

Vernal Pool Survey Report

Heritage Wind Project

Town of Barre

Orleans County, New York

Prepared by:



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MANAGEMENT SUMMARY

Involved State Agencies:	New York State Department of Public Service (NYSDPS) New York State Department of Environmental Conservation (NYSDEC) (Article 10 Application, Case No. 16-F-0546)
Type of Survey:	Vernal Pool Survey
Location Information:	Town of Barre, Orleans County, New York
Project Description:	Proposed Wind Powered Electric Generating Facility (up to 184.8 MW)
Project Area:	5,813 acres (Facility Site)
USGS 7.5-Minute Quadrangle Map:	Albion, NY
Date of Report:	February 2020

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1.0 INTRODUCTION

1.1 Purpose of the Investigation

On behalf of Heritage Wind, LLC (the Applicant), Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services, D.P.C. (EDR) completed a vernal pool survey for the proposed Heritage Wind Project (the Facility), located in the Town of Barre in Orleans County, New York. The purpose of the vernal pool survey was to identify vernal pool habitats within the Facility Site during appropriate season conditions, document the occurrence of amphibian species that may utilize these habitats, and inform the design of the Facility. This Vernal Pool Survey Report (Report) has also been prepared in support of an Application of Heritage Wind, LLC for a Certificate of Environmental Compatibility and Public Need pursuant to Article 10 of the New York State Public Service Law for construction of a major wind-powered electric generating facility. The information included in this Report is intended to summarize the results of the vernal pool survey that was conducted by EDR biologists for the proposed Facility and thereby assist the NYSDEC, the NYSDPS, and agencies in their review of the proposed Facility in accordance with the requirements of Article 10. Please note that information concerning the Facility's potential effects on other ecological resources will be addressed in separate studies conducted by the Applicant.

1.2 Facility Location and Description

The proposed Facility is a 184.8-megawatt (MW) wind-powered electric generating project located in the Town of Barre, Orleans County, New York (see Figure 1). The Facility will be located on approximately 5,813 acres of leased private land that is generally rural in nature (i.e., the Facility Site). The larger area of land within which all Facility components will ultimately be located (the Facility Area, which corresponds to the Town of Barre) collectively totals approximately 35,300 acres. The Facility Site, Facility Area, and the Facility layout are presented in Figure 2.

The proposed Facility consists of the construction and operation of up to 33 wind turbines, associated 34.5 kilovolt (kV) underground electrical collection lines, access roads, meteorological towers, an operation and maintenance (O&M) building, and a temporary construction staging/laydown area. A collection substation will "step-up" power to 115 kV, and a point of interconnection (POI) substation will interconnect with National Grid's existing Lockport-Mortimer 115 kV transmission line.

1.3 Vernal Pool Definition

New York State does not currently have a formal regulatory definition or certification protocol for vernal pools. Therefore, for the purpose of this survey, EDR referenced the following vernal pool definitions, which have been published by the NYSDEC, the Massachusetts Division of Fisheries and Wildlife (MADFW), the New Jersey Division of Fish and Wildlife (NJDFW), and the United States Environmental Protection Agency (USEPA):

Woodland pools are a type of small, temporary wetland (or vernal pool) found in forested landscapes. They occur in isolated, shallow depressions that typically fill during the spring or fall, but dry by late summer or during droughts. Woodland pools are also found in floodplains, at the headwaters of streams, or in larger wetland complexes such as hardwood swamps, but they're usually not connected to permanent surface water flows. Instead, they fill from rain, snowmelt, or groundwater (NYSDEC, No Date).

Vernal pools are temporary bodies of fresh water that provide important habitat for many vertebrate and invertebrate species. "Vernal" means spring, and indeed, many vernal pools are filled by spring rains and snowmelt, and then dry during the summer. However, many vernal pools are filled by autumn rains (i.e., "autumnal pools") and persist through the winter and others are semi-permanent and do not dry every year. Vernal pools are quite often very small and shallow; vernal pools that support rich communities of vertebrate and invertebrate animals may measure only a few yards across (MADFW, 2009).

Vernal pools are confined wetland depressions, either natural or man-made, that hold water for at least two consecutive months out of the year, and are devoid of breeding fish populations [...] These unique ecosystems provide habitat to many species of amphibians, insects, reptiles, plants, and other wildlife (NJDFW, 2002).

Vernal pools are seasonal depressional wetlands that occur under the Mediterranean climate conditions of the West Coast and in glaciated areas of northeastern and midwestern states. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes [...] (USEPA, No Date).

Based on these definitions, EDR defined vernal pools as specialized water bodies that occur in confined basin depressions without permanently flowing inlets or outlets, and which maintain ponded (standing) water for at least two contiguous months between March and September, are fish free, and likely support breeding of obligate amphibian and/or invertebrate species (wood frog [*Lithobates sylvaticus*] and/or mole salamanders [genus *Ambystoma*] and/or fairy shrimp [order Anostraca]) and sometimes additional facultative amphibian species (see NYSDEC, 2018).

2.0 SURVEY METHODS

Given that New York State has not formally defined a certification protocol for vernal pools, the survey was conducted in consideration of existing vernal pool guidelines and other publications from several northeastern state environmental conservation agencies (NYNHP, 2019; NYSDEC, 2018; Lathrop et al., 2005; MADFW, 2009; NJDFW, 2002; NJDFW, 2010; PNHP, 2018; see Appendix A).¹ Primary characteristics used to identify vernal pools included the presence of obligate and/or facultative biological indicator species, hydrological isolation, the absence of fish, and evidence of variable/ephemeral water levels (see Section 2.3 below for a more detailed list of characteristics). All surveys were completed by qualified EDR biologists.

2.1 Study Area

Vernal pools were identified and delineated within the Wetland Study Area (Study Area) defined for other on-site ecological studies conducted in support of the Facility's Article 10 Application. In particular, the Study Area was also used for wetland and streams delineations, and includes all areas of the Facility Site that are within 500 feet of areas to be disturbed by construction (i.e., within 500 feet of the limits of disturbance [LOD]). In other words, this area includes all areas potentially impacted by Facility construction. The Study Area is presented in Figure 3.

