EXHIBIT J. Ecological Assessment

Ecological Assessment

Republic Wind Project
Seneca & Sandusky Counties, Ohio

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Republic Wind
310 4th Street NE, Suite 200
Charlottesville, VA 22902

Cardno
121 Continental Drive, Suite 308
Newark, DE 19713

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Acronyms

agl	above ground level
BBS	Breeding Bird Survey
BHE	BHE Environmental, Inc.
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOCC	Birds of Conservation Concern
CECPN	Certificate of Environmental Compatibility and Public Need
CGP	Construction General Permit
Copperhead	Copperhead Environmental Consulting
CWA	Clean Water Act
CWH	cold water habitat
DOW	Division of Wildlife
EA	Ecological Assessment
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HDD	horizontal directional drilling
HHEI	Headwater Habitat Evaluation Index
HUC	Hydrologic Unit Code
IBA	Important Bird Area
IPaC	Information for Planning and Conservation
IWP	Isolated Wetland Permit
kV	kilovolt
l.f.	linear feet
m/s	meters per second
m	meter
MBTA	Migratory Bird Treaty Act
met	meteorological
MRLC	Multi-Resolution Land Characteristics Consortium
MW	megawatt
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NPDES	National Pollution Discharge Elimination System
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NWI	National Wetland Inventory
NWP	Nationwide Permit
O&M	operation and maintenance
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency

OHWM	Ordinary High Water Mark
OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Method
ORC	Ohio Revised Code
OWI	Ohio Wetland Inventory
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
PHWH	Primary Headwater Habitat
POI	Point of Interconnection
Project	Republic Wind Project
PSS	Palustrine Scrub/Shrub
QHEI	Qualitative Habitat Evaluation Index
Republic	Republic Wind, LLC
RTE	rare, threatened and endangered species
s.f.	square feet
SCADA	Supervisory Control and Data Acquisition
SESC	soil erosion and sediment control
SHPO	State Historic Preservation Office
SWPPP	storm water pollution prevention plan
TNW	traditionally navigable waters
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEG	Wind Erodibility Group
WEST	Western EcoSystems Technology, Inc.
WOTUS	Waters of the United States
WQC	Water Quality Certificate
WWH	warm water habitat

1 Introduction

Republic Wind, LLC (Republic) is proposing to develop the 200 megawatt (MW) Republic Wind Project (Project) in northeastern Seneca County and southeastern Sandusky County, Ohio (Figure 1-1, Project Overview Map for the proposed Republic Wind Project, Seneca and Sandusky Counties, Ohio). The Project is proposed within an area of approximately 23,851 acres (37.3 square miles), and includes portions of Adams, Pleasant, Reed, Scipio, and Thompson Townships in Seneca County, and York Township in Sandusky County.

Permanent Project infrastructure will include 50 wind turbine generators, up to 20 miles of new access roads, up to 83 miles of buried electrical collection lines, permanent meteorological (met) tower(s), a substation, temporary equipment laydown area, and an operation and maintenance (O&M) building. The information provided below in this Ecological Assessment (EA) represents the maximum impacts anticipated for the Project.

The Ohio Power Siting Board (OPSB) regulates the siting of wind projects with a generating capacity of 5 MW or more. Project approval ultimately relies on the issuance of a Certificate of Environmental Compatibility and Public Need (CECPN) by the OPSB. A complete OPSB application includes site-selection criteria, Project/component specifications and plans, reliability/interconnect studies, site-selection studies, phasing plans, and construction procedures. Environmental data requirements are also a part of that application, and include a desktop review of the geologic setting and soils for site suitability, a review of land use, a summary of field surveys for plant and animal species, as well as an ecological impact evaluation of the identified resources as a result of the construction, O&M of the Project.

As such, this EA was completed to comply with the environmental data requirements of the CECPN application (*Ohio Administrative Code [OAC] Chapter 4906-4-08: Health and safety, land use and ecological information)* and includes the following:

1. A detailed description of the Project infrastructure, typical construction methods, and operations and maintenance activities (Section 2).
2. An overview of the anticipated regulatory requirements of the Project (Section 3).
3. A desktop environmental resource assessment of the Project Area and ¼ mile buffer, which considered the following as they apply to the Project (Section 4, and Appendix A – Project Area Maps, Appendix B – Full Soils Table, Appendix C – RTE Species Information):
    a. Land Use – categories to classify the predominant land use (e.g., agriculture, forested, developed, water)
    b. Geologic Setting – underlying formation and morphology, glacial drift, and karst areas
    c. Soils – soil types, hydric and erodible soils
    d. Water Quality/Floodplain – Ohio stream classifications and designations.
    e. Wetlands – areas with hydric soils that support hydrology and hydrophytic vegetation
    f. Wildlife Resources – common and major species
4. A summary of Federal and State agency coordination that has occurred to date (Section 5, and Appendix D – Agency Correspondence).
5. A summary of the pre-construction wildlife surveys completed to date for the Project (Section 6, and Appendix E – Pre-Construction Wildlife Surveys), including:
    a. Bat Mist-netting with Telemetry
    b. Bat Acoustic Monitoring
    c. Raptor Nest Surveys

   d. Breeding Bird Surveys
   e. Passerine Migration Surveys
   f. Diurnal Bird/Raptor Migration Surveys
   g. Bald Eagle Use Surveys

6. A summary of the field surveys completed to identify and evaluate impacts to wetlands and waterbodies, including Waters of the United States (WOTUS) in accordance with Section 404 of the Clean Water Act (CWA) and isolated waters in accordance with the Ohio Revised Code (ORC) Chapter 6111 (Section 6, and Appendix H - Wetland and Stream Delineation Report and Forms).
7. A summary of potential Project impacts, based on current design is provided as Section 7 (and Appendix F – Wetland and Waterbody Impact Tables). Section 7 also provides a discussion of avoidance and minimization measures implemented during Project development (and Appendix G – HDD Frac Out Contingency Plan).

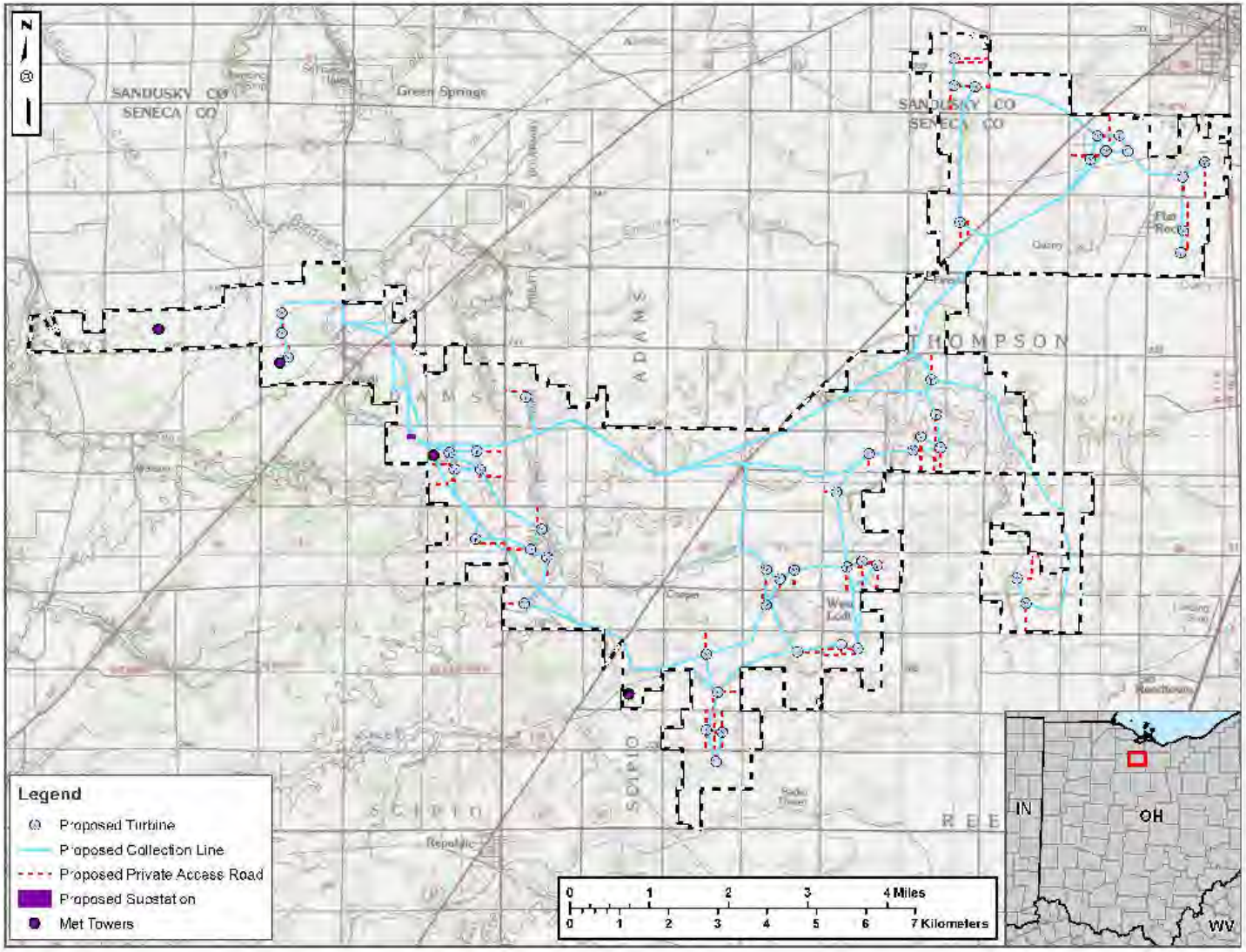

Figure 1-1 Project Overview Map and Proposed Facilities for the Republic Wind Project, Seneca and Sandusky Counties, Ohio

2 Project Description

The Project is a proposed wind generation facility of 200 MW within an area of approximately 23,851 acres (37.3 square miles) on private lands in Seneca and Sandusky Counties, Ohio (Project Area). The Project Area extends into portions of Adams, Pleasant, Reed, Scipio, and Thompson Townships in Seneca County, and York Township in Sandusky County.

The proposed Project consists of several types of facilities required for a utility-scale wind energy facility, including:

> Up to 50 wind turbines constructed on concrete foundations;

> Up to 83 miles of underground 34.5-kilovolt (kV) collection lines;

> Up to 5-acre substation;

> Up to 20 miles of private access roads

> 4 met tower(s);

> 10-acre temporary laydown area for equipment storage during construction;

> Internal infrastructure including access roads, fencing, and communications infrastructure; and

> Up to 5-acre O&M building.

This Project also includes the following, which will be permitted separately:

> 5-acre point of interconnection (POI); and

> 8.2-mile long aboveground transmission line.

As proposed, the wind Project will ultimately connect to the Tiffin Center to Fremont Center 138-kV line.

2.1 Summary of Construction Phases

Construction of wind energy projects typically requires 6 to 8 months, depending on the size of the project, terrain, and weather conditions. The construction component of the Project is anticipated to begin in the spring of 2020 with site preparation activities such as final site surveying, clearing, and grubbing. Major construction activities, such as substation and O&M building construction, placing collection and transmission lines, and erecting turbines, will begin in quarter 2 of 2020 and continue through late 2020. Final site grading and restoration would be completed by the end of 2020.

The construction phases will involve:

> Installation of soil erosion and sediment control (SESC) measures;

> Road construction and upgrades (existing road widening, reinforcement and strengthening as required);

> Turbine site preparation, including establishment of crane pad, workspace areas and turbine foundations;

> Substation and service building construction to take place concurrently with the above three steps;

> Placement of single phase lines for the substation, collector lines from turbines to the substation, and transmission line from the substation to the interconnect substation;

> Erection of towers and placement of turbines;
> Installation of new transmission line connection;
> Testing, connection and integration with grid; and
> Removal of all temporary works and restoration of site.

2.2 Site Preparation

Construction of the proposed Project will incorporate conventional overland construction techniques. A survey crew will begin to stake the outside limits of the disturbed area, including temporary access roads, equipment workspace areas, existing utility lines, and sensitive resources such as wetlands and waterbodies.

Temporary SESC measures will be installed within and along the proposed construction area, equipment workspace areas, access roads, and other work areas, as applicable, in accordance with approved County Soil and Water Conservation District SESC Plans.

Following the installation of the SESC measures, clearing of windrows between Project parcels and smaller woodlots is anticipated to provide access between areas.

The tree clearing will be done primarily by hand clearing, however a skid-steer stump grinder will be used to grind stumps to ground level or just below. Timber and other vegetative debris may be chipped for use as erosion control mulch or otherwise disposed of in accordance with applicable local regulations and landowner preferences.

Since the site is relatively flat, limited grading is anticipated for the Project. Where required, grading will be limited to creating a finished grade slope suitable for roads and storm water management.

A temporary equipment lay down area will be used for storage of construction equipment and supplies, and typically range in size from 10 acres to 12 acres. Staging areas will be covered with timber matting, temporary gravel with geosynthetic fabric, or other suitable material to separate the native soil from construction materials. Up to approximately 5 acres will be maintained as an O&M facility with gravel parking.

The Project will be served by an approximately 20-mile long (maximum length) network of private access roads. To construct the access roads, Republic will utilize a 36-foot wide temporary construction work space to accommodate for cranes. Once constructed, the access roads will be maintained as gravel roads with a permanent 16-foot wide footprint.

A transmission line will be installed to connect the Project substation to the Tiffin Center to Fremont Center 138-kV line. This transmission line will be detailed in a separate permit application.

Throughout construction and operation, Republic will employ best management practices (BMPs) to minimize sedimentation and erosion as outlined in the SESC plans approved by the County Soil and Water Conservation Districts prior to construction.

2.3 Wind Project Infrastructure

2.3.1 Foundations

The wind turbine would sit atop a steel and concrete foundation designed for the specific subsurface conditions at the individual turbine sites. Foundations would be designed by a registered engineer licensed in the State of Ohio who would select the appropriate foundation design for each turbine location based on site-specific geotechnical information, load bearing recommendations of the geotechnical engineer, and specifications of the wind turbine provided by the wind turbine manufacturer. The foundation designs would conform to State and county requirements and standard industry practices.

There are two industry standard foundation designs that may be used for the Project depending on the turbine location and the geotechnical conditions.

1. The 'inverted-T foundation' is a spread footing that employs a relatively shallow concrete base with a relatively large diameter. The base would extend approximately 10 feet below the surface grade and is expected to be between 55 and 80 feet in diameter. The top of the concrete pedestal would extend 6 inches above finished grade and be up to 20 feet in diameter. The turbine tower is fastened to the foundation by tensioned anchor bolts that run through the turbine tower base flange down into the concrete base. A layer of grout 2 to 3 inches thick and a steel ring, are typically located between the turbine tower base flange and the concrete pedestal.
2. A 'rock-anchor foundation' consists of a cylindrical cap of concrete that rests atop the bedrock layer. The concrete cap is typically between 5 and 10 feet thick and can be up to 30 feet in diameter. The top of the concrete cap may extend 6 to 18 inches above finished grade. The concrete cap is anchored to the bedrock by a series of rock bolts 40 to 50 feet in length. Once the rock bolts are tensioned, the conduits in which they are housed are filled with grout. The turbine tower is fastened to the foundation in the same manner as would be done for an inverted-T foundation.

This Project assumes up to 80-foot diameter turbine foundation, which includes a 10-foot wide ring gravel drive around the turbine for maintenance.

2.3.2 Turbines

Following foundation construction, the turbine crane pad would be constructed next to the foundation. This pad would be an engineered parking pad with sufficient rock base to hold the crane and the associated outriggers in a stable position for lifting the heavy equipment. The turbine components, including the tower segments, nacelles (generator housing), rotors, and other parts, would be delivered to the tower locations. Once a sufficient number of tower foundations are in place and finished, the first turbine towers, nacelles, and blades would be brought to the Project Area for placement. The turbine components would be transported to the Project Area by truck and trailer. The towers would have three to four sections, each approximately 70 to 90 feet long. The actual size of each segment would depend on which turbine supplier is selected. The tower segments would be delivered by trailers, each carrying one tower section. Large cranes would lift the multiple tower sections into place. The bottom section would be bolted to the circular ring(s) of anchor bolts on the foundation pedestal, and the upper sections would be sequentially bolted in place. A typical construction sequence would involve a smaller crane working in advance of the larger crane. This smaller crane would place the lower segments of the turbine tower on the foundation and move to the next site. The larger crane would be assembled on-site and would be used to hoist the upper tower segments and nacelle. The nacelle and rotor would be hoisted to the top of the tower by the large crane and bolted to the tower. The rotor hub and blades would be assembled on the ground, and this entire assembly would be lifted by crane and secured to the nacelle. Alternatively, the rotor hub and blades may be lifted individually by the crane and secured to the nacelle in sequence.

