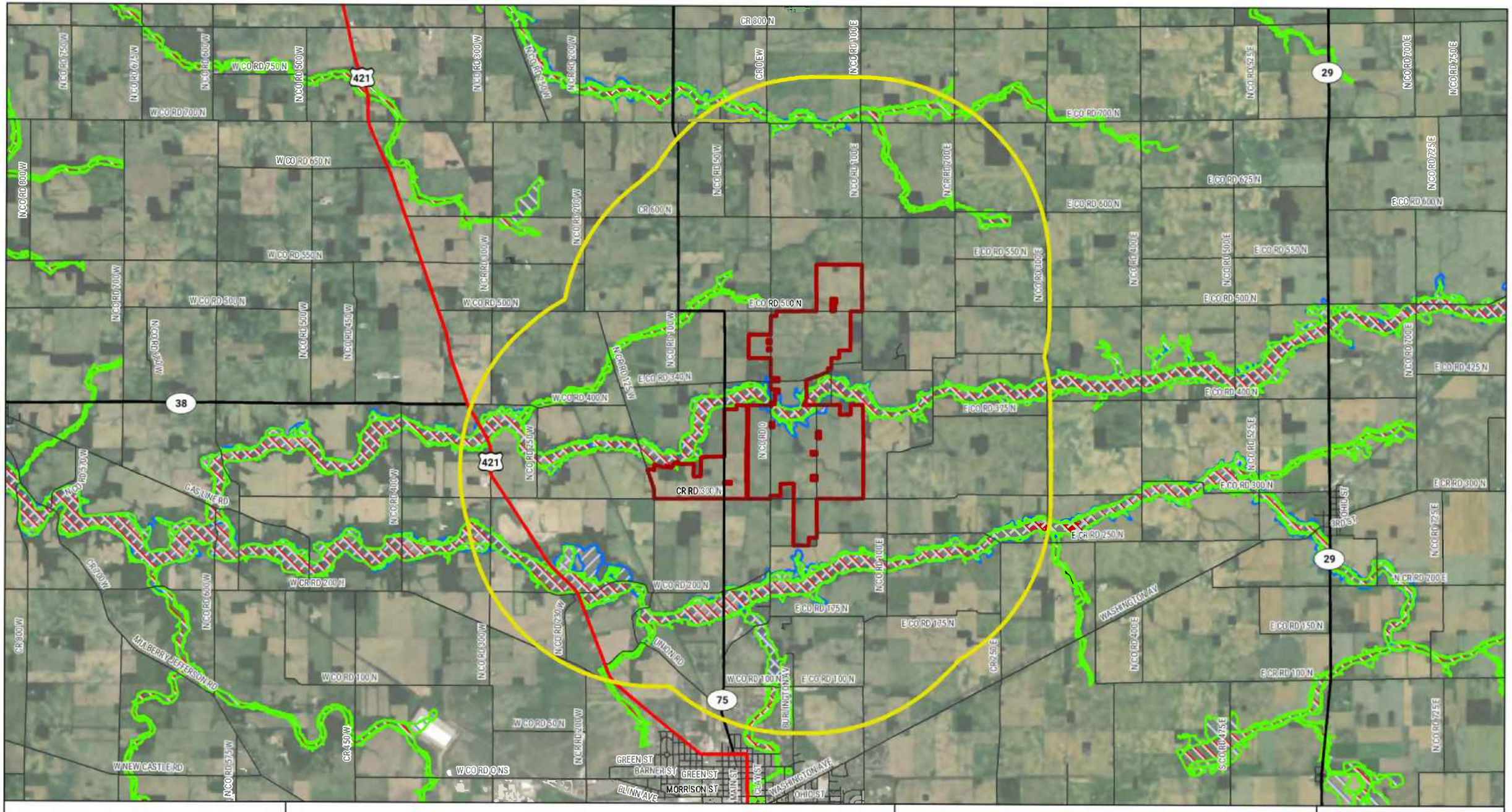
N

0 0.5 1 Mile

FIGURE 4

Prepared by: J. Hobbs

Date: 2020-04-30



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ERP
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LEGEND

- Project Area (~1,770 acres)
- Project Area Buffer (2 miles)
- Floodway (IDNR 2019)
- Floodplain Fringe (IDNR 2019)
- Floodway (FEMA 2011)
- Floodplain (FEMA 2011)

Hardy Hills Solar Energy Project

Flood Hazard Areas

Project Location: Clinton County, Indiana

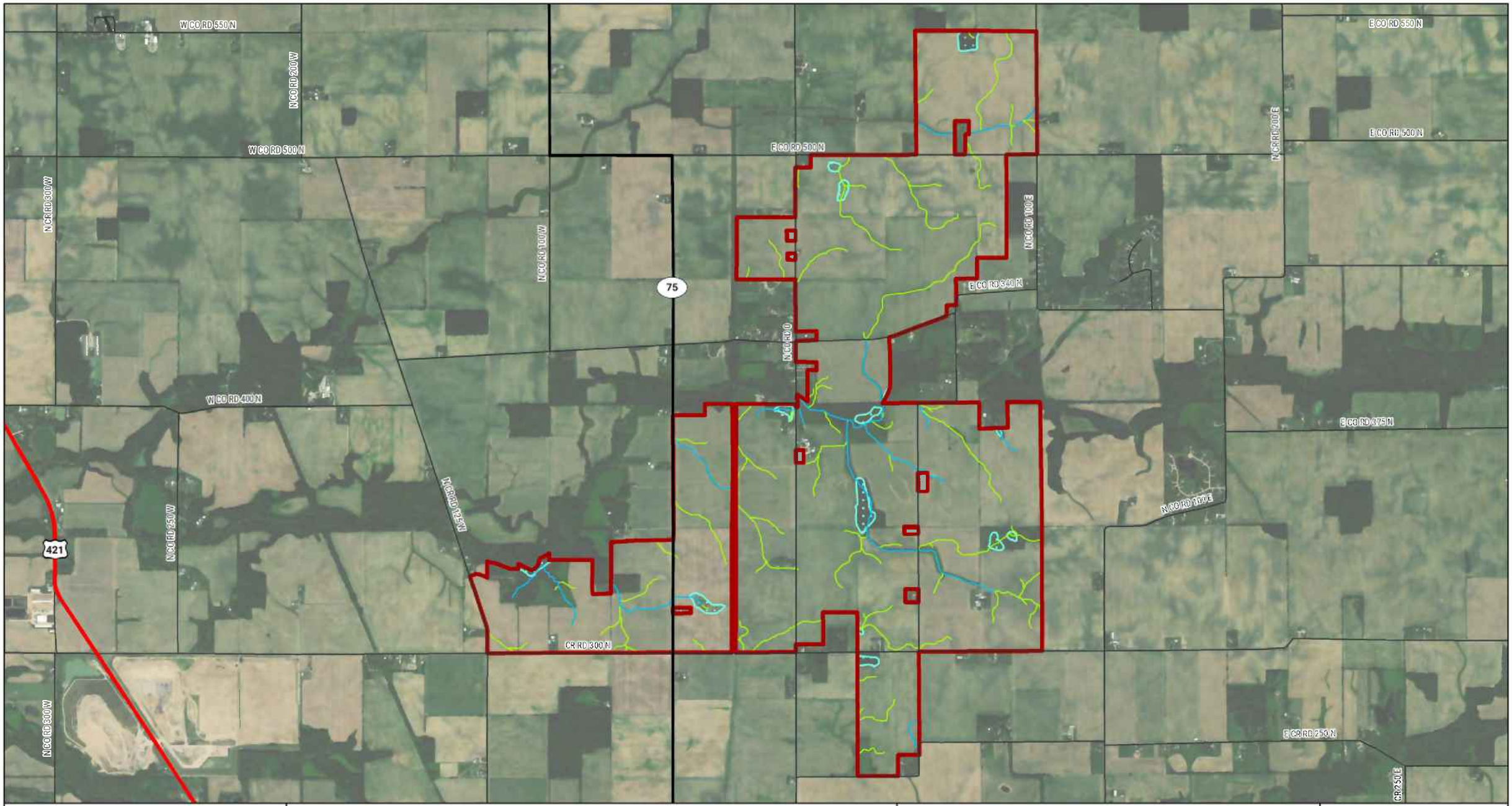
N

0 0.5 1 Mile

FIGURE 5

Prepared by: J. Hobbs

Date: 2020-04-30



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ERP
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LEGEND

- Project Area (~1,770 acres)
- Estimated Wetland
- Estimated Stream/Drainage
- Potential Aquatic Resource

Hardy Hills Solar Energy Project

Desktop and Field Estimated Synthesis of Waters

Project Location: Clinton County, Indiana

N

0 1,000 2,000 Feet

FIGURE 6

Prepared by: J. Hobbs

Date: 2020-04-30

Attachment B

USDA Custom Soil Resource Report for Clinton County, Indiana

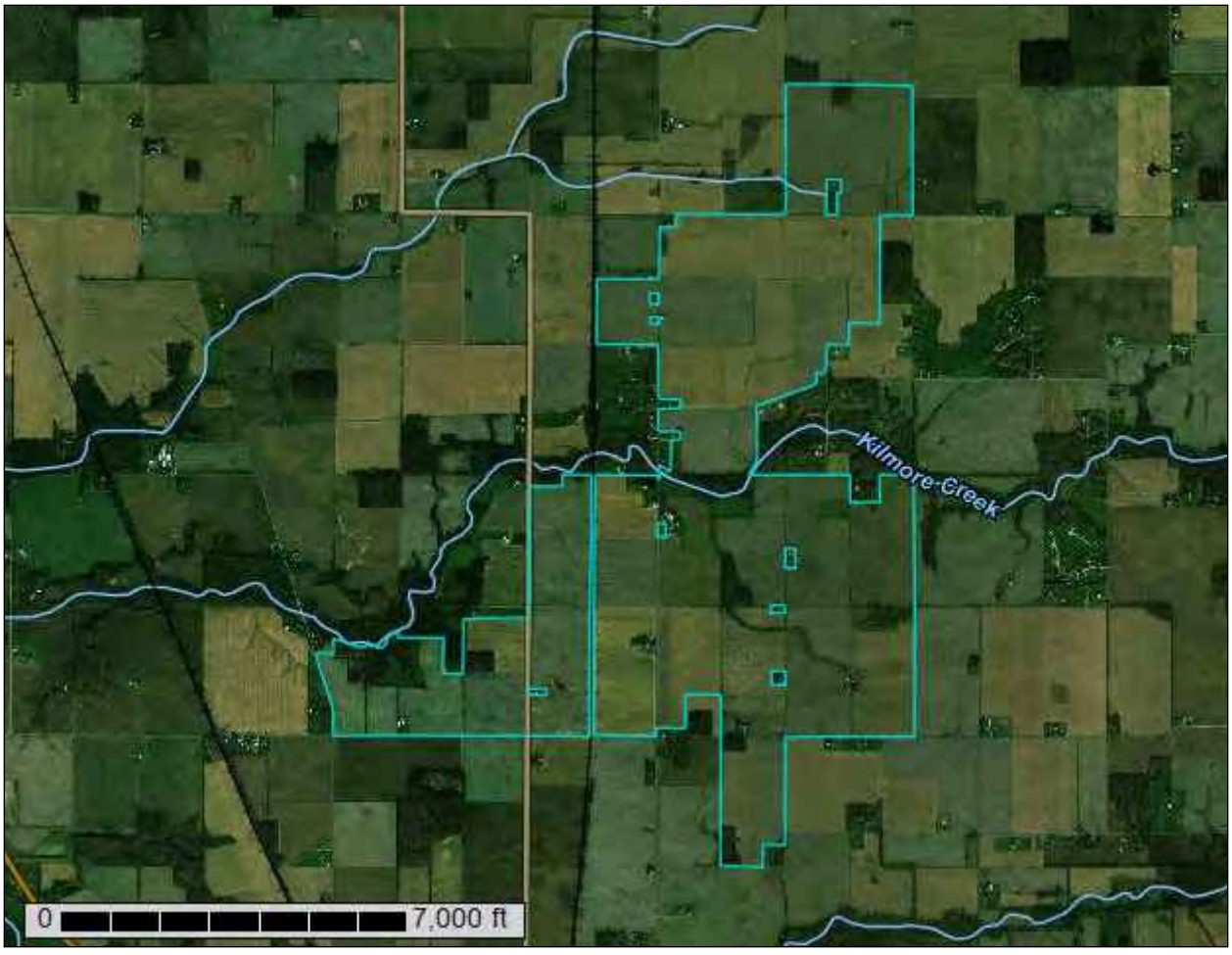
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clinton County, Indiana



March 31, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

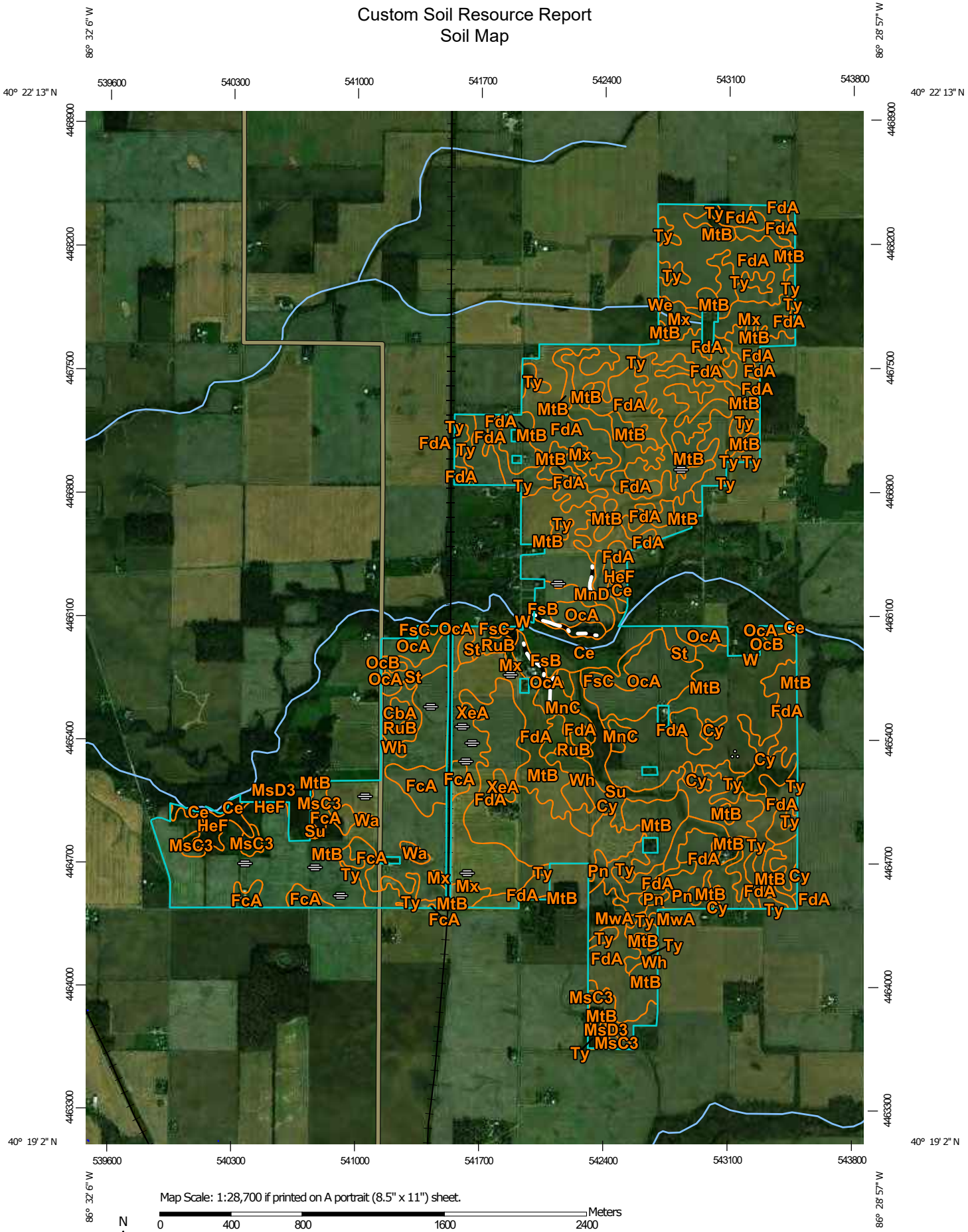
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:28,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 400 800 1600 2400

Feet: 0 1000 2000 4000 6000

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

Soil Survey Area: Clinton County, Indiana
Survey Area Data: Version 23, Sep 16, 2019

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

Date(s) aerial images were photographed: Mar 8, 2015—Dec 26, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CbA	Camden variant silt loam, 0 to 2 percent slopes	3.8	0.2%
Ce	Ceresco loam	45.8	2.6%
Cy	Cyclone silt loam, 0 to 2 percent slopes	35.6	2.0%
FcA	Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes	46.4	2.6%
FdA	Fincastle-Crosby silt loams, 0 to 2 percent slopes	488.1	27.6%
FsB	Fox silt loam, 2 to 6 percent slopes	21.3	1.2%
FsC	Fox loam, 6 to 15 percent slopes	8.6	0.5%
HeF	Hennepin silt loam, 18 to 50 percent slopes	12.3	0.7%
MnC	Miami silt loam, 6 to 12 percent slopes	16.9	1.0%
MnD	Miami silt loam, 12 to 18 percent slopes	3.3	0.2%
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	14.4	0.8%
MsD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	1.8	0.1%
MtB	Miami-Crosby silt loams, 2 to 6 percent slopes	619.6	35.1%
MwA	Miami-Martinsville silt loams, 0 to 2 percent slopes	2.5	0.1%
Mx	Milford silty clay loam	37.0	2.1%
OcA	Ockley silt loam, 0 to 2 percent slopes	79.5	4.5%
OcB	Ockley silt loam, 2 to 6 percent slopes	1.2	0.1%
Pn	Patton silty clay loam, 0 to 2 percent slopes	8.4	0.5%
RuB	Russell silt loam, 2 to 6 percent slopes	17.0	1.0%
St	Sleeth silt loam, 0 to 2 percent slopes	24.6	1.4%
Su	Sloan silt loam	23.5	1.3%
Ty	Treaty silt loam, 0 to 2 percent slopes	224.1	12.7%
W	Water	1.6	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Wa	Wallkill silt loam	4.6	0.3%
We	Westland silty clay loam, 0 to 2 percent slopes	0.4	0.0%
Wh	Whitaker silt loam, 0 to 2 percent slopes	20.2	1.1%
XeA	Xenia silt loam, 0 to 2 percent slopes	5.2	0.3%
Totals for Area of Interest		**1,767.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Indiana

CbA—Camden variant silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5fx5
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Camden variant and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Camden Variant

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over loamy till

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 32 inches: silty clay loam
H3 - 32 to 48 inches: sandy loam
H4 - 48 to 59 inches: stratified loamy sand to sandy loam
H5 - 59 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Ce—Ceresco loam

Map Unit Setting

National map unit symbol: 5fx6
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Ceresco and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ceresco

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Minor Components

Cohoctah

Percent of map unit: 3 percent

Landform: Depressions
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Sloan

Percent of map unit: 3 percent
Landform: Depressions
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Cy—Cyclone silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2thyf
Elevation: 640 to 1,150 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Cyclone and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cyclone

Setting

Landform: Flats, swales, till plains, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 14 inches: silt loam
Btg1 - 14 to 20 inches: silt loam
Btg2 - 20 to 49 inches: silty clay loam
2Bt3 - 49 to 60 inches: loam
2C - 60 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Fincastle
Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Xenia
Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Sugarvalley
Percent of map unit: 3 percent
Landform: Flats, ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Morningsun
Percent of map unit: 2 percent
Landform: Ground moraines, flats
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

FcA—Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2rkb8
Elevation: 400 to 1,140 feet
Mean annual precipitation: 37 to 46 inches

Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fincastle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fincastle

Setting

Landform: Till plains
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material and/or loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
E - 10 to 13 inches: silt loam
Bt1 - 13 to 27 inches: silty clay loam
2Bt2 - 27 to 50 inches: clay loam
2BC - 50 to 59 inches: loam
2Cd - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Cyclone

Percent of map unit: 10 percent
Landform: Flats, swales, till plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Concave
Across-slope shape: Linear, concave

Hydric soil rating: Yes

Mahalasville

Percent of map unit: 5 percent
Landform: Swales on till plains, flats on till plains, depressions on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

FdA—Fincastle-Crosby silt loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4m3
Elevation: 450 to 1,010 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fincastle and similar soils: 55 percent
Crosby and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fincastle

Setting

Landform: Till plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
E - 10 to 13 inches: silt loam
Bt1 - 13 to 27 inches: silty clay loam
2Bt2 - 27 to 50 inches: clay loam
2BC - 50 to 59 inches: loam
2Cd - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Description of Crosby

Setting
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy till

Typical profile
Ap - 0 to 8 inches: silt loam
BE - 8 to 11 inches: silt loam
Bt1 - 11 to 14 inches: silt loam
2Bt2 - 14 to 28 inches: clay loam
2BCt - 28 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Williamstown

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Treaty

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

FsB—Fox silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5fxf
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Fox and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 16 inches: loam
H3 - 16 to 35 inches: gravelly silt loam
H4 - 35 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 24 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

FsC—Fox loam, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 5fxg
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Fox and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 32 inches: gravelly clay loam
H3 - 32 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 6 to 15 percent

Depth to restrictive feature: 24 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

HeF—Hennepin silt loam, 18 to 50 percent slopes

Map Unit Setting
National map unit symbol: 5fxj
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Hennepin and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hennepin

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile
H1 - 0 to 4 inches: silt loam
H2 - 4 to 11 inches: loam
H3 - 11 to 60 inches: loam

Properties and qualities
Slope: 18 to 50 percent
Depth to restrictive feature: 11 to 60 inches to densic material
Natural drainage class: Well drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MnC—Miami silt loam, 6 to 12 percent slopes

Map Unit Setting
National map unit symbol: 5fxq
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Miami and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MnD—Miami silt loam, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 5fxr
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MsC3—Miami clay loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2rk9y
Elevation: 600 to 1,200 feet
Mean annual precipitation: 36 to 43 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami, severely eroded, and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami, Severely Eroded

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 29 inches: clay loam
BCt - 29 to 34 inches: loam
Cd - 34 to 80 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Crosby