2.2 Initial Environmental Review and Desktop Analysis

Prior to conducting on-site surveys, EDR performed an initial environmental review to evaluate the extent of mapped state and federal wetlands and streams and other environmental resource areas within the Facility Area (i.e., the Town of Barre). EDR performed a desktop analysis using a geographic information system (GIS) to specifically identify forested areas, forest edges, and agricultural field edges where vernal pools would be most likely to occur. EDR also created field maps that were used to guide on-site data collection; these field maps included natural color imagery basemapping, mapped wetlands/streams, and Study Area boundaries.

2.3 On-Site Surveys

EDR biologists conducted on-site vernal pool surveys within the Study Area under appropriate seasonal conditions in early May 2018 and also concurrent with wetland and stream delineations during the 2018 and 2019 growing seasons to ensure that all delineated wetlands were also reviewed for vernal pool characteristics. Surveys consisted of: (1) systematically walking throughout the Study Area (with particular additional focus on forested areas, forest edges, and

¹ Note that unlike New York, both Massachusetts and New Jersey have specific regulations for the protection of vernal pools that meet established certification criteria.

agricultural field edges identified during the desktop analysis described above); (2) taking photographs and field notes to document existing conditions within and adjacent to potential vernal pools and other features of interest (i.e., other wetlands and streams); and (3) collecting geographic location data for confirmed vernal pools (using a Global Positioning System [GPS] and the ESRI Collector for ArcGIS application for mobile devices).

Vernal pools were identified and confirmed based on observed biological and physical characteristics including: (1) the presence of obligate and/or facultative biological indicator species within and/or near the pools; (2) hydrological isolation (no permanent inlets or outlets of flowing surface water); (3) observed absence of fish species within the pool; (4) presence of standing water (i.e., evidence of the entire pool holding water); (5) sparse or no vegetation growing within pool; (6) water-stained leaves within/adjacent to the pool; (7) evidence of moss trim lines/buttrressing/watermarks on nearby trees; (8) connectivity to adjacent upland forest habitat. These characteristics were adapted directly the Massachusetts *Guidelines for the Certification of Vernal Pool Habitat* (MADFW, 2009) and from a review of other northeastern state environmental conservation agency publications (NYNHP, 2019; NYSDEC, 2018; NJDFW, 2002; NJDFW, 2010; PNHP, 2018; see Appendix A). Of these characteristics, the presence of obligate biological indicator species was given the highest weight, though features exhibiting multiple other defining characteristics were also classified as vernal pools even if obligate biological species were absent at the time of survey (see Section 3.0 below and Appendix B for additional information). In addition, vernal pools were inventoried in consideration of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (USACE, 2012).

In order to identify biological evidence, EDR personnel inspected the perimeter of each potential vernal pool, and visually scanned all surface water areas for signs of biological indicator species (including adults, egg masses, larvae, tadpoles, and juveniles). As stated above, biological criteria used for field verification of vernal pools were adapted from the certification requirements developed by the MADFW (2009) and other state agencies. The presence of wood frogs and/or mole salamanders (of any life stage) and/or facultative amphibian species (when other vernal pool characteristics were also present) was considered to be sufficient biological evidence.

Once a potential vernal pool was confirmed to contain biological evidence and/or other vernal pool characteristics, it was designated as a confirmed vernal pool. Each vernal pool feature was assigned a unique identifying code (e.g., VP-A). The locations of vernal pool features were established by collecting GPS points and digitizing polygons around the entire boundary of each feature. The following information was also recorded on data sheets for each vernal pool identified during the survey (see Appendix B):

- Survey date;
- Observer name(s);
- Vernal pool ID;
- Nearest road(s);
- Property owner information;
- Estimated pool depth, length, and width;
- Pool origin (natural or artificial) and hydroperiod;
- Presence of inlets/outlets;
- Adjacent land use(s)/ecological community type(s);
- Biological indicator species observed (if any); and
- Characteristics used to make the determination that the feature was a vernal pool (see above and Appendix B).

3.0 SURVEY RESULTS

Overall, a total of 16 vernal pools were identified by EDR within the Facility Area (see Figure 4). Except for vernal pools VP-A, VP-B and VP-G, all vernal pools exhibited ephemeral hydrological connections to other vernal pools and/or wetlands. In other words, 13 of the on-site vernal pools were part of larger wetland complexes. In addition, some of the larger and/or deeper vernal pools identified are expected to have at least some water present throughout the year during most years. Hydroperiod classifications were assigned to each vernal pool to reflect the anticipated degree of drying in most years based on these observations (and following MADFW, 2009).

The most common obligate amphibian indicator species observed at on-site vernal pools was wood frog in the adult life stage. Based on observed habitat suitability and physical characteristics, it is likely that many of the identified vernal pools also support other obligate amphibian species during some years. Common facultative amphibian indicator species observed within or near vernal pools included vocalizing gray treefrog (*Hyla versicolor*) adults, green frog (*Lithobates clamitans*) adults and potential tadpoles, northern leopard frog (*Lithobates pipiens*) adults and potential tadpoles, and vocalizing spring peeper (*Pseudacris crucifer*) adults.

Table 1 below provides a summary of vernal pool survey data. Additional data for each vernal pool are provided in Appendix B, and representative photographs of vernal pools are provided in Appendix C. Information regarding potential Facility-related impacts to vernal pools and amphibians, as well as efforts to avoid and minimize these impacts during the design process, will be presented in Exhibit 22 of the Facility's Article 10 Application.

