

Arche Energy Project, LLC

APPENDIX

D

WETLAND AND STREAM
DELINEATION REPORT AND FORMS

Wetland and Waterbody Delineation Report

7X Energy, Inc.

Arche Solar Project

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Acronyms

CFR	Code of Federal Regulations
CWA	Clean Water Act
DOW	Division of Wildlife
EWH	Possible Exceptional Warm Water Habitat
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
FLS	Federally Listed Species
FWS	U.S. Fish & Wildlife Service
GIS	Geographic Information Systems
GPS	Global Positioning System
HDD	Horizontal Directional Drill
HHEI	Headwater Habitat Evaluation Index
HUC	Hydrologic Unit Code
JD	Jurisdictional Determination
LRW	Limited Resource Water
MW	Megawatt
MWH	Modified Warm Water Habitat
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OBL	Obligate Wetland Plants
ODGS	Ohio Division of Geological Survey
ODNR	Ohio Division of Natural Resources
OEPA	Ohio Environmental Protection Agency
OHWM	Ordinary High Water Mark
ORAM	Ohio Rapid Assessment Methodology
OWI	Ohio Wetland Inventory
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
PHWH	Primary Headwater System
Project	Arche Solar Project
QHEI	Qualitative Habitat Evaluation Index
RTE	Rare, Threatened or Endangered species
SBAS	Satellite-based Augmentation System
UPL	Obligate Upland Plants
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WOTUS	Waters of the United States
WWH	Warm Water Habitat

1 Introduction

Arche Solar, LLC, an affiliate of 7X Energy, is proposing to construct the Arche Solar Project (Project) near Fayette, Ohio, which is located approximately 35 miles west of Toledo, Ohio. The Project is proposed as a 100 megawatt (MW) solar project within an area of approximately 1162.2 acres (1.82 square miles) on leased private lands as well as easement(s) (Project Area). The Project Area is entirely contained within Gorham Township, Fulton County, Ohio.

In support of planning for the Project, Cardno conducted a wetland delineation field survey to identify wetland or potential waterbodies of the United States, in accordance with Sections 401/404 of the Clean Water Act (CWA). Cardno's field efforts focused on accessible parcels across a broad area, totaling approximately 1,162 acres on 19 leased parcels (Survey Area). Figure 1.1 shows the Project Location of the Arche Solar Project. Figure 1.2 shows an Aerial Overview of the Survey Area.

Proposed infrastructure for the Project will include solar panels on metal racking ("arrays"), inverter pads, buried collection lines, access roads, a Project substation, pyranometer stations, and equipment laydown areas.

This report describes the methodology used by Cardno to complete the wetland delineation survey and the results of a desktop assessment and field survey. Specifically, Section 2 of the report identifies the methodology used during the identification of wetlands and surface waters within the Survey Area. Section 3 of the report outlines the findings of the desktop assessment of the Survey Area. Section 4 of the report identifies the results of the field surveys. Section 5 presents the conclusions of the delineation and site survey. Section 6 provides a list of references cited in this report.

The report is accompanied by several appendices. Appendix A contains representative photographic documentation of the delineated wetland and waterbody features. Appendix B contains maps depicting the delineated wetlands and waterbodies. Appendix C contains the completed wetland data and assessment forms from the field efforts. Appendix D contains the completed stream assessment forms.