2.3.3 Meteorological Towers

Permanent met towers are also standard features of utility-scale wind projects. Instruments on the met towers are used to provide the project control system with accurate real-time wind speed and wind direction information. Met towers are only a few feet in diameter and are considerably smaller than wind turbine towers. They are constructed of triangular tubular aluminum sections approximately 14 inches on a side and are secured by multiple guy wires that extend up to 110 feet from the tower base. These towers are approximately 262 feet (80 meters) in height. For this Project, four met towers are anticipated, each is assumed to have a 10-square foot (s.f.) foundation for a total of 40 s.f. permanent impact to upland soils.

2.3.4 Collection Lines

A network of 34.5-kV power collection cables would connect the turbines to the Project substation. Underground cables would be installed in excavated trenches or directly plowed into the earth at a minimum depth of 4 feet below the ground surface. Whenever possible, multiple circuits would be co-located in common trenches, and the trenches would be located within access road corridors. Junction boxes that merge multiple incoming cables into one outgoing line would be installed at various locations within the Project Area to facilitate the collection of the power from the turbines. Each 34.5-kV circuit would carry about 30 MW of power. Several circuits would be required to evacuate power from all turbines to the substation. All buried power cable routes would be clearly marked and built to International Electric Code standards. Following construction, the collection line corridors will be seeded for land stabilization and kept cleared of trees and large brush.

2.3.5 Access Roads

All access roads will be located so as to minimize their impact on the environment. All-season, unpaved access roads will be required to access each turbine location and the substation from existing public roads during the construction, operation and decommissioning phases of the Project. Access roads will be approximately 16 feet wide with a right-of-way width of 36 feet depending on the utility requirements.

2.3.6 Substation and Point of Interconnection

An electrical substation is needed for the Project to provide a further increase in voltage from the 34.5-kV power collection system to the 138-kV voltage used to convey Project power to the regional transmission grid. The proposed location of the Project substation is shown in Figure 1-1.

A large 34.5/138-kV power transformer would be located within the Project substation, along with disconnect switches and communication equipment. The transformer would raise the voltage from 34.5 kV to 138 kV to meet the voltage of the receiving Tiffin Center to Fremont Center transmission line. In addition to the transformer, disconnect switches and metering relays, the substation would have a small metering and operating building that would house the power generation control and relaying equipment, station batteries, and the on-site Supervisory Control and Data Acquisition (SCADA) System, which would communicate operations information with the transmission control information system. The entire substation area would be cleared, graded, covered with gravel, and surrounded by a chain-link fence. The completed substation would occupy up to approximately 5 acres. The substation would be designed to meet the standards of the National Electric Safety Code and the interconnection requirements of AEP Ohio.

The POI would be similar to the substation and house equipment to transfer the power to the grid through a switch connection. The interconnect station will be located adjacent to the existing Tiffin Center to Fremont Center 138-kV line. The interconnect station would be a graveled and fenced area approximately 5 acres, with a parking area and electrical devices such as circuit breakers, transformers, and air switches. The station would also have communication, control equipment and O&M sheds to store equipment.

2.4 Operation and Maintenance

Long-term operations and maintenance activities for the Project would include the following functions:

> 24-hour operations monitoring of the Project electrical output and performance of the individual turbines, and management of the instrument, control, and safety systems;

> Controlling turbine operations and power output to meet scheduled deliveries and implementation of scheduled outages for regular or periodic maintenance;

> Performance of periodic and routine testing and maintenance of the turbines;

> On-site repairs of Project equipment as needed in response to malfunctions or scheduled maintenance;

> Patrolling the Project Area to ensure security and monitor on-site conditions including inspections of equipment, monitoring of re-vegetation and wildlife, and discouraging unauthorized use; and

> Periodic maintenance of Project access roads.

3 Regulatory Overview

Before construction can begin on any major utility facility or economically significant wind project within the State of Ohio, a CECPN must be obtained from the OPSB. The ORC defines an economically significant wind project as a wind project with a generating capacity of 5 MW or more. In accordance with ORC 4906.10[1], to issue a CECPN, the OPSB reviews projects against the following eight criteria (the criteria in bold are those addressed within this EA):

(1) The basis of the need for the facility if the facility is an electric transmission line or gas pipeline;

(2) The nature of the probable environmental impact;

(3) That the facility represents the minimum adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives, and other pertinent considerations;

(4) In the case of an electric transmission line or generating facility, that the facility is consistent with regional plans for expansion of the electric power grid of the electric systems serving this state and interconnected utility systems and that the facility will serve the interests of electric system economy and reliability;

(5) That the facility will comply with all air and water pollution and solid waste disposal laws and regulations;

(6) That the facility will serve the public interest, convenience, and necessity;

(7) The facility's impact on the continued agricultural viability of any land in an existing agricultural district; and

(8) That the facility incorporates maximum feasible water conservation practices as determined by the board, considering available technology and the nature and economics of the various alternatives.

The OPSB review committee is comprised of staff from member agencies, and includes state agencies such as the Ohio State Historic Preservation Office (SHPO), as well as Federal entities such as U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS). Voting board members include directors of the Ohio Environmental Protection Agency (OEPA), Ohio Department of Natural Resources (ODNR), Ohio Department of Agriculture, and Ohio Department of Health. The OPSB review committee provides recommendations, and the board members have final approval in the siting of each project.

3.1 Regulatory Requirements

Based on the potential construction impacts of the proposed Republic Wind Project, environmental regulatory authorization will be needed for various portions of the Project from both the Federal and State agencies.

3.1.1 Federal

In accordance with Section 404 of the CWA, the Project is located within the jurisdiction of the USACE Buffalo District. The USACE holds jurisdiction over "Waters of the United States" located within the

[1] http://codes.ohio.gov/orc/4906.10v1

Project Area. At this time we do not anticipate any traditionally navigable waters (TNW) under Section 10 of the Rivers and Harbors Act being crossed by the proposed Project. Republic has completed detailed field assessment of wetlands and waters to inform Project design and ensure compliance with CWA requirements.

The USFWS requires the protection of species that are listed as threatened or endangered under the Endangered Species Act (ESA). Projects that have the potential to result in "take" of individuals or impact Designated Critical Habitat for these species, require permit authorization from the USFWS. In addition, the Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) establish provisions for the protection of eagles and migratory birds that are not necessarily threatened or endangered. The USFWS will typically review project information and provide technical assistance in an effort to avoid or minimize risk of any potential take of a species. Republic has been in coordination with USFWS regarding methodology and results of Pre-construction Surveys for species projected under the ESA, BGEPA, and MBTA.

3.1.2 State

The ODNR provides an interdisciplinary review of energy projects as the State natural resource management agency. This includes consultation with both Federal and State agencies (i.e. USFWS, OEPA, etc.) as applicable. Specific to wind projects, ODNR will provide guidance on pre- and post-construction monitoring protocols, the potential presence of rare, threatened, and endangered (RTE) species within an area, potential effects to stream quality and other natural resource concerns (e.g., tree clearing).

The OEPA has jurisdiction over isolated wetlands within the Project Area. The OEPA will administer this jurisdiction through Section 401 of the CWA and the ORC 6111.02 to 6111.028 for issuance of a Water Quality Certificate (WQC). If isolated wetlands are affected by the Project, an Isolated Wetland Permit (IWP) would be required and would be issued by the OEPA via WQC application. If the Project is determined to collectively impact more than 0.5 acre of wetlands, an Individual 401 WQC Permit would be required.

The OEPA also administers the National Pollution Discharge Elimination System (NPDES) program in Ohio and issues permits for activities causing land disturbance (ORC Chapter 6111). The Project would require a NPDES Construction General Permit (CGP) based on the assessment that 1 or more acres of land disturbance would occur. A storm water pollution prevention plan (SWPPP) would be prepared for the Project that will describe the use of sound engineering and/or conservation practices and implementation of SESC and storm water management practices addressing all phases of construction.

Table 3-1 below provides further detail of environmental agencies and their regulatory authorities that may potentially apply to the proposed Project.

Table 3-1 Potential Environmental Regulatory Requirements for the Project

Lead Agency/Address	Agency Permit/Approval	Key Permit/Approval Thresholds
Federal Approvals		
U.S. Army Corps of Engineers (USACE) Buffalo District	Clean Water Act (CWA) Section 404	Discharge of dredged and fill materials into WOTUS, including wetlands with a significant nexus to navigable waterways.
U.S. Fish & Wildlife Service (USFWS) Ohio Field Office	Compliance with the Federal ESA and coordination on eagles and MBTA protected species	The Endangered Species Act of 1973 (ESA) under Section 7(a)(2) directs all Federal agencies to ensure that any action they authorize, fund, or carry-out does not jeopardize the continued existence of an endangered or threatened species or designated or proposed critical habitat (collectively referred to as protected resources). The BGEPA (16 U.S.C. 668-668d) provides protections to bald and golden eagles, their nests, eggs, and parts. Under the BGEPA, it is unlawful for any person to take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, any bald or golden eagle, alive or dead, or any part, nest, or egg thereof without a valid permit to do so. The MBTA provides protection to migratory birds. Under the MBTA it is unlawful, among other things, to take or possess any migratory bird, or any part, nest, or egg of such bird protected under the statute (16 U.S.C. § 703).
State Approvals		
Ohio Power Siting Board (OPSB)	Certificate of Environmental Compatibility and Public Need (CECPN) (*ORC Chapter 4906-17*)	The OPSB has the authority to approve electric generation and transmission facilities that will generate 50 or more megawatts (MW) and wind projects of 5 or more MW (*ORC Chapter 4906*). The OPSB also regulates electric transmission lines of 125 kV. Wind projects that receive OPSB certification are exempt from local regulatory oversight; however, local authority is still in place for projects under 5 MW.
Ohio Department of Natural Resources (ODNR)	State Rare, Threatened and Endangered Species (RTE) *(ORC Chapter 1531.25)*	The chief of the division of wildlife, with the approval of the wildlife council, shall adopt and may modify and repeal rules, in accordance with Chapter 119 of the Revised Code, restricting the taking or possession of native wildlife, or any eggs or offspring thereof, that he/she finds to be threatened with statewide extinction.
Ohio Environmental Protection Agency (OEPA)	CWA Section 401 Water Quality Certification (*ORC Chapter 6111*)	Discharge of dredged or fill material into WOTUS to determine whether the discharge will violate the State's Water Quality Standards.
OEPA Division of Surface Water	Isolated Wetlands Permit (*ORC Chapter 6111.02.021*)	Construction activities that disturb isolated wetlands.
OEPA Division of Surface Water	NPDES Construction General Permit (CGP) Ohio EPA Permit No.: OHC000003	The NPDES CGP renewal authorizes NPDES permit coverage for those construction activities involving 1 or more acres of land disturbance.

3.2 Anticipated Authorization

The OPSB is the lead State entity on significant utility projects such as the proposed Project. The OPSB will provide a CECPN; which will incorporate the majority of the authorization for construction for the State of Ohio. The USACE will regulate disturbance to Federal resources (i.e. WOTUS). Based on the proposed layout the following authorizations are anticipated:

3.2.1 U.S. Fish & Wildlife

The USFWS is responsible for the management and protection of species that are Federally-listed as threatened or endangered, issuing permits under BGEPA and providing technical assistance on other species such as those protected under the MBTA. Based on Republic's coordination with USFWS to date and implementation of recommended impact avoidance measures during Project design, construction and operations, no take of Federally-listed species or eagles is expected and no permits are warranted.

3.2.2 U.S. Army Corps of Engineers Nationwide Permits

The overall goal of the Federal CWA is to restore and protect the physical, chemical, and biological integrity of the nation's waters. The sections of the CWA with most relevance for wind projects are Section 404 (permits for the discharge of dredge and fill material to surface waters), Section 401 (Water Quality Certifications), and Section 402 (National Pollution Discharge Elimination System permits).

The Nationwide Permit (NWP) program is maintained by the USACE under the authority of Section 404 of the CWA. These permits have been issued by the USACE to authorize activities which are deemed to have minimal individual or cumulative impact to the environment. By issuing these permits, USACE relieves some of the administrative burden of the applicant and Federal government. The NWPs are reissued every 5 years, the current NWPs were effective March 2017. In addition to the general conditions and permit-specific criteria of the NWPs, the USACE has worked cooperatively with the State of Ohio (via OEPA) to develop regional conditions to the NWPs. The regional conditions allow district-specific resource concerns to be adequately addressed and help to increase compatibility between Federal and State's permitting programs.

Nationwide Permits cover a variety of activities that are applicable to the construction of wind energy projects that may impact WOTUS; there are two NWPs that are primarily used in wind energy projects:

1. NWP 12 covers the construction, maintenance, repair, and removal of utility lines and associated facilities in WOTUS, which includes collection line, associated substations, foundations for overhead utility line towers, poles and anchors, and access roads. NWP 12 has an impact threshold of 0.5 acre of WOTUS for each single and complete project (i.e., a crossing). Additional regional conditions for Ohio include the development of a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-Project conditions for all work in WOTUS having impacts greater than 0.10 acre.
2. NWP 14 may be used for construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in WOTUS, which may include project access roads or local road improvements. NWP 14 has an impact threshold of 0.5 acre of WOTUS for each single and complete project.

Republic has made an active approach to minimize and avoid impacts to regulated resources and has limited the impact where possible. Based on the Project as proposed, each impact to a WOTUS would be authorized under NWP 12 (Utility Line and Associated Activities) with no pre-construction notification requirement to the USACE. The attached wetland delineation report (Appendix H) includes a delineation of potentially jurisdictional WOTUS.

3.2.3 Ohio Environmental Protection Agency 401 Water Quality Certification

The 401 WQC and IWP Section of the OEPA reviews applications for projects that propose the placement of fill or dredged material into WOTUS as well as isolated waterbodies and wetlands that do not have a significant nexus to TNW, which are considered waters of Ohio (as defined under OAC Rule 3745-1-02 (b)(77)[2]). Areas where projects are eligible, ineligible, or may be eligible to use a NWP for 401 coverage are identified in OEPA's Stream Eligibility Map[3] (Figure 3-1). The Republic Wind Project has proposed infrastructure in all three water quality areas; however, impacts are limited to Eligible and Possibly Eligible areas as follows:

1. **Eligible Areas**: The majority of the Project (approximately 397.02 acres) falls within the "Eligible Area" (depicted as white in Figure 3-1); therefore, as long as the Project meets the Ohio 401 Certification Special Limitation and Conditions described below, no individual WQC is needed except if there are impacts to the following resources:
   a. **Category 3 wetlands:** (Note**:** Current Project siting has no anticipated impacts to Category 3 wetlands)
   b. **≥0.10 acres of wetland:** (Note**:** Current Project siting has no anticipated impacts to wetlands ≥0.10 acres)
2. **Possibly Eligible Areas**: Some of the Project (approximately 8.45 acres) is within area designated as Possibly Eligible (depicted as yellow in Figure 3-1); however, there are no impacts planned to WOTUS or waters of the state in this designation area.
3. **Ineligible Areas**: Some of the Project (approximately 0.06 acre) is within area designated as Ineligible (depicted as purple in Figure 3-1); however, there are no impacts planned to WOTUS or waters of the state in this designation area.

[2] OAC 3745-1-02.