Table 1. Summary of Vernal Pool Survey Data

Vernal Pool ID	Map Sheet (Figure 4)	Latitude	Longitude	Area (square feet)	Area (acres)	Hydroperiod ¹	Amphibian Species Present?
VP-A	1	43.2092	-78.1253	321	0.007	Seasonal	Yes
VP-B ²	2	43.1976	-78.1649	999	0.023	Semi-permanent	No
VP-C	4	43.1738	-78.1797	686	0.016	Seasonal	No
VP-D	4	43.1687	-78.1732	893	0.021	Semi-permanent	Yes
VP-E	4	43.1675	-78.1717	14,185	0.326	Permanent	Yes
VP-F	4	43.1689	-78.1721	1,352	0.031	Semi-permanent	Yes
VP-G	3	43.1491	-78.1559	2,324	0.053	Permanent	Yes
VP-H	7	43.1468	-78.2278	5,038	0.116	Semi-permanent	No
VP-I	6	43.1573	-78.2147	3,994	0.092	Semi-permanent	Yes
VP-J	6	43.1575	-78.2147	6,682	0.153	Permanent	Yes
VP-K	6	43.1578	-78.2144	12,663	0.291	Permanent	Yes
VP-L	6	43.158	-78.2142	14,647	0.336	Permanent	Yes
VP-M	6	43.1582	-78.2139	14,419	0.331	Permanent	Yes
VP-N	6	43.1584	-78.214	7,720	0.177	Semi-permanent	Yes
VP-O	5	43.1788	-78.1977	3,126	0.072	Permanent	No
VP-P	5	43.1809	-78.1986	829	0.019	Semi-permanent	Yes

¹ Hydroperiod Classifications: Seasonal = feature expected to dry out in most years; Semi-permanent = feature expected to partially dry out in most years; Permanent = feature is not expected to dry out in most years.

² Note: Vernal Pool VP-B is located in an area that was originally surveyed for vernal pools, but that is no longer part of the Study Area or the Facility Site.

4.0 REFERENCES

Massachusetts Division of Fisheries and Wildlife (MADFW). 2009. *Natural Heritage and Endangered Species Program's Guidelines for the Certification of Vernal Pool Habitat*. Available at: <https://www.mass.gov/files/documents/2017/01/uw/vpcert.pdf> (Accessed October 2019).

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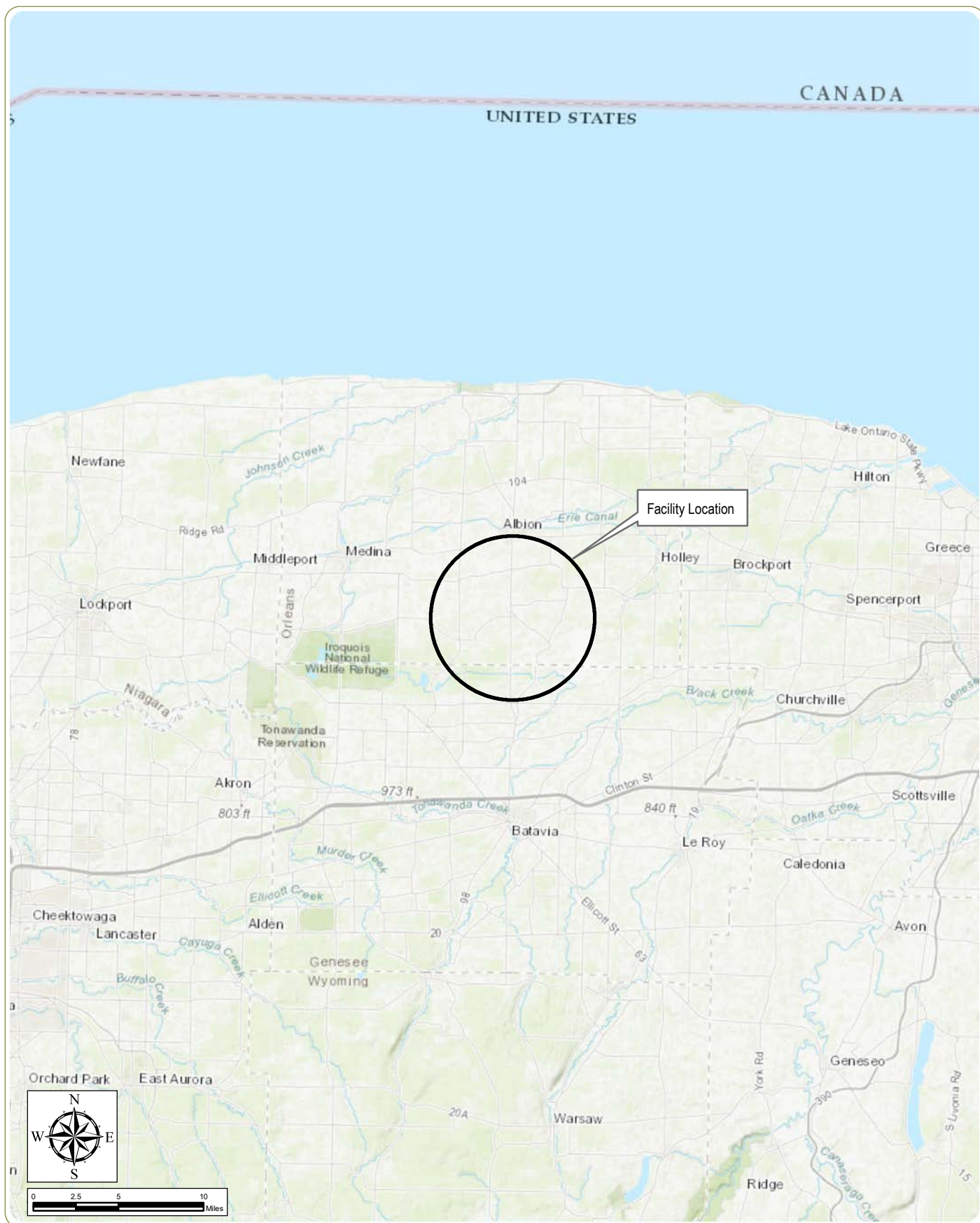
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FIGURES



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Town of Barre, Orleans County, New York

Figure 1: Regional Facility Location

- Notes:** 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
 2. This map was generated in ArcMap on November 22, 2019.
 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.