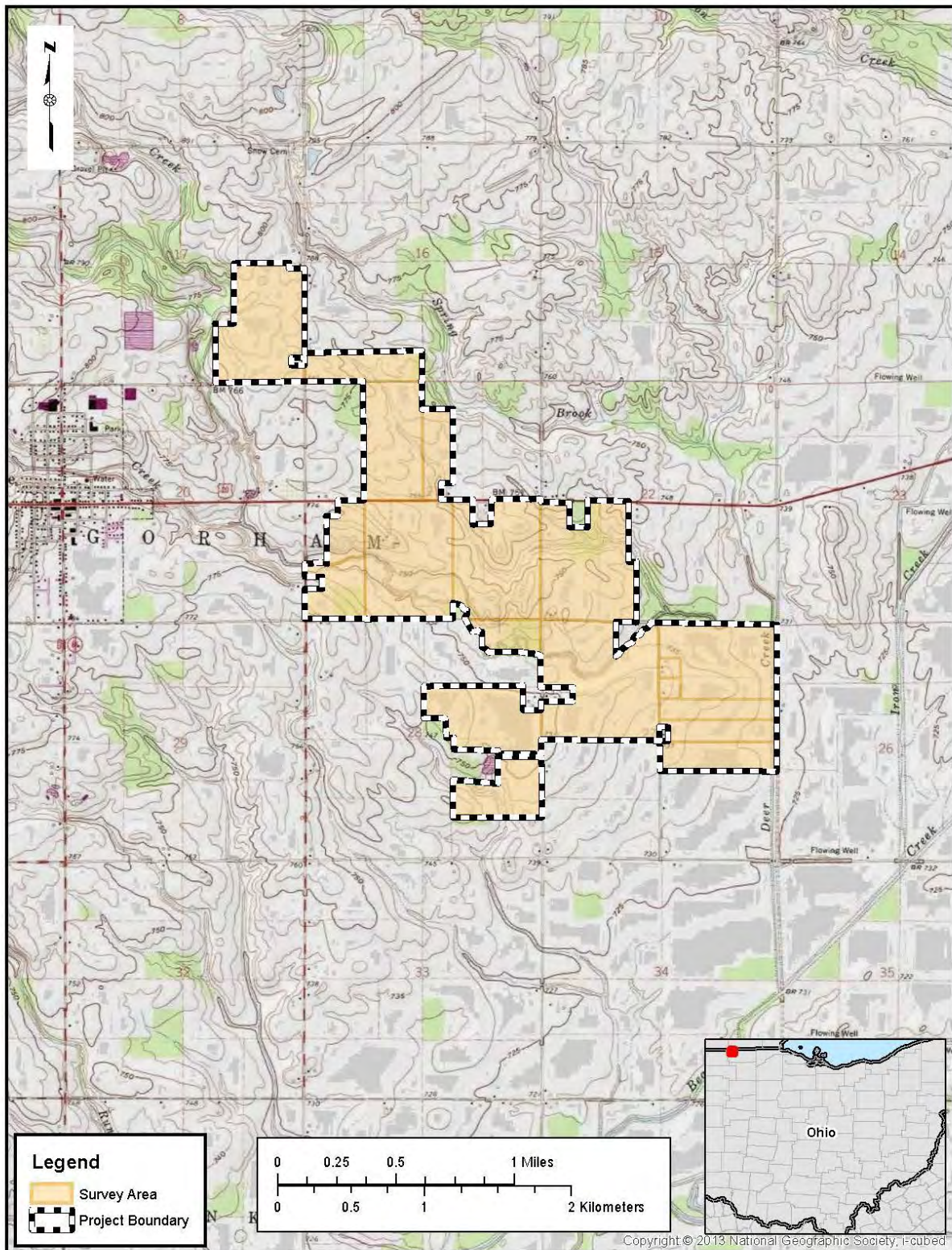
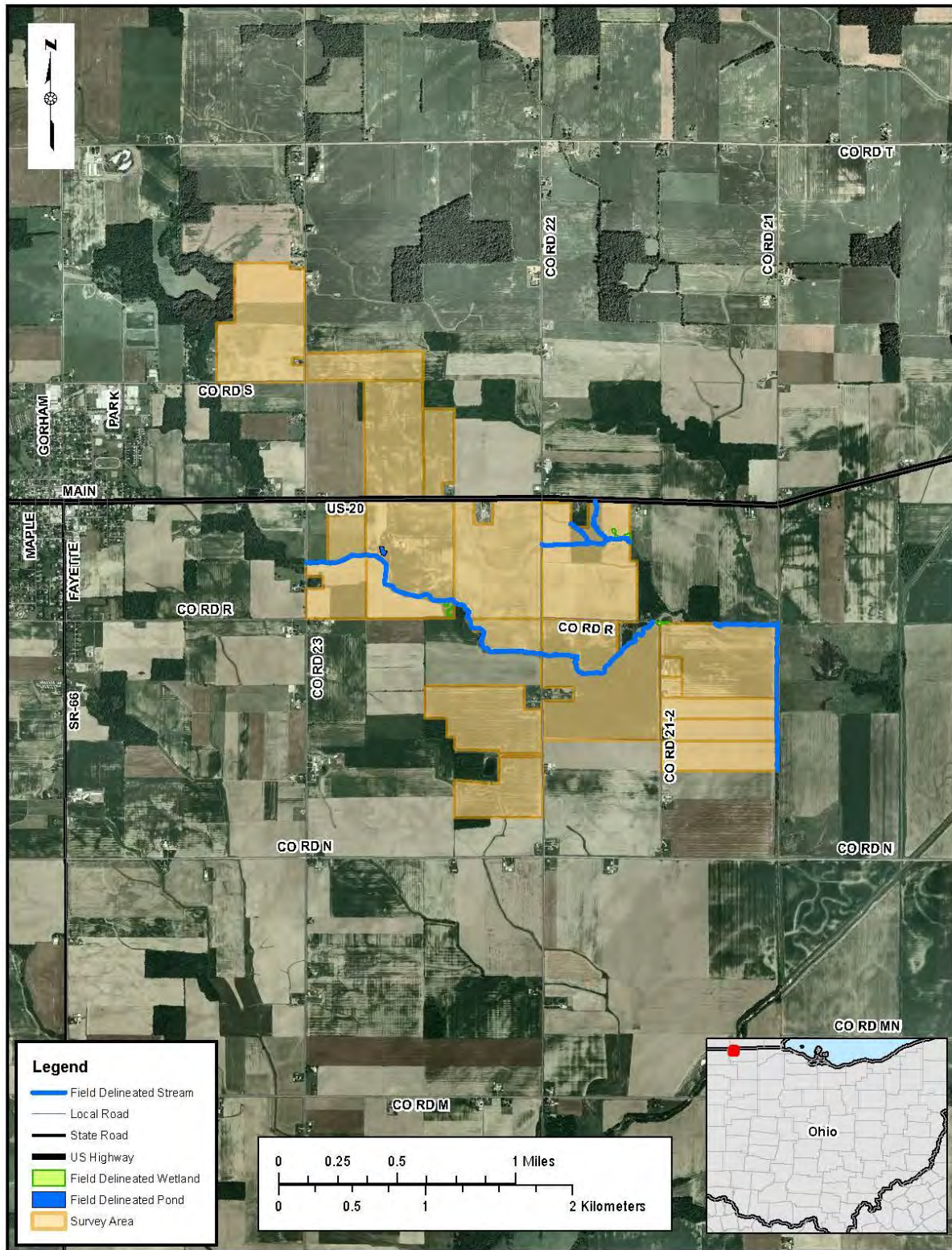


Figure 1.1 Project Overview

Figure 1.2 Survey Area - Aerial Overview



2 Survey Methodology

This section of the report identifies the methodologies used during the desktop review and field delineations of wetland and open waterbodies within the Survey Area. Cardno conducted surveys within 19 parcels that totaled approximately 1,162 acres in October 2019.

2.1 Desktop Review

Prior to field surveys, Cardno conducted a desktop review of the Survey Area using publically available Geographic Information Systems (GIS) data to identify and classify potential environmental resources and create field maps for use during survey. Sources of this reference material included, but was not limited to: the National Land Cover Database (NLCD); the U.S. Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Soil Survey for Preble County; historic aerial photographs; U.S. Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) maps; U.S. Geologic Service (USGS) topographic maps; the USGS National Hydrography Dataset (NHD); and the Ohio Wetland Inventory (OWI).