[3] https://oepa.maps.arcgis.com/apps/webappviewer/index.html?id=e6b46d29a38f46229c1eb47deefe49b6

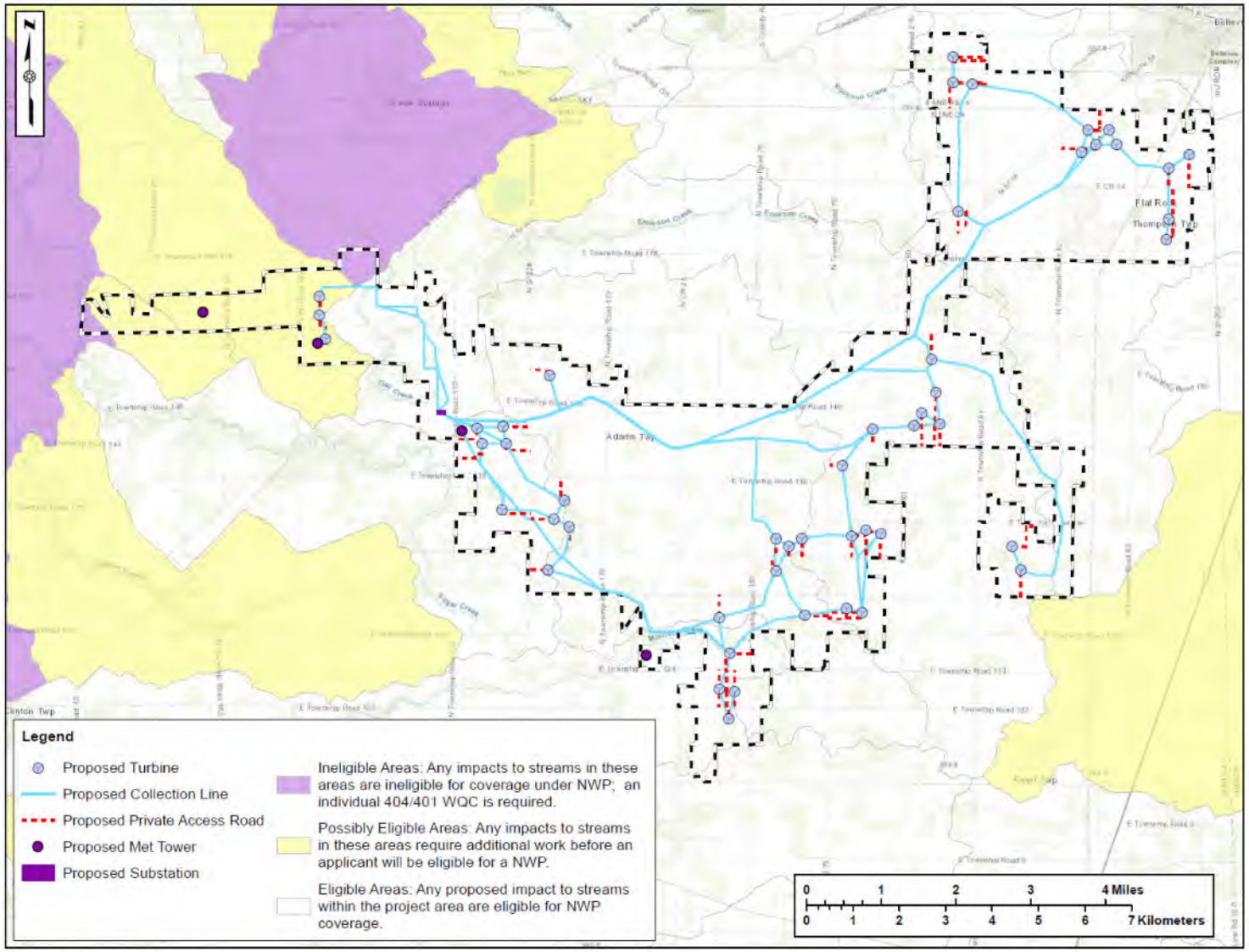

Figure 3-1 401 WQC for the NWP Eligibility Map (2017) as it applies to Proposed Facilities at the Republic Wind Project, Seneca and Sandusky Counties, Ohio

The 2017 NWP 12 Ohio 401 Certification special limitations and conditions are:

1. Ohio State certification general limitations and conditions apply to this NWP.
2. Except for maintenance activities authorized under this NWP, individual 401 WQC is required for use of this NWP when temporary or permanent impacts are proposed on or in any of the following waters:
    a. Category 1 or 2 wetlands when impacts exceed 0.50 acre;
    b. streams located in ineligible areas as depicted in the Geographic Information System (GIS) NWPs Stream Eligibility Map (see Figure 3-1 – 401 WQC for the NWP Eligibility Map (2017) for the Republic Wind Project, Seneca and Sandusky Counties, Ohio);
    c. streams located in possibly eligible areas as depicted in the GIS NWPs Stream Eligibility Map determined to be high quality through one of the NWP eligibility flowcharts;
    d. State wild and scenic rivers;
    e. national wild and scenic rivers; and
    f. general high quality water bodies which harbor Federally- and State-listed threatened or endangered aquatic species.
3. Temporary or permanent impacts to Category 3 wetlands are limited to less than 0.10 acre for activities involving the repair, maintenance, replacement, or safety upgrades to existing infrastructure that meets the definition of public need. OEPA will make the determination if a project meets public need during the ODNR's ORAM verification process.
4. Temporary or permanent impacts as a result of stream crossings shall not exceed a total of three per stream mile per stream.
5. For an individual stream, while the repair or replacement of an existing culvert of any length is not limited by this certification, any culvert extension shall not exceed 300 linear feet (l.f.)
6. All hydric soils up to 12 inches in depth within wetlands shall be stockpiled and replaced as the topmost backfill layer. BMPs, such as silt fencing and soil stabilization, shall be implemented to reduce erosion and sediment runoff into adjacent wetlands.
7. Buried utility lines shall be installed at a 90-degree angle to the stream bank to the maximum extent practicable. When a 90-degree angle is not possible, the length of any buried utility line within any single water body shall not exceed twice the width of that water body at the location of the crossing.
8. The total width of any excavation, grading or mechanized clearing of vegetation and soil shall not exceed a maximum of 50 feet.

If the Project cannot meet the 2017 NWP 12 Ohio 401 Certification special limitations and conditions, then an Individual 401 WQC Permit will be obtained.

4 Desktop Ecological Assessment

A desktop assessment of the Project Area was completed using GIS to describe the Project physical setting and screen for and classify potential environmental resources. The desktop assessment included a review of, but was not limited to, the National Land Cover Database (NLCD), U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey for the Project Counties, historic aerial photographs, National Wetland Inventory (NWI) maps, Ohio Wetland Inventory (OWI) maps, U.S. Geological Survey (USGS) topographic maps, and recent aerial photographs.

4.1 Land Use

The Project is located within the rural, unincorporated portion of Seneca and Sandusky Counties. Based on a review of available aerial imagery, the Project appeared to generally occur in cultivated crop areas. The land use types within the Project Area are based on data provided by the Multi-Resolution Land Characteristics Consortium (MRLC), from the 2011 NLCD (Homer et al., 2015). Review of the 2011 NLCD showed that cultivated crops accounted for approximately 85% of the area within the Project Area. Deciduous forest accounted for approximately 6% of the area and occurs as isolated woodlots between agricultural areas. The next most prominent land use within the Project Area was classified as "Developed, Open Space" for approximately 5% of the acreage. The classification of "Developed, Open Space" refers to "areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses." The remaining land use classifications accounted for 1% or less than the total acreage in the Project Area (Table 4-1). An overview of land use within the Project Area is illustrated in Appendix A, Map 2 – Land Use.

Table 4-1 Land Use within Project Area

	Project Area	
Type	**Acres**	**Percent (%)**
Cultivated Crops	20,219.77	85%
Deciduous Forest	1,487.11	6%
Developed, Open Space	1,255.95	5%
Hay/Pasture	288.36	1%
Barren Land	273.07	1%
Developed, Low Intensity	185.31	1%
Herbaceous	78.01	<1%
Developed, Medium Intensity	29.56	<1%
Open Water	22.86	<1%
Emergent Herbaceous Wetlands	5.11	<1%
Developed, High Intensity	4.89	<1%
Evergreen Forest	1.33	<1%
TOTAL	**23,851**	**100%**

4.2 Geologic Setting

The Project is located within the Central Lowland Physiographic Province of Ohio, which covers the central and western portions of the State south of Lake Erie. The Central Lowland is characterized by glacial till plains with gently rolling hills. Most hills are a series of moraines, which are glacier-created mounds of rock and soil that are up to 100 feet high and 6 miles wide. Elevations in the Central Lowlands range from 700 to 1,150 feet above mean sea level with moderate topographic relief (ODGS, 1998). Bedrock Geology underlying the Project is illustrated in Appendix A, Map 3 – Bedrock Geology (ODGS, 2006).

4.2.1 Glacial Drift

Glacial drift depths are considered during the engineering phase of the Project for subsidence and foundation requirements. Glacial drift depth is defined as the thickness of glacially derived sediments (drift) and post-glacial stream sediments overlying the buried bedrock surface. Overall, areas of shallow glacial drift (<40 feet thick) can be found in the northeastern portion of the Project, with areas of thick glacial drift deposits (>40 feet thick) found in the western portion of the Project. While much of the Project is located over areas determined to have more than 40 feet of depth to bedrock, it was noted that areas overlapping with the Silurian Salina Group of bedrock, which consists largely of sedimentary rocks such as dolomite, anhydrite, gypsum, and shale; consistently had less than 40 feet of glacial till on the surface.

Based on a desktop review of glacial depths, 40 of the 50 proposed turbine locations are identified to be in areas of 40 vertical feet of glacial drift or less. These locations are primarily in the central and eastern portion of the Project. Glacial Drift Thickness of the Project is illustrated in Appendix A, Map 4 – Glacial Drift (ODGS, 2004 rev. 2017). A summary of glacial drift depths and turbines is provided in Table 4-2 below.

Table 4-2 Glacial Depths and Turbine Numbers

Glacial Drift Thickness	No. of Turbines
0 – 10 feet	10
10 – 20	12
20 – 30	13
30 – 40	6
>40 feet	9
TOTAL	**50**

Source: ODGS, 2004.

4.2.2 Karst Terrain

Karst is a type of landform that develops as a result of limestone, dolomite, or gypsum dissolution. Natural processes such as erosion and acidic rainwater cause the dissolution, resulting in networks of conduits below ground level and sinkholes and caves at the surface. Karst terrain is characterized by the presence of features such as sinkholes, caverns, and caves. Karst landforms are host to some of Ohio's rare fauna; however, they also can be a significant geologic hazard. Sudden collapse of an underground cavern or opening of a sinkhole can cause surface subsidence that can severely damage or destroy any overlying structure such as a building, bridge, or highway.

The Project is located within the Bellevue-Castalia Karst Plain region. The area is underlain by up to 175 feet of Devonian carbonates (Delaware Limestone, Columbus Limestone, Lucas Dolomite, and Amherstburg Dolomite) overlying Silurian dolomite, anhydrite, and gypsum of the Bass Islands Dolomite and Salina Group. According to ODNR, the Bellevue-Castalia Karst Plain is believed to contain more

sinkholes than any of Ohio's other karst regions. Huge, irregularly shaped, closed depressions up to 270 acres in size and commonly enclosing smaller, circular-closed depressions 5 to 80 feet in diameter pockmark the land between the village of Flat Rock in northeastern Seneca County and Castalia in western Erie County. Surface drainage on the plain is very limited, and many of the streams which are present disappear into sinkholes called swallow holes.

Based on the ODGS Ohio Karst Areas map (1999, rev. 2006), approximately 12,347 acres (52%) of the Project Area is located in "Probable Karst Area".

4.3 Soils

Soils within the Project Area were represented by 57 different soil types. Project soil information was obtained from the Web Soil Survey, an application of the NRCS (USDA-NRCS, 2017), the Soil Survey of Seneca County, Ohio and the Soil Survey of Sandusky County, Ohio. The Project Area is comprised of primarily of eight soil types, the dominant of which were Blount silt loams (Blg1A1 and Blg1B1), which accounted for 50% of the total Project acreage (see Table 4-3). In general, the soils were considered prime farmland if drained properly, though poor drainage and permeability limits the use of subsurface drainage features (such as tiles). Soil series within the Project Area were identified as low slope, which matched general expectations in reviewing the topographic and aerial maps. A complete list of soil types is provided in Appendix B, Table 1 – Project Area soils.

Table 4-3 Soils within the Project Area

Type	Map Unit Description	Acreage	Percentage of Project Area
Blg1A1	Blount silt loam, ground moraine, 0 to 2% slopes	6,629	28%
Blg1B1	Blount silt loam, ground moraine, 2 to 4% slopes	5,352	22%
GwA	Glynwood silt loam, 0 to 2% slopes	1,553	7%
Gwg1B1	Glynwood silt loam, ground moraine, 2 to 6% slopes	1,420	6%
Pa	Pandora silt loam	1,235	5%
MnB	Milton silt loam, 2 to 6% slopes	675	3%
HoA	Hoytville clay loam, 0 to 1% slopes	534	2%
MnA	Milton silt Loam, 0 to 2% slopes	439	2%
NpA	Nappanee silt loam, 0 to 2% slopes	438	2%
DmA	Digby loam, 1 to 4% slopes	408	2%
KbA	Kibbie fine sandy loam, 0 to 2% slopes	361	2%
	Other soil types (acreage = 1% or less of Project Area)	4,808	20%
TOTAL		***23,851***	***100%***

The Blount silt loams series, 50% of the total Project Area, consists of poorly drained, nearly level flats along the Illinoian till plain. Permeability in this soil series is very slow which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 4%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Glynwood silt loam series, approximately 13% of the total Project Area, consists of deep, moderately well-drained soil formed on uplands in glacial till. Permeability of this soil series is slow, which can lead to

seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 12%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Pandora silt loam series, approximately 5% of the total Project Area, consists of deep, poorly drained soil formed in glacial till on uplands. Permeability of this soil series is slow, which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 2%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Milton silt loam series (2 to 6% and 0 to 2%), approximately 3% of the total Project Area combined, consists of moderately deep, well-drained soil formed in glacial till. Permeability of this soil series is moderate to moderately slow, and is normally found on uplands and lake plains. Slopes of this soil type are from 0 to 6%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Hoytville clay loam series, approximately 2% of the total Project Area, consists of deep, very poorly drained soil formed in glacial till on lake plains. Permeability of this soil series is slow, which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 2%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Nappanee silt loam series, approximately 2% of the total Project Area, consists of deep, somewhat poorly drained soil formed in silty clay or heavy silty clay loam on lake plains. Permeability of this soil series is very slow, which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 6%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Digby loam series, approximately 2% of the total Project Area, consists of very deep, somewhat poorly drained soils formed in loamy outwash. Permeability in this soil series is moderate in the solum and fast in the underlying till. Slopes of this soil type range from 0 to 6%. Most areas are drained and cultivated for crops.

The Kibbie series, approximately 2% of the total Project Area, consists of very deep, somewhat poorly drained soils formed on lake plains, ground moraines, outwash plains and deltas. Permeability in this soil is moderate. Most areas are used for cultivating crops if properly drained.

4.3.1 Highly Erodible Soils / Steep Slopes

Based on a review of the NRCS Web Soil Survey (USDA-NRCS, 2017), the Project Area soils are not classified as highly erodible soils (all received Wind Erodibility Group [WEG] ratings between 5 and 6 [1 being highly erodible; 8 being least erodible]). Additionally, no soil types within the Project Area are found to have 12% slopes or greater.

4.3.2 Hydric Soils

Based upon soil information obtained from the Web Soil Survey (USDA-NRCS, 2017), approximately 1% (247 acres) of the Project Area was determined to be located in fully hydric soils (i.e., soils containing 100% hydric components; Table 4-4). The poor draining qualities of hydric soils combined with local flat or bowl-shaped topography make these locations predisposed to containing wetland areas.

Table 4-4 Hydric Soils in Project Area

Type	Map Unit Description	Hydric Rating	Project Area	
			Acres	%
Bp	Lenawee silty clay loam	100	125	1%
Le	Bono silty clay, loamy substratum	100	81	<1%
Sb	Sebring silt loam	100	41	<1%
TOTAL			***247***	***1.04%***

The Lenawee series, approximately 1% of the total Project Area, consists of very deep, poorly drained and very poorly drained, moderately permeable soils formed in lacustrine deposits. These soils are on lake plains and in depressions on moraines, outwash plains, and glacial drainage ways. Slopes of this soil type range from 0 to 2%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Bono silty clay series, <1% of the total Project Area, consists of very deep, somewhat poorly drained soils formed in lacustrine deposits. These soils are on lake plains and in depressions on moraines, outwash plains, and glacial drainage ways. Permeability of this soil series in moderate to slow. Slopes of this soil type range from 0 to 2%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The Sebring silt loam series, <1% the total Project Area, consists of very deep, very poorly drained soils formed in lacustrine deposits. These soils are on lake plains and in depressions on moraines, outwash plains, and glacial drainage ways. Permeability of this soil series is slow, which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Slopes of this soil type range from 0 to 2%. If drained, most areas are used for cultivated crops, though extended periods of wetness can greatly delay planting.

The remaining Project Area is located in areas of non-hydric or predominantly non-hydric soils.

4.4 Water Quality & Floodplains

Prior to site investigations, the Project Area was screened using the USFWS NWI (USFWS, 2017a) and USGS National Hydrography Dataset (NHD) remote data for potential wetlands and waterbodies in the vicinity of the Project (NRCS-USGS-EPA, 2017).

4.4.1 National Wetland Inventory Wetlands / National Hydrography Dataset Streams

The NWI data shows remotely identified wetlands, which may be based on previous aerial imagery interpretation and soils surveys, while the NHD uses digital stream information to identify potential waterways. Multiple wetlands and waterbodies were identified within the Project Area, with some additional streams and wetlands occurring in the Project vicinity. The majority of the waterbodies remotely identified appeared to be manipulated agricultural ditches. Additionally, several NHD features were identified during field surveys that ran directly through active agricultural areas but were not visible in aerial imagery. These features may have been rerouted by previous land use manipulation or even tiled to route them under crop areas. Most of the wetlands identified in the ODNR dataset occurred in isolated woodlots, with moderate overlap with NWI features (ODNR WMS, 2017).

4.4.2 Navigable Waters

The Project is located entirely within the Sandusky River drainage basin, which drains northward toward Sandusky Bay and ultimately Lake Erie. No navigable waterways are located within the Project Area.

Tributaries of the Sandusky River include several streams that cross into the Study Area such as: Green Creek, Flag Run, Indian Creek, Westerhouse Ditch, Beaver Creek, Raccoon Creek, Sugar Creek, Morrison Creek, Pickerel Creek, and South Creek. Other waterbodies located nearby, but which do not cross into the Project Area, include Spicer Creek, Seymour Creek, and Frick Run.

The Project Area can be categorized into 11 main drainage areas (12-Digit Hydrologic Unit Code (HUC)), as shown in Table 4-5.