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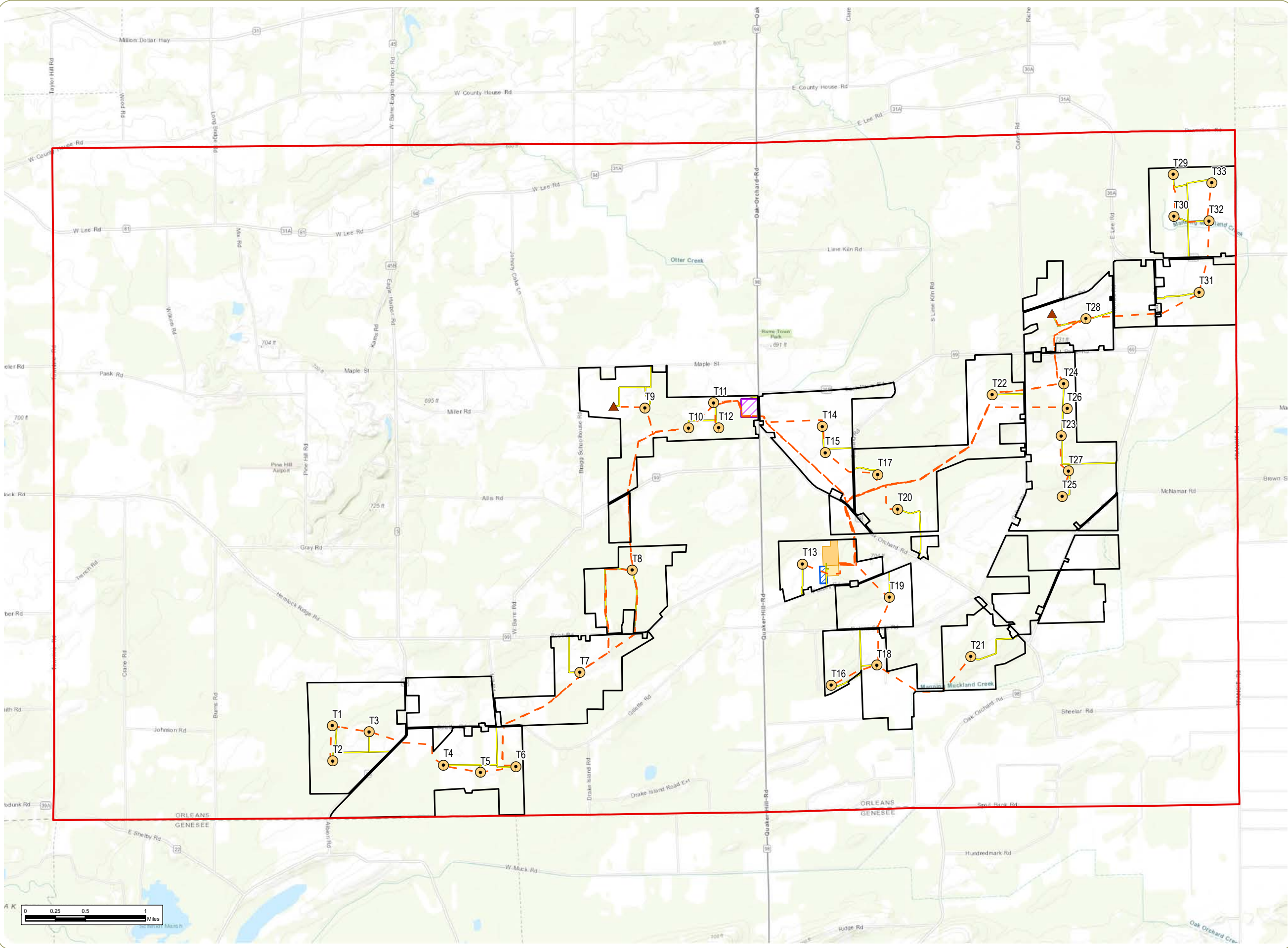
Figure 2: Facility Layout

- Wind Turbine
- Met Tower
- Access Road
- Collection Line
- Collection Substation
- POI Substation
- O&M Building
- Laydown Yard
- Facility Site
- Facility Area

Notes: 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data. 4. This figure depicts preliminary turbine locations, which are subject to change.



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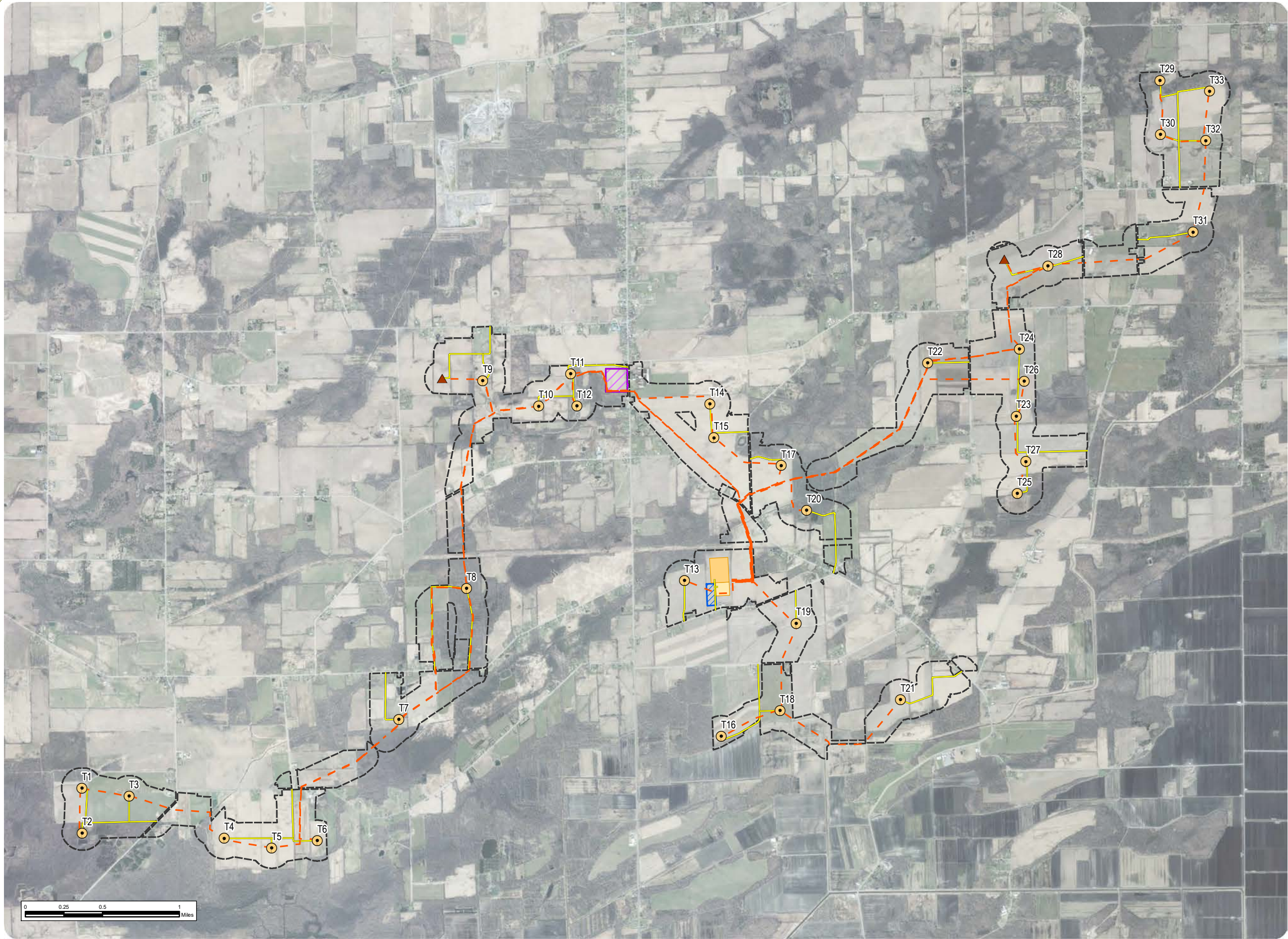
Figure 3: Study Area