2.2 Field Delineation Methodologies

Surveys were conducted in the Survey Area to determine the extent of wetlands and waterbodies in accordance with applicable Federal and State regulations and guidelines. A Trimble® Global Positioning System (GPS) with sub-meter accuracy was used to collect data points for mapping. As wetland and waterbody point features were collected, they were assigned a FEATURE_ID with the format of F-XX, where:

F = Feature Type

- S – Stream
- W – Wetland

XX = Two-digit number as the unique identifier

The information collected in the field was processed real-time in the field using SBAS and verified by the field team for accuracy. If a feature continued outside of the Survey Area, it was noted by the field teams.

2.2.1 Wetland Delineation Methodologies

Wetland delineations were conducted according to the 1987 U.S. Army Corps of Engineers (USACE) *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987) and the applicable regional supplements; *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (USACE, 2010). Together, these documents are referred to as “The Manual.” The methodology outlined in the Manual requires that three wetland criteria be met in order for a wetland to be determined to be present; that is, the area being evaluated must have a dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology to be identified as a wetland.

Dominant vegetation is assessed for hydrophytic preference. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant plant community is hydrophytic, as determined by species dominance and the assigned species-specific indicator status of the identified species. Table 2-1 shows the indicator status categories for plants.

Table 2-1 Plant Indicator Categories

Indicator Category	Indicator Symbol	Definition
Obligate Wetland Plants	OBL	Plants that occur almost always (estimated probability > 99 percent) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1 percent) in nonwetlands.
Facultative Wetland Plants	FACW	Plants that occur usually (estimated probability >67 percent to 99 percent) in wetlands, but also occur (estimated probability 1 percent to 33 percent) in nonwetlands.
Facultative Plants	FAC	Plants with a similar likelihood (estimated probability 33 percent to 67 percent) of occurring in both wetlands and nonwetlands.
Facultative Upland Plants	FACU	Plants that occur sometimes (estimated probability 1 percent to <33 percent) in wetlands, but occur more often (estimated probability >67 percent to 99 percent) in nonwetlands.
Obligate Upland Plants	UPL	Plants that occur rarely (estimated probability <1 percent) in wetlands, but occur almost always (estimated probability >99 percent) in nonwetlands under natural conditions.

After identifying the plant species present within a sampling area of a potential wetland, the dominance and indicator status for each identified unique species was determined. Based on the results, the vegetation community being evaluated was determined to be indicative of a either wetland or non-wetland.

Under certain circumstances, such as after disturbance from storm events or surveys occurring outside of the prime growing season, additional methods are employed to evaluate the vegetative communities of suspected wetlands. This can include calculating a prevalence index which weights the coverage of a particular class of species (using its wetland indicator status) against the total coverage within the sampling area. If a sampling area passes this test (which requires the value to be less than or equal to 3), it can be considered a wetland. Another potential evaluation method is the presence of morphological adaptations, which can include root buttressing, shallow roots, or multi-stemmed trunks. The presence of such adaptations is considered evidence that the plants (even FACU species) have adapted to survive in prolonged inundation or root saturation. Another method is to report “Problematic Hydrophytic Vegetation.” This method is used sparingly, and reflects the delineator’s opinion that conditions outside of those considered normal may be present, such as vegetation being bent or damaged to such a degree that identification to species level is impracticable. Under this method, the vegetation present would be treated as consistent with a wetland, but the vegetation could not be reliably identified.

The Hydric soils criterion is met when the soils identified are officially listed as hydric soils or the soils demonstrate characteristics representative of soils in reducing (hydric) conditions. The latter is determined in the field when the soils fall within the hydric ranges on the Munsell Color Chart, examining soil profiles for other evidence of reducing conditions, and/or observing other indicators of anaerobic activity per the Manual.

The hydrology criterion is met when sufficient hydrologic indicators are present. The indicators must be representative of sufficient saturation or inundation occurring over the growing season sufficient to support a hydrophytic plant-dominated vegetative community. Such indicators may include evidence of standing water, saturated soils, geomorphic position within the landscape, drainage patterns, water-stained leaves, and morphologic adaptation of vegetation.

Wetland delineation data are reported on routine wetland determination data forms. The perimeter of each wetland was mapped using the GPS systems. Physical flagging is hung in areas that do not disturb

the private land owners or endanger livestock. In addition to identifying the boundaries of wetlands, additional data points are taken with the GPS to locate delineation data collection center points.

After delineations, the identified wetlands are scored using the Ohio EPA (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 are 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 59.90 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 one of these transitional ranges should be assigned to the higher category unless collected data suggests the wetland should be placed in the lower category.

Category 1 consists of wetlands that are often isolated emergent marshes dominated by cattails with little or no upland buffers located in active agricultural fields. Category 2 consists of wetlands for which rare, threatened or endangered (RTE) species and their habitat are absent, but may have well developed habitat for other more common 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 that contain or provide habitat for threatened or endangered species, are high quality mature forested wetlands, vernal pools, bogs, fens, or which are scarce regionally and/or statewide.

2.2.2 Waterbody Delineation Methodologies

Linear waterbodies, such as ditches and streams, were surveyed by locating the path (typically the centerline if water depth was shallow, or the top-of-bank if the 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 waterbody features to identify their general course. Observational notes about the characteristics of each waterbody (such as flow regime and substrate) were recorded by the field team to enable the categorization of the types of waterbodies encountered. To be classified as a waterbody, however, each feature must have a defined bed and bank with indications of a channel flow; grassy swales are not waterbodies, and were not identified as such. Table 2-2 identifies the definitions used in assigning waterbody flow.

Table 2-2 Waterbody Flow Categories

Flow Category	Definition
Perennial	Flow is continuous and likely permanent across the seasons (although it may vary). Such flow can be surface based or occur as interstitial flow, which would include the flow driving underground for a portion of the channel.
Intermittent	Flow is present during extended periods of time during some seasons, but gradually returns to a state of isolated pools in the channel or a dry channel. There may be indications of subsurface flow.
Ephemeral	Flow is often not present during the majority of the year, and only occurs after a precipitation event. Channels of ephemeral streams will be dry with no evidence of isolated pools of water.