Percent of map unit: 3 percent
Landform: Till plains
Landform position (three-dimensional): Interfluve
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MsD3—Miami clay loam, 12 to 18 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2w3qq
Elevation: 600 to 1,260 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami, severely eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami, Severely Eroded

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 29 inches: clay loam

BCt - 29 to 34 inches: loam
Cd - 34 to 79 inches: loam

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Crosby

Percent of map unit: 8 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hennepin, eroded

Percent of map unit: 2 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

MtB—Miami-Crosby silt loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t4m9
Elevation: 600 to 1,020 feet
Mean annual precipitation: 37 to 41 inches
Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 155 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Miami and similar soils: 60 percent
Crosby and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 13 inches: silty clay loam
2Bt - 13 to 31 inches: clay loam
2BCt - 31 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 35 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Crosby

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, dip
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
BE - 8 to 11 inches: silt loam
Bt1 - 11 to 14 inches: silt loam
2Bt2 - 14 to 28 inches: clay loam
2BCt - 28 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 31 to 40 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Treaty

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

MwA—Miami-Martinsville silt loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5fxw
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Miami and similar soils: 60 percent
Martinsville and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Rises
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 28 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Martinsville

Setting

Landform: Rises on till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 34 inches: clay loam

H3 - 34 to 39 inches: sandy clay loam
H4 - 39 to 60 inches: stratified loamy sand to sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Mx—Milford silty clay loam

Map Unit Setting

National map unit symbol: 5fxx
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Milford and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Milford

Setting

Landform: Potholes on lake plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Clayey lacustrine deposits

Typical profile

H1 - 0 to 10 inches: silty clay loam
H2 - 10 to 31 inches: silty clay
H3 - 31 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

OcA—Ockley silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4ld
Elevation: 600 to 1,250 feet
Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ockley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silt loam
BA - 10 to 15 inches: silt loam
Bt1 - 15 to 18 inches: silt loam
Bt2 - 18 to 37 inches: clay loam
2Bt3 - 37 to 49 inches: gravelly sandy clay loam

3C - 49 to 79 inches: stratified very gravelly coarse sand to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 72 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wawaka

Percent of map unit: 5 percent
Landform: Till plains on outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fox

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Digby

Percent of map unit: 3 percent
Landform: Glacial drainage channels, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Haney

Percent of map unit: 2 percent
Landform: Glacial drainage channels, outwash plains

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

OcB—Ockley silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t4lk
Elevation: 350 to 1,300 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 155 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ockley and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting

Landform: Stream terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silt loam
2Bt1 - 10 to 26 inches: clay loam
2Bt2 - 26 to 45 inches: gravelly clay loam
3C - 45 to 79 inches: stratified coarse sand to very gravelly sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 31 to 55 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Fox, eroded
Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Sleeth
Percent of map unit: 5 percent
Landform: Stream terraces, channels on stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Pn—Patton silty clay loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2w0td
Elevation: 670 to 960 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition
Patton, drained, loamy substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Patton, Drained, Loamy Substratum

Setting
Landform: Depressions on lake plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, flat, dip

Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy glaciolacustrine deposits over loamy outwash

Typical profile

Ap - 0 to 12 inches: silty clay loam
Bg - 12 to 40 inches: silty clay loam
2Cg - 40 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Crosby

Percent of map unit: 6 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Treaty, drained

Percent of map unit: 5 percent
Landform: Water-lain moraines, swales, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Starks

Percent of map unit: 4 percent
Landform: Till plains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Hydric soil rating: No

Westland, drained

Percent of map unit: 3 percent
Landform: Swales on stream terraces, depressions on stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Palms, drained

Percent of map unit: 2 percent
Landform: Depressions on moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

RuB—Russell silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2w0vz
Elevation: 540 to 1,170 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Russell and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Russell

Setting

Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 13 inches: silty clay loam
Bt2 - 13 to 28 inches: silty clay loam
2Bt3 - 28 to 52 inches: clay loam
2BCt - 52 to 58 inches: loam

2Cd - 58 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 42 to 60 inches to densic material
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Xenia

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fincastle

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Cyclone, drained

Percent of map unit: 3 percent
Landform: Swales, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Williamstown

Percent of map unit: 2 percent
Landform: Water-lain moraines, till plains, recessionial moraines
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Nose slope

Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

St—Sleeth silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w3qm
Elevation: 500 to 1,170 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Sleeth and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sleeth

Setting

Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: silt loam
E - 9 to 14 inches: silt loam
2Bt1 - 14 to 38 inches: clay loam
2Btg2 - 38 to 50 inches: gravelly clay loam
3Cg - 50 to 60 inches: stratified gravelly gravelly gravelly coarse sand to sand to sand to loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 38 to 50 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 38 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Sleeth, till substratum

Percent of map unit: 15 percent
Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Westland, drained

Percent of map unit: 3 percent
Landform: Stream terraces on outwash plains, depressions on outwash plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave, convex
Hydric soil rating: Yes

Eldean

Percent of map unit: 1 percent
Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Ockley

Percent of map unit: 1 percent
Landform: Outwash terraces, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Su—Sloan silt loam

Map Unit Setting

National map unit symbol: 5fyf
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F

Frost-free period: 180 to 190 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition
Sloan and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sloan

Setting
Landform: Flood plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile
H1 - 0 to 13 inches: silt loam
H2 - 13 to 50 inches: loam
H3 - 50 to 60 inches: stratified sand to silty clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: High (about 10.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Ty—Treaty silt loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2ygzm
Elevation: 670 to 1,210 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Treaty, frequently ponded, drained, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Treaty, Frequently Ponded, Drained

Setting

Landform: Water-lain moraines, swales, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Silty material or loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
A - 10 to 14 inches: silt loam
Btg1 - 14 to 36 inches: silty clay loam
2Btg2 - 36 to 59 inches: loam
2C - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Williamstown, eroded

Percent of map unit: 5 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Milford, frequently ponded, drained

Percent of map unit: 5 percent
Landform: Depressions on lake plains
Landform position (three-dimensional): Talf, dip

Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Crosby

Percent of map unit: 5 percent
Landform: Ground moraines, water-lain moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Miami, eroded

Percent of map unit: 5 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Wa—Wallkill silt loam

Map Unit Setting

National map unit symbol: 5fyk
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Wallkill, drained, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wallkill, Drained

Setting

Landform: Depressions on till plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy slope alluvium over herbaceous organic material over loamy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 22 inches: silt loam
Oa3 - 22 to 52 inches: muck
H4 - 52 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very high (about 17.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

We—Westland silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4m1
Elevation: 400 to 1,000 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Westland, drained, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Westland, Drained

Setting

Landform: Swales on stream terraces, depressions on stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silty clay loam
Btg1 - 10 to 21 inches: silty clay loam
2Btg2 - 21 to 37 inches: clay loam
2BCg - 37 to 47 inches: loam
3Cg - 47 to 79 inches: stratified extremely gravelly coarse sand to coarse sand to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 55 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Mahalaland, drained

Percent of map unit: 15 percent
Landform: Swales on terraces, outwash terraces, terraces, flats on terraces, depressions on terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Treaty, drained

Percent of map unit: 9 percent
Landform: Till plains
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Sleeth

Percent of map unit: 6 percent
Landform: Stream terraces, outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wh—Whitaker silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2vzcw
Elevation: 400 to 1,160 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Whitaker and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitaker

Setting

Landform: Outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty outwash over loamy outwash

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 20 inches: silty clay loam
2Bt - 20 to 37 inches: sandy clay loam
2BC - 37 to 48 inches: sandy loam
2C - 48 to 79 inches: stratified sand to sandy loam to loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Rensselaer
Percent of map unit: 5 percent
Landform: Flats, drainageways, glacial drainage channels, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Sleeth
Percent of map unit: 3 percent
Landform: Stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Martinsville, till substratum
Percent of map unit: 2 percent
Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

XeA—Xenia silt loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2t98q
Elevation: 360 to 1,020 feet

Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Xenia and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xenia

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
Bt1 - 10 to 30 inches: silty clay loam
2Bt2 - 30 to 50 inches: clay loam
2BCt - 50 to 58 inches: loam
2Cd - 58 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Treaty

Percent of map unit: 5 percent
Landform: Till plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave

Hydric soil rating: Yes

Ragsdale

Percent of map unit: 5 percent
Landform: Till plains, flats, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Rating by Map Unit

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:

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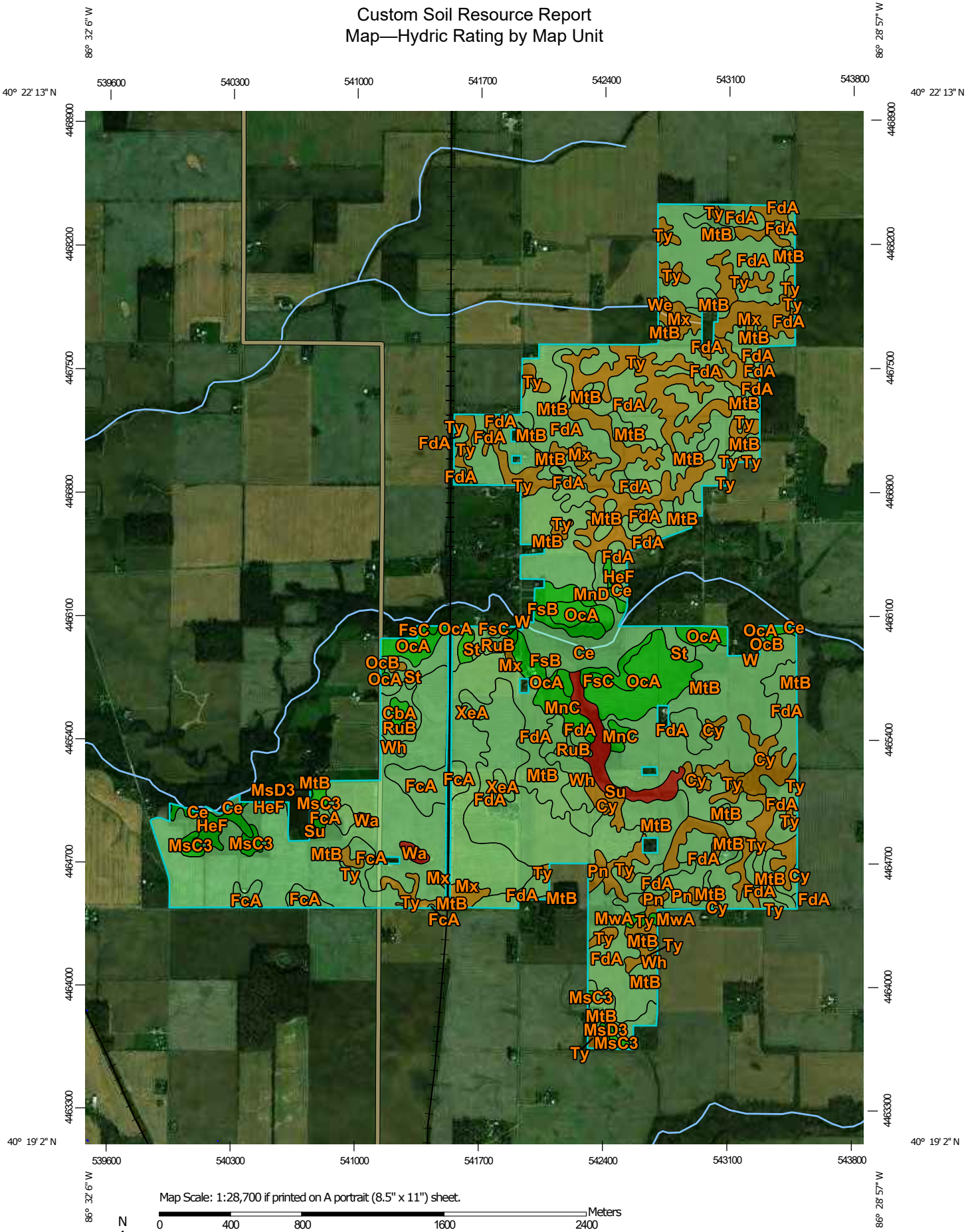
86° 32' 6" W
86° 28' 57" W
40° 22' 13" N
40° 19' 2" N
539600
540300
541000
541700
542400
543100
543800
4468900
4468200
4467500
4466800
4466100
4465400
4464700
4464000
4463300
Map Scale: 1:28,700 if printed on A portrait (8.5" x 11") sheet.
Meters
0 400 800 1600 2400
Feet
0 1000 2000 4000 6000
N
Map projection: 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 1:20,000.

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

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

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

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

Soil Survey Area: Clinton County, Indiana
Survey Area Data: Version 23, Sep 16, 2019

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

Date(s) aerial images were photographed: Mar 8, 2015—Dec 26, 2016

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—Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CbA	Camden variant silt loam, 0 to 2 percent slopes	0	3.8	0.2%
Ce	Ceresco loam	6	45.8	2.6%
Cy	Cyclone silt loam, 0 to 2 percent slopes	85	35.6	2.0%
FcA	Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes	15	46.4	2.6%
FdA	Fincastle-Crosby silt loams, 0 to 2 percent slopes	5	488.1	27.6%
FsB	Fox silt loam, 2 to 6 percent slopes	0	21.3	1.2%
FsC	Fox loam, 6 to 15 percent slopes	0	8.6	0.5%
HeF	Hennepin silt loam, 18 to 50 percent slopes	0	12.3	0.7%
MnC	Miami silt loam, 6 to 12 percent slopes	0	16.9	1.0%
MnD	Miami silt loam, 12 to 18 percent slopes	0	3.3	0.2%
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	0	14.4	0.8%
MsD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	0	1.8	0.1%
MtB	Miami-Crosby silt loams, 2 to 6 percent slopes	10	619.6	35.1%
MwA	Miami-Martinsville silt loams, 0 to 2 percent slopes	0	2.5	0.1%
Mx	Milford silty clay loam	90	37.0	2.1%
OcA	Ockley silt loam, 0 to 2 percent slopes	0	79.5	4.5%
OcB	Ockley silt loam, 2 to 6 percent slopes	0	1.2	0.1%
Pn	Patton silty clay loam, 0 to 2 percent slopes	90	8.4	0.5%
RuB	Russell silt loam, 2 to 6 percent slopes	3	17.0	1.0%
St	Sleeth silt loam, 0 to 2 percent slopes	3	24.6	1.4%
Su	Sloan silt loam	100	23.5	1.3%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ty	Treaty silt loam, 0 to 2 percent slopes	85	224.1	12.7%
W	Water	0	1.6	0.1%
Wa	Wallkill silt loam	100	4.6	0.3%
We	Westland silty clay loam, 0 to 2 percent slopes	94	0.4	0.0%
Wh	Whitaker silt loam, 0 to 2 percent slopes	5	20.2	1.1%
XeA	Xenia silt loam, 0 to 2 percent slopes	10	5.2	0.3%
Totals for Area of Interest			**1,767.7**	**100.0%**

Rating Options—Hydric Rating by Map Unit

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

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Attachment C
Photo Log

Photo 1: View of typical field estimated stream and field estimated wetland within a tributary to Kilmore Creek within the Project area, facing southeast.

Photo 2: Photo of Kilmore Creek from N County Road 0 E bridge with forested and grassland riparian areas, facing east.

ERP ENERGY RENEWAL PARTNERS, LLC	Invenergy Solar Project Development, LLC **Hardy Hills Solar Energy Project** Photo Log	Location: Clinton County, Indiana Photos By: D. Roberts and F. Sawyers Date Taken: July 22-23, 2019

Photo 3: Photo of typical potential aquatic resource with road culvert on a mapped NWI headwaters. Located near N County Road 100 E and E County Road 700 N intersection, facing south.

Photo 4: Typical view of field estimated NWI wetland in cropland located off E County Road 500 N, facing south.

ERP ENERGY RENEWAL PARTNERS, LLC	Invenergy Solar Project Development, LLC **Hardy Hills Solar Energy Project** Photo Log	Location: Clinton County, Indiana Photos By: D. Roberts and F. Sawyers Date Taken: July 22-23, 2019

Photo 5: View of typical NWI wetland along agricultural fields located west of N County Road 50 E along a tributary to Kilmore Creek, facing north.

Photo 6: View of NWI wetland located off E County Road 500 N in cultivated cropland with indications of potential hydric soils and inundation, facing north.

ERP ENERGY RENEWAL PARTNERS, LLC	Invenergy Solar Project Development, LLC **Hardy Hills Solar Energy Project** Photo Log	Location: Clinton County, Indiana Photos By: D. Roberts and F. Sawyers Date Taken: July 22-23, 2019

Appendix E
Photo Log

Photo 1: View of typical developed, open space along East County Road 600 N in the northeastern Project area, facing south.

Photo 2: View of typical field classified as hay/pasture by NLCD. Located off of N County Road 0 Ew and E County Road 200 N, in the southwest Project area, facing east.

ERP ENERGY RENEWAL PARTNERS, LLC	Invenergy Solar Project Development, LLC **Hardy Hills Solar Energy Project** Photo Log	Location: Clinton County, Indiana Photos By: D. Roberts and F. Sawyers Date Taken: July 22-23, 2019

Photo 3: View of typical forested area in the central Project area, facing north.

Photo 4: View of a typical grassland and riparian forest. Located in the Project area along Kilmore Creek, facing north.

Photo 5: View of typical potentially jurisdictional stream and emergent wetland within a tributary to Kilmore Creek in the Project area, facing southeast.

Photo 6: Photo of Kilmore Creek within the Project area from N County Road 0 Ew bridge with forested and grassland riparian areas facing east.

Photo 7: Photo of typical vegetated swale with road culvert on a mapped NWI headwaters. Located near the N County Road 100 E and E County Road 700 N intersection in the Project area buffer, facing south.

Photo 8: Typical view of cultivated cropland with forest in background. Located in the Project area off N County Road 50 E near E County Road 300 N, facing east.

Photo 9: View of forested and herbaceous wetland fringe along crop fields. Located within the Project area west of N County Road 50 E along a tributary to Kilmore Creek, facing north.

Photo 10: Typical NWI wetland located in Project area off E County Road 500 N in cultivated crop with patch of missing crops due to hydric soils, facing north.

Appendix F
Common Field Observed Species

Appendix G: Common Field Observed Species within the Hardy Hills Solar Energy Project, Clinton County, Indiana

Scientific Name	Common Name
Fauna	
Anas platyrhynchos	Mallard
Buteo jamaicensis	Red Tail Hawk
Cathartes aura	Turkey Vulture
Coragyps atratus	Black Vulture
Dumetella carolinensis	Gray Catbird
Empidonax traillii	Willow Flycatcher
Falco sparverius	American Kestrel
Hirundo rustica	Barn Swallow
Odocoileus virginianus	White-tailed Deer
Passerina cyanea	Indigo Bunting
Sciurus carolinensis	Grey Squirrel
Setophaga petechia	Yellow Warbler
Sturnus vulgaris	European Starlings
Tamias striatus	Chipmunk
Troglodytes aedon	House Wren
Turdus migratorius	American Robin
Tyrannus tyrannus	Eastern Kingbird
Zenaida macroura	Mourning Dove

Flora	
Acer negundo	Box Elder
Acer rubrum	Red Maple
Andropogon gerardii	Big Bluestem
Asimina triloba	Pawpaw
Celtis occidentalis	Common Hackberry
Equisetum hyemale	Rough Horsetail
Festuca arundinacea	Tall Fescue
Juglans nigra	Black Walnut
Lemna minor	Common Duckweed
Ligustrum sinense	Chinese Privet
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Tulip Poplar
Oxydendrum arboreum	Sourwood
Panicum virgatum	Switch Grass
Phalaris arundinacea	Reed Canarygrass
Phytolacca decandra	Pokeweed
Populus deltoides	Eastern Cotton Wood
Quercus alba	White Oak
Quercus rubra	Red Oak
Quercus stellata	Post Oak
Rubus argustris	Sawtooth Blackberry
Salix nigra	Black Willow
Schizachyrium scoparium	Little Bluestem
Solidago canadensis	Canadian Goldenrod
Sorghastrum nutans	Indian Grass
Taraxacum officinale	Common Dandelion
Ulmus americana	American Elm
Ulmus rubra	Slippery Elm

Protected Species Habitat Assessment

Hardy Hills Solar Energy Project

Clinton County, Indiana

October 2020

Prepared for:
Hardy Hills Solar Energy LLC
One South Wacker Drive, Suite 1800
Chicago, Illinois 60606

Prepared by:
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October 5, 2020

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Staff Scientist

Sean Martin
Project Manager

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Appendices

Appendix A	USFWS Information for Planning and Consultation Official Species List
Appendix B	IDNR Clinton County Endangered, Threatened, and Rare Species List
Appendix C	Indiana Natural Heritage Data Center Information Request Response
Appendix D	USDA Custom Soil Resource Report for Clinton County, Indiana
Appendix E	Photo Log
Appendix F	Field-Observed Vegetative Species by Ecosystem within the Hardy Hills Solar Energy Project, Clinton County, Indiana

1.0 Executive Summary

Energy Renewal Partners, LLC (ERP) completed a Protected Species Habitat Assessment for the proposed Hardy Hills Solar Energy Project (the "Project") for Hardy Hills Solar Energy LLC. The Project is a proposed photovoltaic solar energy facility located on approximately 1,780 acres (the "Project area") in north-central Clinton County, Indiana approximately 1.5 miles north of the town of Frankfort (Figure 1).

The objective of this assessment is to evaluate the environmental setting and classify habitats within the Project area, and subsequently evaluate whether onsite habitats are suitable or unsuitable for state or federally endangered, threatened, or protected species. The results of the assessment provide descriptions and an evaluation of existing habitats within the Project area as well as their potential to support state or federally endangered, threatened, or protected species.

Prior to this Protected Species Habitat Assessment, ERP conducted a literature and database search, in the form of a Tiers 1-2 Site Characterization Survey (SCS), dated June 11, 2020, which was used to identify the state or federally endangered, threatened, or protected species within range of the Project area and to provide an understanding of supporting habitat criteria for each of the identified species. Following the literature and database search, ERP completed a desktop review to identify portions of the Project area as having environmentally sensitive conditions and to understand the spatial distribution of existing land use, landcover, and vegetation communities. As a result of this analysis, potential locations of listed species suitable habitat within the Project area were mapped and consequently used during the field investigation to target areas for investigation and evaluation during the field assessment. Field investigated habitat areas were evaluated based on conditions and vegetation communities for further classification, and habitat areas were assessed on the likeliness to support listed state or federally endangered, threatened, or protected species.