- Wind Turbine
- Met Tower
- Access Road
- Collection Line
- Collection Substation
- POI Substation
- O&M Building
- Laydown Yard
- Study Area

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service. 2. This map was generated in ArcMap on January 9, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data. 4. This figure depicts preliminary turbine locations, which are subject to change.



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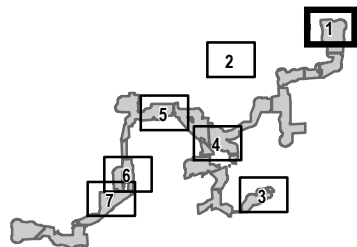


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Figure 4: Vernal Pools

- Vernal Pool
- Limit of Disturbance
- Study Area



Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service; ESRI StreetMap North America, 2012. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may



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Figure 4: Vernal Pools

Vernal Pool

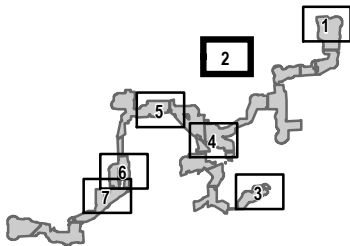
Vernal Pool VP-B is located in an area
that is no longer part of the Facility Site

VP-B

S Lime Kiln Rd

Lime Kiln Rd

0 250 500 1,000 Feet

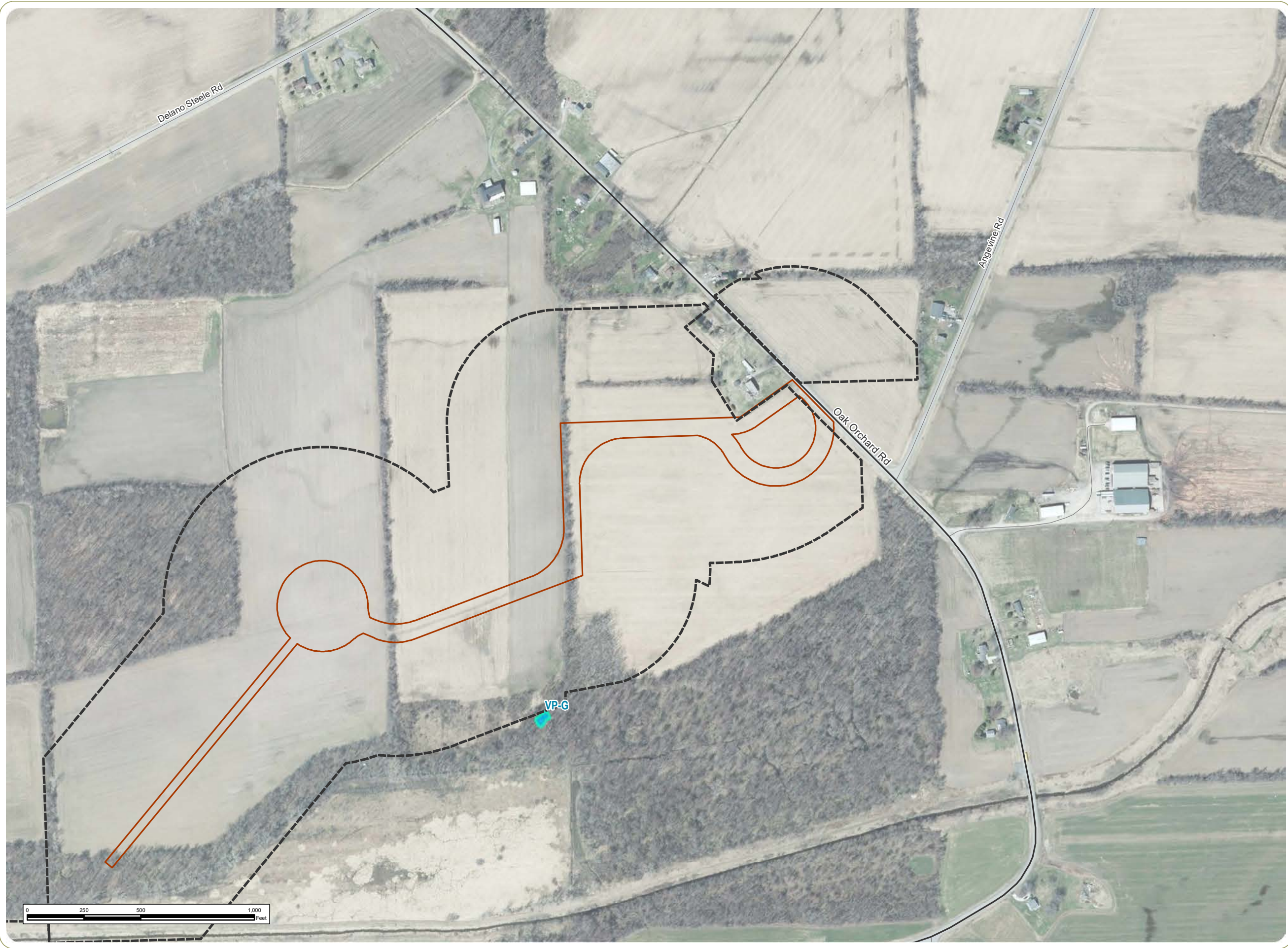


Sheet 2 of 7

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service; ESRI StreetMap North America, 2012. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may