All flowing waterbodies (streams and ditches, but not ponds) delineated in the Survey Area were assessed using the Headwater Habitat Evaluation Index (HHEI). The HHEI allows for uniform scoring of various waterbodies using a standard methodology that identifies pertinent information about the waterbody including substrates, pool depths, and ecological value or condition. HHEI forms typically are completed for waterbodies with a drainage area of less than 1 square mile. A summary of the HHEI Scoring is provided in Table 2-3 below.

Table 2-3 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 Stream

Larger features are evaluated using the Qualitative Habitat Evaluation Index (QHEI). The QHEI form is used to describe similar aspects of waterbodies, but is focused on larger (often higher quality) waterbodies. Typically, QHEI forms are completed for those perennial features with drainage areas greater than 1 square mile and pools deeper than 40 centimeters (approximately 15 inches). In cases where a feature scored highly on the HHEI forms but failed to meet either of QHEI criteria, they were still evaluated with the QHEI to better record the conditions present. Table 2-4 provides an overview of the typical score ranges and waterbody classification under QHEI.

Table 2-4 Qualitative Habitat Evaluation Index (QHEI) Scoring

Final QHEI 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 (EWH)

2.2.3 Ohio Mussel Survey

All native mussels in the State of Ohio are protected per Ohio Revised Code Section 1533.324, as are the 10 federally protected species which may occur in the state. In order to protect these species, the Ohio Department of Natural Resources' Division of Wildlife (ODNR DOW) and FWS developed a series of survey protocols to identify the presence or absence of mussels in a waterbody. The protocols identify five types of streams based on their size and potential for federally listed species (FLS), as shown in Table 2-5.

Table 2-5 Stream Classifications according to Mussel Survey Protocol, per ODNR and FWS

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 FLS are expected
Group 1	Small to mid-sized streams, FLS not expected
Group 2	Small to mid-sized streams, FLS expected
Group 3	Large Rivers, FLS not expected
Group 4	Large Rivers, FLS expected

Such mussel surveys are required to be conducted by trained and accredited individuals, with the group of streams determining exact scale of surveys required. The unlisted streams and Group 1 streams may have visual reconnaissance surveys completed, with the results being forwarded to ODNR who then determine need for any additional surveys. All Group 2, 3, and 4 streams require a full survey.

Cardno field staff conducted only visual reconnaissance surveys as part of the typical delineation process. If any mussels are found during stream delineations and if the stream is to be impacted, Cardno identifies the stream for a follow-up survey. 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 less than 10 square miles also do not require surveys. Based on this criteria, full mussel surveys are not required for the Project.

None of the delineated streams within the Survey Area meet the requirements for mussel survey; however, Spring Creek (S01) and Deer Creek (S02) have drainage areas greater than 10 square miles.

During the field surveys, Cardno observed no individuals or populations of freshwater mussel species.

2.2.4 Jurisdictional Determination

While Cardno cannot formally determine the jurisdictional status of a waterbody or wetland, Cardno has identified features it considers potentially jurisdictional. Any determination made by the USACE would be binding however, and may vary from Cardno’s interpretation. Our interpretation is made based on available documentation from the U.S. Environmental Protection Agency (USEPA), including guidance on the “Current Implementation of Waters of the United States”¹ (WOTUS) which refers to the original 1986/1988 promulgation and subsequent Supreme Court cases which further defined the term. In general, the term Waters of the U.S. means:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
 - a. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or

¹ <https://www.epa.gov/cwa-404/definition-waters-united-states-under-clean-water-act>

- b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
 - c. Which are used or could be used for industrial purposes by industries in interstate commerce;
- 4. All impoundments of waters otherwise defined as WOTUS under this definition;
 - 5. Tributaries of waters identified in paragraphs (o)(3)(iii) of this section;
 - 6. The territorial sea;
 - 7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 Code of Federal Regulations (CFR) 423.11(m) which also meet the criteria of this definition) are not WOTUS.

Although no navigable WOTUS were identified in the Project, many of the features could be considered tributaries that eventually flow into a WOTUS. Tributaries themselves may not be navigable, but have a significant impact on water quality 'downstream' in the WOTUS. Status as a tributary was primarily assessed on the presence or absence of a USGS NHD blue line feature and possibility for flow into a larger WOTUS. Additionally, if the waterbody or wetland abutted a potentially jurisdictional feature and had a permanent or potentially permanent hydrologic connection, then both waterbodies would be considered jurisdictional. For clarity, any features identified as jurisdictional, will be referred to as jurisdictional for the purposes of this wetland delineation report. However, final determinations of jurisdiction are the responsibility of the USACE. Any determination made by the USACE would be binding and modifications to a feature's jurisdictional status that varies from Cardno's would have to be honored.

3 Desktop Assessment Results

Multiple sources were reviewed prior to field investigations to identify potential resources as part of a preliminary desktop assessment. The findings of the desktop assessment were also verified during the field surveys.

3.1 National Land Cover Database Review

Based on a review of available aerial imagery, the Survey Area appeared to generally occur in cultivated crop areas. Review of the 2011 NLCD (Homer et al. 2015) confirmed this assessment, which showed that cultivated crops accounted for approximately 88% of the total acreage in the Survey Area. The second most prominent land use within the Survey Area was classified as “Developed, Open Space” which accounted for 6% of the acreage. The classification “Developed, Open Space” refers to “areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses” (Homer et al. 2015). Pasture/Hay and Deciduous Forest each accounted for 2% of the Survey Area. The deciduous forests were observed to occur as isolated woodlots between agricultural areas. All other land use activities accounted for 1% or less of the total acreage in the Survey Area. A summary is provided in Table 3-1 below.

Table 3-1 Land Use within the Survey Area

Type	Survey Area (acres)	Survey Area (%)
Cultivated Crops	1,019.71	88%
Developed, Open Space	70.87	6%
Pasture/Hay	25.55	2%
Deciduous Forest	21.99	2%
Woody Wetlands	12.89	1%
Developed, Low Intensity	1.56	<1%
Developed, Medium Intensity	1.33	<1%
TOTAL	1,153.89*	100%

Compiled from USDI 2011, amended 2014.