Table 4-5 Drainage Areas (12-Digit HUC) within the Project Area

Spicer Creek-Sandusky River	Westerhouse Ditch
Indian Creek-Sandusky River	Beaver Creek
Morrison Creek	Sugar Creek
Raccoon Creek-Frontal Sandusky Bay	Mills Creek
Pickerel Creek-Frontal Sandusky Bay	Rock Creek
Frink Run	

4.4.3 Water Quality

All of the waterbodies identified in the Project Area are designated as warm water habitat (WWH) in the OEPA's Water Quality Standards, except for a portion of Beaver Creek/Green Creek which is listed as cold water habitat (CWH) (OEPA, 2007). Watersheds and named streams within the Project Area are illustrated in Map 6 – Water Quality & Floodplains of Appendix A.

4.4.4 Floodplains

Approximately 551.2 acres of the Project Area are located within the 100-year floodplain as defined by Federal Emergency Management Agency (FEMA) Flood Insurance Maps (FEMA, 2017). Based on current design of the Project, no proposed turbines or access roads will be located within the 100-year floodplain. Collection lines will temporarily impact less than 5 acres of the floodplain, spread across three drainage basins (Pickerel Creek – Frontal Sandusky Bay, Westerhouse Ditch, and Beaver Creek). The 100-year Floodplains within the Project Area are also illustrated in Appendix A, Map 6 – Water Quality & Floodplains.

4.5 Major Species

Major species, as defined by OAC Chapter 4906-17, *are those which are of commercial or recreational value, or species designated as endangered or threatened in accordance with the United States and Ohio threatened and endangered species lists.*

4.5.1 Commercial or Recreational Value Species

Common game species in northern Ohio include white-tailed deer, wild turkey (*Meleagris gallopavo*), small game (cottontail rabbit, squirrel, groundhog), northern bobwhite (*Colinus virginianus*) and other quail (*Coturnix* spp.), Canada goose (*Branta canadensis*), waterfowl such as mallard (*Anas platyrhynchos*) and other ducks, mourning dove (*Zenaida macroura*), ring-necked pheasant (*Phasianus colchicus*), and ruffed grouse (*Bonasa umbellus)* (ODNR DOW, 2017).

Sugar Creek and Knobby's Prairie Wildlife Areas are located southwest of the Project Area and offer over 170 acres of combined public hunting areas. Beaver Creek Reservoir, located approximately ½ mile north of the Project Area, is an aboveground reservoir owned by the city of Clyde. Beaver Creek Reservoir is open to public fishing through a cooperative agreement between the City of Clyde and the ODNR Division of Wildlife (DOW).

The Project Area is located 3 miles east of the Sandusky River Important Bird Area (IBA), which is located along the Sandusky River and provides both recreational bird watching opportunities and important bird habitat. This river corridor is a known flyway for waterfowl heading for Sandusky Bay and is notable for its concentration of nesting and wintering bald eagles. Additionally, large numbers of migrant landbirds use the corridor and the Federally-endangered Kirtland's warbler has been recorded during spring migration (Audubon, 2017a).

Agricultural crops and livestock are present in the area, which have commercial value.

Republic completed a socioeconomic evaluation as part of the OPSB application, which can be found in a separate report (see Exhibit G).

Appendix A, Map 1 – Pre-Construction Study Area provides an overview of the extent of previous studies and adjacent Wildlife Areas.

4.5.2 Threatened & Endangered Species

4.5.2.1 Federal Listings

On November 15, 2018, the USFWS's Information for Planning and Consultation (IPaC) tool was used to screen the Project Area for resources managed by the USFWS. The IPaC report listed three endangered and three threatened species that may occur within the Project Area, including three migratory bird species, two bat species and one plant species (see Table 4-6). A copy of the IPaC report is included in Appendix C.

Table 4-6 Federally-Listed Threatened, Endangered, Proposed, and Candidate Species Potentially Located in the Project Area

Species	Federal Status[1]	Habitat
Indiana bat (*Myotis sodalis*)	Endangered	Hibernates in caves and mines. Roosts and forages in small stream corridors with well-developed riparian woods and upland forests.
Northern long-eared bat *(Myotis septentrionalis)*	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests during late spring and summer.
Kirtland's warbler (*Dendroica kirtlandii*)	Endangered	Known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
Piping plover *(Charadrius melodus)*	Endangered	Beaches along shorelines of the Great Lakes (spring/summer) During spring, spend 3 to 4 months on their breeding grounds in the Great Lakes and then migrate to wintering areas along the Atlantic and Gulf Coasts in the fall.
Red knot *(Calidris canutus rufa)*	Threatened	Present in Ohio during spring and fall migration.
Eastern prairie-fringed orchid *(Platanthera leucophaea)*	Threatened	Mesic to wet prairies and meadows.

Source: USFWS Information for Planning and Consultation (IPaC), based on Project Area, generated January 2, 2018 (Appendix C).

[1] USFWS Federally-listed Species Status Definitions:

Endangered – The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Threatened – Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The IPaC report identified no Critical Habitats, Wildlife Refuges, or Fish Hatcheries within the Project Area.

The IPaC report also identified 15 migratory bird species (including Birds of Conservation Concern [BOCC]) that may occur within the Project Area. The majority of the BOCC species identified have a breeding season between March and October, when these species have higher potential to be present in the vicinity of the Project.

4.5.2.2 State Listings

The ODNR DOW Ohio's Listed Species report, updated July 2018 (ODNR DOW, 2018a) and ODNR's State-listed Plant and Wildlife Species by County, Sandusky County and Seneca County lists, dated July 2016 (ODNR DOW, 2016a, b) lists several species that have the potential to be located within the Project Area. A complete listing of State-listed Species for Sandusky and Seneca Counties is included in Appendix C. When two sources of listings provided different statuses for a particular species, the more conservative status is presented.

Based on the ODNR lists above, the following numbers of State-listed species have potential to occur within the Project Area: 26 birds, 4 fish, 3 insects, 10 mammals (including 7 bats), 2 amphibians, 13 freshwater mussels, and 19 plants. The majority of the State-listed species with the potential to occur are associated with aquatic habitats; however, it is unlikely that the habitats within the Project Area are adequate to support many of these species due to nearby and habitat fragmentation from clearing land for farming activities. Since the Project is proposed primarily in active agricultural areas which are regularly disturbed (e.g., tilled, planted, harvested, etc.) it is unlikely that these species would reside in these areas.

4.6 Wildlife

Wildlife resources have the potential of being directly or indirectly impacted by utility-scale energy projects. Potential direct impacts include collision and electrocution, whereas potential indirect impacts include the displacement of wildlife using the area for foraging, breeding, and nesting by construction activities such as earthmoving, vehicular movements, and construction equipment. Since the Project is located within a primarily agricultural area, impacts to wildlife are generally anticipated to be limited.

4.6.1 Birds

Based on review of the USGS North American Breeding Bird Survey (BBS) routes, the Vickery BBS route runs north-south along the eastern portion of the Project. A total of 86 bird species were identified during 11 surveys of the Vickery route completed from 2007 to 2017. Four species identified as Ohio Species of Concern were identified along this route: great egrets (*Ardea Alba*), black-billed cuckoo (*Coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), and the sedge wren (*Cistothorus stellaris*). Additionally, three bald eagle sightings were recorded (2 in 2008, 1 in 2015). No other Federally- or State-listed species were observed (USGS BBS, 2018).

Additionally, eBird (http://ebird.org) was reviewed for the Project Area plus an approximate 1 mile buffer. eBird's publically available data (1996 to 2018), is an aggregation of bird sightings reported by bird watchers, researchers and conservationists. No Federally-listed bird species were identified in the eBird database for the Project Area. Species sightings within the Project Area or ≈1 mile buffer included three State-endangered species (Northern harrier [*Circus hudsonius*], n=2; common tern [*Sterna hirundo*], n=1; black tern [*Chlidonias niger*], n=13), two State-threatened species (trumpeter swan [*Cygnus buccinator*], n=2; sandhill crane [*Grus Canadensis]*, n=26), five State Species of Concern and 12 State Species of Special Interest (eBird, 2018). In addition, five bald eagle sightings were recorded, and most of the BOCC identified in the IPaC review have been documented at low levels within the Project Area.

A review of the 116th Audubon Christmas Bird Count (December 2017) was completed for the Tiffin Circle, which borders the Republic Project Area's southwest boundary. Results indicated one State-endangered species (Northern harrier), and four State Species of Special Interest (brown creeper (*Ceria Americana*), dark-eyed junco (*Junco hyemalis)*, golden-crowned kinglet *(Regulus satrapa)*, and red-breasted nuthatch (*Sitta canadensis)*), were observed in the vicinity of the Project Area (Audubon, 2017b).

4.6.2 Bats

Of the 46 bat species in the United States, seven have the potential to occur in the Project Area: Indiana bat, northern long-eared bat, big brown bat (*Eptesicus fuscus)*, eastern red bat (*Lasiurus borealis)*, hoary bat (*Lasiurus cinereus)*, little brown bat (*Myotis lucifugus*) and tri-colored bat (*Perimyotis subflavus)*. Each of these seven species are also State-listed.

4.6.3 Freshwater Mussels

All native mussels in the State of Ohio are protected per ORC Section 1533.324, as are the 10 Federally-protected species which may occur in the State. If impacts to Federally- and State-protected mussels and their habitats cannot be avoided, then surveys are required to identify the presence or probable absence of mussels in a waterbody prior to any proposed stream disturbance. The Ohio Mussel Survey Protocol (ODNR DOW, 2018b) classifies streams based on their size and potential for Federally-listed species, as shown in Table 4-7 below.

Table 4-7 Stream Classifications according to Mussel Survey Protocol, per ODNR and USFWS

Group	Definition
Unlisted	Streams not listed in the Survey Protocol, having a watershed larger than 10 square miles with the potential for mussels, but no Federally-listed species are expected
Group 1	Small to mid-sized streams, Federally-listed species not expected
Group 2	Small to mid-sized streams, Federally-listed species expected
Group 3	Large rivers, Federally-listed species not expected
Group 4	Large rivers, Federally-listed species expected

Per the Ohio Mussel Survey Protocol (2018), all Group 2, 3, and 4 streams require a full mussel survey prior to any planned impact. Group 1 and unlisted streams with a watershed of 10 square miles or greater based on the point of impact should be assessed using the Reconnaissance Survey for Unionid Mussels to determine if mussels are present. Results of the reconnaissance survey should be forwarded to ODNR who then determine the need for additional surveys.

The survey protocol notes that use of horizontal directional drill (HDD) to cross a stream eliminates the need for surveys, and streams with a drainage area of less than 10 square miles do not require surveys. Based on this criteria, there will be no impact to freshwater native mussels as a result of the construction or operation of this Project and full mussel surveys are not required.

5 Agency Consultation

Communications with ODNR and the USFWS have been ongoing since 2011 to review existing information on wildlife use of the Project Area, implement appropriate survey protocols to evaluate risk, inform siting and operational considerations, and agreed-upon appropriate impact avoidance and minimization measures, as well as monitoring of potential impacts, for resources under their jurisdictional authority. Summaries of these consultations are provided below, and meeting summaries are provided in Appendix D.

5.1 U.S. Fish and Wildlife Service

Coordination with USFWS was initiated in January 2011 (see Appendix D), and will continue through development and operations of the Project. In a letter dated March 18, 2011, from the USFWS, the agency provided several considerations regarding the Indiana bat (e.g., recommendations for mist-net surveys, radio telemetry, acoustic surveys, and Indiana bat migratory habitat considerations). Other species identified at this time as warranting consideration for the Project Area included rayed bean (*Vilosa fabalis*; Federally-endangered freshwater mussel), eastern massasauga (*Sistrurus catenatus*; Federal Candidate species, Ohio endangered rattlesnake), and Kirtland's warbler (Federally-endangered songbird). The USFWS also noted that several bald eagle nests were located in the Project vicinity, and surveys to fully evaluate the bald eagle's nesting would need to be completed in coordination with the office.

In an email communication on March 3, 2017, the USFWS confirmed that there were no known occurrences of eastern massasauga within the Project Area, therefore additional consideration for this species was not warranted (Appendix D). And, the rayed bean was not indicated as potentially present in the IPaC review completed for the Project on November 15, 2018 (see Section 4.5.2.1).

Republic met with USFWS and ODNR on August 17, 2016 at the USFWS office in Columbus, Ohio to discuss the current Project. During the meeting, USFWS confirmed that wildlife studies completed to date were sufficient to adequately assess and respond to risk to wildlife within the revised Project Area.

In an email dated February 24, 2016, USFWS confirmed that take of listed bats would be avoided if the Republic implements the following impact avoidance measures (see Appendix D):

> Feathering turbines at wind speeds below 6.9 meters per second (m/s) from 30 minutes before sunset to 30 minutes after sunrise during spring (March 15 – May 15) and fall (Aug 1 – Oct 31) migration throughout the Project Area;

> Feathering turbines at wind speeds below 6.9 m/s from 30 minutes before sunset to 30 minutes after sunrise from May 16 – July 31 within 2.5 miles of the documented Indiana bat roost center-point; and

> Conducting 2 years of post-construction monitoring in accordance with ODNR guidelines.

USFWS Guidelines from other States recommend setting turbines back 1,000 feet from suitable Indiana bat habitat to prevent risk of take during summer (May 16 – July 31; USFWS, 2017b). Therefore, Republic has also committed to setting turbines back a minimum of 1,000 feet from suitable Indiana bat habitat within 2.5 miles of the documented Indiana bat roost. In addition, Republic will minimize tree clearing, and where necessary it will be avoided within 2.5 miles of the documented Indiana bat roost from April 1 – October 31, and within 150 feet of identified northern long-eared bat roost trees from June 1 – July 31.

5.2 Ohio Department of Natural Resources

Coordination with the ODNR was initiated in April 2010 (see Appendix D) and will continue through development and operations of the Project. Initial survey recommendations based on the original Project Area were issued on April 2, 2010, with subsequent survey recommendation letters issued as the boundary was revised through development. A survey recommendation letter based on the current Project Area was issued October 31, 2017, which identified the Project as being in an area needing moderate monitoring efforts, to include breeding bird surveys, raptor nest surveys, bat acoustic monitoring, passerine migration surveys, diurnal bird/raptor migration surveys, and bat mist-net surveys (Appendix D).

The most recent agency coordination documentation is an email from ODNR dated January 25, 2018 confirming that wildlife studies completed to date are sufficient to adequately assess and respond to risk to wildlife within the Project Area.

6 Pre-Construction Surveys

Wildlife surveys were completed between 2011 and 2017 across a broad Study Area, defined as an area encompassing the largest extent of these pre-construction wildlife surveys, for a total of approximately 96,590 acres in and around the Project Area (Appendix A, Map 1 – Pre-construction Study Area). As the Project design has progressed, infrastructure was sited to avoid important/sensitive areas identified within the Study Area (i.e., eagle nests, etc). The current Project Area is a smaller area within this wide Study Area.

6.1 Avian Surveys

Five avian survey reports were completed for the Republic Wind Project, and three avian survey reports were completed for the adjacent Emerson West Wind Project (a portion of which is now incorporated within the Project Area), each of which were completed in coordination with agency recommendations and in accordance with ODNR's *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio (2009)*. Copies of all avian survey reports are included in Appendix E. Both USFWS and ODNR concurred that the results of these surveys were sufficient to adequately assess risk within the current Project Area and no further surveys were necessary (see Appendix D).

(1) Raptor Nest Survey, Republic Wind Farm, Seneca County, Ohio, prepared by BHE Environmental, Inc. (BHE), dated May 2011.

BHE completed raptor nest surveys between March 17 and 25, 2011, within a previous Project Area plus a 2-mile buffer. BHE identified 11 raptor nests and 1 great blue heron (*Ardea herodias*) breeding colony. The raptor nests were identified as potentially active red-tailed hawk (*Buteo jamaicensis*) nests or inactive nests of unknown species. The great blue heron colony was identified within the 2-mile buffer. The colony included 12 to 15 nests, each with an adult great blue heron nearby.

No nests of Federally- or State-listed species were observed during the raptor survey within the Project Area or 2-mile buffer. Three bald eagle nests were documented within 6 miles of the Project Area. The nests were monitored to assess daily movement patterns, the results of which are further discussed in section (5) below.

(2) Breeding Bird Survey for the Republic Wind, LLC, Seneca and Sandusky Counties, Ohio, prepared by BHE Environmental, Inc., dated August 2011.

BHE completed three breeding bird surveys between May and June, 2011, at 24 points within a previous Project Area, and a late-summer (i.e., July) breeding bird survey at eight points per ODNR recommendations.