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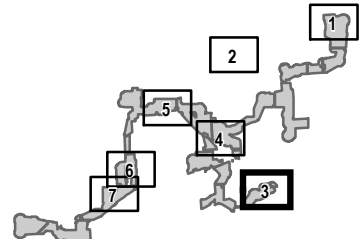


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Figure 4: Vernal Pools

-  Vernal Pool
-  Limit of Disturbance
-  Study Area



Sheet 3 of 7

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service; ESRI StreetMap North America, 2012. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may



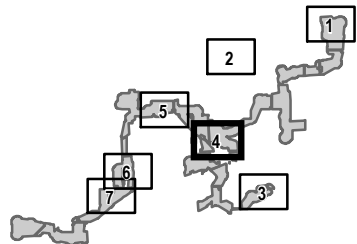
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Figure 4: Vernal Pools

- Vernal Pool
- Limit of Disturbance
- Study Area



Sheet 4 of 7

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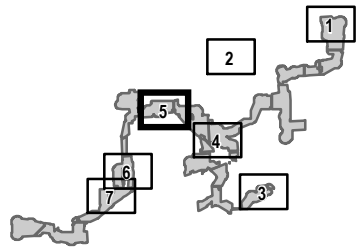


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Figure 4: Vernal Pools

- Vernal Pool
- Limit of Disturbance
- Study Area

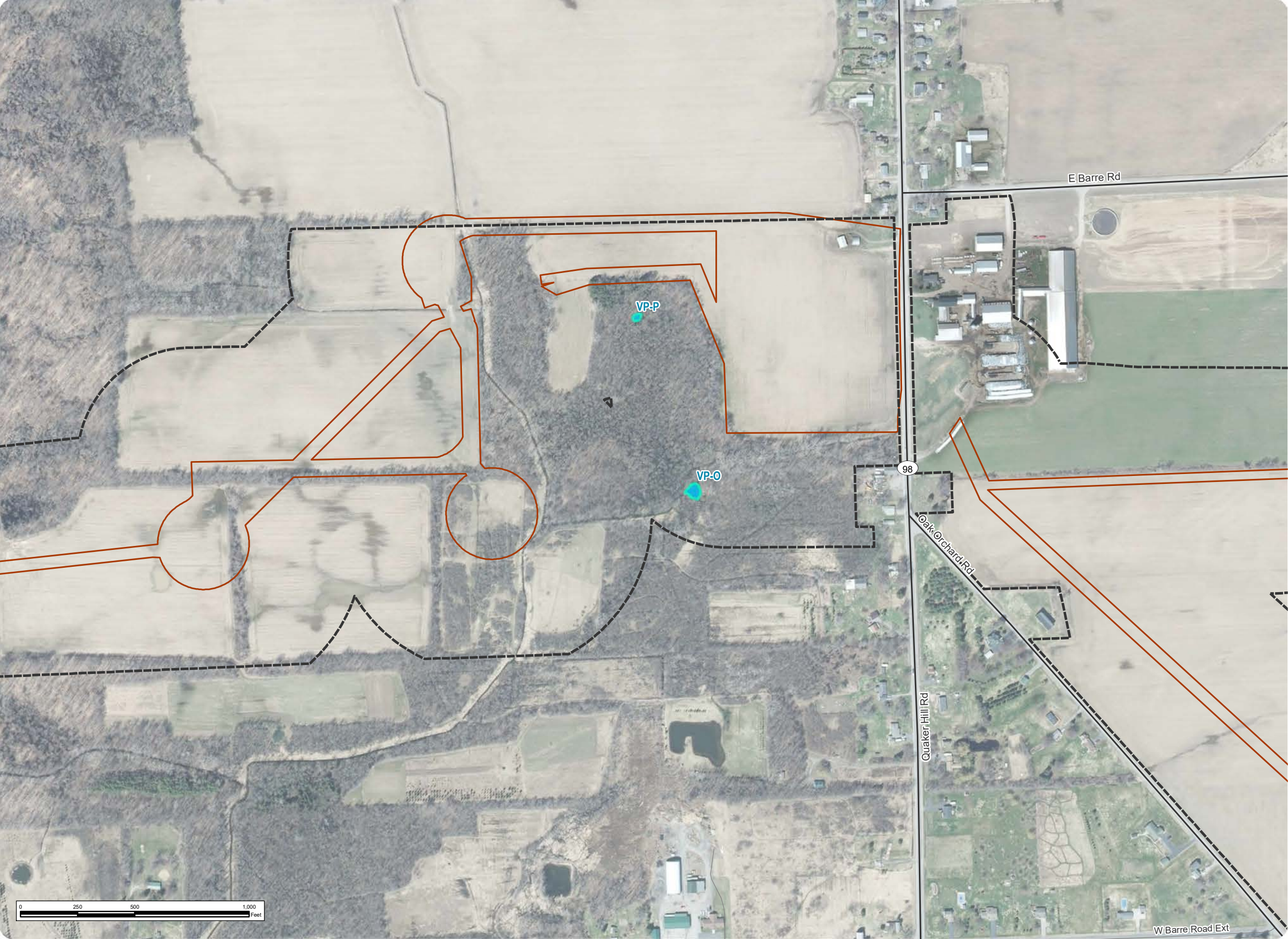


Sheet 5 of 7

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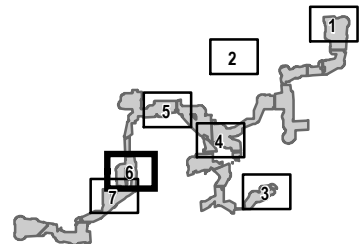
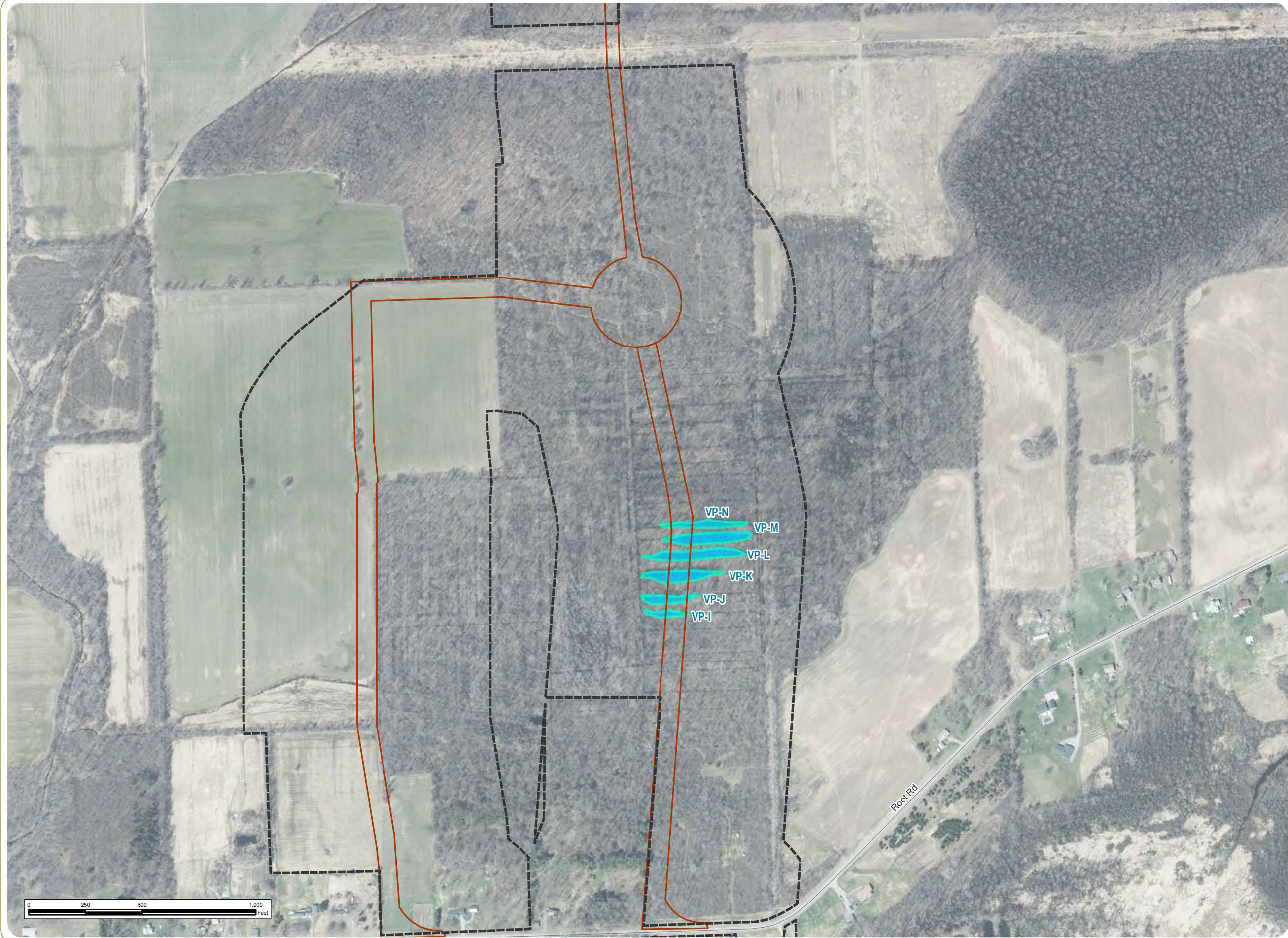


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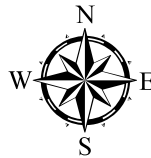
Figure 4: Vernal Pools

- Vernal Pool
- Limit of Disturbance
- Study Area



Sheet 6 of 7

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service; ESRI StreetMap North America, 2012. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may



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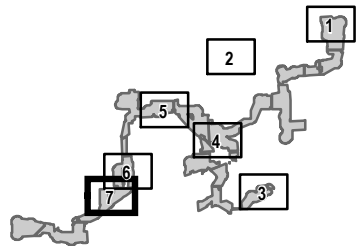


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Figure 4: Vernal Pools

- Vernal Pool
- Limit of Disturbance
- Study Area



Sheet 7 of 7