*The total acreage used in these calculations differs slightly from the project area due to tiny differences inherent to the level of precision of the National Land Cover Dataset.

The field team observed that the land use in the Survey Area closely matched the remote land use data described above.

3.2 Geology

The Project is located between the Central Ohio Clayey Till Plain and the Maumee Lake Plains Physiographic Regions of Ohio. The Central Ohio Clayey Till Plain has a surface of clayey till, well-defined moraines with intervening flat-lying ground moraine and intermorainal lake basins; no boulder belts; about a dozen silt-, clay- and till-filled lake basins range in area from a few to 200 square miles; few large streams; limited sand & gravel outwash; elevation 700'-1150', moderate relief (100'). The Maumee Lake Plains is a flat-lying Ice-Age lake basin with beach ridges, bars, dunes, deltas, and clay flats;

contained the former Black Swamp; slightly dissected by modern streams; elevation 570'-800', very low relief (5') ODGS, 1998, Physiographic Regions of Ohio².

3.3 Soils & Hydric Ratings

Cardno reviewed soil types for the Survey Area using the Web Soil Survey, an application of the NRCS (USDA-NRCS 2018). Based upon Table 3-2, below, there were 29 soil types identified. Although no fully hydric soils were identified in the Survey Area, seven soils have a Hydric Rating of 85 or greater and occupy a total of 31.6% of the Survey Area. The poor draining qualities of hydric soils combined with local flat or bowl-shaped topography can make locations predisposed to wetlands.

Table 3-2 Soils within the Survey Area

Type	Map Unit Description	Hydric Rating	Acreage	Percentage of Survey Area
Blo2A1	Blount loam, 0 to 2 percent slopes	6	42.4	3.6%
Blo2B1	Blount loam, 2 to 6 percent slopes	4	97.1	8.4%
ByA	Brady sandy loam, 0 to 3 percent slopes	8	13.3	1.1%
DfA	Del Rey silt loam, 0 to 3 percent slopes	5	14.3	1.2%
DmA	Digby loam, 0 to 3 percent slopes	7	1.4	0.1%
DtA	Dixboro fine sandy loam, 0 to 3 percent slopes	10	14.1	1.2%
FtA	Fulton silty clay loam, 0 to 2 percent slopes	5	155.9	13.4%
FtB	Fulton silty clay loam, 2 to 6 percent slopes	4	33.4	2.9%
Gf	Gilford fine sandy loam	95	0.1	0.0%
GnB2	Glynwood loam, 2 to 6 percent slopes, eroded	4	0.9	0.1%
GnC2	Glynwood loam, 6 to 12 percent slopes, eroded	3	3.9	0.3%
GnD2	Glynwood loam, 12 to 18 percent slopes, eroded	0	2.1	0.2%
HkA	Haskins loam, 0 to 3 percent slopes	5	195.2	16.8%
KfA	Kibbie loam, 0 to 3 percent slopes	10	12.1	1.0%
Lc	Latty silty clay, till substratum, 0 to 1 percent slopes	87	76.0	6.5%
Lf	Lenawee silty clay loam, 0 to 1 percent slopes	93	65.8	5.7%
Mf	Mermill loam	92	51.0	4.4%
Mo	Millgrove loam	90	38.1	3.3%
OrB	Oshtemo loamy sand, 0 to 6 percent slopes	0	5.1	0.4%
OtB	Ottokee fine sand, 0 to 6 percent slopes	10	4.4	0.4%
Pm	Pewamo clay loam	93	30.8	2.6%
RbB	Rawson sandy loam, 2 to 6 percent slopes	8	30.3	2.6%
RnA	Rimer loamy fine sand, 0 to 3 percent slopes	2	4.2	0.4%
SdB	Seward loamy fine sand, 2 to 6 percent slopes	4	1.8	0.2%
SfB2	Shinrock silty clay loam, 2 to 6 percent slopes, eroded	5	59.0	5.1%

² http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Misc_State_Maps&Pubs/physio.pdf

Table 3-2 Soils within the Survey Area

Type	Map Unit Description	Hydric Rating	Acreage	Percentage of Survey Area
SfC2	Shinrock silty clay loam, 6 to 12 percent slopes, eroded	0	8.2	0.7%
SgB2	Shinrock-Tuscola complex, 3 to 8 percent slopes, eroded	0	70.9	6.1%
So	Sloan silty clay loam, frequently flooded	85	105.6	9.1%
TuB	Tuscola fine sandy loam, 3 to 8 percent slopes	0	25.3	2.2%
TOTAL			1,162.7*	100%

3.4 Navigable Waters

The Survey Area is located within the Deer Creek – Bean Creek and Stag Run – Bean Creek watersheds (Hydrologic Unit Code (HUC)-12), which is located within the larger Maumee River drainage basin, which ultimately drains northeast into western Lake Erie. No navigable waterways are located within the Survey Area. Deer Creek and Spring Creek have a designated use, and are identified as warm water habitat (WWH) in the Water Quality Standards³

3.5 Remote Wetland and Waterbody Identification

Prior to site investigations, the Survey Area was screened using the FWS NWI, ODNR, and USGS NHD remote data for potential wetlands and waterbodies in the vicinity of the Project. The NWI and ODNR 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.

Few wetlands and waterbodies were identified within the Survey Area, with some additional streams and wetlands occurring in the vicinity. The majority of the waterbodies remotely identified appeared to be headwater tributaries to Spring Creek. Additionally, the Cardno team identified several NHD features that ran directly through active agricultural areas but were not visible in any aerial imagery. These relic NHD features may have been rerouted by previous land use manipulation or even tiled, which would route them under crop areas. Most of the wetlands identified by ODNR occurred in isolated woodlots, with moderate overlap with NWI features.