Based on the desktop database and literature review and field observations, the Project area consists predominantly of cultivated cropland with small areas of deciduous forest in the northern, central, southern, and southwestern portions (Figure 2). The Project area may provide suitable roosting and foraging habitat for the federal and state endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (NLEB) (*Myotis septentrionalis*) within the deciduous forest in the northern, central, southern, and southwestern portions, as well as the riparian areas containing shagbark hickories (*Carya ovata*) surrounding Kilmore Creek in the central portion. The Project area may also provide suitable habitat for the federal and state endangered mussel species clubshell (*Pleurobema clava*) and federal candidate purple lilliput (*Toxolasma lividus*) in Kilmore Creek, Boyle's Ditch, and an unnamed tributary to Kilmore Creek, in the central and northern portions of the Project area. Suitable habitat for the state endangered sedge wren (*Cistothorus plantensis*), loggerhead shrike (*Lanius ludovicianus*), and black-crowned night-heron (*Nycticorax nycticorax*) occurs in the pasture habitats found in the southern and southwestern portions, containing dense low growth with scattered bushes (Figure 3). A cemetery adjacent to Kilmore creek in the central portion of the Project area provides additional habitat for the loggerhead shrike (*Lanius ludovicianus*), and the riparian corridors associated with Kilmore Creek, Boyle's

Ditch, and a tributary associated with Kilmore Creek, in the central and northern portions of the Project area, provide additional habitat for the black-crowned night heron (*Nycticorax nycticorax*).

2.0 Introduction

2.1 Purpose

Energy Renewal Partners, LLC (ERP) completed a Protected Species Habitat Assessment for the proposed Hardy Hills Solar Energy Project (the "Project") for Hardy Hills Solar Energy LLC. The Project is a proposed photovoltaic solar energy facility located on approximately 1,780 acres (the "Project area") in north-central Clinton County, Indiana approximately 1.5 miles north of the town of Frankfort (Figure 1). The Project area is generally bound by North County Road 130 West to the west, East County Road 250 North to the south, and North County Road 130 East to the east (Figure 1). Assessment objectives included identifying, evaluating, and assessing potential habitats of federally protected species listed under the Endangered Species Act (ESA),the Bald and Golden Eagle Protection Act (BGEPA), species proposed for federal listing and candidate species, and state protected species protected under the Nongame and Endangered Species Conservation Act.

2.2 Project Background

The Project area is being developed as a solar energy facility. Although the final project boundaries and internal design of the solar facility has not been completed, the Project will likely entail the installation of photovoltaic modules, inverters, an underground electrical collection system, internal project roads, security fencing, operation and maintenance structures, and temporary parking and laydown areas. Clearing of onsite vegetation and grading, if necessary, will occur before the installation of Project infrastructure.

The Project area is situated in a relatively rural area of Clinton County largely dominated by agriculture. The unincorporated community of Kilmore is located adjacent to the west-central boundary of the Project area along West County Road 425 North. An abandoned section of the Conrail Railroad bisects the southwestern portion of the Project area, oriented north-south. Several rural residences are located within and directly adjacent to the Project boundaries.

Prior to this Protect Species Habitat Assessment, ERP scientists conducted a Tiers 1-2 Site Characterization Survey (SCS) on June 11, 2020, where they reviewed available literature and relevant, supporting information including the appropriate portions of the 2019 Frankfort [IN] 1:24000 and 2019 Michigantown [IN] 1:24000 U.S. Geological Survey (USGS) Topographic Quadrangle (USGS 2019a, USGS 2019b) , the USGS National Land Cover Database (NLCD) (Homer et al. 2015), and representative aerial imagery. ERP personnel also reviewed the USGS National Hydrography Dataset (NHD) (USGS 2018) and the USFWS National Wetlands Inventory (NWI) map (USFWS 2018). Additionally, ERP utilized the United States Department of Agriculture's (USDA) Web Soil Survey to determine soils which are located throughout the Project area (Appendix D). ERP also reviewed the Protected Areas Database of the U.S. (PAD-US 2018) to determine if state or federally protected areas are located within the Project area or within a ten (10) mile buffer to the Project area. ERP reviewed these sources to assist in the characterization of land cover, land use, and habitat conditions present within the Project area.

ERP obtained protected species information for the Project area and Clinton County from the USFWS Information for Planning and Consultation (IPaC) Official Species List (Appendix A) and the Indiana Department of Natural Resources (IDNR) Clinton County Endangered, Threatened, and Rare Species List

(Appendix B). Additionally, ERP requested element occurrence data from the Indiana Natural Heritage Data Center (NHDC) for information regarding records of federal and state protected species occurring within the Project area and a two (2) mile buffer of the Project area ("Project area buffer") (Appendix C).

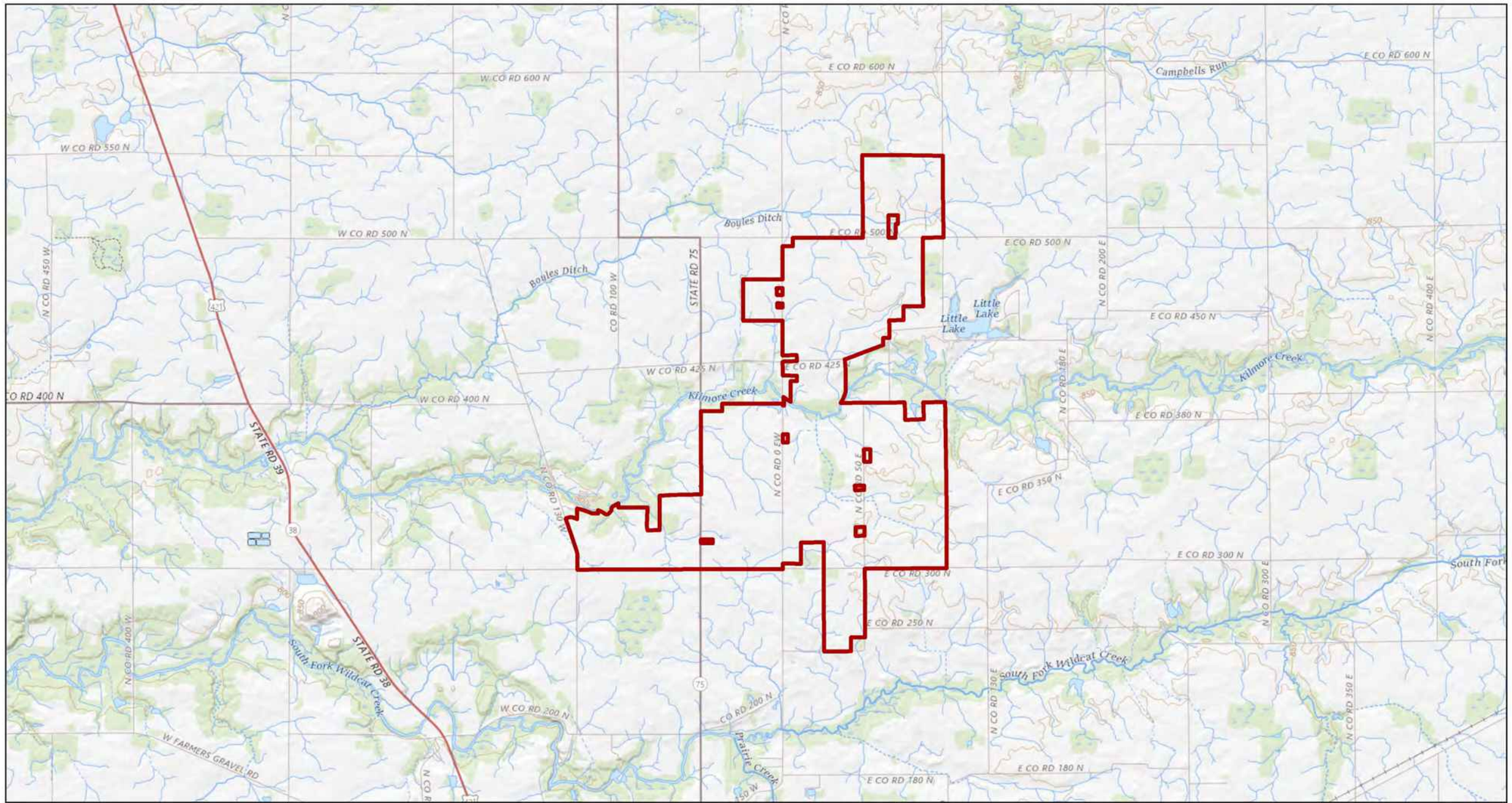
2.3 Regulatory Considerations

The federal ESA, administered by the U.S. Fish and Wildlife Service (USFWS), provides for the conservation of species that are listed as endangered or threatened throughout all or a significant portion of their range and the conservation of the ecosystems on which they depend. The ESA authorizes the determination and listing of species as endangered or threatened, and prohibits the unauthorized take, possession, sale, and transport of species without a permit, with civil and criminal penalties for violations.

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the unauthorized take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), including their parts, nests, or eggs, and is also administered by USFWS.

Indiana passed the Nongame and Endangered Species Conservation Act (IC 14-22-43) in 1973. Under this Act, the Wildlife Diversity personnel within the Division of Fish and Wildlife are charged with the task of managing and conserving nongame and endangered species. Protections provided by the Act are limited to wildlife species that are listed as endangered within the state of Indiana, which includes all species endangered by the federal government that occur in Indiana, but also includes a state endangered definition to protect any animal species in jeopardy or danger of disappearing from the state. The Act includes a definition for species of special concern, although these species do not receive legal protection.

With respect to the above-described federal and state laws and regulations, ERP conducted a Protected Species Habitat Assessment for the Hardy Hills Solar Energy Project and the following discusses the methods and findings from this assessment.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Little Lake
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N CO RD 400 E
W CO RD 425 N
E CO RD 425
Kilmore Creek
CO RD 400 N
W CO RD 400 N
N CO RD 180 E
E CO RD 380 N
STATE RD 39
N CO RD 0 EW
N CO RD 50 E
E CO RD 350 N
E CO RD 300 N
N CO RD 300 E
E CO RD 250 N
South Fork Wildcat Creek
N CO RD 400 W
STATE RD 38
W CO RD 200 N
CO RD 200 N
N CO RD 130 E
N CO RD 350 E
W FARMERS GRAVEL RD
Prairie Creek
E CO RD 180 N
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LEGEND
Project area (~1,780 acres)
Invenergy Solar Project Development, LLC
Hardy Hills Solar Energy Project
Regional Topography
USGS National Map (2020)
Project Location: Clinton County, Indiana
N
0 1,500 3,000 Feet
FIGURE 1
Prepared by: J. Hobbs
Date: 2020-10-02

3.0 Methodology

3.1 Literature and Database Review

ERP utilized the findings from the Tiers 1-2 SCS conducted in June 2020 and the findings of the field assessment to evaluate which species, and their respective roosting, nesting, foraging, and/or migratory habitats, may occur within the Project area.

Relevant ecological parameters identified during the field assessment were mapped where potential suitable habitat requirements for any protected species with potential occurrence were met within the Project area (Figure 3). Relevant ecological parameters were determined by researching documented species occurrences and their respective foraging and breeding habitat requirements. Research entailed comparing publications and aerial imagery to determine if published species records were still relevant and to assess the extent of habitat fragmentation caused by habitat loss to agriculture and other anthropogenic sources. Indiana-specific publications were utilized to ensure the most granular analysis possible of local ecosystems, species occurrences, and terminology.

3.2 Field Assessment

Subsequent to the literature and database review, a field assessment was conducted by ERP Staff Scientist Hannah Hayes, Associate Wildlife Biologist (AWB), and ERP Senior Biologist Daniel Roberts, Professional Wetland Scientist (PWS), to confirm land cover, land use, and habitat characteristics of the Project, determine whether habitat onsite can support the presence of protected species, and if so, map the suitable habitats.

During the field assessment, ERP completed pedestrian surveys by visually surveying the Project area for general ecosystems (Figure 2). During these pedestrian surveys, ERP documented the habitat conditions within the various identified ecosystems including a characterization of vegetation community and structure, general topography, surface hydrology, and anthropogenic disturbance within the Project area. General vegetative communities of ecosystems within the Project area were noted and are presented in a table within Appendix F, attached. While specific species surveys were not conducted, if protected species were observed during the pedestrian surveys, location and abundance of species was documented.

ERP understands there is an abandoned Conrail Railroad right-of-way that bisects the southwestern portion of the Project area (Figure 3). ERP evaluated the abandoned railroad right-of-way to determine whether undisturbed and remnant mesic prairie habitats exist onsite.

4.0 Habitat Assessment Findings

4.1 Literature and Database Review

The USFWS IPaC Official Species List (Appendix A) contained two (2) federally listed species, both of which are described below in Section 5.1. The IDNR Endangered, Threatened and Rare Species List for Clinton County (Appendix B) included a total of eight (8) mussels, four (4) birds, two (2) mammals, and two (2) high quality natural communities; however, because only endangered and threatened species have legal protection under the Nongame and Endangered Species Conservation Act (IC 14-22-43), and because of some overlap with IPaC federally listed species, only four (4) of these IDNR-provided species for Clinton County are discussed below in Section 5.2. The IDNR Natural Heritage Data Center (Appendix C) also supplied a list of two (2) mammals and four (4) mollusks; one (1) of these species, a federally listed candidate species, is discussed below in Section 5.3, along with two (2) species under federal protection by the BGEPA.

The Project area is located in a portion of central Indiana regarded as the Central Till Plain Natural Region, an 8-million acre relatively level region originally composed of approximately 26 percent forest; 70 percent forest-wetland complexes; and two (2) percent mosaic of forest, prairie and wetland. The forests originally comprising the Project area were beech-maple mesic forests, covering most of central Indiana at approximately 5.8-11.7 million acres. These areas have predominately been converted to row crops in the last two centuries; by 1998, the acreage of these beech-maple forests was estimated to only comprise approximately 1.4 million acres, statewide. Other than sugar maple and American beech, which make up the dominant species and canopy, other common tree and shrub species in this habitat include tulip poplar, white ash, American linden, northern red oak, shagbark hickory, bladdernut, maple-leaved viburnum, and northern spicebush. Forest dominated by sugar maple tends to have fewer understory species than oak-dominated forest with more open canopies (Whitaker et al. 2012).

4.2 Field Assessment

Following the desktop review, ERP conducted a field assessment within the Project area on June 1 – 5, 2020. The temperature during the field assessment ranged from 52° to 93° Fahrenheit with partly cloudy to sunny skies.

ERP identified six (6) basic ecosystems within the Project area (Figure 2). Approximately 89 percent of the Project area is currently used for agriculture while the remaining 11 percent is composed of forested areas (3.8 percent), grasslands (2.2 percent), developed areas (1.8 percent), railroad right-of-way (1.4 percent), wetlands (1.2 percent), and waters (streams and ponds; 0.4 percent). Vegetative breaks between the agriculture fields and other ecosystems are abrupt while vegetative breaks between the other five (5) ecosystems are generally more gradual. Below is a detailed summary of each ecosystem identified within the Project area. Photographs taken during the field assessment are included in Appendix E, and species lists for each respective ecosystem type are included in Appendix F; common names are discussed in the paragraphs below, but both common names and scientific species names can be found in Appendix F.

Agriculture – Onsite agricultural fields cover a majority of the Project area (Figure 2). Agricultural fields within the Project area are used exclusively for cultivating crops. Cultivated crops observed within the

Project area were composed of soybeans and corn (Appendix E, Photos 1 and 2). Cultivated areas have abrupt transitions between vegetative communities.

Developed – Developed areas identified within the Project area are composed of roadways, rural residential areas, and buildings for agricultural purposes such as barns and storage facilities (Appendix E, Photos 17 and 18). These developed areas are comprised of both pervious and impervious areas such as maintained lawns, driveways, gardens, and buildings and are generally located along roadways in the southern half of the Project area. Vegetation within developed areas is comprised of a variety of vegetation including fescue, red cedar, silver maple, hackberry, and various oak species.

Forested – Upland forested areas were identified in the southwestern, central, southern, and southeastern portions of the Project area (Figure 2). Forested areas were generally comprised of a closed canopy with a semi-dense mid-story and a partially open understory, along riparian zones and along the fringes of forested wetlands. Specific species noted during field assessment included sugar maple, green ash, honey locust, eastern black walnut, shagbark hickory, Chinese privet, ground-ivy, goldenrod, common blue violet, and goosegrass.

Grasslands- Grasslands are generally located in the southwestern, southern, and central portions of the Project area (Figure 2). Identified grasslands are typically adjacent to agricultural fields and forested areas, though some are located along IDEM regulated drains. Based on observed conditions, grasslands appear to be mowed or otherwise maintained periodically to prevent the establishment of woody vegetation (Appendix E, Photos 8-10). Grasslands identified within the central portion of the Project area and along regulated drains were generally comprised of a variety of upland herbaceous species with small pockets of hydrophytic vegetation (Appendix E, Photo 8). Typical upland herbaceous species observed included, but are not limited to red clover, fescue, giant ragweed, orchard grass, smooth broom grass, and meadow grass. Typical hydrophytic vegetation observed included meadow sedge, fox sedge, bulrush, red clover, and smooth-sheathed sedge. Grasslands identified in the southwestern and southern portions of the Project area were comprised of taller, less regularly maintained herbaceous and woody vegetation typical of transition ecosystems (Appendix E, Photos 9-10). Typical observed vegetation in these grassland areas include tall golden rod, wild teasel, white clover, yellow clover, poison hemlock, blackberry, hackberry, ragweed, honey locust, black walnut, Chinese privet, Virginia creeper, and poison ivy.

Railroad buffer - An abandoned Conrail Railroad right-of-way bisects the southwestern portion of the Project area and is oriented north to south (Figures 2 and 3). ERP evaluated this feature to determine if undisturbed and remnant mesic prairie habitats exist. The term mesic refers to soils containing a moderate amount of moisture. Mesic prairies have fire-dependent vegetation communities in which frequent fires help maintain the vegetative structure and species diversity. In the absence of frequent fires, mesic prairies revert to forests (IDNR 2020). Additionally, mesic prairies are located in areas of the state dominated by moraines and till plains, areas that have been valued for the agricultural values of the soil and commonly converted. ERP did not observe vegetation indicative of mesic prairies typically consisting of native grasses such as little bluestem, big bluestem, ear-leaved brome woodland brome, Indian grass, and switchgrass as well as wildflower species including early goldenrod, old-field goldenrod, Riddell's goldenrod, showy goldenrod, stiff goldenrod, purple prairie clover , prairie phlox, prairie blazing star, and prairie violet, to name a few, along the railroad right-of-way or within the Project area (Betz

1976). The dominant species observed within the railroad right-of-way included cheatgrass, poison hemlock, wild teasel, giant ragweed, giant goldenrod, hackberry, soft brome, yellow sweet clover, and Virginia creeper. The species listed are not indicators of mesic and remnant prairie vegetative communities. Additionally, areas within the abandoned railroad and associated rights-of-way appear to have been almost entirely converted to agricultural land uses. These abandoned railroads and associated 100-foot buffer were found to be composed of typical upland herbaceous and forested areas, and no evidence of frequent fires, either through management forestry practices or natural occurrences, were observed (Appendix E, Photos 10-11). Therefore, undisturbed, remnant mesic prairie ecosystems do not exist within the Project area.

Waters – Aquatic ecosystems include streams, ponds, and other open water areas. Two (2) named streams occur within the Project area. Kilmore Creek is located in the center of the Project area and Boyle's Ditch is located in the northern Project area. Both waters exhibit perennial flow and flow from east to west across the Project area. An additional seven (7) streams, acting as tributaries to these named streams, occur within the Project area and exhibit intermittent to ephemeral flow. An unnamed tributary to Kilmore Creek flowing from approximately southeast to north-northwest is located in the central portion of the Project area. A mussel was observed within Boyle's Ditch and similar suitable habitat occurs within Kilmore Creek and the unnamed tributary to Kilmore Creek (Appendix E, Photo 12). A pond identified by desktop resources is located in the eastern portion of the Project area. Other desktop-mapped tributaries were observed to be buried or drained, no longer exhibiting surface flow. The riparian areas surrounding Boyle's Ditch within the Project area was primarily composed of herbaceous and agricultural vegetation, with only occasional, scattered woody vegetation. The riparian areas surrounding Kilmore Creek was primarily forested with and open to sparse understory.

Wetlands – Wetlands identified within the Project area include areas identified during the jurisdictional waters of the U.S. delineation performed in June 2020; specific details and results of the delineation are provided in a separate standalone report, *Jurisdictional Waters of the U.S. Delineation*. Wetlands with discernably different vegetation cover are presented in Figure 2. These wetlands are comprised of two (2) different vegetation types, forested and emergent. Forested wetlands are found within other forested in the northern, central, southern, and eastern portions of the Project area. These areas are generally distinguishable by their more herbaceous and open understory. Typical species included black willow, sugar maple, green ash, reed canary grass, Lizard's tail, orange jewelweed, stinging nettle, blue flag, and poison ivy. Emergent wetlands are generally found in the southwestern portion of the Project area and are generally discernable from the adjacent cropland by the presence of typical wetland species absent of planted crops. Emergent wetland species include meadow sedge, fox sedge, bulrush, red clover, smooth-sheathed sedge, narrowleaf cattail, poison hemlock, and redtop.

5.0 Species Habitat Accounts

The following are brief descriptions of suitable habitat criteria for each species considered in this assessment and a description of the extent and condition of any suitable habitat found during the field assessment. Table 1 depicts each species described below and includes the species' state and/or federal listing, suitable habitat description, and whether suitable habitat was found in the Project area (Table 1).