Consistent with the primary land use in the Project Area (intensive agricultural management), most species identified during the breeding bird survey were open woodland and grassland birds. Common species observed included the American robin (*Turdus migratorius*), American crow (*Corvus brachyrhynchos*), common grackle (*Quiscalus quiscula*), northern cardinal (*Cardinalis cardinalis*), and mourning dove. Other birds observed were species that prefer woodland edges and open thickets such as song sparrow (*Melospiza melodia*), American goldfinch (*Spinus tristis*), chipping sparrow (*Spizella passerina*), indigo bunting (*Passerina cyanea*), gray catbird (*Dumetella carolinensis*), and house wren (*Troglodytes aedon*). Many of the grassland species observed are common birds adaptable to open settings such as horned lark (*Eremophila alpestris*), savannah sparrow (*Passerculus sandwichensis*), brown-headed cowbird (*Molothrus ater*), and killdeer (*Charadrius vociferus).* Forest birds observed were

species adapted to open habitats and urban settings, such as the blue jay (*Cyanocitta cristata*), tufted titmouse (*Baeolophus bicolor*), red-bellied woodpecker (*Melanerpes carolinus*), black-capped chickadee (*Poecile atricapillus*), white-breasted nuthatch (*Sitta carolinensis*), and downy woodpecker (*Picoides pubescens*). The balance of the species observed comprised of birds associated with scrub vegetation or lakes/ponds. A single flock of 37 Canada geese counted for the vast majority of the birds classified as lake/pond habitat species.

No Federally-listed species were observed. Two Ohio-listed Species of Concern were observed during the surveys, the bobolink (n=3) and Henslow's sparrow (*Ammodramus henslowii,* n=1), in grassland areas in the southeastern portion of the Project (Points 6 & 11, respectively). Incidental observations of Ohio-listed bird species during the summer breeding season included the two endangered species (northern harrier (n=2) and upland sandpiper (*Bartramia longicauda; n=1*)), three Ohio Species of Special Interest (red-breasted nuthatch (*Sitta Canadensis*), n=1, western meadowlark (*Sturnella neglecta*), n=1, least flycatcher (*Empidonax minimus*), n=1), and one Ohio Species of Concern (great egret, n=1). A single bald eagle was incidentally observed feeding on carrion near Point 11 during the breeding bird survey.

BHE concluded that the previous Project Area is generally lacking in the features associated with a diverse breeding bird population (i.e., river corridors, forest cover, scrublands, water, wetlands, etc.). Results of the breeding bird surveys suggest that the potential for breeding bird displacement or collision caused by the proposed Project turbines should be similar to other Midwestern wind projects where the landscape is dominated by row crop agriculture.

(3) Results of the Passerine Migration Survey, Republic Wind Farm, Seneca and Sandusky Counties, Ohio, prepared by BHE Environmental, Inc., dated December 2011.

During the spring (April 4 – May 30) and fall (August 18 – November 18) of 2011, BHE completed a passerine migration survey of a previous Project Area in accordance with ODNR recommendations.

A total of 15,525 individuals of 98 species were identified. In general, large flocks of birds observed were common species (e.g., red-winged blackbird (*Agelaius phoeniceus*), European starling (*Sturnus vulgaris*), and tree swallow (*Tachycineta bicolor*)). No Federally-listed species were observed. State-listed species were observed in low numbers and included: endangered northern harrier (n=2), endangered yellow-bellied sapsucker (*Sphyrapicus varius*, n=1), threatened least flycatcher (n=1), threatened dark-eyed junco (n=16), threatened hermit thrush (*Catharus guttatus* , n=1). Observations also included one State Species of Concern: bobolink (n=3), and four Species of Special Interest: green-winged teal (*Anas crecca*, n=3), golden-crowned kinglet (*Regulus satrapa*, n=2), red-breasted nuthatch (n=2), and winter wren (*Troglodytes hiemalis*, n=1).

Based on the results of the survey, BHE concluded that the previous Project Area does not represent a unique resource for a large number of passerines during migration. Additionally, the survey did not demonstrate avian use patterns that would indicate that the previous Project Area is an essential contributor to passerine migration in the region.

(4) Results of the Diurnal Bird/Raptor Migration Survey, Republic Wind Farm, Seneca and Sandusky Counties, Ohio, prepared by BHE Environmental, Inc., dated December 2011.

During the spring (March 17 – April 30) and fall (September 4 – October 28) of 2011, BHE completed diurnal bird and raptor migration surveys three times per week at three points within a previous Project Area. A total of 20 survey days were completed in the spring and 22 survey days in the fall.

A total of 12,337 birds comprising 52 species were observed during the migration surveys. Three species comprised over half of the individuals observed: red-winged blackbird, European starling, and common grackle. One flock of Bonaparte's gulls (*Chroicocephalus philadelphia*, n=62) was observed during the spring. This was the only large flock of birds outside of blackbirds, starlings, and grackles.

Eight species of raptors were documented during the surveys, the most common of which was turkey vulture (*Cathartes aura,* n=527 [80% of observations]) and red-tailed hawk (n=71). No Federally-listed species were observed. One State-endangered species was observed (northern harrier, n=13) and one State-threatened species was observed (sandhill crane (*Grus Canadensis)*, n=1).

A total of four bald eagle observations were recorded over 294 hours of survey, all during the spring migration period. Three of the eagle observations occurred in the northwestern portion of the previous Project Area, all of which were juvenile birds flying within the assumed rotor-swept zone. One adult bird was observed in the southern portion of the previous Project Area, flapping/gliding north out of a woodlot and across a field.

Based on the observations made by BHE during the diurnal-migration surveys in spring and fall, the previous Project Area does not appear to be an important diurnal bird and raptor migratory pathway. Large flocks observed using the area consisted of common species, and listed species were observed in limited numbers. BHE concluded that due to the limited size of woodlots, wetlands, open water, and potential stopover sites present, and due to an availability of similar habitat in northwestern Ohio, the previous Project Area does not appear to represent a unique resource for large numbers of migratory diurnal birds and raptors.

(5) Final Results for the Bald Eagle Survey Effort, Republic Wind Farm, Seneca and Sandusky Counties, Ohio, prepared by BHE Environmental, Inc., dated November 2012.

From 2011 to 2012, BHE completed a bald eagle point-count survey and bald eagle nest monitoring in accordance with USFWS recommendations.

BHE monitored three bald eagle nests identified during the 2011 raptor nest surveys to assess daily movement patterns and attempt to identify the productivity success of each nest during the 2011 and 2012 breeding/nesting seasons. Nest monitoring surveys were completed at each nest twice a week for at least 4 hours per survey during the incubation and rearing stages. Only one of the three nests, the Fort Seneca nest located approximately 6 miles west of the Project Area, remained active in 2011 and produced two eaglets. The eagles were observed to use the Sandusky River and surrounding area almost exclusively, and were not observed using the Project Area. Due to a variety of constraints, BHE was unable to determine the productivity status of any of the bald eagle nests in the 2012 survey period.

Point-count surveys were completed twice a month from August 2011 – July 2012 at 20 points across a previous Project Area. A total of two bald eagle observations were recorded over 154 hours of survey, both at Point 19, which was located along E Township Road 136, west of Weiker Road. No activity was observed at the remaining 19 point-count locations during the survey period. At no time were the eagles observed within the assumed rotor-swept zone (40 to 120 meters[m]) of the proposed wind turbines. This information was provided to USFWS to assist in determining the potential risk to bald eagles posed by the proposed Project.

(6) Raptor Nest Surveys for the Emerson West Wind Project, Seneca County, Ohio prepared by Western EcoSystems Technology, Inc. (WEST), dated Spring 2016.

From March 25 – April 13, 2015, WEST completed raptor nest surveys within the Emerson West Wind Project, located immediately south of the Republic Project Area, and a 1-mile buffer, as well as checked known bald eagle nests within 4 miles to confirm presence and status of these nests . For the eagle observations, four active and no inactive eagle nests were recorded within 4 miles of the Emerson West Wind Project, three of which were new or previously undocumented. Fourteen (14) active red-tailed hawk nests and 21 inactive non-eagle nests were observed.

Given the proximity of the two projects, the raptor and eagle nest surveys completed for the Emerson West Wind Project covered a sizeable portion of the current Republic Project Area. None of the eagle nests identified during the surveys are located within the Republic Project Boundary.

(7) Breeding Bird Surveys for the Emerson West Wind Project, Seneca County, Ohio, prepared by Western EcoSystems Technology, Inc., dated May 12, 2017.

WEST completed additional breeding bird surveys for the proposed Emerson West Wind Project located in Seneca County, Ohio in accordance with the ODNR *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio (2009)*. Fifteen (15) fixed-point surveys occurred throughout the Emerson West Wind Project over a 3-year period from May – June in 2011; 2012; and 2016. There were 895 individual observations of 69 known and 2 unknown species across the 3 years. Twenty-seven percent of the bird observations were dominated by four species: American robin, red-winged blackbird, song sparrow, and indigo bunting. Throughout the surveys, no Federally-listed species were observed, and only one State-listed species (northern harrier, State-endangered, n=1) was observed.

WEST concluded that breeding bird species were typical of a primarily agricultural landscape, and impacts are likely to be similar to those at currently operating projects in similar habitats.

(8) Large Bird and Eagle Use Surveys for the Emerson West Wind Project, Seneca County, Ohio, prepared by Western EcoSystems Technology, Inc., dated January 2018.

WEST completed year-round large bird and eagle surveys for the proposed Emerson West Wind Project in Seneca County, Ohio. The surveys were completed monthly from May 2016 – April 2017, at 29 different locations within the Emerson West Project Area. The objective of the surveys was to estimate large bird and eagle use in the area and evaluate risk associated with construction and operation of the proposed wind Project. A total of 18 species (1,784 individuals) were observed during the 20-minute large bird surveys. Eight species were diurnal raptors and were most abundant in the summer and winter with the most common raptor being the red-tailed hawk. Four species composed 74.9% of all large bird observations: Canada goose (25.7%), turkey vulture (23.1%), killdeer (15.5%), and mourning dove (10.6%). Diversity of large bird species was highest in spring.

During the 60-minute eagle surveys, 15 bald eagle observations were recorded. Bald eagles were recorded at low levels throughout the Project during all seasons compared to use by other raptors, but slightly elevated use was evident to the north of the Project near a known bald eagle nest near the northeastern edge of the Emerson West Wind Project Area.

No Federally-listed species were observed during the surveys. One State-endangered species, the northern harrier, was observed (n=7). The majority of the northern harrier observations were recorded in the winter and none were observed during the summer breeding season. In addition, one peregrine falcon (a BOCC) was observed incidentally in the fall.

WEST concluded that the species observed during these surveys were geographically abundant and unlikely to be affected by the construction and operation of this Project. Any habitat fragmentation occurring is unlikely to have any impact on large bird populations during any given season in the Project Area. WEST also recommended avoiding siting turbines in close proximity to the nests to reduce risk associated with these higher use areas, which Republic has done in coordination with USFWS recommendations.

A summary of avian species observations during Pre-construction Surveys completed for the Project, and adjacent Emerson West Wind Project, is provided in Table 6-1 below:

Table 6-1 Ohio State-listed Avian Species (as of July 2018) Observed During Pre-construction Surveys Completed for the Project

Ohio Status (Sept 2017)	Common Name	Scientific Name	Survey
State-Endangered	Northern harrier	*Circus cyaneus*	*BBS incidental, PMS, D/RMS, BBS Emerson, AU Emerson*
	Upland sandpiper	*Bartramia longicauda*	*BBS Incidental*
State-Threatened	Sandhill crane	*Grus canadensis*	*D/RMS*
State Species of Concern	Henslow's sparrow	*Ammodramus henslowii*	*BBS, BBS Emerson*
	Bobolink	*Dolichonyx oryzivorus*	*BBS, PMS, BBS Emerson*
	Great egret	*Ardea alba*	*BBS Incidental*
State Species of Special Interest	Red-breasted nuthatch	*Sitta canadensis*	*BBS Incidental, PMS*
	Yellow-bellied sapsucker	*Sphyrapicus varius*	*PMS*
	Western meadowlark	*Sturnella neglecta*	*BBS Incidental*
	Golden-crowned kinglet	*Regulus satrapa*	*PMS*
	Green-winged teal	*Anas crecca*	*PMS*
	Winter wren	*Troglodytes*	*PMS*
	Northern pintail	*Anas acuta*	*D/RMS*
	Dark-eyed junco	*Junco hyemalis*	*PMS*
	Hermit thrush	*Catharus guttatus*	*PMS*
	Least flycatcher	*Empidonax minimus*	*BBS Incidental, PMS*
	Black-throated blue warbler	*Setophaga caerulescens*	*BBS Emerson*
State Extirpated	None	--	--
Not listed	Bald eagle	*Haliaeetus leucocephalus*	*BBS Incidental, D/RMS, BE Survey, Raptor Nests Emerson, AU Emerson*

Notes:
BBS – Breeding Bird Survey (May to July 2011)
BBS Incidental – Breeding Bird Survey, Incidental Observation (May to July 2011)
PMS – Passerine Migration Survey (Spring 2011 / Fall 2011)
D/RMS – Diurnal/Raptor Migration Survey (Spring 2011 / Fall 2011)
BE Survey – Bald Eagle Survey Effort (2011-2012)
BBS Emerson - Breeding Bird Survey at Emerson Wind Project (2012-2016)
Raptor Nests Emerson – Raptor Nest Surveys at Emerson Wind Project (Spring 2016)
AU Emerson – Avian Use Survey at Emerson Wind Project (Spring 2016-Spring 2017)

6.2 Bat Surveys

Four bat survey reports were completed for the Project, as well as one survey report for the adjacent Emerson West Wind Project (a portion of which is now incorporated within the Project Area). Copies of all bat survey reports are included in Appendix E. Both USFWS and ODNR concurred that the results of these surveys were sufficient to adequately assess risk within the current Project Area and no further surveys were necessary (see Appendix D). Table 6-2 summarizes State-listed bats that were observed within the Project Area during the Pre-construction Surveys.

(1) Mist-Net Surveys of Summer Bats on the Proposed Republic Wind Farm, Seneca and Sandusky Counties, Ohio, prepared by Environmental Solutions & Innovations, Inc. (ESI), dated October 5, 2011

ESI completed mist-net surveys at 25 sites during July 2011, with a primary objective to assess the presence, or probable absence of Federally-listed Indiana bats or other Species of Concern within a previous Project Area. Other objectives of the study included determining if any colonies of common species were present and locate the roosts, and to provide an overview of the summer bat community. The survey was designed to meet ODNR and USFWS guidelines as a mechanism for ESA compliance.

A total of 907 bats of eight species were captured, including the big brown bat, northern long-eared bat, eastern red bat, little brown bat, hoary bat, tri-colored bat, evening bat (*Nycticeius humeralis*), and Indiana bat.

One adult post-lactating female Indiana bat was captured during the 2011 summer mist-netting survey and six roost trees were identified via radio telemetry. The report concluded that a maternity colony of Indiana bats is present, considering factors such as the adult female had recently ceased lactation; all roosts used by the bat were large, living shagbark hickories; and that five of six roosts were located within a single woodlot, suggesting the woodlot also contains a primary roost.

No eastern small-footed (*Myotis leibii*) or Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) were captured; however, there were 12 little brown bats, and 2 evening bats captured. Evidence of reproduction was found for all three species, which likely indicates that a maternity colony is present within the local area for these species as well.

Biologists radio-tagged a total of nine big brown bats from nine net sites whose conditions indicated recent reproduction. Seven of these bats were successfully tracked to roosts in anthropogenic structures including five barns, one garage, and one house.

(2) Bat Acoustic Monitoring Survey Report, Republic Wind Farm, Seneca County, Ohio, prepared by Tetra Tech Inc. (Tetra Tech), dated December 2011

Tetra Tech completed a bat acoustic survey from March 16 – November 16, 2011, to characterize seasonal bat activity within a previous Project Area. Two detectors were suspended from a centrally-located met tower at different heights to capture information about bat species flying at variable altitudes: one at 5 m above ground level (agl) and one at 45 m agl near the rotor-swept zone (raised).

A total of 534 bat call sequences were recorded over the 245-night survey period (490 detector nights). Bat activity was higher at the ground detector (197.1) when compared to the raised detector (19.6), with overall activity highest during August. Sixty-six percent of the calls were further classified to species (hoary bat, silver-haired bat (*Lasionycteris noctivagans*), eastern red bat, evening bat, big brown bat, tri-colored bat, and little brown bat), the majority of which were silver-haired bats (35%). Calls that could not be accurately identified to species or guild level were classified as Unknown.

No calls of Federally-listed bat species were positively identified during the survey. Indiana bats are known to occur in the vicinity of the Project Area, and species classifications for many Myotis calls recorded during the 2011 surveys (n = 44) was not feasible; therefore, it is possible that Indiana bats were recorded but not identified in the dataset. The location of the met tower (over 670 m away from wooded areas) could attribute to the low occurrence of acoustic calls during this survey. The increase in activity of hoary bat, silver-haired bat, and eastern red bat during September was almost certainly attributable to migration and/or pre-migration staging. Overall, patterns of activity do not suggest the presence of a large bat migration corridor through the previous Project Area.