3.6 Desktop Review Summary

The desktop review indicated potential for wetlands to be located in multiple woodlots in the Survey Area. The area also included a number of streams running between crop areas and through several wooded areas. It is not uncommon for the NHD set to indicate features that are no longer present due to landowners rerouting the channel or moving it underground via tiles. Much of the Survey Area, however, is cultivated crop area that limits the development of wetlands. The remotely identified features and land use information was expected given the region’s heavy, historic manipulation of land use to accommodate and maintain farming operations.

³ <http://epa.ohio.gov/Portals/35/rules/01-17.pdf>

4 Field Survey Results

The following is a discussion of the results of field surveys conducted October 2019 within the Survey Area. Climatic conditions were considered normal during the survey periods. Appendix A contains representative photographic documentation of the delineated wetland and waterbody features. Appendix B contains maps depicting the delineated wetlands and waterbodies. Appendix C contains the completed routine wetland data and assessment forms from the field efforts, and Appendix D contains stream assessment forms

4.1 General Habitat within the Survey Area

The data obtained during the desktop review was found to be generally consistent with the results of the field survey. As identified in Table 3-1, the predominant land use in the Survey Area is agricultural (crops).

The agricultural fields were observed to be primarily a mix of remnants from the previous year's soybean and corn crops. Additionally, some crop areas were actively planted with winter wheat. It is likely that the type of crop changes seasonally, but the general extent of the cultivated area remains roughly the same. Many of the cultivated areas and roadsides have grassy swales, which helped maintain drainage for proper growing conditions. These swales often had a mix of herbaceous species including reed canary grass (*Phalaris arundinacea*) and various other grasses (*Festuca* sp. and *Fescue* sp.). The swales appear to be mowed seasonally. Vegetation in the narrow woodlots was characterized by intrusion of weedy species from nearby crop edges including: Canada goldenrod (*Solidago canadensis*), pokeweed (*Phytolacca americana*), Queen Anne's lace (*Daucus carota*), common teasel (*Dipsacus fullonum*), and purple deadnettle (*Lamium purpureum*). Where limited woody vegetation and shrub growth was observed, species included willows (*Salix* sp.), black locust (*Robinia pseudoacacia*), and sycamores (*Platanus occidentalis*).

The wooded areas of the Survey Area occur as isolated woodlots between cultivated fields and along roads. Aggressive weedy species such as pokeweed, blackberry (*Rubus* sp.), and poison ivy (*Toxicodendron radicans*) often occur along the woodlot edges, with the interiors of woodlots comprised predominately of: walnuts (*Juglans* sp.), oaks (*Quercus* sp.), cherry (*Prunus* sp.), pawpaw (*Asimina triloba*), American beech (*Fagus grandifolia*), Osage orange (*Maclura pomifera*) and a few shagbark hickories (*Carya ovata*).

The habitats surveyed during field efforts appear to lack significant or obvious evidence of RTE species. Visual reconnaissance surveys were conducted during the wetland and waterbody delineations and did not observe any RTE species. The modification of the majority of available habitat has likely degraded the quality and limited potential RTE habitat. Wooded areas in the Survey Area were typically of moderate quality, with isolated occurrences of relatively large high quality trees surrounded by younger second growth forest and saplings. Many of the woodlots had vehicle paths through them, which were likely to allow farm equipment access to surrounding fields. The delineated waterbodies could potentially provide RTE species habitat, but at reduced quality due to the surrounding land use impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). During the field surveys, Cardno staff observed minimal wildlife use in the Survey Area and observed no RTE species due to the Survey Area being relatively low quality and highly disturbed.

4.2 Description of the Delineated Wetlands in the Survey Area

A total of four wetlands were delineated during field surveys, for a total of 1.24 acres of wetland within the Survey Area. All of the delineated wetlands accounted for less than 1 acre. Two wetlands were palustrine forested wetlands and two were palustrine emergent. All of the wetlands fell into the Category 2. Cardno anticipates that five wetlands could be jurisdictional, based on potential hydrologic connectivity to a potential WOTUS. Final verification of their boundaries for regulatory purposes can only be completed through a Jurisdictional Determination (JD) review by the USACE or its duly appointed representative. Table 4-1 provides a list of the delineated wetlands and associated characteristics. Wetland acreages reported in the summaries below are representative only of the portion of the wetland located within the Survey Area.

4.2.1 Category 1 Wetlands

No Category 1 wetlands were delineated within the Survey Area.

4.2.2 Category 2 Wetlands

All of the wetlands were identified as Category 2 (or Modified 2) wetlands using the ORAM metrics. Two of the wetlands were smaller forested wetlands adjacent to Spring Creek. Two of the wetlands were larger emergent wetlands adjacent to Spring Creek. All should be considered jurisdictional.

4.2.3 Category 3 Wetlands

No Category 3 wetlands were delineated within the Survey Area.

Table 4-1 Wetlands Delineated in the Survey Area

Wetland ID	Latitude of Center Point	Longitude of Center Point	Acres within Survey Area	Wetland Type	ORAM Score	Wetland Category	Anticipated Jurisdictional?	Drainage Basin
W01	41.6678	-84.296	0.22	PFO	45	2	Yes	Deer Creek - Bean Creek
W02	41.6673	-84.2958	0.17	PFO	41	2	Yes	Deer Creek - Bean Creek
W03	41.6722	-84.2818	0.56	PEM	40	2	Yes	Deer Creek - Bean Creek
W04	41.6669	-84.2784	0.3	PEM	32	Modified 2	Yes	Deer Creek - Bean Creek
Total Acreage			1.24					

Notes:
 PEM – Palustrine Emergent Wetland
 PFO – Palustrine Forested Wetland
 ORAM – Ohio Rapid Assessment Method

4.3 Description of the Delineated Waterbodies in the Survey Area

The waterbody delineation results are summarized in Table 4-2. Representative photographs of typical waterbodies can also be found in Appendix A. The waterbody features delineated were broken into three categories: ditches, streams, and ponds.