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service; ESRI StreetMap North America, 2012. 2. This map was generated in ArcMap on February 17, 2020. 3. This is a color graphic. Reproduction in grayscale may



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APPENDIX A

Vernal Pool Guidelines

Vernal Pool



Vernal pool at Saratoga National Historical Park



Photo credits: Gregory J. Edinger

System	Palustrine
Subsystem	Forested Mineral Soil Wetlands

Did you know?

Many animals depend on vernal pools, especially for breeding. Most of these animals such as frogs, toads, turtles, and salamanders spend a majority of their life in nearby wetlands but migrate to breed or feed in productive vernal pools. Fingernail clams and air-breathing snails live their entire life in vernal pools and must burrow beneath leaves and mud when the pool dries until the water returns. Fairy shrimp produce eggs that remain in the dry pool after the adult's death and hatch after the pool refills.

Summary

Protection Not listed in New York State, not listed federally.

Rarity G4, S3S4

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

A state rarity rank of S3S4 means: Vulnerable in New York, or Apparently Secure - Vulnerable to becoming imperiled in New York, with relatively few populations or locations, few individuals, and/or restricted range; or uncommon but not rare in New York; may be rare in some parts of the state; possibly some cause for long-term concern due to declines or other factors. More information is needed to assign a single conservation status.