(3) Summer 2015 Bat Surveys for the Proposed Republic Wind Project, Seneca and Sandusky Counties, Ohio, prepared by Copperhead Environmental Consulting (Copperhead), dated December 22, 2015

Copperhead completed a bat mist-net and telemetry survey in July 2015 within a previous Project Area to document bat species diversity and abundance, and understand roost habitat, foraging range, and spatial distribution of Indiana bats and northern long-eared bats (if captured). Based on the amount of forested habitat in a previous Project Area (approx. 4,454 acres), a total of 36 mist-net sites were surveyed. A total of 429 bats of six species were captured, including big brown bat (n=320), eastern red bat (n=88), hoary bat (n=5), northern long-eared bat (n=14), tri-colored bat (n=1), and one female Indiana bat (n=1). In accordance with the ODNR/USFWS approved study plan, seven northern long-eared bats and the only Indiana bat captured were radio-tagged in order to locate diurnal roost trees. As a result of the telemetry effort, 14 northern long-eared bat roost trees and two Indiana bat roost trees were located. Foraging telemetry was additionally conducted on the Indiana bat and five of the northern long-eared bats. Foraging areas of the northern long-eared bats and Indiana bats were primarily restricted to forest and forest edges, with individual location points well clustered.

Based on the data collected, Copperhead concluded that at least eight areas within the Study Area are being used by northern long-eared bats. All northern long-eared bats were captured within their respective estimated foraging areas; however, the Indiana bat was captured in a woodlot that it did not revisit during the collection of foraging data. The Indiana bat utilized several woodlots in close proximity to one another during foraging bouts, suggesting that this Indiana bat was more likely than the northern long-eared bats to travel between noncontiguous woodlots during foraging bouts. However, three of these areas are not within the Project Area. The close proximity of the 2015 and 2011 Indiana bat captures and the overlap in foraging areas from both studies suggests that 2015 and 2011 captures are from the same colony.

(4) Summer 2016 Bat Survey for the Proposed Republic Wind Project, Seneca and Sandusky Counties, Ohio, prepared by Copperhead Environmental Consulting, dated November 1, 2016

After the completion of Copperhead's 2015 mist-net survey, the Project Area was modified to add an additional 7,882-acres on the north and west. As a result, Copperhead surveyed an additional five mist-net sites from July 19 – 22, 2016. Mist-net sites were chosen based on the best available habitat present within parcels where landowner access was granted, and deemed most likely to yield Indiana and northern long-eared bat captures.

A total of 78 bats, representing three species, were captured during this survey. Big brown bats comprised the majority of the captured bats (85%, n=66), ten eastern red bats were captured comprising 13%, and two hoary bats were captured (7%). No Federally- or State-listed species were captured during this survey. Copperhead concluded that the lack of Indiana and northern long-eared bat captures suggests that these species are not using this portion of the Project Area during the summer maternity season, or that the species are present at such low densities that the survey techniques failed to detect them.

The Project Area was again modified in June 2017 resulting in a small area where presence/probable absence surveys had not been completed. USFWS confirmed that additional survey was not needed in the unsurveyed portion of the current Project Area given the extensive survey effort completed for the Project to date (see Appendix D).

(5) Summer 2015 and 2016 Bat Surveys for the Proposed Emerson West Wind Project, Seneca County, Ohio, prepared by Copperhead Environmental Consulting, dated April 12, 2017

Copperhead completed bat mist-net and telemetry surveys for the proposed Emerson West Wind Project in Seneca County to document bat species diversity and abundance, and to inform the understanding of roosting habitat, foraging range, and spatial distribution of Indiana bats and northern long-eared bats, and State-listed Rafinesque's big-eared bats and eastern small-footed bats (if captured). Surveys were completed at 29 sites from July 11 – 22, 2016. Copperhead's report also incorporated results from a Summer 2015 survey, which are presented in report #3 above.

A total of 310 bats of four species were captured, including big brown bat (n=250), eastern red bat (n=53), northern long-eared bat (n=4), and hoary bat (n=3). Foraging areas of the northern long-eared bats were primarily restricted to forests, forest edges, forested fence rows and forested waterways. Copperhead determined that placing turbines away from forested habitat will greatly reduce the risk of them colliding with the structures.

In November 2017, the Republic Wind Project Area was revised to include portions of the Emerson West Study Area. As such, five of the Emerson West Wind Project mist-net sites fall within the Project Area, none of which were capture sites for northern long-eared bat.

Based on agency recommendations and regulatory requirements, Republic is committed to minimizing tree clearing where possible, and observing seasonal restrictions on tree clearing to protect Indiana and northern long-eared bats (e.g., cutting trees only between November and March within 2.5 miles of the Indiana bat roost), or as conditions specify.

Table 6-2 Ohio State-listed (as of September 2017) Species Observed in the Study Area during 2011, 2015 & 2016 Bat Surveys

Ohio Status (September 2017)	Common Name	Scientific Name	Survey
State-Endangered	Indiana bat	*Myotis sodalis*	*2011 MN, 2015 MN*
State-Threatened	Northern long-eared bat	*Myotis septentrionalis*	*2011 MN, 2015 MN, Emerson MN*
State Species of Concern	Big brown bat	*Eptesicus fuscus*	*2011 MN, 2011 AM, 2015 MN, 2016 MN, Emerson MN*
	Little brown bat	*Myotis lucifugus*	*2011 MN, 2011 AM*
	Tri-colored bat	*Perimyotis subflavus*	*2011 MN, 2011 AM, 2015 MN*
	Hoary bat	*Lasiurus cinereus*	*2011 MN, 2011 AM, 2015 MN, 2016 MN, Emerson MN*
	Eastern red bat	*Lasiurus borealis*	*2011 MN, 2011 AM, 2015 MN, 2016 MN, Emerson MN*
State Species of Special Interest	None	--	--
State Extirpated	None	--	--

Notes:

2011 MN – Mist-Net Surveys (June, July 2011)

2011 AM – Acoustic Monitoring Surveys (Spring, Summer, Fall 2011)

2015 MN – Mist-Net Survey (Summer 2015)

2016 MN – Mist-Net Survey (Summer 2016)

Emerson MN – Mist-Net Survey at Emerson West Wind Project (2016)

6.3 Eastern Massasauga

As discussed in Section 5.1, the USFWS confirmed that there were no known occurrences of eastern massasauga within the previous Project Area and that no species-specific surveys were necessary to confirm low risk for the current Project Area (see Appendix D). However, the Project Area was modified in November 2017 to include a portion of the Emerson West Wind Project, where a habitat assessment was completed as outlined below (report is included in Appendix E).

In 2016, WEST completed a desktop assessment of potentially suitable eastern massasauga habitat within the Emerson West Wind Project. WEST found 88 patches of potentially suitable habitat, less than 3.3% of the Project Area. This species prefers open wetland habitats with less than 50% canopy coverage, and this type of wetland appeared to be rare and fragmented within the Emerson West Wind Project Area. Most of the wetlands found were forested and lacked suitable adjacent upland areas. They found that the risk of impact to this species due to this Project is low.

Based on review of the WEST report, nine patches of potentially suitable eastern massasauga habitat overlap with the Republic Wind Project Area. Republic will ensure any potentially suitable habitat impact is avoided.

6.4 Field Ecological Assessment

Between the fall of 2016 and fall of 2018, a desktop habitat assessment and field survey was completed on the Survey Area (20,286 acres on 315 parcels) for the Republic Wind Project, Seneca and Sandusky Counties, Ohio (see Figure 6-1).

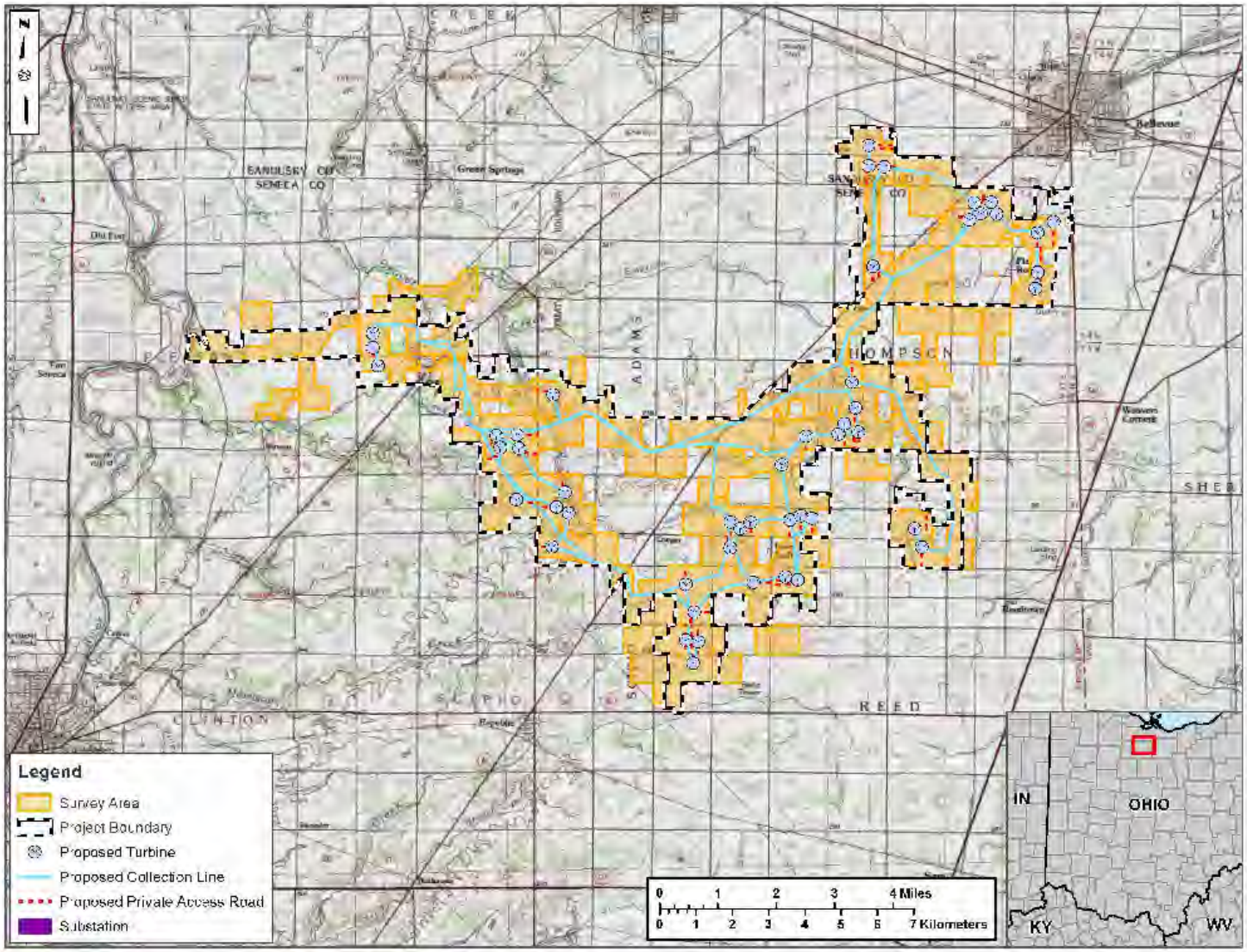

Figure 6-1 Surface Water Survey Area with Proposed Facilities for the Republic Wind Project, Seneca and Sandusky Counties, Ohio

6.4.1 Vegetative Communities

Vegetative communities within the Survey Area were evaluated based on desktop interpretation of aerial photography then verified during field surveys. Agricultural land and forestland are the dominant community types in the Study Area, with scattered developed/disturbed lands clustered along public roads (Table 4-1). Successional communities (e.g., old fields and shrubland) do not occur to any significant extent. The data obtained during the desktop review was found to be generally consistent with the results of the field survey.

Brief descriptions are provided below for each of the ecological communities in the Survey Area. All of the major plant communities found within the area are common to Ohio. Vegetative communities within the Survey Area were dominated by agricultural monocultures, including soy beans and corn. Many agricultural areas had limited amounts of forestland remaining, typically as isolated woodlots. Additional discussion of the observed vegetative communities are provided in the following sections. Appendix H also includes documentation of the vegetative communities associated with the surface water features that were delineated.

6.4.1.1 Agricultural Land

Much of the acreage within the Survey Area is used for agricultural production and is either currently active or recently fallowed. The dominant crops produced on agricultural lands in the Survey Area include soy beans (*Glycine max*) and corn (*Zea mays*); during the winter months fields may be planted in a cover crop such as winter wheat (*Triticum aestivum*) to control erosion and restore soil nutrients. The type of crop may change seasonally, but the general extent of the crop area would remain consistent. Small maintained pastures for livestock (i.e. chickens, sheep, and goats) are also common though not widespread within the Study Area.

Many of the crop areas and roadsides had man-made or modified ditches which helped maintain drainage for proper growing conditions. In intermittent and ephemeral ditches, the channels were often vegetated with reed canary grass (*Phalaris arundinacea*) and narrow-leaf cattail (*Typha angustifolia*) indicating the presence of water during portions of the year. Some ditches which rarely received any runoff except during severe storm events lacked vegetation in the channel or had a mix of grasses (*Festuca* spp. and *Fescue* spp.). The majority of ditches identified appeared to be mowed seasonally, which reduced the development of mature riparian buffers along the banks. Many of the identified ditches had bank areas covered in additional weedy species such as: Canada goldenrod (*Solidago canadensis*), pokeweed (*Phytolacca americana*), Queen Anne's lace (*Daucus carota*), common teasel (*Dipsacus fullonum*), and hairy white oldfield aster (*Symphyotrichum pilosum*). Where limited woody vegetation and shrub growth was observed, species included willows (*Salix* spp.), black locust (*Robinia pseudoacacia*), Southern catalpa (*Catalpa bignonioides*), and American sycamore (*Platanus occidentalis*).

6.4.1.2 Forestland

Two types of forestland were observed within the Survey Area: windrows and woodlots. The windrows consisted of narrow forested strips between cultivated areas, and likely served as property boundaries historically. Windrows typically ranged in depth from 30 to 60 feet, with the wider windrows often containing man-made ditches which served to improve drainage along the adjoining cultivated areas. Woodlots within the Survey Area were often larger in size, but surrounded by cultivated areas along at least two sides. Larger woodlots are likely maintained for hunting opportunities as evidenced by the presence of tree stands and vehicle trails. Some woodlots were maintained to serve as a buffer around larger surface water features.

Both the windrows and woodlots have a dominance of weedy vegetation along the edges including pokeweed, blackberry (*Rubus* spp.), and poison ivy (*Toxicodendron radicans*). Mature trees along windrows and within the interiors of the woodlots include: maples (*Acer* spp.), oaks (*Quercus* spp.), American elm (*Ulmus americana*), dogwoods (*Cornus* spp.), and shagbark hickories (*Carya ovata*).

6.4.1.3 Developed/Disturbed

Developed/disturbed lands are found in low densities throughout the Survey Area, and are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns/landscaped areas. Vegetation in these areas is generally either lacking or highly managed (i.e., ornamental plantings and managed lawns of tall fescue [*Festuca arundinacea*]). In areas that are not intensely managed, weedy herbaceous species such as dandelion (*Taraxacum officinale*), thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), clover (*Trifolium* spp.), and common purslane (*Portulaca oleracea*) may develop.

6.4.2 Wildlife Observations

Wildlife within the Project Area are associated with agricultural, grassland, forested, and wetland habitats. Typical wildlife species, or evidence of the species, observed during fieldwork included evidence of white-tailed deer, red fox, common woodland and grassland songbirds, and ducks.

The habitats surveyed during field efforts appeared to lack significant or obvious evidence of RTE species due to the high level of habitat fragmentation and degradation by historic land use manipulation and surrounding land use (e.g., agriculture). Many of the waterbodies observed were identified as potential wildlife habitat, but at reduced quality due to surrounding land use impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). Minimal wildlife use was observed in the Survey Area and no RTE species were documented.

An active bald eagle nest was observed near the edge of a forested area east of Township Road 32 and south of Sand Ridge Road during the April 2017 field efforts. A pair of eagles was observed, one sitting in the nest and the other flying in the immediate vicinity. In response to the discovery of the eagle nest, Republic adjusted the northwest boundary of the Project Area to exclude the nest and minimize risk to nesting eagles. Republic also notified the USFWS Field Office on June 22, 2017 of the nest and provided documentation of the nest location.

Though shagbark hickories can be used as roosting habitat for many bat species, no bats were observed during surveys; however, surveys were conducted during daylight hours when bats are generally inactive.

While delineating the waterbodies in the Survey Area, features were evaluated for suitability as habitat for RTE species, including freshwater mussels. Due to the modification and disturbance present in the surrounding land use, none of the ditches were identified as highly likely to serve as habitat for any RTE species such as mussels or snakes. The streams on average, had a slightly higher potential for providing suitable habitat to RTE species (such as mussels and snakes), but none were observed during the field surveys. Often a waterbody may be able to provide physical habitat, but due to intensive land use in the upland areas it may lack suitable water chemistry.