5.1 Federally Listed Species

5.1.1 Indiana Bat (*Myotis sodalis*)

The federal and state endangered Indiana bat spends the summer season within deciduous forests, typically near a river or stream corridor where this species can easily travel from roosting sites to foraging sites. The Indiana bat roosts in living, dead, and dying trees under sloughing bark with consistent sun exposure. Females roost in groups of up to 300 bats, while males roost individually or in small groups. Female Indiana bats have high roost fidelity, meaning they will return to the same primary roost tree each year. Indiana bats forage in forested stream corridors, upland and bottomland forests, forested wetlands, and along wooded edges of agriculture fields, pastures, and ponds. The Indiana bat migrates to hibernacula in the fall and hibernates during the winter in caves and mines in large clusters on cave ceilings. This species requires cool, humid hibernacula with stable temperatures (USFWS 2008).

The deciduous forest habitat within the northern, central, southern, and southwestern portions of the Project area is considered suitable habitat for the Indiana bat for both roosting and foraging (Figure 3). The IPaC states that there is final critical habitat for this species; however, the Project area is located outside of critical habitat (Appendix A). The forested areas provide suitable roosting habitat, as ERP observed numerous dead trees and shagbark hickories that could serve as potential roosts for this species. The understory within the forested areas are moderately open. Additionally, forested areas within the central portion of the Project area surround Kilmore Creek which can provide suitable travel corridors and foraging habitat for the Indiana bat (Figure 3).

5.1.2 Northern Long-eared Bat (*Myotis septentrionalis*)

The federally threatened NLEB spends the summer within deciduous forests near riparian corridors where this species can easily travel from roosting sites to foraging sites. The NLEB selects for a variety of summer roosting structures including dead or living trees of various sizes, stumps, fences, barns, etc., all of which must have a consistent source of sun exposure. The Project area was observed as containing farming structures and fences capable of providing suitable habitat for the NLEB, however, the locations of these structures and conditions were not noted during the field evaluation. The NLEB hibernates throughout the winter in caves and abandoned mines of various sizes that must have constant temperatures, high humidity, and no air current (USFWS 2015).

The areas of deciduous forest located within the northern, central, southern, and southwestern portions of the Project area are considered suitable roosting and foraging habitat for the NLEB as ERP observed numerous dead trees and shagbark hickories present that could serve as potential roosts for this species. Additionally, forested areas within the central portion of the Project area surround Kilmore Creek which can provide suitable travel corridors and foraging habitat for the NLEB (Figure 3).

5.2 State-listed Species

5.2.1 Sedge Wren (*Cistothorus platensis*)

The state endangered sedge wren occurs within Indiana during the summer breeding season. This species prefers habitat consisting of grassy marshes, sedge meadows, and lush hayfields or similar fields with dense low growth and scattered bushes (Audubon n.d.). Sedge wrens have low fidelity to both breeding and wintering sites, abandoning sites with high levels of water level fluctuation, but preferring wet grasslands adjacent to wetlands for nesting. Little information is provided on minimum patch size requirement, but USFWS suggests a minimum of 1.8 acres (USFWS, 2001).

Pasture habitat within the southern and southwestern portions of the Project area are comprised of dense low growth with scattered bushes and have the potential to provide suitable habitat for the sedge wren. However, the presence of this species within Indiana during the summer breeding season is considered uncommon (Audubon n.d.). The Indiana NHDC did not reveal record of this species occurring within the Project area or Project area buffer (Appendix C). As the habitat suitable by the sedge wren is located within the Project area, this species may occur onsite.

5.2.2 Loggerhead Shrike (*Lanius ludovicianus*)

The state endangered loggerhead shrike occurs within Indiana year-round. This species prefers habitat consisting of open country with short vegetation with shrubs and low trees that have spines or thorns. The loggerhead shrike prefers agriculture fields, pastures, orchards, riparian areas, scrublands, prairies, and maintained habitat such as golf courses and cemeteries (Cornell n.d.).

There is a cemetery within the central portion of the Project that is adjacent to Kilmore Creek that could provide suitable habitat for the loggerhead shrike (Appendix E, Photo 10). Additionally, there is pasture habitat within the southern and southwestern portions of the Project area that can provide suitable habitat for the loggerhead shrike (Figure 3 and Appendix E, Photos 8-9). The Indiana NHDC did not reveal records of the loggerhead shrike occurring within the Project area or Project area buffer (Appendix C). As there is suitable habitat for the loggerhead shrike within the Project area, this species may occur onsite (Figure 3 and Appendix E, Photos 8-10).

5.2.3 Black-crowned Night-heron (*Nycticorax nycticorax*)

The state endangered black-crowned night heron occurs within Indiana during the migration and summer breeding season. This species prefers habitat consisting of wetlands, freshwater marshes, swamps, streams, rivers, lakes, ponds, reservoirs, and wet agriculture fields. This species requires aquatic habitat for foraging (Cornell n.d.).

Kilmore Creek and Boyle's Ditch are located within the central and northern portions of the Project area, respectively, and both provide suitable habitat for the black-crowned night heron. A tributary associated with Kilmore Creek that flows south to north within the central portion of the Project area can provide suitable habitat for this species. Additionally, numerous agriculture fields within the Project area had saturated depressions that can hold water after a rain event, which can provide suitable habitat for this species (Figure 3). The Indiana NHDC did not reveal records of the black-crowned night-heron occurring

within the Project area or Project area buffer (Appendix C). As there is suitable habitat for the black-crowned night-heron within the Project area, this species may occur onsite.

5.2.4 Clubshell (*Pleurobema clava*)

The federal and state endangered clubshell prefers habitat consisting of clean, loose sand and gravel in medium to small rivers and streams. The clubshell will bury itself up to four (4) inches within the stream substrate (USFWS 1997). Mussel shells were observed within Boyle's Ditch within the northern portion of the Site (Figure 3). The species of the mussel is unknown. Photographs of the mussel shells are included in the photo log. Kilmore Creek and Boyle's Ditch are located within the central and northern portions of the Project area, respectively, and both provide suitable habitat for the clubshell. A tributary associated with Kilmore Creek that flows south to north within the central portion of the Project area can provide suitable habitat for this species (Figure 3). The NHDC did not reveal records of the clubshell occurring within the Project area or Project area buffer (Appendix C). Although the clubshell was not included in the IDNR Clinton County Endangered, Threatened, and Rare Species List, their exact range is unknown and suitable habitat for this species was found onsite. Therefore, this species may occur onsite.

5.3 Other Federally Protected Species

5.3.1 Purple Lilliput (*Toxolasma lividus*)

The purple lilliput is listed as a candidate for listing under the ESA. This species was not included in the IPaC Official Species List. However, the NHDC revealed record of the purple lilliput occurring either within the Project area or Project area buffer (Appendix C). Detailed information regarding the exact location of the record was not included. The purple lilliput prefers habitat consisting of fine-particle substrates, sand, gravel, cobbles, and/or boulders within riffles or flats within small to medium sized rivers (Nature Serve Explorer 2011). Mussel shells were observed within Boyle's Ditch within the northern portion of the Site (Figure 3). The species of the mussel is unknown. Photographs of the mussel shells are included in the photo log. Kilmore Creek and Boyle's Ditch are located within the central and northern portions of the Project area, respectively, and both provide suitable habitat for the purple lilliput. A tributary associated with Kilmore Creek that flows south to north within the central portion of the Project area can provide suitable habitat for this species. As there is suitable habitat for the purple lilliput within the Project area as well as record of this species occurring within the Project area or Project area buffer, this species may occur onsite.

5.3.2 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is protected under the BGEPA and occurs within Indiana year-round. This species utilizes large, super-canopy trees located in close proximity to rivers, lakes, marshes, and other large waterbodies where fish, their primary prey, are abundant. The bald eagle is an opportunistic forager and will consume carrion of fish, birds, and mammals. This species requires large trees that provide high perches used to locate prey while also providing branches that afford the strength required to support the weight of the nest (USFWS 2007). In Indiana, bald eagles had been extirpated by 1897; as of 2018, nearly 300 breeding pairs occur in the state in 85 of the 92 counties (IDNR, 2018). A review of publicly available data revealed several observations within close proximity to the Project area, the nearest of which was recorded approximately 1.2 miles north of the Project area (eBird 2012).

Suitable nesting and foraging habitat for the bald eagle was not observed within the Project area. However, there are several lakes with recorded observations that are located within the vicinity of the Project area that provide suitable habitat for the bald eagle, such as Little Lake located adjacent to the eastern edge of the Project area (Figure 1) (eBird 2012).

5.3.3 Golden Eagle (*Aquila chrysaetos*)

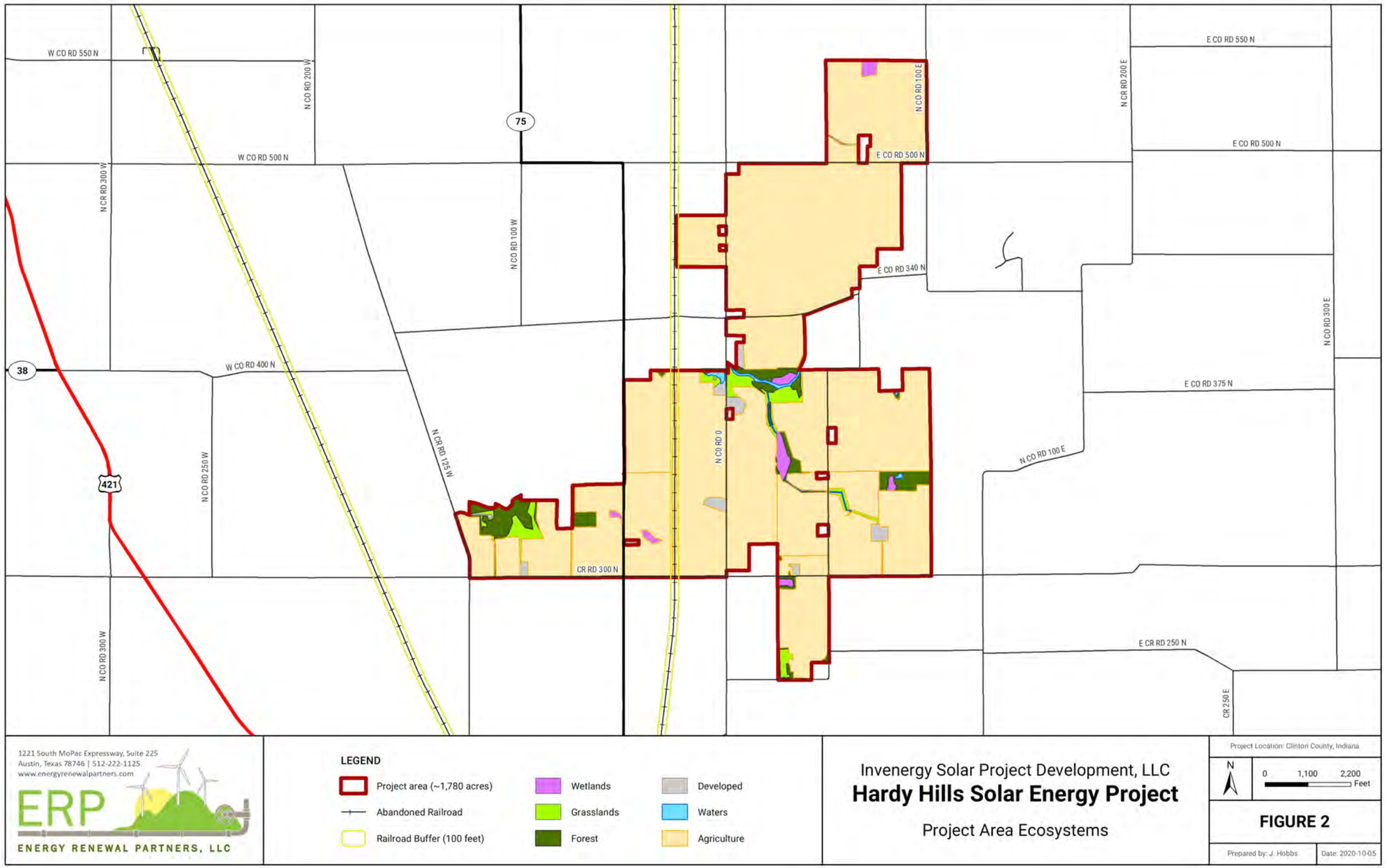
The golden eagle is protected under the BGEPA and occurs within Indiana during the migration and winter seasons. This species can be found in habitats consisting of grassland, forests, brushlands, and arid deserts. The golden eagle prefers to forage in open habitat where it can easily hunt for small to mid-sized animals including reptiles, birds, and mammals. This species prefers nesting habitat consisting of large trees within forest stands and cliffs that provide an unobstructed view of the surrounding habitat (USFWS 2011). A review of publicly available data revealed that the nearest observation of the golden eagle was recorded approximately 18 miles northwest of the Project area (eBird 2012).

Suitable winter/migration foraging habitat for the golden eagle was not observed onsite. The NHDC did not reveal records of the golden eagle occurring within the Project area or Project area buffer (Appendix C). Therefore, the golden eagle is not anticipated occur within the Project area.

Table 1: State and Federally Protected Species Habitat Requirements and Investigation Findings

Common Name (*Scientific Name*)	Federal Status	State Status	Suitable Habitat Description	Suitable Habitat Observed Onsite?	Approximate Extent of Suitable Habitat
Indiana bat (*Myotis sodalis)*	Endangered	Endangered	Deciduous forests near streams and river corridors. Roosting requirements include dead or dying trees with sloughing bark with consistent sun exposure. Winter habitat includes caves and abandoned mines.	Yes, roosting and foraging	121 acres
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	-	Deciduous forests near riparian corridors. Roosting requirements include trees and anthropomorphic features. Winter habitat includes caves and abandoned mines.	Yes, roosting and foraging	121 acres
Sedge Wren (*Cistothorus platensis*)	-	Endangered	Grassy marshes, sedge meadows, and lush hayfields or similar fields with dense low growth and scattered bushes.	Yes	31 acres
Loggerhead Shrike (*Lanius ludovicianus*)	-	Endangered	Open country with short vegetation with shrubs and low trees that have spines or thorns. Additionally, agriculture fields, pastures, orchards, riparian areas, scrublands, prairies, golf courses, and cemeteries.	Yes	31 acres
Black-crowned Night-heron (*Nycticorax nycticorax*)	-	Endangered	Wetlands, freshwater marshes, swamps, streams, rivers, lakes, ponds, reservoirs, and wet agriculture fields.	Yes	9,665 feet
Clubshell (*Pleurobema clava*)	Endangered	Endangered	Clean, loose sand and gravel in medium to small rivers and streams.	Yes	9,665 feet
Purple Lilliput (*Toxolasma lividus*)	Candidate	-	fine-particle substrates, sand, gravel, cobbles, and/or boulders within riffles or flats within small to medium sized rivers.	Yes	9,665 feet
Bald eagle (*Haliaeetus leucocephalus*)	BGEPA	-	Large, super-canopy trees capable of supporting nest and can provide suitable perches. Foraging habitat includes rivers, lakes, and reservoirs where fish are prevalent.	May travel through Project area to more suitable habitat	-

Common Name (*Scientific Name*)	Federal Status	State Status	Suitable Habitat Description	Suitable Habitat Observed Onsite?	Approximate Extent of Suitable Habitat
Golden eagle (*Aquila chrysaetos*)	BGEPA	-	Cliffs and large trees within forested habitat with an unobstructed view of surrounding habitat. Prefers to forage in open habitat.	No	-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N CO RD 100 E
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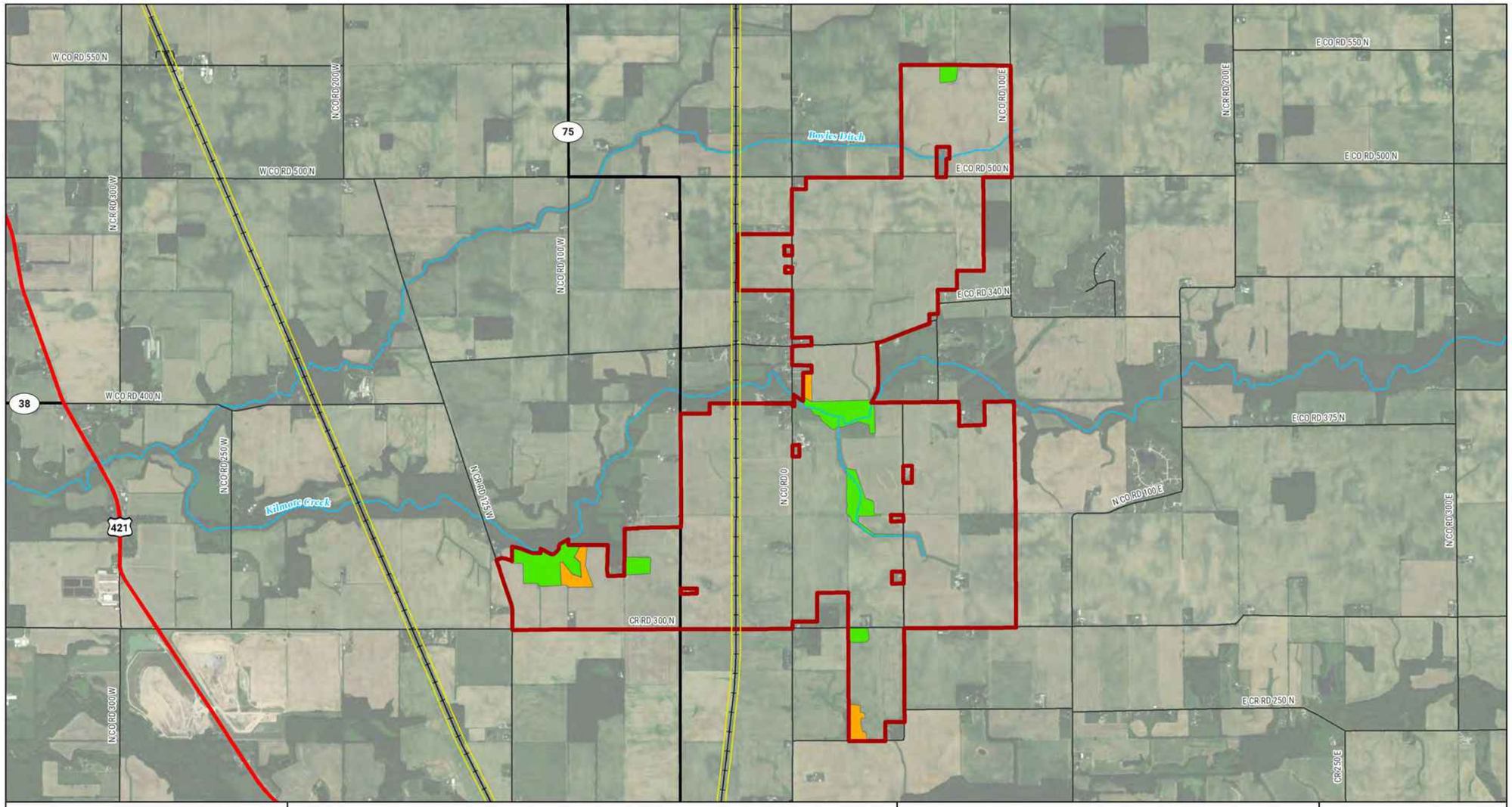
LEGEND
Project area (~1,780 acres)
Abandoned Railroad
Railroad Buffer (100 feet)
Wetlands
Grasslands
Forest
Developed
Waters
Agriculture
Invenergy Solar Project Development, LLC
Hardy Hills Solar Energy Project
Project Area Ecosystems
Project Location: Clinton County, Indiana
N
0 1,100 2,200 Feet
FIGURE 2
Prepared by: J. Hobbs
Date: 2020-10-05



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ENERGY RENEWAL PARTNERS, LLC

LEGEND

- Project area (~1,780 acres)
- Abandoned Railroad
- Railroad Buffer (100 feet)
- Stream/Drainage (NHD) *(Black-crowned Night-Heron, Clubshell, and Purple Lilliput habitat)*
- Bat Habitat
- Loggerhead Shrike and Sedge Wren Habitat

Invenergy Solar Project Development, LLC

Hardy Hills Solar Energy Project

Locations of Potentially Suitable Protected Species Habitat

Project Location: Clinton County, Indiana

N

0 1,100 2,200 Feet

FIGURE 3

Prepared by: J. Hobbs | Date: 2020-10-02

6.0 Conclusion

ERP conducted a desktop review and subsequent field assessment to chronicle the habitat types present within the Project area for this Protect Species Habitat Assessment for the Hardy Hills Solar Energy Project. Based on the desktop review and field assessment of the Project area, ERP concluded that the Project area is primarily composed of cultivated agricultural fields, with small areas of deciduous forests within the northern, central, southern, and southwestern portions. ERP did not observe vegetative communities associated with remnant mesic prairies onsite. The Project area may provide limited suitable roosting and foraging habitat for the federal and state endangered Indiana bat and federally threatened NLEB (approximately 121 acres). The Project area may also provide suitable habitat for the federal and state endangered clubshell and federal candidate purple lilliput (approximately 9,665 linear feet of stream). Additionally, the Project area may provide suitable habitat for the state endangered sedge wren, loggerhead shrike, and black-crowned night-heron (approximately 31 acres).

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Appendix A

USFWS Information for Planning and Consultation Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Indiana Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273
http://www.fws.gov/midwest/Endangered/section7/s7process/step1.html

In Reply Refer To: March 25, 2020
Consultation Code: 03E12000-2020-SLI-1129
Event Code: 03E12000-2020-E-05101
Project Name: Hardy Hills

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

To Whom It May Concern:

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.

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 Service if they determine their project “may affect” listed species or critical habitat.

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. This verification can be completed formally or informally. You may verify the list by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation and completing the same process you used to receive the attached list. As an alternative, you may contact this Ecological Services Field Office for updates.

Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at - http://www.fws.gov/midwest/endangered/section7/s7process/index.html. This website contains step-by-step instructions which will help you

determine if your project will have an adverse effect on listed species and will help lead you through the Section 7 process.

For all **wind energy projects** and **projects that include installing towers that use guy wires or are over 200 feet in height**, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project or may be affected by your proposed project.