Ditches were identified as man-made or modified channels, which were manipulated by landowners or communities to improve drainage among farm fields. Modification to channels could include the mowing of bank vegetation, altering of channel morphology, or removal of debris to maintain flow conditions. Many ditches have ephemeral or intermittent flows and heavily vegetated channels. At the time of the survey, most were flowing though due to the recent rains and saturated soils. Most ditches also had trapezoidal cross sections, with a small bankfull width/channel at the bottom and a wider crossing distance at the top-of-bank. If a ditch crossed under a road, the deepest pools of water were normally located at the edges of the culvert, which occur as a result of eddies and currents of stormwater flow creating erosion.

Streams were more often considered natural channels that had indications of significant recovery since any historic modification had occurred. All streams were flowing at the time of the survey, with slightly elevated turbidity, which was attributed to runoff from nearby ditches and cultivated areas during recent rains. Streams were more likely to have vegetated riparian buffers along the banks and pools of water, which might support wildlife.

Ponds were features that appeared to hold water throughout the year. Many of the ponds observed in the vicinity of the Survey Area were man-made impoundments, which may be used for holding water for irrigation or recreational fishing and aesthetics.

The OEPA's HHEI forms were completed for each stream and ditch and serve to record and score a variety of aspects about the feature. The HHEI forms score the types and percent composition of substrates, maximum pool depth, and average bank full width. Additional descriptive information is recorded in the forms regarding flow regime, riparian width and quality, morphology, and modification. Stream channel modification is referenced in many of the descriptions below, as either 'naturalized' or 'modified'. Naturalized features are those that have either never been modified or have historic signs of modification but appear to have recovered to a natural state. Modified features are those that appear to have recently been modified (such as through dredging or armoring of the banks) and may have little to no evidence of recovery. Scores are tallied for each feature, and result in a HHEI Category of Class I, II, or III as described in Section 2.2.2 above.

While delineating the waterbodies in the Survey Area, Cardno evaluated the features for suitability as habitat for RTE species. Due to the modification and disturbance present in the surrounding area, none of the ditches were identified as highly likely to serve as habitat for any RTE species. On average, the streams 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. Frequently a waterbody may be able to provide physical habitat, but lack suitable water chemistry due to intensive land use in the upland areas.

A total of six waterbodies were delineated in the Survey Area, with five streams and one pond. One stream (Spring Creek) was classified as a modified warm water habitat (MWH). Deer Creek was classified as a limited resource water (LRW). Three streams were classified as Class II.

4.3.1 Class I Waterbodies

Deer Creek (S02) was classified as a limited resource water (LRW). This stretch was channelized, with no riparian corridor and bordered by a road. Deer Creek was considered jurisdictional.

4.3.2 Class II Waterbodies

The majority of the delineated waterbodies were scored as Class II (n=4). These streams were natural streams that had some level of modification, but were still exhibited ecological function. All of these streams were considered jurisdictional.

4.3.3 Class III Waterbodies

No streams were considered Class III waterbodies.

Table 4-2 Waterbodies Delineated in the Survey Area

Stream ID	Type	Linear Feet in Survey Area	HHEI Score	QHEI Score	PHWH Class Designation	Flow Regime	Drainage Basin	Stream Name	Anticipated Jurisdictional?	Potential RTE Habitat	Mussels Observed	S	W	E	M	S	C	L	P	A	I	B	P	S
												R	W	W	W	S	W	R	W	W	W	W	W	R
S01a	Stream	10524	N/A	46	N/A	Perennial	Deer Creek - Bean Creek	Spring Creek	Yes	Moderate	No				X					X	X		X	
S01b	Stream	1486	N/A	41	N/A	Perennial	Deer Creek - Bean Creek	Spring Creek	Yes	Low	No				X					X	X		X	
S02	Stream	3298	N/A	26	N/A	Perennial	Deer Creek - Bean Creek	Deer Creek	Yes	Low	No						X		X	X		X		
S03	Stream	2153	52	N/A	Class II	Perennial	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Moderate	No													
S04	Stream	1210	32	N/A	Class II	Ephemeral	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Low	No													
S05	Stream	647	47	N/A	Class II	Ephemeral	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Low	No													
P01	Pond	N/A	N/A	N/A	N/A	Perennial	Deer Creek - Bean Creek	Private Pond	No	Low	No													

Total Linear Feet 19,318

Notes:

- HHEI – Headwater Habitat Evaluation Index
- n/a – No QHEI performed
- PHWH – Primary Headwater Habitat Stream
- QHEI – Qualitative Habitat Evaluation Index
- RTE – rare, threatened or endangered species
- TBD – To Be Determined once a field delineation is conducted

QHEI – Scoring

- < 32: Limited Resource Water (LRW)
- 32 to 60: Modified Warmwater Habitat (MWH)
- 60 to 75: Warmwater Habitat (WWH)
- > 75: Possible Exceptional Warmwater Habitat (EWH)

HHEI – Scoring

- < 30: Class I PHWH (typically ephemeral streams)
- 30 to 50 Class II PHWH (intermittent warm water streams)
- > 50: Class II or III PHWH (depending on conditions)
- > 75: Class III PHWH (perennial cool water streams)

Notes:

- PHWH – Primary Headwater Habitat Stream
- N/A – Not Applicable
- WWH – Warm Water Habitat
- EWH – Exceptional Warm Water Habitat
- MWH – Modified Warm Water Habitat
- SSH – Seasonal Salmonid Habitat
- SRW - State Resource Water
- CWH – Cold Water Habitat
- LRW – Limited Resource Water

- PWS - Public Water Supply
- AWS – Agricultural Water Supply
- IWS – Industrial Water Supply
- BW - Bathing Waters
- PCR – Primary Contact Recreations
- SCR – Secondary Contact Recreation
- UNT – Unnamed Tributary
- HHEI – Headwater Habitat Evaluation Index
- QHEI – Qualitative Habitat Evaluation Index

5 Conclusions

The Survey Area is dominated by agricultural land use (cultivated crops) and isolated woods. The quality of forested areas and streams varied across parcels. The history of land conversion for farming and other landscape manipulation to support farming operations has reduced the land available for wetlands to develop. The majority of wetlands were located adjacent to Spring Creek in depressional areas prone to flooding.