6.5 Surface Water Delineations

In order to identify and minimize impacts to potentially jurisdictional WOTUS and waters of the State to meet regulatory requirements, on-site investigations were competed between the fall of 2016 and fall of 2018 to delineate boundaries of wetland and waterbody features within the Survey Area. Potentially jurisdictional WOTUS, including TNW, their tributaries, and non-isolated wetlands, which are regulated under the jurisdiction of the State of Ohio and the USACE in accordance with Sections 401/404 of the CWA were identified. In addition, isolated waterbodies and wetlands that do not have a significant nexus to TNW, which are considered waters of Ohio (as defined under OAC Rule 3745-1-02 (b)(77)[4]) and are regulated by OEPA's Isolated Wetlands Permitting Program were also identified.

[4] OEPA 2017.

Appendix H, Section 3.1.6 details the field survey and approach to identifying potentially jurisdictional features within the Survey Area using USACE and U.S. Environmental Protection Agency regulatory guidance. Map 5 in Appendix A provides a series of maps showing the wetlands and waterbodies delineated within the Survey Area.

6.5.1 Wetland Features

6.5.1.1 Wetland Delineation Criteria and Methods

Wetland delineations were completed according to the 1987 USACE *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987) and the relevant regional supplements, which included the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (USACE, 2011) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (USACE, 2010). These documents are cumulatively referred to as the Manual.

Appendix H, Section 3.1.1 in has additional information on the methodologies used during field surveys of surface waters.

6.5.1.2 Ohio Rapid Assessment Method for Wetland Assessment

Field-delineated wetlands were scored using the OEPA's Ohio Rapid Assessment Method (ORAM). The ORAM wetland functional assessment was developed to determine the ecological "quality" and level of function of a particular wetland in order to meet requirements under Section 401 of the CWA. Wetlands were scored on the basis of hydrology, upland buffer, habitat alteration, special wetland communities, and vegetation communities. Each of these subject areas is further divided into sub-categories under ORAM v5.0 resulting in a score that describes the wetland using a range from 0 (low quality and high disturbance) to 100 (high quality and low disturbance). Wetlands scored from 0 to 29.9 are grouped into "Category 1," 30 to 59.9 are "Category 2," and 60 to 100 are "Category 3". Transitional zones exist between "Categories 1 and 2" from 30 to 34.9 and between "Categories 2 and 3" from 60 to 64.9. However, wetland scores that fall into the transitional range should be assigned to the higher Category unless scientific data has been collected that suggests the wetland should be placed in the lower category.

Category 1 wetlands are often isolated emergent marshes dominated by cattails with little or no upland buffers located in active agricultural fields. Category 2 wetlands do not have RTE species or the habitat for such species. Category 2 wetlands constitute the broad middle category of "good" quality wetlands. A "Modified Category 2" wetland appears to have some signs of degradation but also has the potential to restore some of the lost functionality. Category 3 wetlands are typified by high levels of diversity, a high proportion of native species, and/or high functional values. Category 3 wetlands include wetlands which contain or provide potential habitat for RTE species, are high quality mature forested wetlands, vernal pools, bogs, fens, or which are scarce regionally and/or Statewide.

Section 3.1.2 in Appendix H has additional information on the ORAM methodology used during field surveys of surface waters.

6.5.1.3 Wetland Survey Results

A total of 106 wetlands were identified in the Survey Area, totaling 155.23 acres. The majority of wetlands were identified as Palustrine Forested Wetlands (PFO; n=62), followed by Palustrine Emergent Wetlands (PEM; n=32). Only one wetland was identified as Palustrine Scrub/Shrub (PSS). The remaining 11 wetlands were a combination of PEM/PFO, PSS/PFO, or PEM/PSS. Thirty-nine (39) wetlands were identified as Category 1 using ORAM scoring metrics, which denotes small, isolated wetlands with a dominance of invasive vegetation. Fifty-five (55) wetlands were identified as Category 2 or Modified Category 2 which indicates the potential for moderate quality habitat but that it has been

disturbed. Twelve (12) wetlands were identified as Category 3 which indicates potentially high quality habitat is present. A total of 37 wetlands were considered Federally-jurisdictional (WOTUS) based on the Manual, accounting for 84.60 acres.

Appendix H Section 3.2 includes additional information on delineated wetlands within the Survey Area.

6.5.1.4 Waterbody Delineation Methods

Linear ditches and streams were surveyed by locating the path (typically centerline if water depth was shallow, or top-of-bank if centerline was not accessible) and documenting widths (both as Ordinary High Water Mark [OHWM] to OHWM and top-of-bank to top-of-bank) at each survey point. Physical flagging was hung along the delineated feature(s) to identify their general course. Observational notes about the characteristics including flow regime and substrate were recorded by the field team. To be called out as a potentially jurisdictional WOTUS, each feature must have a defined bed and bank with indications of a channel flow – either perennial, intermittent, or ephemeral.

Appendix H, Section 3.1.3 has additional information on the waterbody delineation methodology used during field surveys of surface waters.

6.5.2 Waterbody Features

6.5.2.1 Waterbody Qualitative Assessments

All waterbodies delineated were assessed using the Headwater Habitat Evaluation Index (HHEI) as identified in OAC 3745-1-03, and summarized in Table 6-3 below. The HHEI allows for uniform scoring of various waterbodies using a standard methodology which identifies pertinent information about the waterbody including substrates, pool depths, and ecological value or condition. HHEI forms typically are only filled out for waterbodies with a drainage area of less than 1 square mile though.

Table 6-3 Headwater Habitat Evaluation Index (HHEI) Scoring

Final HHEI Score	Definition
<30	Class I PHWH (ephemeral streams, normally dry channel, little to no aquatic life)
30 – 50	Class II PHWH (intermittent flow, summery-dry, warm water streams)
>50	Class II or III PHWH (depending on conditions)
>75	Class III (perennial flow, cool-cold water streams)

PHWH – Primary Headwater Habitat Stream

Larger features were evaluated using the Qualitative Habitat Evaluation Index (QHEI). The QHEI form works to describe similar aspects of the waterbodies as the HHEI, but is focused on larger (often higher quality) waterbodies. Typically QHEI forms are only completed for those perennial features with drainage areas greater than 1 square mile and pools deeper than 40 centimeters (approximately 16 inches). In cases where a feature scored highly on the HHEI forms and failed to meet either of QHEI criteria, the feature was evaluated with the QHEI to better record the conditions present. Table 6-4 summarizes scoring descriptions under the QHEI.

Table 6-4 Qualitative Habitat Evaluation Index (QHEI) Scoring

Final HHEI Score	Definition
<32	Limited Resource Water (LRW)
32 – 60	Modified Warm Water Habitat (MWH)
60 – 75	Warm Water Habitat (WWH)
>75	Possible Exceptional Warm Water Habitat (EW)

Section 3.1.4 in Appendix H has additional information on the HHEI methodology used during field surveys of surface waters. Section 3.1.5 in Appendix H details the QHEI methodology used during field surveys.

6.5.2.2 Waterbody Survey Results

A total of 123 waterbodies were identified in the Survey Area, including 83 ditches, 8 ponds, and 32 streams. All of the linear features were scored using the HHEI metrics described above. Thirty-six (36) scored as a Primary Headwater Habitat (PHWH) Class I, indicating typically ephemeral flow regimes with poorly defined channels and pools that likely provided limited ecological value. Class I features included 29 ditches (27 modified and 2 considered naturalized) and 7 streams (4 modified and 3 considered naturalized). Sixty-one (61) were scored as PHWH Class II which typically had intermittent flow regimes and moderate development of channel features that could provide ecological value. Class II features included 48 ditches (44 modified and 4 considered naturalized) and 13 streams (9 modified and 4 considered naturalized). The remaining 18 features were identified as PHWH Class III, including 12 streams (8 modified and 4 considered naturalized) and 6 ditches (all modified). Seventy-six (76) of the delineated waterbodies were considered Federally-jurisdictional (WOTUS). The jurisdictional features included 52 ditches, 23 streams, and 1 pond. The majority of the jurisdictional features were portions of a WOTUS or identified as a tributary to a WOTUS. The pond, POH-001, was determined to be an impoundment of tributary waters to the Sandusky River, which still maintained hydrologic connection to downstream features, and thereby potentially a WOTUS.

Appendix H Section 3.3 includes additional information on the delineated waterbodies within the Survey Area.

6.5.3 Ohio Mussel Survey

During the field surveys, the Cardno team recorded the presence or absence of freshwater mussels within the field-delineated streams. The survey teams also designated the field-delineated streams for their potential for RTE habitat (i.e., Low, Moderate, High). Most of the waterbodies delineated were identified as low potential habitat, due to surrounding land use likely impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). Additionally, the agricultural drainage systems often exhibit maintained stream banks that are unlikely to provide suitable habitat for rare fish and freshwater mussels. Mussels prefer streams with well-developed banks and forested buffer areas that provide locations for the mussels to adhere to. During the field surveys, Cardno observed no individuals or populations of freshwater mussel species. Based on the Ohio Mussel Survey criteria, there will be no impact to freshwater native mussels as a result of the construction or operation of this Project and full mussel surveys are not required.

7 Estimated Project Impacts

Compared to the environmental impact of traditional energy sources, the production of wind power does not affect air quality, groundwater, or surface water through air emissions or water discharges such as other forms of energy generation. Unlike fossil fuel and nuclear power sources, wind power consumes no fuel and emits no air pollution in operation. In order to build wind turbines, materials must be mined, manufactured, processed and transported as with all conventional power plants. While a wind project may expand over a large area of land, the actual facility footprint on the landscape is very small and many land uses such as agriculture (the dominant land cover of the Proposed Republic Wind Project) are compatible.

7.1 Project Infrastructure Summary

Of the 23,851-acre Project Area, up to 50.5 acres (0.2% of the total Project Area) would be needed for permanent Project infrastructure (turbine foundations and roads) and no longer be available for current land use based on current proposed siting. The total acres of permanent impact has been reduced with revised Project siting and micro-siting of facilities to further minimize or avoid potential impacts. Table 7-1 provides a summary of the reviewed and proposed Project infrastructure.

The total potential impacts to existing environmental features within the Survey Area are presented in Appendix F (Tables F-1 and F-2). These impacts are calculated based on the following parameters:

> Turbine Impact Areas:
- 300-foot diameter buffer for temporary workspace
- 80-foot diameter for permanent foundation

> Access Road Impact Areas:
- 36-foot wide for temporary workspace
- 16-foot wide for permanent road

> Collection Line Impact Areas:
- 20-foot wide temporary impact

> Meteorological Towers:
- 10 s.f. permanent impact

Table 7-1 Summary of Proposed Republic Wind Project Permanent Infrastructure

Features	Maximum Values
Project Generation Capacity	200 MW
Project Area	23,851 acres
Surface Water Delineation Survey Area	20,286 acres
Number of Turbines	50
Turbine Foundations	Up to 5.74 acres
Project Substation	Up to 5 acres
Supporting Facilities (Met Stations, other)	Up to 40 s.f.
Collection Lines (buried)	Up to 83 miles
Permanent Access Roads (gravel-covered)	Up to 19.93 miles

7.2 Natural Resource Impacts Summary

Overall, the Republic Wind Project will have limited environmental impacts. The Project is proposed to be built primarily on land that is already being disturbed seasonally/annually for agriculture. Through careful Project design and avoidance measures, Republic has limited waterbody impacts to 0.55 acres of temporary impacts (streams and ditches) and 0.04 acres of permanent impacts; and limited wetland impacts to 0.12 acres of temporary impacts and avoided all wetland permanent impacts. The only permanent waterbody impacts are to ditches for the installation of access roads culverts (0.04 acres or 160 l.f. of streambed). The temporary impacts to waterbodies are anticipated from the installation of collection lines and access roads crossing a total of 47 waterbodies (6 streams, 41 ditches) via open cut (0.55 acres or 2,203 l.f. of streambed; Appendix F). Temporary impacts to wetlands are anticipated from collection lines due to three wetland crossings (0.12 acres or 5,118 s.f.). There will be an additional 11 waterbody crossings (3 streams, 8 ditches) which will be completed via HDD resulting in no temporary or permanent impacts to the waterbody. An HDD Frac Out Contingency Plan is included in Appendix G.

Republic has designed the Project to avoid and minimize impacts to wetlands, waterbodies, woodlots, and aquatic and terrestrial wildlife species to the extent practicable. A summary of potential impacts to existing environmental features within the Project Area are presented in Tables 7-2 and 7-3. These anticipated impacts will likely be lower for the finalized proposed infrastructure as these numbers are based on maximum construction impacts (i.e. includes alternative turbines and associated infrastructure).

Impact Type	Wetland (s.f.)	Wetland (acres)	Streams l.f.	Streams (acres)	Ditches (l.f.)	Ditches (acres)	Ponds (acres)	100-Yr Floodplain (acres)
Turbine Foundations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Access Roads	0.00	0.00	0.00	0.00	539	0.07	0.00	0.00
Collection Line	5,118	0.12	199	0.06	1,465	0.42	0.00	5.51
Equipment Lay Down Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O&M Facility	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Met Stations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**5,118**	**0.12**	**199**	**0.06**	**2,004**	**0.49**	**0.00**	**5.51**

Impact Type	Wetland (s.f.)	Wetland (acres)	Streams l.f.	Streams (acres)	Ditches l.f.	Ditches (acres)	Ponds (acres)	100-Yr Floodplain (acres)
Turbine Foundations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Access Roads	0.00	0.00	0.00	0.00	160	0.04	0.00	0.00
Collection Line	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Lay Down Area	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Substation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O&M Facility	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Met Stations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**0.00**	**0.00**	**0.00**	**0.00**	**160**	**0.04**	**0.00**	**0.00**

7.2.1 Land Use

The Project Area is primarily used as active agricultural lands (86%). The wooded areas of the Project Area occurred as isolated woodlots, windrows between crop areas, and along roads (6%).

7.2.2 Uplands

Generally, wind projects do not impact significant areas of land for turbines or supporting infrastructure. This Project has been designed to locate as much of the infrastructure as possible on uplands, minimizing impacts to wetlands and waterbodies.

7.2.2.1 Soil

The majority of impacts to the Project Area will occur as a result of upland soil disturbance for construction of facility infrastructure. Disturbances would include wind turbines foundations, access roads (permanent and temporary), and additional support infrastructure such as met stations, an O&M facility, and a Project substation.

7.2.2.2 Forested Uplands/Tree Clearing

Forested areas within the Project Area will be preserved where possible, however, Republic anticipates the need to clear select windrows and edges of woodlots in order to construct and operate the Project. Up to 20.5 acres of tree clearing is anticipated for construction of the access roads, collection lines, and turbines. No tree clearing is anticipated for the substation, O&M facility, or met towers. Other infrastructure is assumed to be constructed on non-regulated resource areas, with no additional tree clearing required. The windrows within the Project Area provide minimal habitat and likely were used as historical property boundaries. Republic is working to minimize this tree clearing as much as possible, which would significantly reduce the overall impact of the Project on forested areas. Temporary work areas necessary for construction and installation of infrastructure (e.g., access road and turbines) will be seeded for soil stabilization and allowed to regenerate once construction is complete.

Republic is committed to minimizing tree clearing to the extent practicable; however, where tree clearing is necessary seasonal restrictions to protect Federally- and State-listed bats will be followed (e.g., cutting trees within 2.5 miles of the Indiana bat roost between November 1 – March 31). Tree clearing will be done primarily by hand clearing, however a skid-steer stump grinder will be used to grind stumps to ground level or just below. Timber and other vegetative debris may be chipped for use as erosion control mulch or otherwise disposed of in accordance with applicable local regulations and landowner preferences.

7.2.3 Surface Waters

7.2.3.1 Estimated Turbine Foundation Impacts

There are no temporary or permanent impacts to wetlands or waterbodies that will result from the turbine foundations.

7.2.3.2 Estimated Collection Line Impacts

Collection line installation will involve 57 waterbody crossings (48 ditch crossings, 9 stream crossings, some features being crossed multiple times). Of the 57 waterbody crossings, 11 will be completed via HDD resulting in no temporary or permanent impacts to the waterbody. A total of 46 waterbodies are planned to be crossed via open cut method for collection line installation for a total temporary impact of 0.48 acres or 1,665 l.f. of streambed. No permanent waterbody impacts are associated with collection line installation.

Three wetlands will be temporarily crossed by collection lines, resulting in 0.12 acres of temporary impact; 2 jurisdictional wetlands totaling 0.12 acres, and 1 isolated wetlands totaling less than 0.01 acres.

7.2.3.3 Estimated Access Road Impacts

Based on the current layout design, up to 20 miles of new permanent gravel roads will be installed for construction, operation, and maintenance of the Project. Currently, it is anticipated that there will be no temporary or permanent impacts to delineated stream reaches due to access roads. Construction of the Project access roads will likely require impacting eight ditches for a total of 539 l.f. (temporary) and 160 l.f. (permanent). Seven of these ditches will utilize a standard culvert with rock fill to create stable road crossing. One of the ditches (DOH-205) will be impacted by 343 s.f. (0.02 acres) of temporary workspace to install the road; however, the road will not permanently impact the ditch. Republic will design these crossings to allow adequate flow and not affect the flow of water within the Project Area. Where feasible, Republic would use existing farm road crossings to minimize crossing impacts.

No wetlands are impacted by access roads for the construction, operation, or maintenance of the Project.