Although no longer protected under the Endangered Species Act, be aware that bald eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*) and Migratory Bird Treaty Act *(*16 U.S.C. 703 *et seq*), as are golden eagles. Projects affecting these species may require measures to avoid harming eagles or may require a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at http://www.fws.gov/midwest/midwestbird/EaglePermits/index.html to help you determine if you can avoid impacting eagles or if a permit may be necessary.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

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:

Indiana Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
(812) 334-4261

Project Summary

Consultation Code: 03E12000-2020-SLI-1129

Event Code: 03E12000-2020-E-05101

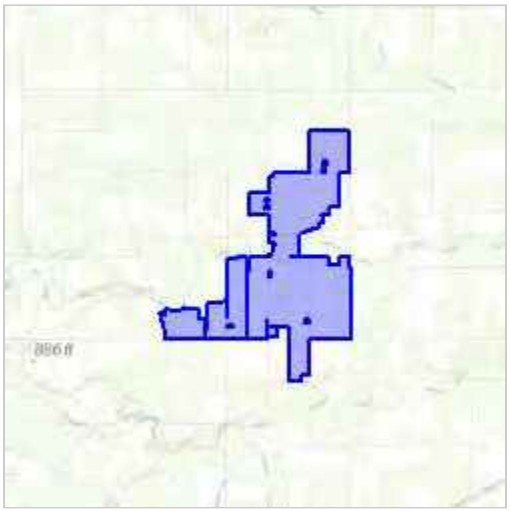
Project Name: Hardy Hills

Project Type: POWER GENERATION

Project Description: Potential solar farm construction.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.343990640000044N86.49875946852684W



Counties: Clinton, IN

Endangered Species Act Species

There is a total of 2 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 1 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 is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/1/office/31440.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Incidental take of the NLEB is not prohibited here. Federal agencies may consult using the 4(d) rule streamlined process. Transportation projects may consult using the programmatic process. See www.fws.gov/midwest/endangered/mammals/nleb/index.html Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

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

Appendix B

IDNR Clinton County Endangered, Threatened, and Rare Species List

Indiana County Endangered, Threatened and Rare Species List

County: Clinton

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
Alasmidonta viridis	Slippershell Mussel		SSC	G4G5	S3
Eurynia dilatata	Spike		SSC	G5	S4
Lampsilis fasciola	Wavyrayed Lampmussel		SSC	G5	S3
Pleurobema clava	Clubshell	LE	SE	G1G2	S1
Ptychobranchus fasciolaris	Kidneyshell		SSC	G4G5	S2
Simpsonaias ambigua	Salamander Mussel	C	SSC	G3	S2
Toxolasma lividus	Purple Lilliput	C	SSC	G3Q	S2
Villosa iris	Rainbow		SSC	G5	S3
Bird					
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Haliaeetus leucocephalus	Bald Eagle		SSC	G5	S2
Lanius ludovicianus	Loggerhead Shrike		SE	G4	S3B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Mammal					
Myotis sodalis	Indiana Bat	LE	SE	G2	S1
Taxidea taxus	American Badger		SSC	G5	S2
High Quality Natural Community					
Forest - flatwoods central till plain	Central Till Plain Flatwoods		SG	G3	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2

Indiana Natural Heritage Data Center
Division of Nature Preserves
Indiana Department of Natural Resources
This data is not the result of comprehensive county surveys.

Fed: LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant; WL = watch list

GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long-term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank

SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long-term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Appendix C

Indiana Natural Heritage Data Center Information Request Response

Division of Nature Preserves
402 W. Washington St., Rm W267
Indianapolis, IN 46204-2739

March 10, 2020

Sean Martin
Energy Renewal Partners, LLC
127 W Worthington Ave, Suite 270
Charlotte, North Carolina 28203

Dear Sean Martin:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas for Hardy Hills a Utility-scale Solar Energy Facility located in Clinton County, Indiana. The Indiana Natural Heritage Data Center has been checked and included you will find a datasheet with information on the ETR species and high quality natural communities documented within 2 miles of the project area. There were no bald eagle nests or bat maternity roots documented within 5 miles of the project area.

Within a half mile of the project location is the Phil and Joan Ferguson Nature Preserve which is owned and managed by Niches Land Trust. For more information about this property please contact Niches Land Trust, niches@nicheslandtrust.org or (765) 423 – 1605.

For more information on the animal species mentioned, please contact Christie Stanifer, Environmental Coordinator, Division of Fish and Wildlife, 402 W. Washington Room W273, Indianapolis, Indiana, 46204, (317)232-8163.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. If you have concerns about potential Endangered Species Act issues you should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service
620 South Walker St.
Bloomington, Indiana 47403-2121
812-334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal. For more information, please contact:

Department of Natural Resources
Attn: Christie Stanifer
Environmental Coordinator
Division of Fish and Wildlife
402 W. Washington Street, Room W273
Indianapolis, IN 46204
(317)232-8163

Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)233-2558 if you have any questions or need additional information.

Sincerely,

Taylor Davis
Indiana Natural Heritage Data Center

Enclosure: invoice
datasheet

March 10, 2020

INDIANA HERITAGE DATA WITHIN 2.0 MILES OF:

Hardy Hills - Utility-scale Solar Energy Facility, Clinton County

Sci. Name	Com. Name	State	Fed.	Date	Site	Comments
Mammal						
Myotis sodalis	Indiana Bat	SE	LE	1991	1991 BRACK SURVEY SITE G	BAT SUMMER CAPTURE
Taxidea taxus	American Badger	SSC		1985		
Mollusk						
Lampsilis fasciola	Wavyrayed Lampmussel	SSC		2014	KILMORE CREEK	2014: LIVE (FISHER)
Ptychobranchus fasciolaris	Kidneyshell	SSC		2004	SOUTH FORK WILDCAT CREEK	HISTORICAL; WEATHERED DEAD. (FISHER AND BRIGGS, 2004).
Toxolasma lividus	Purple Lilliput	SSC	C	2014	KILMORE CREEK	2014: WEATHERED DEAD (FISHER)
Villosa iris	Rainbow	SSC		2018	KILMORE CREEK	WEATHERED DEAD (FISHER, 2018)

Fed: LE= Listed Federal endangered; C = Federal candidate species

State: SE = State endangered; ST= State threatened; SR = State rare; SSC = State species of special concern; SG = State significant; WL = watch list; no rank - not ranked but tracked to monitor status

Appendix D

USDA Custom Soil Resource Report for Clinton County, Indiana

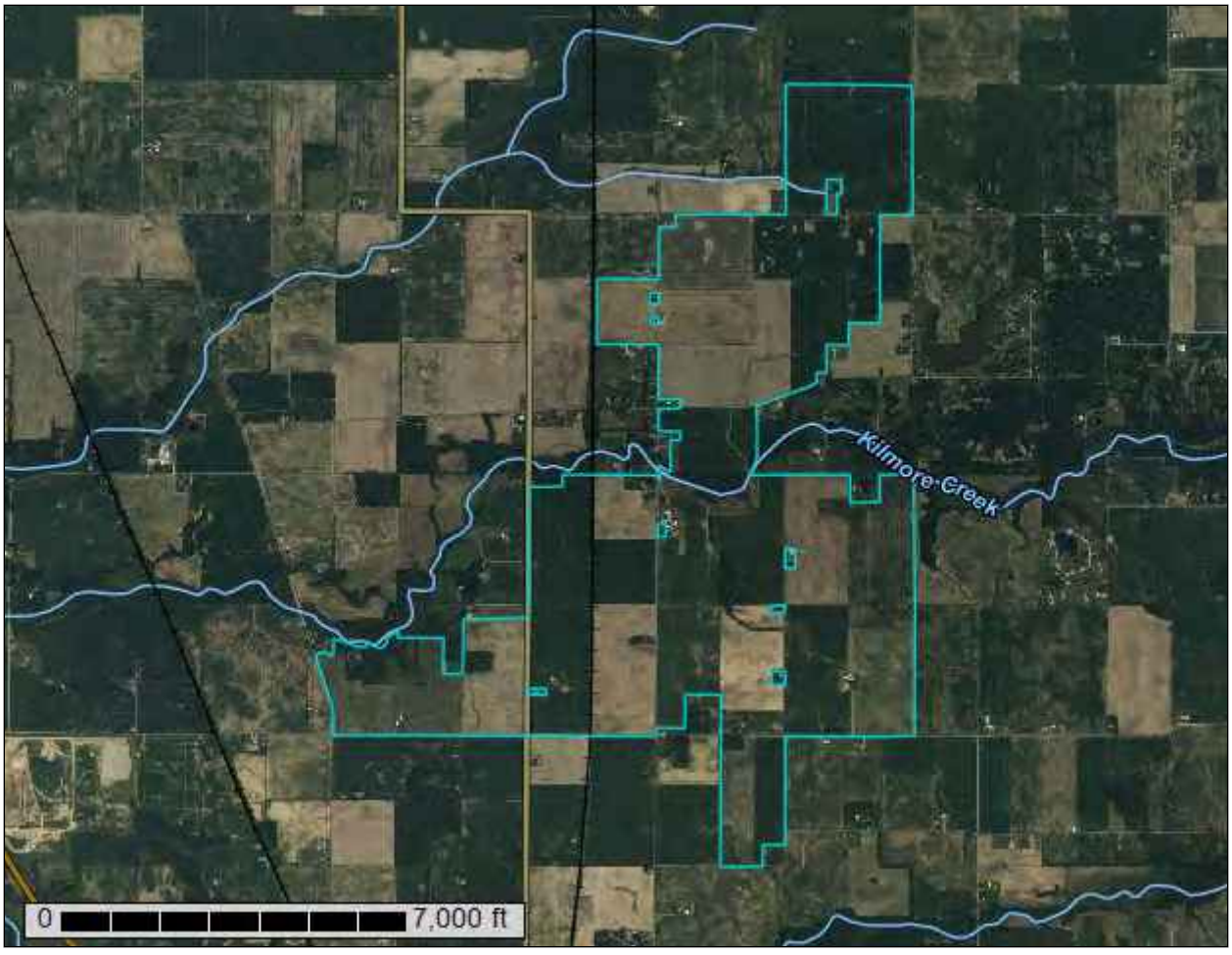
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clinton County, Indiana



June 24, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

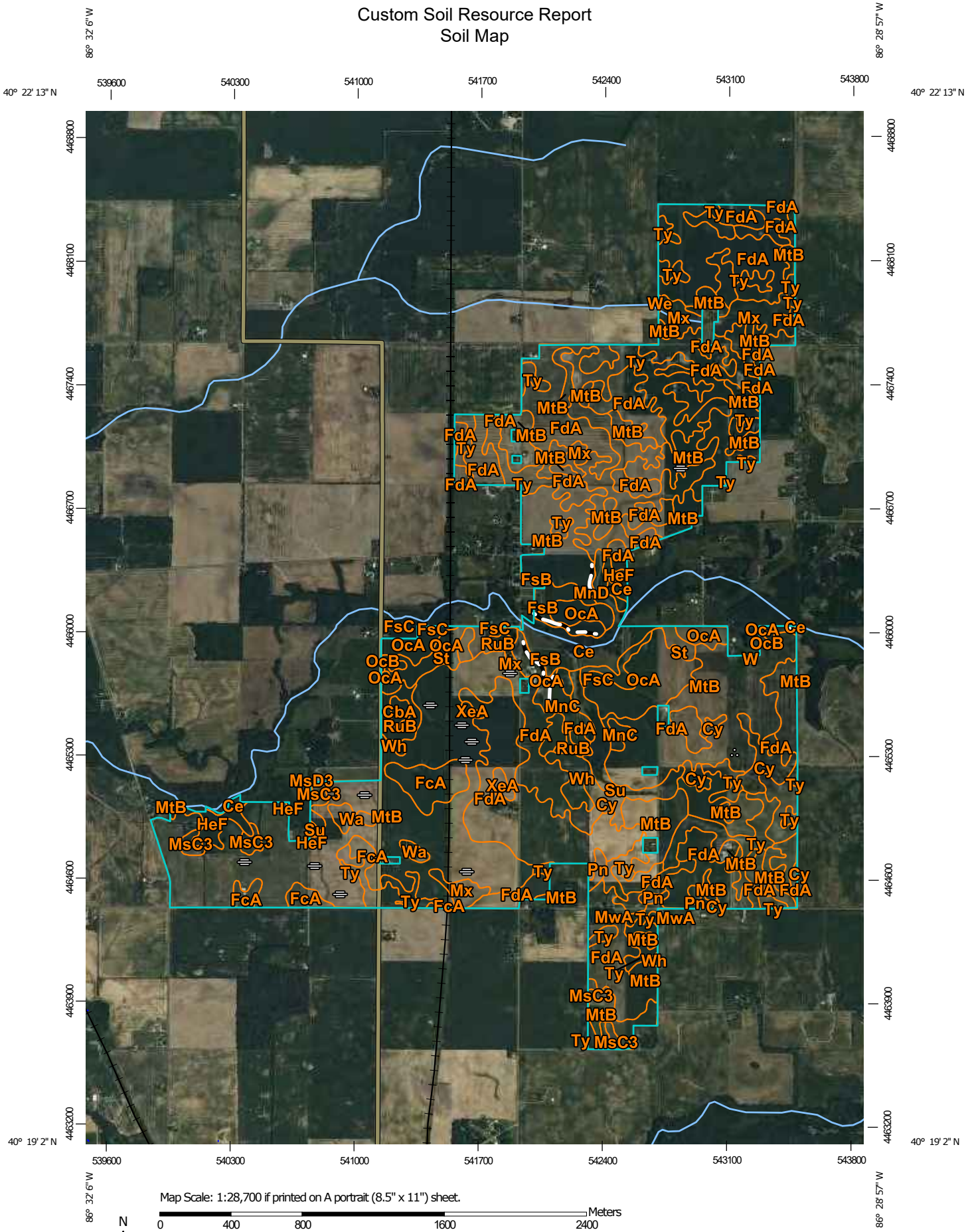
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

Soil Survey Area: Clinton County, Indiana
Survey Area Data: Version 23, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 25, 2019—Sep 26, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CbA	Camden variant silt loam, 0 to 2 percent slopes	3.8	0.2%
Ce	Ceresco loam	44.6	2.5%
Cy	Cyclone silt loam, 0 to 2 percent slopes	35.8	2.0%
FcA	Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes	49.2	2.8%
FdA	Fincastle-Crosby silt loams, 0 to 2 percent slopes	489.4	27.5%
FsB	Fox silt loam, 2 to 6 percent slopes	21.1	1.2%
FsC	Fox loam, 6 to 15 percent slopes	8.3	0.5%
HeF	Hennepin silt loam, 18 to 50 percent slopes	11.8	0.7%
MnC	Miami silt loam, 6 to 12 percent slopes	16.9	0.9%
MnD	Miami silt loam, 12 to 18 percent slopes	3.4	0.2%
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	14.3	0.8%
MsD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	1.8	0.1%
MtB	Miami-Crosby silt loams, 2 to 6 percent slopes	627.6	35.3%
MwA	Miami-Martinsville silt loams, 0 to 2 percent slopes	2.6	0.1%
Mx	Milford silty clay loam	37.4	2.1%
OcA	Ockley silt loam, 0 to 2 percent slopes	78.2	4.4%
OcB	Ockley silt loam, 2 to 6 percent slopes	1.1	0.1%
Pn	Patton silty clay loam, 0 to 2 percent slopes	8.4	0.5%
RuB	Russell silt loam, 2 to 6 percent slopes	16.9	0.9%
St	Sleeth silt loam, 0 to 2 percent slopes	25.4	1.4%
Su	Sloan silt loam	23.5	1.3%
Ty	Treaty silt loam, 0 to 2 percent slopes	224.3	12.6%
W	Water	1.6	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Wa	Wallkill silt loam	4.6	0.3%
We	Westland silty clay loam, 0 to 2 percent slopes	0.4	0.0%
Wh	Whitaker silt loam, 0 to 2 percent slopes	20.4	1.1%
XeA	Xenia silt loam, 0 to 2 percent slopes	5.2	0.3%
Totals for Area of Interest		**1,777.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Indiana

CbA—Camden variant silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5fx5
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Camden variant and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Camden Variant

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over loamy till

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 32 inches: silty clay loam
H3 - 32 to 48 inches: sandy loam
H4 - 48 to 59 inches: stratified loamy sand to sandy loam
H5 - 59 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Ce—Ceresco loam

Map Unit Setting

National map unit symbol: 5fx6
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Ceresco and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ceresco

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Minor Components

Cohoctah

Percent of map unit: 3 percent

Landform: Depressions
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Sloan

Percent of map unit: 3 percent
Landform: Depressions
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Cy—Cyclone silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2thyf
Elevation: 640 to 1,150 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Cyclone and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cyclone

Setting

Landform: Flats, swales, till plains, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 14 inches: silt loam
Btg1 - 14 to 20 inches: silt loam
Btg2 - 20 to 49 inches: silty clay loam
2Bt3 - 49 to 60 inches: loam
2C - 60 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Fincastle
Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Xenia
Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Sugarvalley
Percent of map unit: 3 percent
Landform: Flats, ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Morningsun
Percent of map unit: 2 percent
Landform: Ground moraines, flats
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

FcA—Fincastle silt loam, Tipton Till Plain, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2rkb8
Elevation: 400 to 1,140 feet
Mean annual precipitation: 37 to 46 inches

Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fincastle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fincastle

Setting

Landform: Till plains
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty material and/or loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
E - 10 to 13 inches: silt loam
Bt1 - 13 to 27 inches: silty clay loam
2Bt2 - 27 to 50 inches: clay loam
2BC - 50 to 59 inches: loam
2Cd - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Cyclone

Percent of map unit: 10 percent
Landform: Flats, swales, till plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Concave
Across-slope shape: Linear, concave

Hydric soil rating: Yes

Mahalasville

Percent of map unit: 5 percent
Landform: Swales on till plains, flats on till plains, depressions on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

FdA—Fincastle-Crosby silt loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4m3
Elevation: 450 to 1,010 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fincastle and similar soils: 55 percent
Crosby and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fincastle

Setting

Landform: Till plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
E - 10 to 13 inches: silt loam
Bt1 - 13 to 27 inches: silty clay loam
2Bt2 - 27 to 50 inches: clay loam
2BC - 50 to 59 inches: loam
2Cd - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Description of Crosby

Setting
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy till

Typical profile
Ap - 0 to 8 inches: silt loam
BE - 8 to 11 inches: silt loam
Bt1 - 11 to 14 inches: silt loam
2Bt2 - 14 to 28 inches: clay loam
2BCt - 28 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Williamstown

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Treaty

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

FsB—Fox silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5fxf
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Fox and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 16 inches: loam
H3 - 16 to 35 inches: gravelly silt loam
H4 - 35 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 24 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

FsC—Fox loam, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 5fxg
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Fox and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 32 inches: gravelly clay loam
H3 - 32 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 6 to 15 percent

Depth to restrictive feature: 24 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

HeF—Hennepin silt loam, 18 to 50 percent slopes

Map Unit Setting
National map unit symbol: 5fxj
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Hennepin and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hennepin

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile
H1 - 0 to 4 inches: silt loam
H2 - 4 to 11 inches: loam
H3 - 11 to 60 inches: loam

Properties and qualities
Slope: 18 to 50 percent
Depth to restrictive feature: 11 to 60 inches to densic material
Natural drainage class: Well drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MnC—Miami silt loam, 6 to 12 percent slopes

Map Unit Setting
National map unit symbol: 5fxq
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Miami and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting
Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities
Slope: 6 to 12 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MnD—Miami silt loam, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 5fxr
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MsC3—Miami clay loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2rk9y
Elevation: 600 to 1,200 feet
Mean annual precipitation: 36 to 43 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami, severely eroded, and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami, Severely Eroded

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 29 inches: clay loam
BCt - 29 to 34 inches: loam
Cd - 34 to 80 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Crosby

Percent of map unit: 3 percent
Landform: Till plains
Landform position (three-dimensional): Interfluve
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

MsD3—Miami clay loam, 12 to 18 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2w3qq
Elevation: 600 to 1,260 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Miami, severely eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami, Severely Eroded

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 29 inches: clay loam

BCt - 29 to 34 inches: loam
Cd - 34 to 79 inches: loam

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Crosby

Percent of map unit: 8 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hennepin, eroded

Percent of map unit: 2 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

MtB—Miami-Crosby silt loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t4m9
Elevation: 600 to 1,020 feet
Mean annual precipitation: 37 to 41 inches
Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 155 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Miami and similar soils: 60 percent
Crosby and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Till plains
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 13 inches: silty clay loam
2Bt - 13 to 31 inches: clay loam
2BCt - 31 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 35 to 40 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Crosby

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, dip
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
BE - 8 to 11 inches: silt loam
Bt1 - 11 to 14 inches: silt loam
2Bt2 - 14 to 28 inches: clay loam
2BCt - 28 to 36 inches: loam
2Cd - 36 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 31 to 40 inches to densic material
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Treaty

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

MwA—Miami-Martinsville silt loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5fxw
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 175 to 190 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Miami and similar soils: 60 percent
Martinsville and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miami

Setting

Landform: Rises
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 31 inches: clay loam
H3 - 31 to 36 inches: loam
H4 - 36 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 28 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Martinsville

Setting

Landform: Rises on till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 34 inches: clay loam

H3 - 34 to 39 inches: sandy clay loam
H4 - 39 to 60 inches: stratified loamy sand to sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Mx—Milford silty clay loam

Map Unit Setting

National map unit symbol: 5fxx
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Milford and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Milford

Setting

Landform: Potholes on lake plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Clayey lacustrine deposits

Typical profile

H1 - 0 to 10 inches: silty clay loam
H2 - 10 to 31 inches: silty clay
H3 - 31 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

OcA—Ockley silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4ld
Elevation: 600 to 1,250 feet
Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ockley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silt loam
BA - 10 to 15 inches: silt loam
Bt1 - 15 to 18 inches: silt loam
Bt2 - 18 to 37 inches: clay loam
2Bt3 - 37 to 49 inches: gravelly sandy clay loam

3C - 49 to 79 inches: stratified very gravelly coarse sand to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 72 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wawaka

Percent of map unit: 5 percent
Landform: Till plains on outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fox

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Digby

Percent of map unit: 3 percent
Landform: Glacial drainage channels, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Haney

Percent of map unit: 2 percent
Landform: Glacial drainage channels, outwash plains

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

OcB—Ockley silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t4lk
Elevation: 350 to 1,300 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 155 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ockley and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley

Setting

Landform: Stream terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silt loam
2Bt1 - 10 to 26 inches: clay loam
2Bt2 - 26 to 45 inches: gravelly clay loam
3C - 45 to 79 inches: stratified coarse sand to very gravelly sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 31 to 55 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Fox, eroded
Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Sleeth
Percent of map unit: 5 percent
Landform: Stream terraces, channels on stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Pn—Patton silty clay loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2w0td
Elevation: 670 to 960 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition
Patton, drained, loamy substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Patton, Drained, Loamy Substratum