In summary, Cardno delineated 6 waterbodies (5 streams and 1 pond) with 5 expected to be jurisdictional due to their potential hydrologic connection to a WOTUS. An additional 4 wetlands were delineated with all expected to be jurisdictional (accounting for 1.24 acres). Final verification of wetland and waterbody boundaries for regulatory purposes can only be completed through a JD review by the USACE or its duly appointed representative.

During the field surveys, Cardno did not observe any RTE species in the Survey Area or vicinity or freshwater mussel species in the waterbodies in the Survey Area. The fragmentation of wooded habitats by roads, residential land use, and farm fields reduces the likelihood of significant wildlife occurring in the Survey Area.

The findings of this investigation represent a study of the Survey Area for non-tidal wetlands and waterbodies. The findings depend on the season, the conditions at that time of year, site-specific influences (e.g. anthropogenic disturbance), and individual professional judgment. This report represents a professional estimate of the Survey Area wetlands and waterbodies based upon available information and techniques. Final verification of their boundaries for regulatory purposes can only be completed through a JD review by the USACE or its duly appointed representative.

6 References

- Homer, C.G., Dewitz, J.A., Yang, L., Jin, S., Danielson, P., Xian, G., Coulston, J., Herold, N.D., Wickham, J.D., and Megown, K., 2015, Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. *Photogrammetric Engineering and Remote Sensing*, v. 81, no. 5, p. 345-354.
- Ohio Division of Natural Resources (ODNR) Division of Geological Survey. 1998. Physiographic Regions of Ohio. Available at: http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Misc_State_Maps&Pubs/physio.pdf. Accessed April 2017.
- U.S. Army Corps of Engineers (USACE). 1987. Wetlands Delineation Manual. Technical Report Y-87-1. USACE Waterways Experiment Station, Vicksburg, MS: U.S. Army Engineer Research and Development Center.
- U.S. Department of the Interior (USDI) 2011. National Land Cover Database 2011, issued 2011, amended 2014. Available at: <https://www.mrlc.gov/nlcd2011.php>
- U.S. Department of Agriculture National Resources Conservation Service (USDA-NRCS) 2018. Web Soil Survey. Available at: <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Arche Solar Project

APPENDIX

A

PHOTOGRAPHS OF SURVEY AREA
AND VICINITY



DP01, View Looking North



DP01, View Looking East



DP01, View Looking South



DP01, View Looking West



DP02, View Looking North



DP02, View Looking East



DP02, View Looking South



DP02, View Looking West



DP03, View Looking North



DP03, View Looking East



DP03, View Looking South



DP03, View Looking West



DP04, View Looking North



DP04, View Looking East



DP04, View Looking South



DP04, View Looking West



DP05, View Looking North



DP05, View Looking East



DP05, View Looking South



DP05, View Looking West



DP06, View Looking North



DP06, View Looking East



DP06, View Looking South



DP06, View Looking West



DP07, View Looking North



DP07, View Looking East



DP07, View Looking South



DP07, View Looking West



DP08, View Looking North



DP08, View Looking East



DP08, View Looking South



DP08, View Looking West



DP09, View Looking North



DP09, View Looking East



DP09, View Looking South



DP09, View Looking West



DP10, View Looking North



DP10, View Looking East



DP10, View Looking South



DP10, View Looking West



DP11, View Looking North



DP11, View Looking East



DP11, View Looking South



DP11, View Looking West



DP12, View Looking North



DP12, View Looking East



DP12, View Looking South



DP12, View Looking West



DP13, View Looking North



DP13, View Looking East



DP13, View Looking South



DP13, View Looking West



DP14, View Looking North



DP14, View Looking East



DP14, View Looking South



DP14, View Looking West



DP15, View Looking North



DP15, View Looking East



DP15, View Looking South



DP15, View Looking West



PS01, View Looking North



PS01, View Looking East



PS01, View Looking South



PS01, View Looking West



PS02, View Looking North



PS02, View Looking East



PS02, View Looking South



PS02, View Looking West



PS03, View Looking North



PS03, View Looking East



PS03, View Looking South



PS03, View Looking West



PS04, View Looking North



PS04, View Looking East



PS04, View Looking South



PS04, View Looking West



PS05, View Looking North



PS05, View Looking East



PS05, View Looking South



PS05, View Looking West



PS06, View Looking North



PS06, View Looking East



PS06, View Looking South



PS06, View Looking West



PS07, View Looking South



PS08, View Looking East



PS09, View Looking East



PS09, View Looking West



PS10, View Looking West



PS13, View Looking North



PS14, View Looking East



PS16, View Looking West



PS11, View Looking North



PS11, View Looking East



PS11, View Looking South



PS11, View Looking West



PS12, View Looking North



PS12, View Looking East



PS12, View Looking South



PS12, View Looking West

Site Photographs

Arche Solar Project
Regulated Waters Delineation Report
7X Energy
Fulton County, Ohio

Project Number:
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PS15, View Looking North



PS15, View Looking East



PS15, View Looking South



PS15, View Looking West



PS17, View Looking East



PS18, View Looking East



PS18, View Looking West



PS19, View Looking West



PS20, View Looking East



PS21, View Looking East



PS22, View Looking West



PS23, View Looking West



PS24, View Looking West



PS25, View Looking West



PS27, View Looking North



PS27, View Looking South



PS26, View Looking North



PS26, View Looking East



PS26, View Looking South



PS26, View Looking West



PS28, View Looking East



PS28, View Looking Northeast



PS30, View Looking South



PS32, View Looking West



PS29, View Looking North



PS29, View Looking East



PS29, View Looking South



PS29, View Looking West



S01b, View Looking Upstream



S01b, View Looking Downstream



S02, View Looking Upstream



S02, View Looking Downstream



S03, View Looking Upstream



S03, View Looking Downstream



S04, View Looking Upstream



S04, View Looking Downstream



S05, View Looking Upstream



S05, View Looking Downstream



PS31, View Looking North



PS31, View Looking South