7.2.3.4 Additional Minimization Measures

Crossings using open cut will involve traditional excavation of the ditch or stream for the collection lines. If the ditch or stream has flowing water at the time of construction, work will be conducted using a dam and pump method. A dam will be constructed using materials to prevent sediment from entering the waterbody (i.e., sandbags or barrier). Equipment in the waterbody will be limited to only what is necessary to complete the crossing. Flow will be diverted using a pump to maintain flow upstream and downstream during in-water activities. During pumping operations, a construction representative would oversee the pump and generator to ensure aquatic resources are protected in the event of a spill. Energy dissipation devices will be used at the downstream outlet to prevent excessive scour or erosion of the streambed. It is anticipated each crossing will take approximately 48 hours or less for all activities (i.e., trenching, installing the line, restoring to pre-construction contours). Republic will adhere to any restrictions and/or conditions that may apply to construction within these ditches and streams.

Republic will obtain an NPDES CGP, prepare a SWPPP incorporating the most appropriate erosion and sediment control measures, and BMPs to ensure compliance with Water Quality Standards and regulations.

There are no planned operations and/or maintenance facilities as part of this Project and no water and/or sewer requirements. As a result, the Project will not necessitate any water withdrawals or waste water discharges.

There are no impacts to other water users anticipated as a result of Project construction or operation.

7.2.4 <u>Aquatic and Wildlife Resources</u>

The Project would not significantly impact wildlife or wildlife habitat. Information on the existing wildlife in the Project Area was obtained from a variety of sources, including observations during site surveys, and publicly available data from Federal and State agencies. Wildlife within the Project Area could potentially utilize the site for foraging, migratory stopover, breeding and/or shelter. Based on the current land use, species present in the Project vicinity are primarily associated with agricultural fields, pasture grasslands, isolated wooded lots, and wetland areas.

The Project Area and ¼-mile buffer are not known to provide significant habitat for sensitive bird, bat, or freshwater mussel species. Due to the lack of adequate habitat in the immediate Project Area, it is likely many individuals would opt for higher quality habitat nearby such as in the Sandusky River or Sugar Creek and Knobby's Prairie Wildlife Areas for roosting, foraging and breeding. Other nearby areas for wildlife include the: Sandusky Scenic River, Abbotts Bridge Scenic River Lands, Scenic River easements, and Bowen Nature Preserve.

Typical construction-related impacts to wildlife include incidental injury and mortality of juvenile and/or slow-moving animals (e.g., salamanders, turtles, etc.) due to construction activity and vehicular

movement; construction-related silt and sedimentation impacts to aquatic organisms; habitat disturbance/loss associated with clearing and earthmoving activities; and displacement of wildlife due to increased noise and human activities. However, the Project has been sited to avoid and/or minimize such impacts. Project facilities have been located primarily within active agricultural land which only provides habitat for a limited number of wildlife species. The species that typically utilize this type of habitat are often opportunistic and able to temporarily vacate areas that are being disturbed by construction. On a landscape scale, there is abundant availability of similar land cover and habitat within the Project Area and beyond.

7.2.5 Listed Species

Two Federally-listed bat species, the endangered Indiana bat and the threatened northern long-eared bat, and three State-listed avian species, the endangered northern harrier and upland sandpiper, and the threatened sandhill crane, were documented during surveys completed for the Project. In addition, three State Species of Concern, and 11 State Species of Special Interest were documented, as well as low levels of bald eagle use.

While northern harriers are often observed during Pre-construction Surveys at wind facilities, it is important to note that no fatalities of this species have been recorded in the Midwest. The lack of fatalities is likely due to the northern harrier's hunting and flight habits, as they generally hunt and fly at low altitudes; therefore, have a low risk of collision with modern wind turbines (Whitfield and Madders 2006).

Upland sandpipers breed in grasslands, pastures, unkempt agricultural land with a mosaic of old fields and crop lands, and sometimes the grassy expanses of airports. Although the documented upland sandpiper was observed during the breeding bird surveys, the species is an uncommon breeder in Ohio and suitable breeding habitat is limited within the Project area. Therefore, the species is not anticipated to be impacted by the Project.

Sandhill cranes migrate through Ohio, with a number of pairs electing to breed in wet meadows, shallow marshes, or bogs. The documented sandhill crane was observed flying over the Project area during spring migration surveys; however, the species is not expected to stopover in the Project area due to the lack attractive stopover habitat and is not anticipated to be impacted by the Project.

Republic has worked closely with USFWS and ODNR to identify appropriate minimization and avoidance measures to reduce potential risk to these species. Measures include focusing infrastructure within previously disturbed areas, minimizing habitat fragmentation, setting turbines away from eagle nests and bat roosts and adjusting operational protocols during higher risk periods, siting infrastructure in uplands rather than wetlands, and minimizing perennial stream crossings. Based on current Project designs, significant impacts to these species and habitats are not anticipated; however, post-construction monitoring is planned to confirm low risk conclusions.

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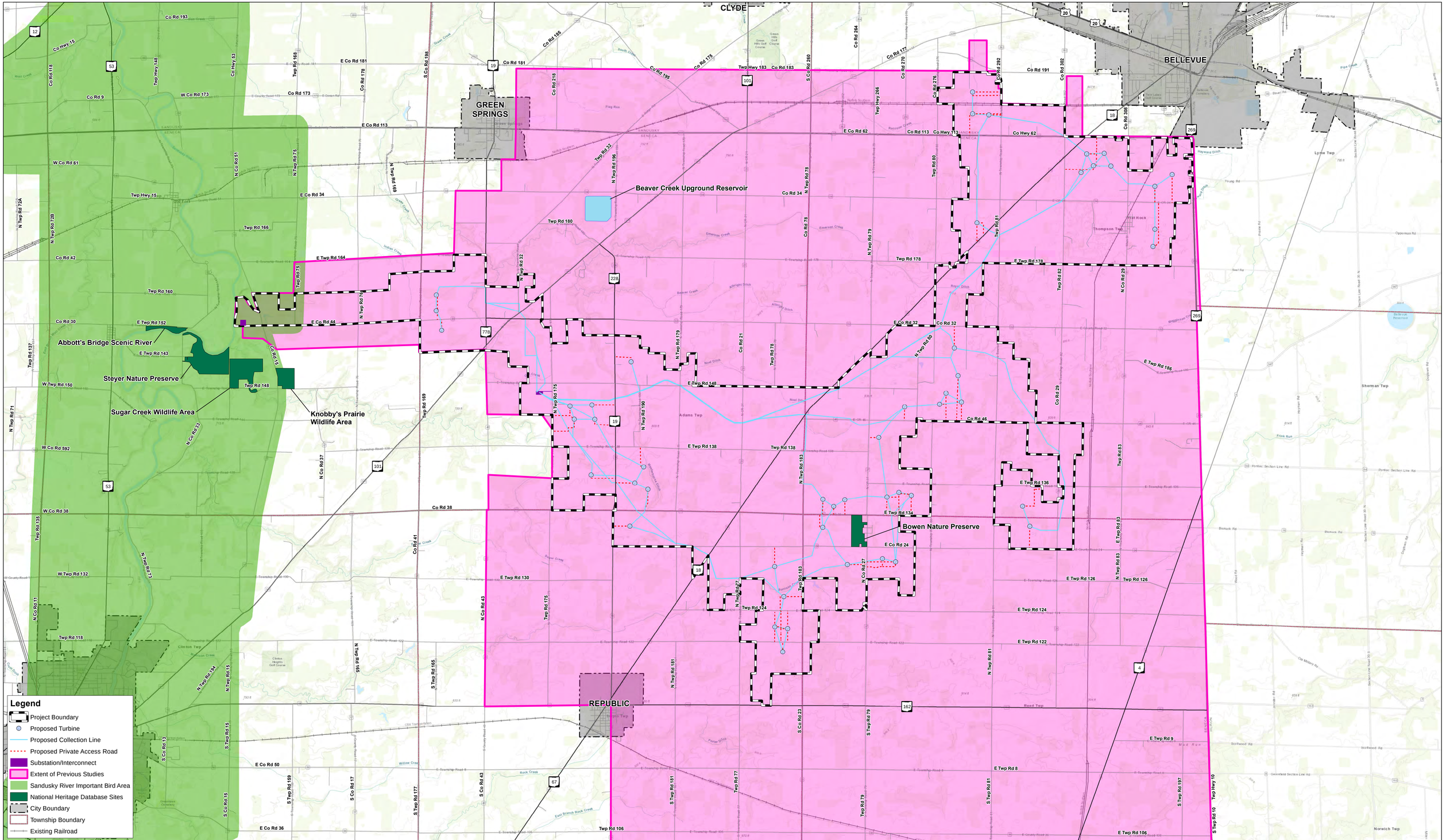
Republic Wind Project

APPENDIX A

PROJECT AREA MAPS



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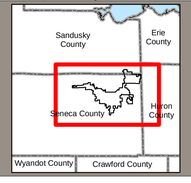

Map 1 – Pre-Construction Study Area

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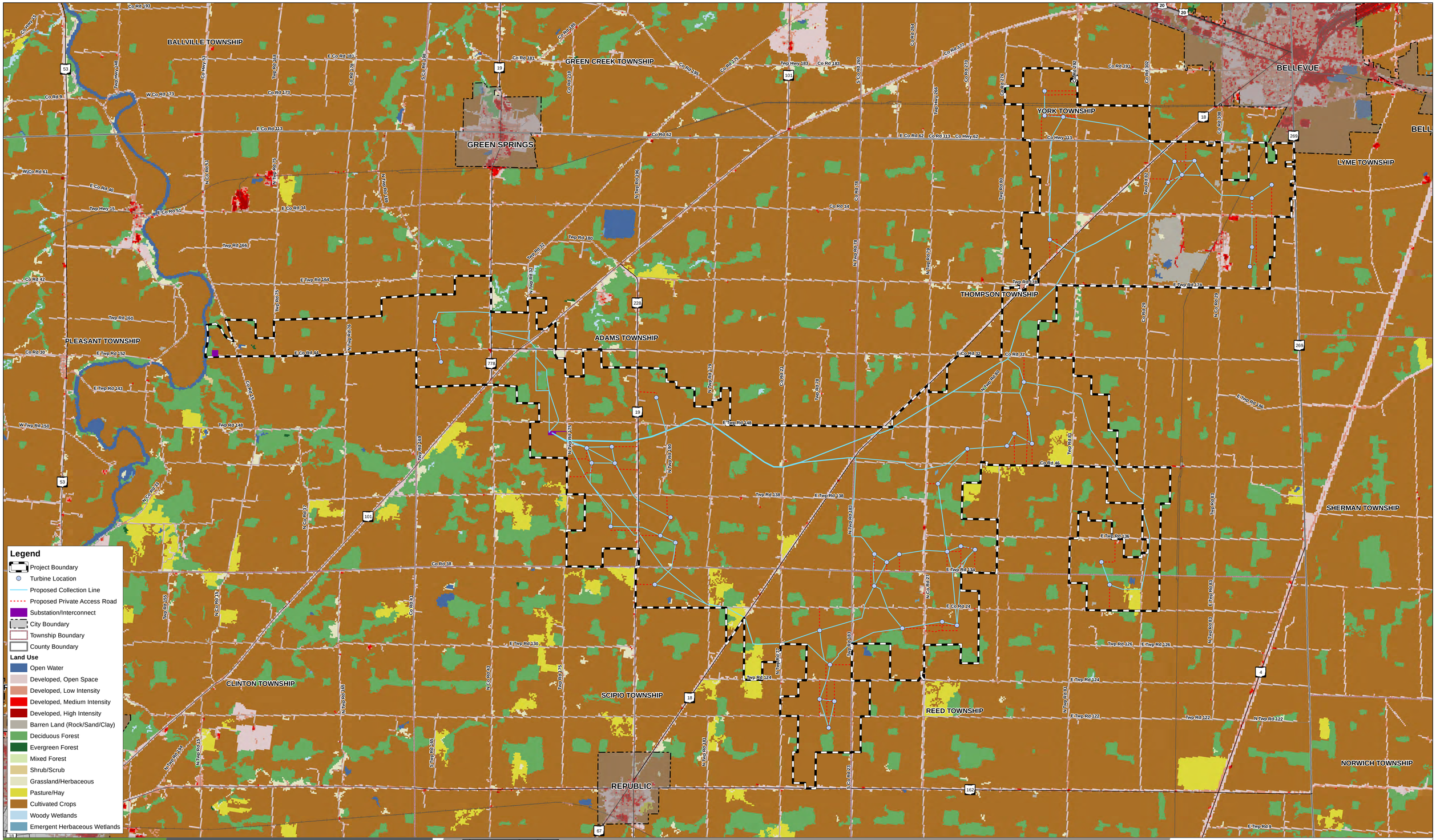

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Land Use: National Land Cover Database (2011, 2014)
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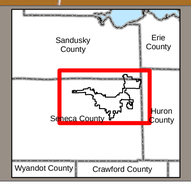

Map 2 - Land Use

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Newark, DE 19713
Phone (+1) 302-395-1919 Fax (+1) 302-395-1920
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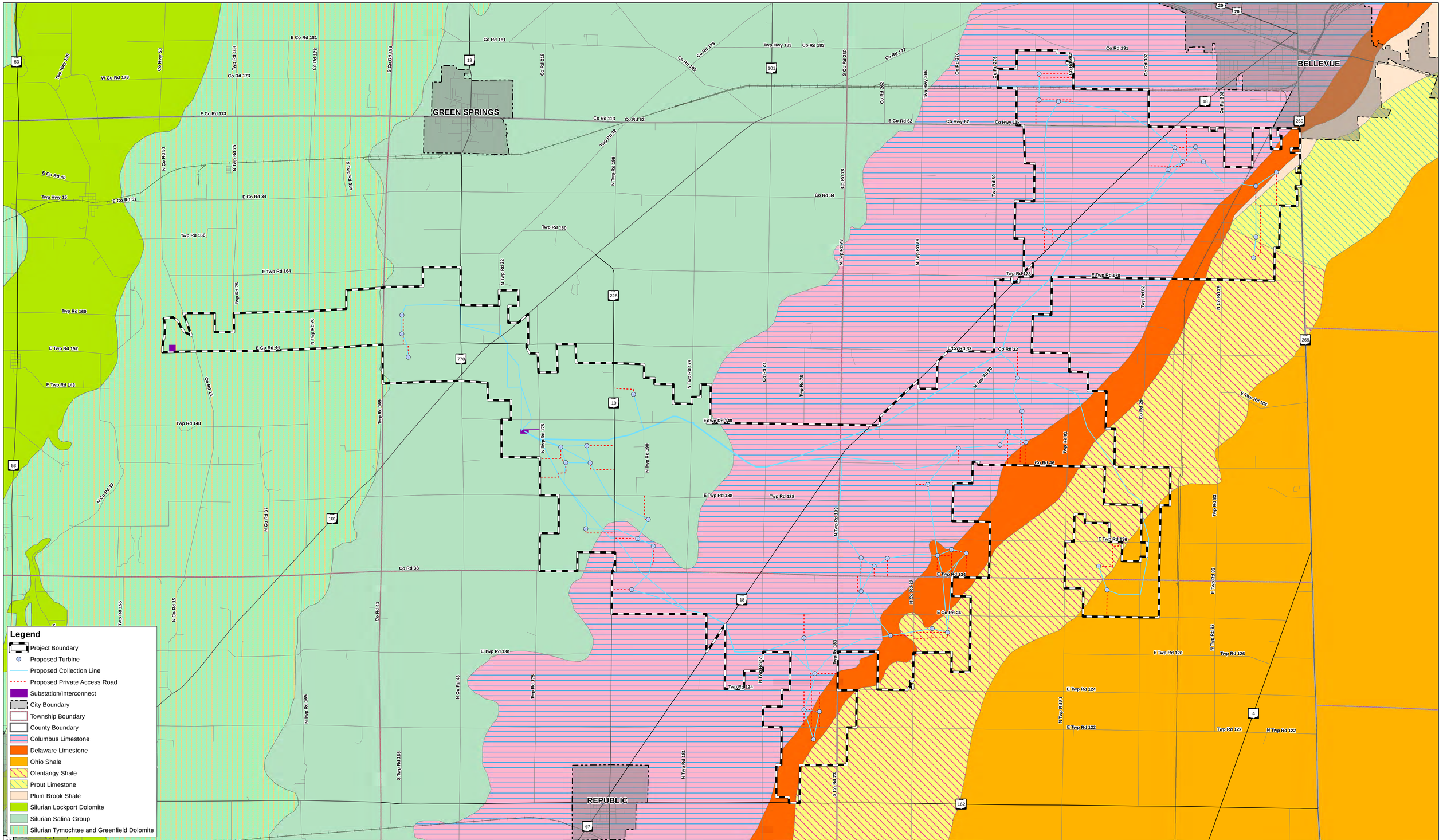

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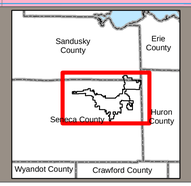

Map 3 - Bedrock Geology

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