Setting
Landform: Depressions on lake plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, flat, dip

Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy glaciolacustrine deposits over loamy outwash

Typical profile

Ap - 0 to 12 inches: silty clay loam
Bg - 12 to 40 inches: silty clay loam
2Cg - 40 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Crosby

Percent of map unit: 6 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Treaty, drained

Percent of map unit: 5 percent
Landform: Water-lain moraines, swales, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Starks

Percent of map unit: 4 percent
Landform: Till plains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Hydric soil rating: No

Westland, drained

Percent of map unit: 3 percent
Landform: Swales on stream terraces, depressions on stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Palms, drained

Percent of map unit: 2 percent
Landform: Depressions on moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

RuB—Russell silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2w0vz
Elevation: 540 to 1,170 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Russell and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Russell

Setting

Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 13 inches: silty clay loam
Bt2 - 13 to 28 inches: silty clay loam
2Bt3 - 28 to 52 inches: clay loam
2BCt - 52 to 58 inches: loam

2Cd - 58 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 42 to 60 inches to densic material
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Xenia

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fincastle

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Cyclone, drained

Percent of map unit: 3 percent
Landform: Swales, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Williamstown

Percent of map unit: 2 percent
Landform: Water-lain moraines, till plains, recessionial moraines
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Nose slope

Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

St—Sleeth silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w3qm
Elevation: 500 to 1,170 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Sleeth and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sleeth

Setting

Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: silt loam
E - 9 to 14 inches: silt loam
2Bt1 - 14 to 38 inches: clay loam
2Btg2 - 38 to 50 inches: gravelly clay loam
3Cg - 50 to 60 inches: stratified gravelly gravelly gravelly coarse sand to sand to sand to loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 38 to 50 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 38 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Sleeth, till substratum

Percent of map unit: 15 percent
Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Westland, drained

Percent of map unit: 3 percent
Landform: Stream terraces on outwash plains, depressions on outwash plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave, convex
Hydric soil rating: Yes

Eldean

Percent of map unit: 1 percent
Landform: Stream terraces on outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Ockley

Percent of map unit: 1 percent
Landform: Outwash terraces, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Su—Sloan silt loam

Map Unit Setting

National map unit symbol: 5fyf
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F

Frost-free period: 180 to 190 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition
Sloan and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sloan

Setting
Landform: Flood plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile
H1 - 0 to 13 inches: silt loam
H2 - 13 to 50 inches: loam
H3 - 50 to 60 inches: stratified sand to silty clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: High (about 10.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Ty—Treaty silt loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2ygzm
Elevation: 670 to 1,210 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Treaty, frequently ponded, drained, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Treaty, Frequently Ponded, Drained

Setting

Landform: Water-lain moraines, swales, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Silty material or loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
A - 10 to 14 inches: silt loam
Btg1 - 14 to 36 inches: silty clay loam
2Btg2 - 36 to 59 inches: loam
2C - 59 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Williamstown, eroded

Percent of map unit: 5 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Milford, frequently ponded, drained

Percent of map unit: 5 percent
Landform: Depressions on lake plains
Landform position (three-dimensional): Talf, dip

Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Crosby

Percent of map unit: 5 percent
Landform: Ground moraines, water-lain moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Miami, eroded

Percent of map unit: 5 percent
Landform: Water-lain moraines, ground moraines, recessionial moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Wa—Wallkill silt loam

Map Unit Setting

National map unit symbol: 5fyk
Elevation: 630 to 940 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 180 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Wallkill, drained, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wallkill, Drained

Setting

Landform: Depressions on till plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy slope alluvium over herbaceous organic material over loamy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 22 inches: silt loam
Oa3 - 22 to 52 inches: muck
H4 - 52 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very high (about 17.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

We—Westland silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t4m1
Elevation: 400 to 1,000 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 155 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Westland, drained, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Westland, Drained

Setting

Landform: Swales on stream terraces, depressions on stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Loess over loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: silty clay loam
Btg1 - 10 to 21 inches: silty clay loam
2Btg2 - 21 to 37 inches: clay loam
2BCg - 37 to 47 inches: loam
3Cg - 47 to 79 inches: stratified extremely gravelly coarse sand to coarse sand to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 55 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Mahalaland, drained

Percent of map unit: 15 percent
Landform: Swales on terraces, outwash terraces, terraces, flats on terraces, depressions on terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Treaty, drained

Percent of map unit: 9 percent
Landform: Till plains
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Sleeth

Percent of map unit: 6 percent
Landform: Stream terraces, outwash terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wh—Whitaker silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2vzcw
Elevation: 400 to 1,160 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Whitaker and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitaker

Setting

Landform: Outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty outwash over loamy outwash

Typical profile

Ap - 0 to 10 inches: silt loam
Bt - 10 to 20 inches: silty clay loam
2Bt - 20 to 37 inches: sandy clay loam
2BC - 37 to 48 inches: sandy loam
2C - 48 to 79 inches: stratified sand to sandy loam to loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Rensselaer
Percent of map unit: 5 percent
Landform: Flats, drainageways, glacial drainage channels, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Sleeth
Percent of map unit: 3 percent
Landform: Stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Martinsville, till substratum
Percent of map unit: 2 percent
Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

XeA—Xenia silt loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2t98q
Elevation: 360 to 1,020 feet

Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Xenia and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xenia

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy till

Typical profile

Ap - 0 to 10 inches: silt loam
Bt1 - 10 to 30 inches: silty clay loam
2Bt2 - 30 to 50 inches: clay loam
2BCt - 50 to 58 inches: loam
2Cd - 58 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Treaty

Percent of map unit: 5 percent
Landform: Till plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave

Hydric soil rating: Yes

Ragsdale

Percent of map unit: 5 percent
Landform: Till plains, flats, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

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Appendix E
Photo Log

Photo 1: View of general onsite cultivated cropland habitat. Photo taken in the eastern portion of the Project area, facing south.

Photo 2: Additional view of general onsite cultivated cropland habitat. Photo taken in the southwestern portion of the Project area, facing west.

Photo 3: View of deciduous forest habitat suitable for the Indiana bat and northern long-eared bat. Photo taken in the southern portion of the Project area, facing south.

Photo 4: View of woody wetland habitat suitable for the black-crowned night-heron. Photo taken in the central portion of the Project area, facing east.

Photo 5: View of Kilmore Creek that represents stream habitat suitable for the Indiana bat, northern long-eared bat, and black-crowned night-heron. Photo taken in the central portion of the Project area, facing west.

Photo 6: View of unnamed drainage associated with Kilmore Creek that represents stream habitat suitable for the black-crowned night-heron. Photo taken in the south-central portion of the Project area, facing north.

Photo 7: View of Boyle's Ditch that represents stream habitat suitable for the black-crowned night-heron. Photo taken in the northern portion of the Project area, facing west.

Photo 8: View of pasture habitat considered suitable for the loggerhead shrike. Photo taken in the central portion of the Project area, facing east.

Photo 9: View of pasture habitat suitable for the sedge wren and loggerhead shrike. Photo taken in the southern portion of the Project area, facing north.

Photo 10: View of edge of cemetery which is considered suitable habitat for the loggerhead shrike. Photo taken in the central portion of the Project area, facing west.

Photo 11: View of snag that can be considered suitable roosting habitat for the Indiana bat and northern long-eared bat. Photo taken in the southern portion of the Project area.

Photo 12: View of unknown mussel shell found in Boyle's Ditch in the northern portion of the Project area.

Photo 13: View of abandoned railroad right-of-way. Photo taken in the southwestern portion of the Project area at the southern-most end of the right-of-way, facing north.

Photo 14: View of abandoned railroad right-of-way. Photo taken in the western portion of the Project area at the northern-most end of the right-of-way, facing south.

Photo 15: View of abandoned railroad right-of-way. Photo taken in the interior portion of the right-of-way, facing north.

Photo 16: View of abandoned railroad right-of-way. Photo taken in the interior portion of the right-of-way, facing northwest.

Photo 17: View of typical developed areas adjacent to agriculture fields. Photo taken in the southwestern portion of the Project area, facing west.

Photo 18: View of typical developed areas adjacent to agriculture fields. Photo taken in the western portion of the Project area, facing east.

Appendix F

Field-Observed Vegetative Species by Ecosystem within the Hardy Hills Solar Energy Project, Clinton County, Indiana

Appendix F: Field Observed Vegetative Species by Ecosystem within the Hardy Hills Solar Energy Project, Clinton County, Indiana

Scientific Name	Common Name
Grasslands	
Ambrosia trifida	Giant Ragweed
Bromus inermis	Smooth Brome
Carex granularis	Meadow Sedge
Carex laevivaginata	Smooth-sheathed Sedge
Carex vulpinoidea	Fox Sedge
Celtis occidentalis	Hackberry
Conium maculatum	Poison Hemlock
Dactylis glomerata	Orchard Grass
Dipsacus fullonum	Wild Teasel
Festuca arundinacea	Tall Fescue
Festuca rubra	Red Fescue
Glechoma hederacea	Ground-Ivy
Gleditsia triacanthos	Honey Locust
Juglans nigra	Black Walnut
Ligustrum sinense	Chinese Privet
Melilotus officinalis	Yellow Clover
Microstegium vimineum	Nepalese Browntop
Morus alba	White Mulberry
Parthenocissus quinquefolia	Virginia Creeper
Phytolacca decandra	Pokeweed
Plantago lanceolata	Ribwort Plantain
Platanus occidentalis	Sycamore
Poa annua	Annual Bluegrass
Rubus argustris	Blackberry
Scirpus pendulus	Rufous Bulrush
Solidago altissima	Tall Goldenrod
Solidago canadensis	Canadian Goldenrod
Toxicodendron radicans	Poison Ivy
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Viola sororia	Common Blue Violet
Forest	
Acer negundo	Box Elder
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Andropogon gerardii	Big Bluestem
Asimina triloba	Pawpaw
Carya ovata	Shagbarck Hickory
Celtis occidentalis	Common Hackberry
Cephalanthus occidentalis	Buttonbush

Forest	
Equisetum hyemale	Rough Horsetail
Festuca arundinacea	Tall Fescue
Fraxinous pennsylvanica	Green Ash
Galium aparine	Goosegrass
Glechoma hederacea	Ground Ivy
Gleditsia triacanthos	Honey Locust
Juglans nigra	Black Walnut
Ligustrum sinense	Chinese Privet
Lindera benzoin	Spicebush
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Tulip Poplar
Morus alba	White Mulberry
Oxydendrum arboreum	Sourwood
Panicum virgatum	Switch Grass
Phalaris arundinacea	Reed Canarygrass
Phytolacca decandra	Pokeweed
Platanus occidentalis	Sycamore
Populus deltoides	Eastern Cotton Wood
Quercus alba	White Oak
Quercus rubra	Red Oak
Quercus stellata	Post Oak
Rubus argustris	Sawtooth Blackberry
Salix nigra	Black Willow
Schizachyrium scoparium	Little Bluestem
Solidago canadensis	Canadian Goldenrod
Sorghastrum nutans	Indian Grass
Taraxacum officinale	Common Dandelion
Ulmus americana	American Elm
Ulmus rubra	Slippery Elm
Viola sororia	Common Blue Violet
Wetlands	
Acer rubrum	Red Maple
Agrostis gigantea	Redtop
Asimina triloba	Pawpaw
Carex granularis	Meadow Sedge
Carex laevivaginata	Smooth-sheathed Sedge
Carex stipata	Awl-fruited Sedge
Carex vulpinoidea	Fox Sedge
Celtis occidentalis	Common Hackberry
Cephalanthus occidentalis	Buttonbush
Echinochloa crus-galli	Cockspur Grass
Eleocharis palustris	Common Spikerush
Equisetum hyemale	Rough Horsetail
Fraxinous pennsylvanica	Green Ash
Impatiens capensis	Jewelweed
Iris versicolor	Northern Blue Flag Iris
Lemna minor	Common Duckweed

Wetlands	
Lindera benzoin	Spicebush
Panicum virgatum	Switch Grass
Phalaris arundinacea	Reed Canarygrass
Platanus occidentalis	Sycamore
Salix nigra	Black Willow
Saururus cernuus	Lizard's Tail
Scirpus pendulus	Rufous Bulrush
Toxicodendron radicans	Posion Ivy
Typha angustifolia	Narrowleaf Cattail
Urtica dioca	Stinging Nettle
Developed	
Acer rubrum	Red Maple
Acer saccharinum	Silver Maple
Celtis occidentalis	Hackberry
Festuca arundinacea	Tall Fescue
Festuca rubra	Red Fescue
Juglans nigra	Black Walnut
Juniperus virginiana	Eastern Red Cedar
Ligustrum japonicum	Wax-leaf Privet
Ligustrum sinense	Chinese Privet
Liriodendron tulipifera	Tulip Poplar
Platanus occidentalis	Sycamore
Quercus rubra	Red Oak
Quercus stellata	Post Oak
Taraxacum officinale	Common Dandelion
Waters	
Lemna minor	Common Duckweed
Agriculture	
Bromus hordeaceus	Soft Brome
Bromus inermis	Smooth Brome
Glycine max	Soybean
Poa annua	Annual Bluegrass
Zea mays	Corn
Railroad Buffer	
Ambrosia trifida	Giant Ragweed
Bromus inermis	Smooth Brome
Bromus tectorum	Cheatgrass
Celtis occidentalis	Hackberry
Conium maculatum	Poison Hemlock
Dipsacus fullonum	Wild Teasel
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Toxicodendron radicans	Poison Ivy
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Trifolium repens	White Clover

ENERGY RENEWAL PARTNERS, LLC

Cultural Resources Desktop Review

Hardy Hills Solar Energy Project
Clinton County, Indiana

November 2020

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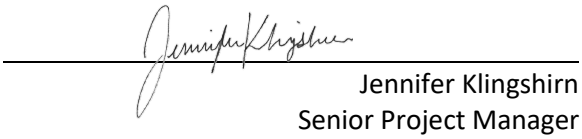

Jennifer Klingshirn
Senior Project Manager

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APPENDIX

Abstract

The records search revealed one (1) historic site within the Area of Potential Effect (APE) and 80 historic sites within two (2) miles of the Project area. Additionally, the National Register of Historic Places (NRHP) was assessed for potential listings or eligible listings within five (5) miles of the Project area. No listings were identified onsite, however, eight (8) were identified within five (5) miles.

In general, inland prehistoric archaeological sites are often found in close proximity to water bodies such as creeks, rivers, and lakes. Typically, areas close to or overlooking water are more likely to contain surface or buried archaeological features and artifacts. Historic period archaeological sites are typically found in proximity to historic era settlements or routes. Each of these landscape feature types are located either onsite or near the APE, which increases the likelihood of encountering cultural resources. Although agricultural activities may have extensively destroyed or disturbed any plow zone archaeological deposits, it is possible that deeply buried and preserved prehistoric features and artifacts exist beneath the plow zone. Additionally, the presence of residences and structures onsite increases the likelihood of uncovering shallow, historic era resources nearer the surface.

The State of Indiana has regulations in place which help to protect archaeological and cultural resources. A cemetery development plan is required by the state for development within 100 feet of a burial or cemetery which includes plan review by the Historic Preservation Review Board; ERP identified one (1) known cemetery onsite during the desktop review. Although avoidance is likely, should Project construction activities occur within 100 feet of a cemetery, a cemetery development plan and plan review will be required; the review period for a cemetery development plan is 60 days. If no construction activities are planned to occur within 100 feet (i.e. equipment installation, clearing, grading, stormwater control, etc.), then Historic Preservation Review Board approval is not required.

If a project is located on state lands or is in whole or in part stated funded or the project is state-sponsored, it is subject to state approval and must undergo a state review and obtain a Certificate of Approval from the Historic Preservation Review Board; the Certificate generally takes 40 to 60 days to obtain form the Board. ERP understands that there is no state nexus that would trigger cultural resource protection at the state or local levels at this time as described above; however, the Project would still be required to adhere to state laws regulating unanticipated discoveries of human remains or artifacts during construction, which includes a notification process.

If a project is federally permitted, licensed, located on federal lands, or in whole or in part federally funded, it is subject to Section 106 of the National Historic Preservation Act (NHPA). ERP understands that the proposed solar project will be constructed on private property utilizing private funds and that there are no federal permits related to this Project that trigger necessary archaeological studies in order for the undertaking to move forward. As there is no federal nexus at this time, the Project is not required to comply with Section 106 of the National Historic Preservation Act of 1966. Should the Project trigger a federal nexus (such as a U.S. Army Corps of Engineers permit), additional requirements may be necessary in order for the undertaking to move forward including additional site investigation studies and consultation with the State Historic Preservation Office.

1.0 Introduction

Hardy Hills Solar Energy LLC engaged Energy Renewal Partners, LLC (ERP) to conduct a desktop cultural resources review of its proposed Hardy Hills Solar Energy Project (the "Project"). The Project property ("Project area," Area of Potential Effect, or "APE") consists of approximately 1,770 acres of primarily agricultural land with scattered trees, Kilmore Creek and additional drainage features, and rural residences and associated structures. The APE is located in north-central Clinton County, Indiana approximately 1.5 miles north of the city of Frankfort (Figure 1). The unincorporated town of Kilmore is located within the Project area.

1.1 Purpose

The Project area is the location of a proposed solar energy project. The purpose of this assessment is to provide preliminary review of desktop sources pertaining to cultural and historic resources with the potential to be located onsite or be impacted by the Project. Project construction considerations include: the installation of inverter pads and photovoltaic panels, connections by an underground electrical collection system, and possible additional above-ground transmission/substation structures. Project development would also include vegetation clearing in the construction area footprint, construction of internal access roads, operation and maintenance structures, and temporary parking and construction laydown areas.

1.2 Project Location

The Project area is approximately 1,770 acres located in north-central Clinton County, Indiana approximately 1.5 miles north of the city of Frankfort (Figure 1). The Project area is located generally east of North County Road 130 West, south of East County Road 600 North, and west of North County Road 130 East, and north of East County Road 250 North. Indiana 75 (IN-75) bisects the southwestern portion of the Project area and runs along a portion of the western boundary. The majority of the Project area's acreage consists of agricultural land with scattered trees. Kilmore Creek bisects the central portion of the APE, oriented approximately east-west; additional drainage features, including Boyles Ditch, are located throughout the Project area. Numerous single-family rural residences and associated agricultural sheds and outbuildings are located onsite. The surrounding area consists primarily of agricultural land, scattered trees, and pasture with several additional single-family rural residences and structures within close proximity; additionally, the city of Frankfort is located 1.5 miles south of the Project area.

1.3 Regulatory Considerations

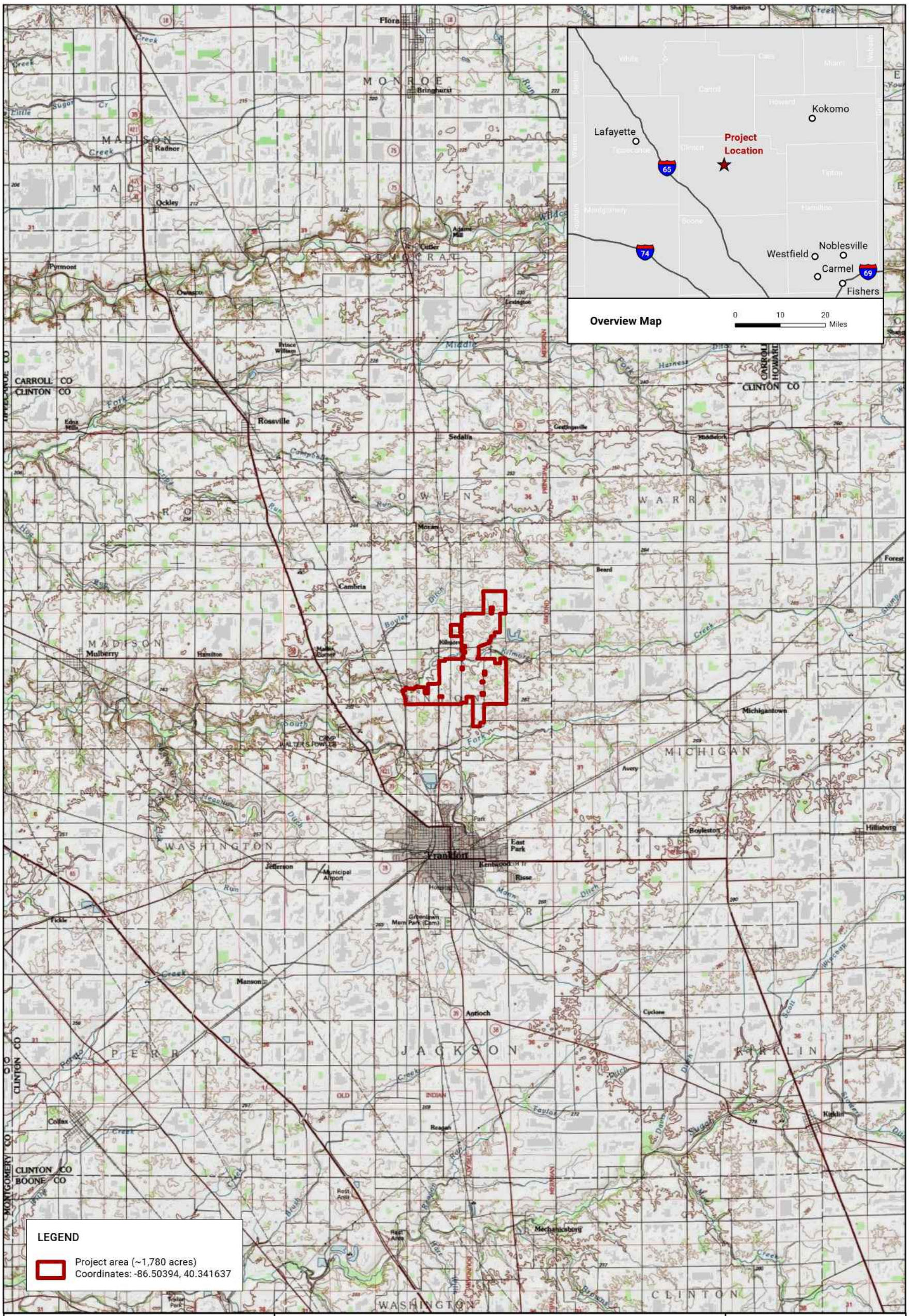
Regulations concerning cultural resources are guided at the federal level by the National Historic Preservation Act of 1966 (NHPA), as amended, and at the state level by Indiana Code (IC) Title 14, particularly Article 21 regarding Historic Preservation and Archeology. In Indiana, each is administered through the Indiana Department of Natural Resources (IDNR) Division of Historic Preservation & Archaeology (DHPA). If a project is federally permitted, licensed, located on federal lands, or in whole or in part federally funded, it is subject to Section 106 of the NHPA. If a project is located on state lands or is in whole or in part stated funded, it is subject to the IC and must undergo a state review and obtain a

Certificate of Approval from the Historic Preservation Review Board (IC 14-21-1-18). Additional requirements exist related to the sale or transfer of certain state-owned lands (IC 14-21-1-14).

Regarding burials, cemetery development plans are required for development projects that will disturb the ground within 100 feet of a cemetery or burial ground for the purpose of excavating or covering over the ground or erecting, altering, or repairing any structure. The review period for cemetery development plans is 60 days, and the review is conducted by the Historic Preservation Review Board (IC 14-21-1-26.5).

It is possible that during construction activities, which involve digging, trenching, or earth moving, that unanticipated discoveries of cultural or archaeological artifacts considered significant finds or burials may occur. The State of Indiana has processes in place by which the DHPA must be notified within two (2) business days if human remains or artifacts are uncovered (IC 14-21-1-27 and 14-21-1-29). An artifact is defined as "(1) feature that is (a) nonportable evidence of past human behavior or activity; (b) found on or in the ground, including structural remains; and (c) formed before December 31, 1870; or (2) an object made, modified, or used before December 31, 1870" (IC 14-21-1-2). In addition to the notification requirement, under IC 14-21-1-29, if an artifact or burial object is uncovered, work must immediately cease within 100 feet of the discovery. The DHPA may then (1) authorize work to continue, with or without conditions, or (2) require that the activity only be conducted with an approved plan in place; if the latter is the case, this regulation shall not apply after ten (10) business days from when the DHPA receives notice.

Pursuant to its scope of services with Invenergy, ERP conducted a desktop assessment for the Hardy Hills Solar Project. The following is a discussion of the methodology, findings, and implications of ERP's review.


Overview Map
Lafayette
Kokomo
Project Location
Noblesville
Westfield
Carmel
Fishers
65
74
69
0 10 20 Miles
LEGEND
Project area (~1,780 acres)
Coordinates: -86.50394, 40.341637
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Austin, Texas 78746 | 512-222-1125
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Hardy Hills Solar Energy LLC
Hardy Hills Solar Energy Project
Regional Topography
La Fayette (1991)
1:100,000-scale USGS Topographic Quadrangle
Project Location: Clinton County, Indiana
N
0 1 2 Miles
FIGURE 1
Prepared by: L. Kauffman
Date: 2020-10-21

2.0 Methodology

As part of the records review, ERP reviewed the National Register of Historic Places (NRHP) for listed sites or sites eligible for listing within five (5) miles of the Project area. ERP reviewed the following information available to identify the nature and extent of past cultural resource surveys, artifacts, or historic or cultural resources within two (2) miles of the APE, as well as to note the presence or absence of recorded historic and prehistoric period sites within the APE.

Desktop sources review include the information from the DHPA, including the Indiana State Historic Architectural, and Archaeological Research Database (SHAARD) online tool, which includes data from Indiana Historic Sites and Structures Inventory (IHSSI) (County Survey Program), the Indiana Cemetery and Burial Ground Registry, historic bridges, properties listed in the National Register of Historic Places (NRHP), and historic theaters. Access to specific archaeological site locations as well as certain details is restricted.

Additionally, ERP reviewed historical and current USGS topographic maps, historical and current available aerial imagery, tax parcel information, county and municipal resources, and educational and agency websites.

In addition to the sources above, ERP also consulted desktop sources to further assist in the characterization of other environmental field conditions present within the proposed Project boundaries, including the USGS National Hydrography Dataset (NHD), U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Clinton County Web Soil Survey, and the Indiana Geological Survey.

3.0 Environmental Background

3.1 Topography and Drainage

The APE is situated in a rural portion of north-central Clinton County (Figure 1). Onsite elevation ranges from approximately 800 to 870 feet above mean-sea-level (AMSL), and therefore, the Project area is relatively flat (Figures 1-3). Locally, topography is dictated by areas of natural drainage features, with more varied topography associated with onsite and nearby drainages (Figure 1).

The NHD and USGS topographic maps depict several drainages onsite, primarily in the form natural drainages (Figure 4). Kilmore Creek bisects the central portion of the Project area. Boyles Ditch and its tributaries are located in the northern portion of the Project area. The NWI depicts wooded, wetland areas in small pockets throughout the Project area (Figure 4).

3.2 Geology and Soils

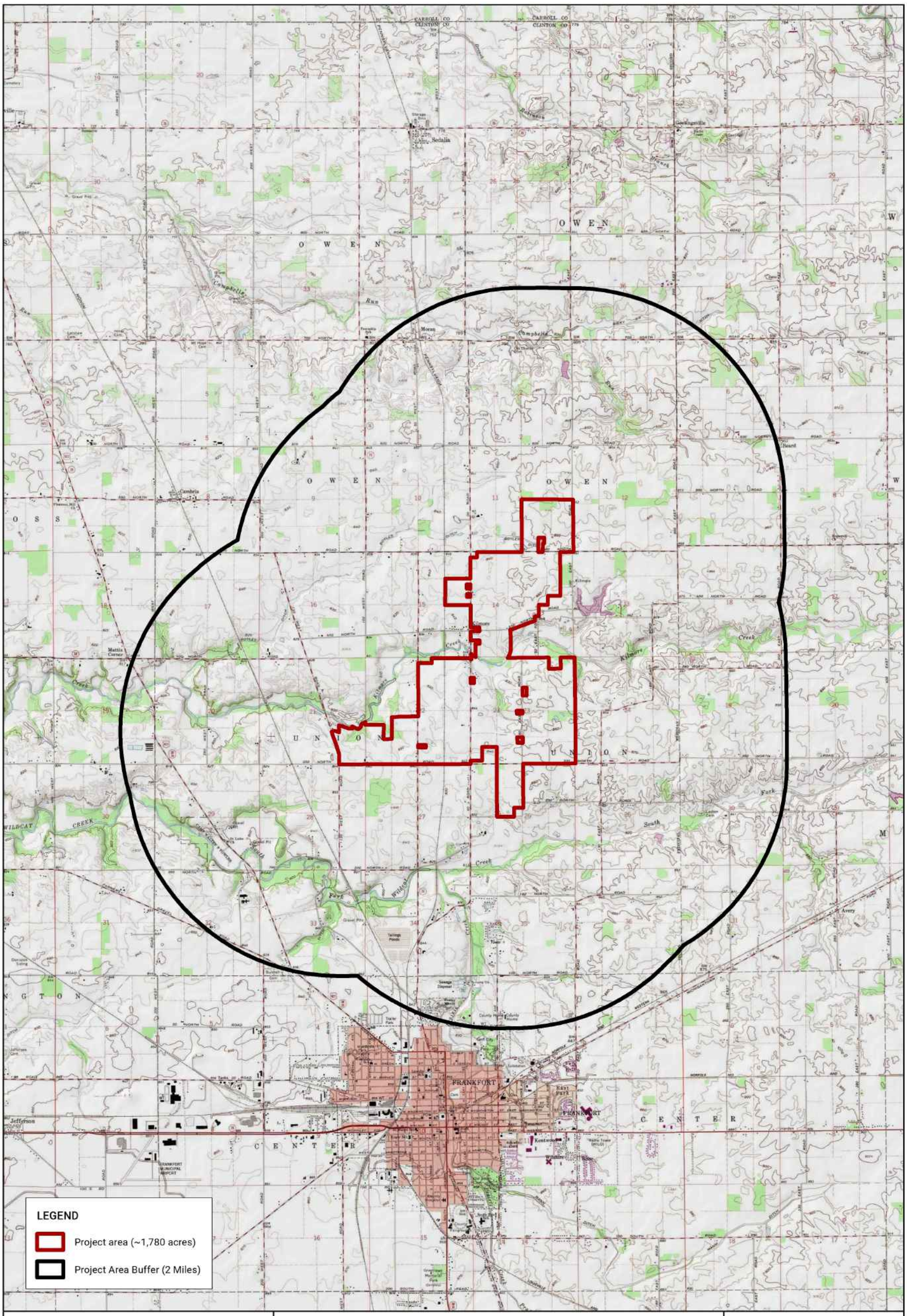
According to the Indiana Geological Survey (Gray et al. 1987), the subsurface geology underlying the northern portion of the Project area consists of New Albany Shale, comprised primarily of shale. The majority of the southern portion of the Project area is underlain by the Muscatatuck Group, consisting of limestone and dolomite, with a portion of the southeastern APE underlain by the Wabash Formation, consisting of limestone, dolomite, and argillaceous dolomite. The Natural Resources Conservation Service (NRCS) was reviewed, and the Project area is underlain primarily by silt loam and loam soils (NRCS 2019).

3.3 Ecological Setting and Land Use

The Project area is located in central northern Indiana with a climate which can be characterized humid hot summers and cold winters with snowfall common (Indiana State Climate Office 2002). For the nearby town of Frankfort, Indiana, the average annual rainfall is 41.09 inches (U.S. Climate Data 2019).

The highest topographic areas in this region are along a series of moraines throughout north-central Indiana; the topography then descends to the Till Plains, including the Kankakee Till Plain/Kankakee Outwash, Iroquois Till Plain, Bluffton Till Plain, and the Tipton Till Plain, within which the APE is located (USGS 1999).

The APE is situated in the Loamy, High Lime Till Plains region of the Eastern Corn Belt Plains Ecoregion (U.S. EPA 2011). The Loamy, High Lime Till Plains ecoregion contain soils from glacial deposits with good natural drainage and fertility. Once an area dominated by hardwood and elm-ash swamp forests, today the nearly level terrain is dominated by corn, soybean, and livestock production (U.S. EPA 1997).



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Site Location with Two (2) Mile Buffer

Burlington (1984), Frankfort (1980), Michigantown (1981), and Rossville (1961)
1:24,000-scale USGS Topographic Quadrangles

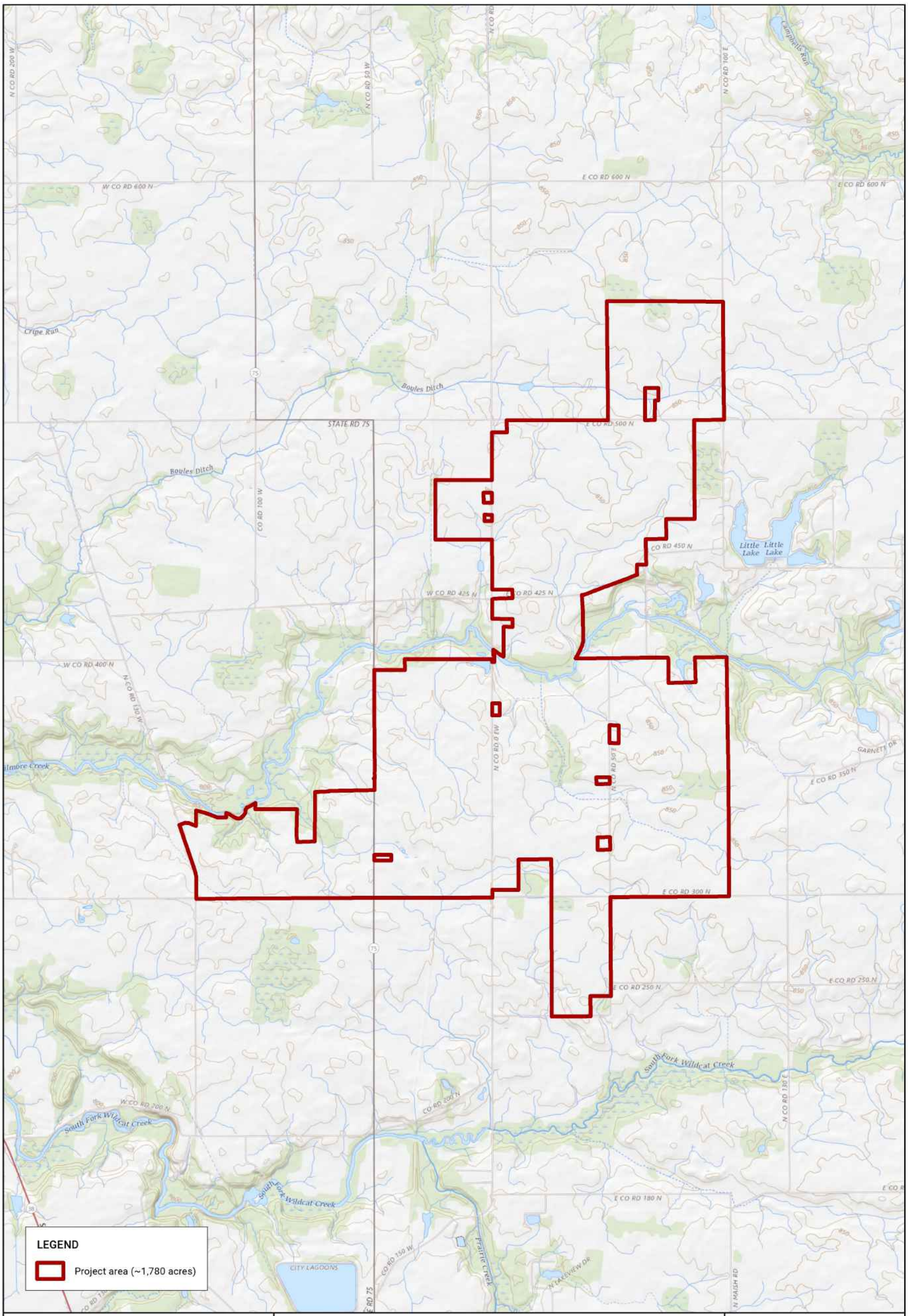
Project Location: Clinton County, Indiana

N

0 2,250 4,500 Feet

FIGURE 2

Prepared by: L. Kauffman | Date: 2020-10-21



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Site Location
USGS National Map (2018)

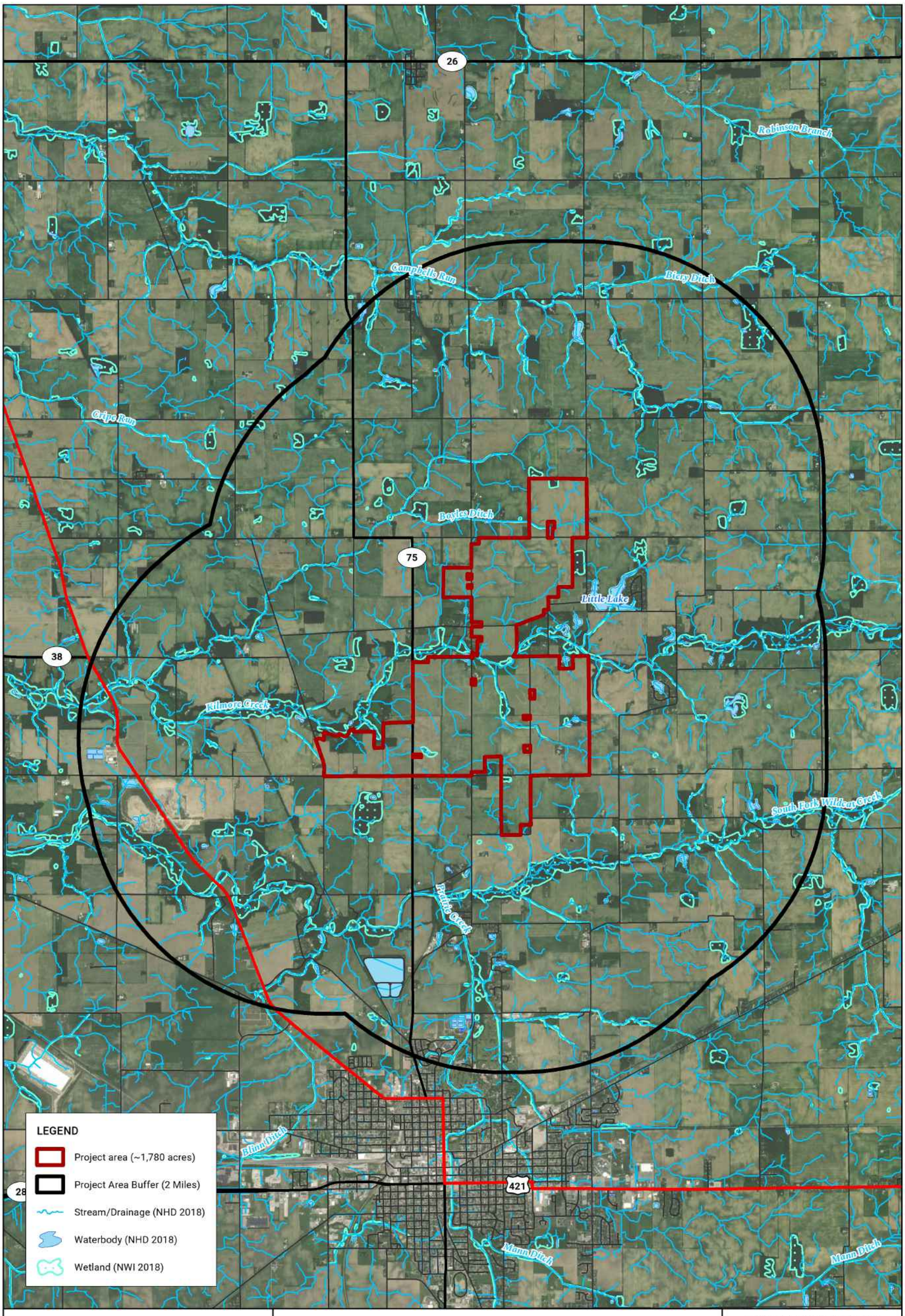
Project Location: Clinton County, Indiana

N

0 1,000 2,000 Feet

FIGURE 3

Prepared by: L. Kauffman | Date: 2020-10-21



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Hydrography and NWI Wetlands

Project Location: Clinton County, Indiana

N

0 2,000 4,000 Feet

FIGURE 4

Prepared by: L. Kauffman | Date: 2020-10-21

4.0 Cultural Background

Local cultural developments are generally classified by archaeologists according to five (5) primary chronological periods: Paleo-Indian, Archaic (Early, Middle, and Late), Woodland, Mississippian, and Historic. These classifications are primarily defined by changes in material culture over time, as evidenced through features, artifacts, and data recovered from archaeological sites. The following cultural chronology was adapted from the timeline provided by the Indiana Historical Bureau (IHB 2019a), and several of the periods overlap as a result:

Table 1: Cultural Chronology of Indiana

Period	Approximate Dates
Historic	Post AD 1650
Mississippian	AD 1,000 – AD 1650
Woodland	1,000 BC – AD 1,200
Archaic	8,000 BC – 750 BC
Paleo-Indian	10,000 BC – 7,500 BC

4.1 Paleo-Indian Period

It is commonly accepted that human activity in the region can be seen since as early as 12,000 years ago, approximately 10,000 BC. Traditionally, Paleo-Indian groups have been characterized as small, hunter-gatherer, migratory bands who hunted megafauna such as the mammoth and mastodon, which still occurred in Indiana during this period (IHB 2019a; Madison 2014).

With the end of the last glacial period approximately 20,000 years ago, northern Indiana had been particularly shaped by glacial activity where southern Indiana had not been as geologically impacted (Madison 2014). Paleo-Indians greatly utilized rivers, lakes, and streams, and Paleo-Indian deposits are often times deeply buried in alluvial settings along these drainage and water features, making them difficult to locate and study. As a result, few intact Paleo-Indian sites have been recorded. Diagnostic artifacts from the Paleo-Indian period include well-made stone Clovis projectile points as well as Agate Basin and Hi-Lo points (IHB 2019a).

4.2 Archaic Period

Beginning around 8,000 BC, a diversification in subsistence patterns emerged as the harsher climatic conditions of the Ice Age began to reflect a climate more similar to that seen by European explorers (Madison 2014). This period is referred to as the Archaic and is notable for changes in the style of projectile points and tools, the distribution of site types, the introduction of other stone tools (IHB 2019a). The changes reflect a growing population exploiting abundant plant and animal resources in environments like those of today with a more similar climate. Populations were greater in number and nomadic, roaming seasonally (IHB 2019a).

The Archaic period is divided into three (3) main sub-periods, Early (8,000 BC – 6,000 BC), Middle (6,000 BC – 3,500 BC), and Late (4,000 BC – 1,500 BC), with a relatively shorter Terminal Late period (1,500 BC – 700 BC). During the Early Archaic sub-period, groups exhibited many of the characteristics of the Paleo-Indian period that preceded it. However, as the extinction of megafauna herds took hold, a subsistence shift towards heavier reliance on other mammals, as well as fish, mussels, and plants became necessary. This is exhibited in the archaeological record by changes in stone artifacts, such as grinding stones and pitted stones for food processing (IHB 2019a). Additionally, evidence of cremation mortuary practices appears. Around the time of the Middle Archaic, as the climate continued to warm from the previous glacial period, sites became larger and peoples appears to be more sedentary than earlier periods (IHB 2019a). By the beginning of the Late Archaic period, tool types appeared for further food processing and woodworking. Larger cemeteries and a more recognizable cultural groups, as well as evidence of scheduled harvesting of different resources, suggests an increase and growth in settlements over the previous primarily hunter-gatherer groups (IHB 2019a). The latter part of the Late Archaic, the Terminal Late Archaic, is marked by differing tools, including the use of barbed, smaller projectile points as well as turkey-tail points and copper implements (IHB 2019a).

4.3 Woodland Period

The Woodland period is marked by a continued reliance of earlier traditions of hunting, gathering, and fishing with evidence of the initiation of plant cultivation. The Woodland period is also typically divided into three (3) sub-periods, Early (1,000 BC – 200 BC), Middle (200 BC – AD 600), and Late (AD 500 – AD 1200) (IHB 2019a). Fire-hardened pottery, ceramic pots, arrow heads (providing evidence of bow hunting), and evidence of agricultural equipment are observed; additionally, earthwork structures and burials suggest that groups were associating more closely and there was some cooperation amongst different bands (Madison 2014).

The Middle Woodland in particular was known for the development of the Hopewell culture, or Hopewell tradition, which created the first settlements in Indiana characterized as permanent and grew and maintained crops such as squash (Britannica 2019). Trade with other tribes, including some in Central America, is seen as well, and there is evidence of stratified, hierarchical societies (Kehoe 1981; Galloway 1995). These populations were known for constructing the earthwork structures discussed above, typically called mounds, thought to be used for burial and ceremony (Nash 2015). The Hopewell culture declined rather rapidly from approximately AD 400 to AD 500, and the reason is largely unknown.

4.4 Mississippian Period

During the Mississippian period, the archaeological record suggests major population movements, changes in settlement patterns, and more complex and ranked societies (Madison 2014; IHB 2019a). Prior to AD 1600, what later became known as the Beaver Wars, or the French and Iroquois Wars, broke out between several Native American tribes as a result of expansion of fur trading with Europeans throughout the St. Lawrence River Valley in Canada and into the lower Great Lakes region (Parrott and Marshall 2006). With increased competition and the introduction of firearms to some groups, sporadic fighting occurred until the first Europeans entered Indiana during the 1670s (Parrott and Marshall 2006).

4.5 Historic Period

Beginning in the late 1600s, European explorers traveled the rivers of the region, including the Wabash River approximately 17 miles northwest of the Project area, on to the Mississippi River (IHB 2019b). Wildcat Creek, a fork of which is located south of the APE, is considered a major tributary of the Wabash River (Wabash 2010). By the 1760s, the French ceded control of the Indiana Territory to the British, and following several wars, including the American Revolutionary War and the War of 1812, Indiana achieved statehood in 1816.

The fur trade and trapping industry eventually shifted to other prominent industries such as lumbering. In the mid-19th century, additional means of transporting good appeared, and two (2) major railways are located through Frankfort, the Norfolk Southern Railway and the CSX Railway (Wabash 2010). Following the decline in the lumbering industry when hardwood forest resources began to be become depleted, agricultural production became the mainstay of the region.

5.0 Records Review

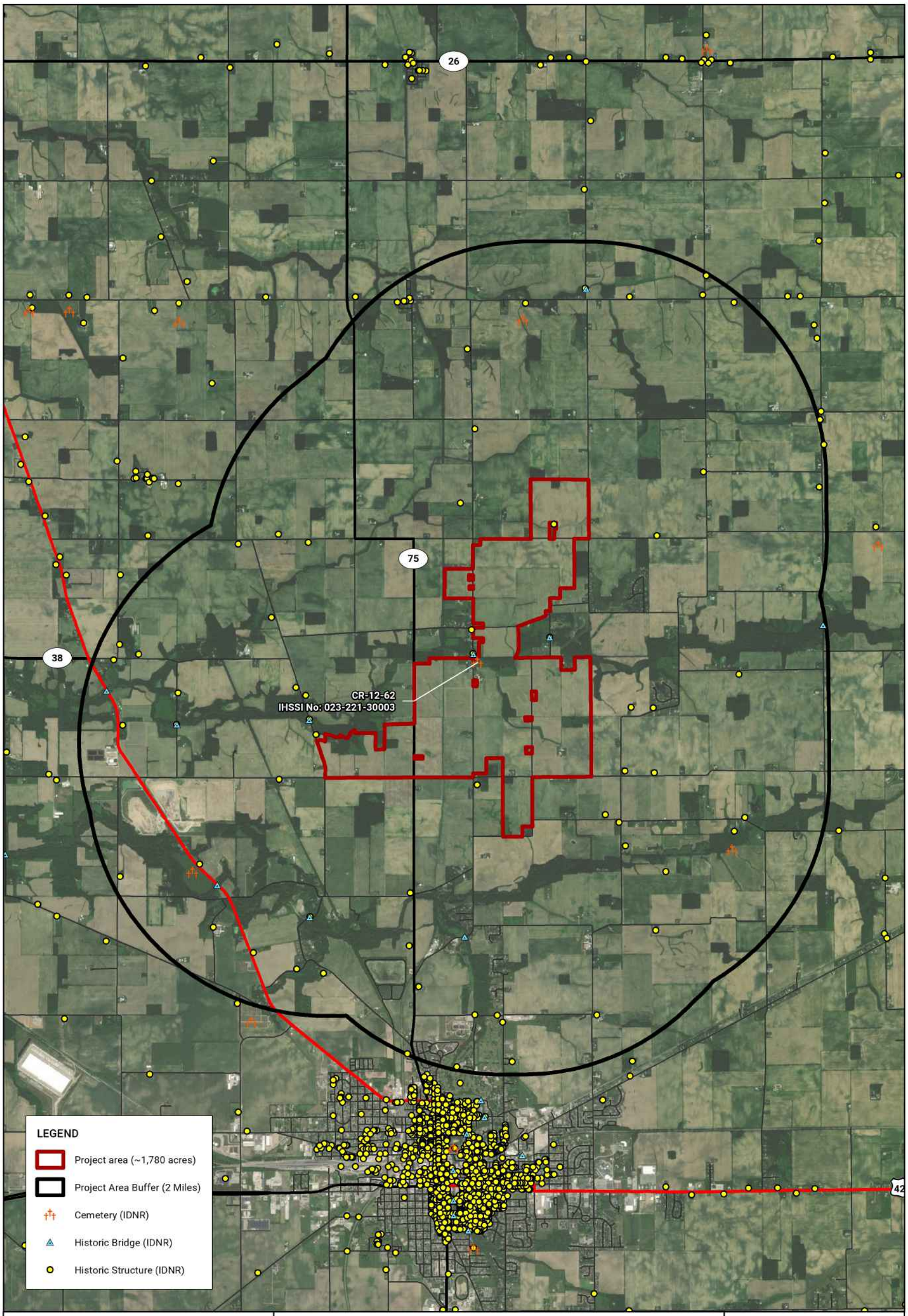
A records search of database and desktop sources has identified the following 16 sites within the APE (Table 2) (Figure 5):

Table 2: Desktop Database Findings Onsite or within 100 Feet of Project Area

Site Type or Name	Rating[1]	Distance	ID[2]	Description
Kilmore Cemetery	Contributing	Onsite, central	IHSSI No: 023-221-30003 / CR-12-62	c.1835 - Present
Clinton County Bridge No. 60	Contributing	Within 100 ft of APE	IHSSI No: 023-221-30002 / HB-0309	c.1925
Commercial Building	Demolished	Within 100 ft of APE	IHSSI No: 023-221-30004	c.1905 small barn and mobile home
House	Contributing	Within 100 ft of APE	IHSSI No: 023-407-10039	c.1935 residence and barn

[1] (a) Outstanding: property has enough historic or architectural significance that it is already listed, or may be eligible for listing, in the National Register of Historic Places. (b) Notable: property did not quite merit an "outstanding" rating but still is above average in its importance. Further research may reveal that the property is eligible for National Register listing. (c) Contributing: property met the basic inventory criterion of being pre-1970, but that it is not important enough to stand on its own as individually "outstanding" or "notable". (d) Non-Contributing: usually built after 1970, are older structures that have undergone bad alterations and lost historic character or are otherwise incompatible with their historical surroundings. These properties are not eligible for the National Register. (e) Demolished: demolished since the original survey (IDNR 2018).

[2] IHSSI = Indiana Historic Sites and Structures Inventory (County Survey Program); HB = Historic Bridge; CR = Cemetery



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Desktop and Database Findings
within Two (2) Miles

DigitalGlobe Aerial Imagery (2017)

Project Location: Clinton County, Indiana

N

0 2,000 4,000 Feet

FIGURE 5

Prepared by: L. Kauffman | Date: 2020-10-21

Each of the 16 identified sites are classified as a historic structure (i.e. house, farm, school, commercial building, grain elevator, park, etc.), historic bridge, or cemetery, dating from the late 19th through early 20th centuries more specifically. There is one (1) cemetery located within the central portion of the APE within the town of Kilmore. The locations of listings provided on Figure 5 are depicted to show the general center point location of the historic resource identified within database sources.

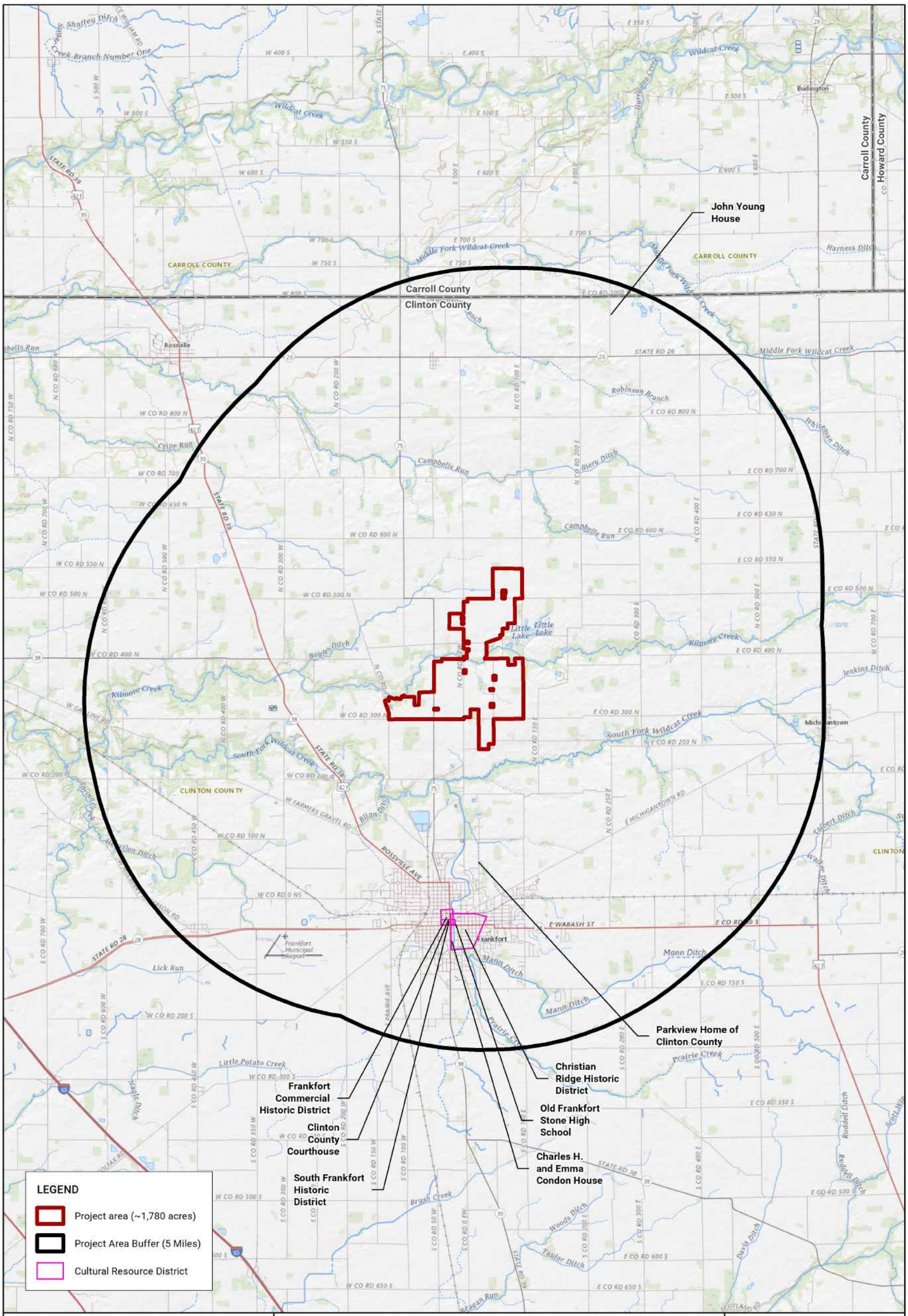
Additionally, ERP reviewed current and historic topographic maps and aerial imagery to supplement the database search. Historical topographic maps depict residences and structures throughout the Site. One (1) cemetery, the Kilmore Cemetery, is noted within the APE (Figures 1-3). ERP did not observe indications of additional cemeteries or other indications of burials on the property. A railroad is depicted bisecting the west-central portion of the APE, approximately north south; however, recent aerial imagery reveals that the railroad infrastructure is no longer in place (Google Earth 2018). The remaining 15 IHSSI-listings identified correspond to aerial imagery observed structures, including houses, a school, and other buildings, as well as two (2) bridge locations.

Additionally, ERP identified 80 historic findings within desktop sources within two (2) miles of the APE (Figure 5). These sites are summarized in Appendix A. Several cemeteries are located within the search buffer. Historic bridges are located throughout the county, including within two (2) miles of the APE. The majority of the listings correspond to structures such as schools, commercial buildings, houses, grain elevators, and farms.

ERP reviewed the NRHP for listed sites or listed eligible sites within five (5) miles of the APE and identified eight (8) historic sites (Table 3, Figure 6):

Table 3: National Register of Historic Places within Five (5) Miles

Site Name	Listed or Eligible for Listing	Distance from APE
Parkview Home of Clinton County	Listed	1.6 miles south
Frankfort Commercial Historic District	Listed	2.3 miles south
Clinton County Courthouse	Listed	2.4 miles south
Old Frankfort Stone High School	Listed	2.5 miles south
Christian Ridge Historic District	Listed	2.6 miles south
South Frankfort Historic District	Listed	2.7 miles south
Charles H. And Emma Condon House	Listed	2.8 miles south
John Young House	Listed	3.7 miles north



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National Register of Historic Places
within Five (5) Miles

Project Location: Clinton County, Indiana

N

0 0.5 1 1.5 Miles

FIGURE 6

Prepared by: L. Kauffman | Date: 2020-10-21

6.0 Summary

A desktop records search revealed one (1) historic site within the APE and 80 historic sites within two (2) miles of the Project area. Additionally, the NRHP was assessed for potential listings or eligible listings within five (5) miles of the Project area; no listings were identified onsite, however, eight (8) were identified within five (5) miles. Several of the NRHP listings are districts within the city of Frankfort south of the APE; additional listings within the city are generally located within these districts. Each of these NRHP sites are not located within or in close proximity to the APE and are not anticipated to be impacted by the Project, including direct impacts from construction or indirect visual impacts.

ERP identified one (1) known cemetery within the APE within desktop sources. Although avoidance is likely, should Project construction activities occur within 100 feet of a cemetery, a cemetery development plan and plan review by the Historic Preservation Review Board per IC 14-21-1-26.5 will likely be required; the review period for a cemetery development plan is 60 days. If no construction activities are planned to occur within 100 feet (i.e. equipment installation, clearing, grading, stormwater control, etc.), then Historic Preservation Review Board approval is not required.

In general, inland prehistoric archaeological sites are often found in close proximity to water bodies such as creeks, rivers, and lakes. Typically, areas close to or overlooking water are more likely to contain surface or buried archaeological features and artifacts. Historic period archaeological sites are typically found in proximity to historic era settlements or routes. Each of these landscape feature types are located either onsite or near the APE, which increases the likelihood of encountering cultural resources. Although agricultural activities may have extensively destroyed or disturbed any plow zone archaeological deposits, it is possible that deeply buried and preserved prehistoric features and artifacts exist beneath the plow zone. Additionally, the presence of residences and structures onsite increases the likelihood of uncovering more shallow, historic era resources. Should there be an unanticipated discovery of human remains or artifacts during construction, the Project would need to adhere to the state requirements outlined in Section 1.3 above (IC 14-21-1-27 and 14-21-1-29).

If a project is federally permitted, licensed, located on federal lands, or in whole or in part federally funded, it is subject to Section 106 of the NHPA. ERP understands that the proposed solar project will be constructed on private property utilizing private funds and that there are no federal permits related to this Project that trigger necessary archaeological studies in order for the undertaking to move forward. As there is no federal nexus at this time, the Project is not required to comply with Section 106 of the NHPA. Should the Project trigger a federal nexus (such as a U.S. Army Corps of Engineers permit), additional requirements may be necessary in order for the undertaking to move forward including additional site investigation studies and consultation with the State Historic Preservation Office. ERP can provide additional information and review at that time as the scope of work will depend on the location and amount of planned impacts to federally jurisdictional waters.

If a project is located on state lands or is in whole or in part stated funded or the project is state-sponsored, it is subject to state approval and must undergo a state review and obtain a Certificate of Approval from the Historic Preservation Review Board; the Certificate generally takes 40 to 60 days to obtain form the

Board. ERP understands that there is no state nexus that would trigger cultural resource protection at the state or local levels at this time as described above.

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Appendix A

Desktop Database Findings within Two (2) Miles

Site Type or Name	Rating[1]	ID[2]
Layton Cemetery	Contributing	IHSSI No: 023-407-45005 / CR-12-32
Moran School	Contributing	IHSSI No: 023-553-10027
Old Chaney Cemetery	Contributing	IHSSI No: 023-081-10021
Kilmore Cemetery	-	CR-12-62
Moran Cemetery	-	CR-12-36
Saint Luke Church and Cemetery	Notable	IHSSI No: 023-221-30039 / CR-12-63
Thomas Farm	Contributing	IHSSI No: 023-081-05032
Scroggy School	Contributing	IHSSI No: 023-221-30032
Biery Farm	Contributing	IHSSI No: 023-081-10018
Bridge	Contributing	IHSSI No: 023-221-40003
Bridge	Contributing	IHSSI No: 023-221-40002
IN State Highway Bridge No. 39-12-1792B	Contributing	HB-1901
Clinton County Bridge Number 68	Demolished	HB-0310
Clinton County Bridge Number 69	Demolished	HB-0311
Clinton County Bridge Number 66	Demolished	HB-2388
IN State Highway Bridge No. (421) 39-12-1793B	Contributing	HB-1902
Bridge	Contributing	IHSSI No: 023-221-40001
Clinton County Home	Outstanding	IHSSI No: 023-221-35006
Commercial Building	Demolished	IHSSI No: 023-221-30004
Commercial Building	Contributing	IHSSI No: 023-553-10023
Clinton County Bridge Number 160	Contributing/Demo	IHSSI No: 023-221-30033 / HB-2392
Clinton County Bridge Number 55	Contributing	IHSSI No: 023-221-30014 /HB-2079
Clinton County Bridge Number 60	Contributing	IHSSI No: 023-221-30002 /HB-0309
Clinton County Bridge Number 5	Demolished	IHSSI No: 023-081-10020 /HB-2926
County Bridge	Contributing	IHSSI No: 023-407-30001
Clinton County Bridge Number 45	Demolished	IHSSI No: 023-221-30017 / HB-0307
Farm	Contributing	IHSSI No: 023-221-30008
Farm	Notable	IHSSI No: 023-221-30011
Farm	Contributing	IHSSI No: 023-221-30034
Farm	Notable	IHSSI No: 023-407-30029
Farm	Contributing	IHSSI No: 023-407-30022
Farm	Contributing	IHSSI No: 023-407-30023
Farm	Contributing	IHSSI No: 023-407-30024

Site Type or Name	Rating[1]	ID[2]
Farm	Contributing	IHSSI No: 023-407-30025
Farm	Contributing	IHSSI No: 023-407-30027
Farm	Contributing	IHSSI No: 023-221-25001
Farm	Contributing	IHSSI No: 023-221-30020
Farm	Outstanding	IHSSI No: 023-221-30030
Farm	Contributing	IHSSI No: 023-407-30026
Farm	Contributing	IHSSI No: 023-407-05058
Farm	Contributing	IHSSI No: 023-221-30031
Farm	Contributing	IHSSI No: 023-407-35005
Farm	Contributing	IHSSI No: 023-221-30006
Farm	Contributing	IHSSI No: 023-221-30007
Farm	Contributing	IHSSI No: 023-221-30016
Farm	Demolished	IHSSI No: 023-407-10037
Farm	Contributing	IHSSI No: 023-221-30038
Farm	Contributing	IHSSI No: 023-407-10038
Farm	Contributing	IHSSI No: 023-407-30021
Farm	Contributing	IHSSI No: 023-221-30012
Farm	Contributing	IHSSI No: 023-553-10022
Farm	Contributing	IHSSI No: 023-221-10041
House	Contributing	IHSSI No: 023-407-10039
House	Contributing	IHSSI No: 023-221-10036
House	Notable	IHSSI No: 023-221-10040
House	Contributing	IHSSI No: 023-221-30015
House	Contributing	IHSSI No: 023-221-30037
House	Contributing	IHSSI No: 023-221-30040
House	Contributing	IHSSI No: 023-221-30019
House	Contributing	IHSSI No: 023-221-30005
House	Contributing	IHSSI No: 023-407-30028
House	Contributing	IHSSI No: 023-221-30010
House	Contributing	IHSSI No: 023-081-05031
House	Demolished	IHSSI No: 023-221-30013
House	Contributing	IHSSI No: 023-221-30018
House	Notable	IHSSI No: 023-221-30035
House	Demolished	IHSSI No: 023-221-40005

Site Type or Name	Rating[1]	ID[2]
House	Contributing	IHSSI No: 023-553-10024
House	Contributing	IHSSI No: 023-553-10025
House	Contributing	IHSSI No: 023-553-10026
House	Contributing	IHSSI No: 023-081-10019
House	Contributing	IHSSI No: 023-407-45008
House	Contributing	IHSSI No: 023-407-45033

[1] (a) Outstanding: property has enough historic or architectural significance that it is already listed, or may be eligible for listing, in the National Register of Historic Places. (b) Notable: property did not quite merit an "outstanding" rating but still is above average in its importance. Further research may reveal that the property is eligible for National Register listing. (c) Contributing: property met the basic inventory criterion of being pre-1970, but that it is not important enough to stand on its own as individually "outstanding" or "notable". (d) Non-Contributing: usually built after 1970, are older structures that have undergone bad alterations and lost historic character or are otherwise incompatible with their historical surroundings. These properties are not eligible for the National Register. (e) Demolished: demolished since the original survey (IDNR 2018)

[2] IHSSI = Indiana Historic Sites and Structures Inventory (County Survey Program); HB = Historic Bridge; CR = Cemetery