Conservation Status in New York

There are probably a few thousand occurrences statewide. Vernal pools are typically small (i.e., generally under one acre) and may be overlooked as wetlands after the water draws down. A few documented occurrences have good viability and are protected on public land or private conservation land. This community has statewide distribution, and likely includes several high quality examples. The current trend of this community is probably stable for occurrences on public land, or declining slightly elsewhere due to moderate threats related to development pressure, alteration to the natural hydrology, and reduced protection regulations for isolated wetlands. This community has probably declined moderately from historical numbers likely correlated with logging and development of the surrounding landscape.

Short-term Trends

The number and acreage of vernal pools in New York have probably declined in recent decades as a result of reduced protection regulations for isolated wetlands. Their relatively small size and seasonal hydroperiod may have contributed to the decline with many occurrences going undetected as regulated wetlands.

Long-term Trends

The number and acreage of vernal pools in New York have declined moderately from historical numbers likely correlated to the alteration to the natural hydrology and direct destruction, in both forested and urban areas.

Larger occurrences of this natural community (>12.5 acres) are protected under NY State wetland laws.

Conservation and Management

Threats

In 2001, the federal Supreme Court ruled that the US Congress did not give authority to the US Army Corps of Engineers (US ACE) under section 404 of the Clean Water Act to regulate the filling of isolated wetlands. This decision led US EPA and US ACE officials to issue guidance in January 2003 that made it more difficult for regulators to protect isolated wetlands, such as vernal pools (Brooks and Paton 2005). Vernal pools are threatened by development (e.g., agriculture, residential, roads) and its associated run-off (e.g., septic, silt, nutrients), habitat alteration (e.g., excessive logging, pollution, trash dumping), and recreational overuse (e.g., ATVs). Alteration to the natural hydrological regime is also a threat to this community (e.g., ditching, impoundments).

Conservation Strategies and Management Practices

Where practical, establish and maintain a natural wetland buffer to reduce storm-water, pollution, and nutrient run-off, while simultaneously capturing sediments before they reach the vernal pool. Buffer width should take into account the erodibility of the surrounding soils, slope steepness, and use of the surrounding upland by vernal pool fauna. Wetlands protected under Article 24 are known as New York State "regulated" wetlands. The regulated area includes the wetlands themselves, as well as a protective buffer or "adjacent area" extending 100 feet landward of the wetland boundary (NYS DEC 1995). Vernal pools seldom meet the size criteria for state regulated wetland. If possible, minimize the number and size of impervious surfaces in the surrounding landscape. Avoid habitat alteration within the wetland and surrounding landscape. For example, roads and trails should be routed around vernal pools, and ideally should not pass through the buffer area. Restore vernal pools that have been unnaturally disturbed (e.g., remove obsolete impoundments and ditches in order to restore the natural hydrology). Prevent the spread of invasive exotic species into the wetland through appropriate direct management, and by minimizing potential dispersal corridors, such as roads.

Specific management recommendations for vernal pools can be found in the following: 1) Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States (Calhoun and Klemens 2002), and 2) Forestry Habitat Management Guidelines for Vernal Pool Wildlife (Calhoun

and deMaynadier 2004).

Development and Mitigation Considerations

When considering road construction and other development activities minimize actions that will change what water carries and how water travels to this community, both on the surface and underground. Water traveling over-the-ground as run-off usually carries an abundance of silt, clay, and other particulates during (and often after) a construction project. While still suspended in the water, these particulates make it difficult for aquatic animals to find food; after settling to the bottom of the wetland, these particulates bury small plants and animals and alter the natural functions of the community in many other ways. Thus, road construction and development activities near this community type should strive to minimize particulate-laden run-off into this community. Water traveling on the ground or seeping through the ground also carries dissolved minerals and chemicals. Road salt, for example, is becoming an increasing problem both to natural communities and as a contaminant in household wells. Fertilizers, detergents, and other chemicals that increase the nutrient levels in wetlands cause algae blooms and eventually an oxygen-depleted environment where few animals can live. Herbicides and pesticides often travel far from where they are applied and have lasting effects on the quality of the natural community. So, road construction and other development activities should strive to consider: 1. how water moves through the ground, 2. the types of dissolved substances these development activities may release, and 3. how to minimize the potential for these dissolved substances to reach this natural community.

Inventory Needs

Survey for occurrences statewide to advance documentation and classification of vernal pools. Finding occurrences with several pools forming a complex should be a priority. A statewide review of vernal pools is desirable.

Research Needs

Research is needed to fill information gaps about vernal pools, especially to advance our understanding of their classification, hydrology, floristic variation, and characteristic fauna. Research is needed to see if vernal pool species assemblages are related to the underlying bedrock (e.g., acidic vs. alkaline) and/or the surrounding forest type (e.g., needle-leaf evergreen vs. broad-leaf deciduous).

Rare Species

False Hop Sedge (*Carex lupuliformis*)
Cat-tail Sedge (*Carex typhina*)
Brown Bog Sedge (*Carex buxbaumii*)
Featherfoil (*Hottonia inflata*)
Tiger Salamander (*Ambystoma tigrinum*)
Little Brown Bat (*Myotis lucifugus*)
Lance Aplexa (*Aplexa elongata*)
Lyre-tipped Spreadwing (*Lestes unguiculatus*)

Identification Comments

Vernal pools are intermittently to ephemerally ponded, small, shallow depressions usually located within an upland forest. They are typically flooded in spring or after a heavy rainfall, but are usually dry during summer. Many vernal pools are filled again in autumn. The substrate is dense leaf litter over hydric soils. Vernal pools typically occupy a confined basin (i.e., a standing waterbody without a flowing outlet), but may have an intermittent stream flowing out of it during high water. Since vernal pools cannot support fish populations, there is no threat of fish predation on amphibian eggs or invertebrate larvae. Characteristic animals of vernal pools include species of amphibians, reptiles, crustaceans, mollusks, annelids, and insects. Vernal pool amphibians include spotted salamander (*Ambystoma maculatum*), blue-spotted salamander (*A. laterale*), Jefferson's salamander (*A. jeffersonianum*), marbled salamander (*A. opacum*), and wood frog (*Rana sylvatica*). Fairy shrimp (Anostraca) are obligate vernal pool crustaceans, with *Eubranchipus* spp. being the most common.

The Best Time to See

Vernal pools are best observed after spring thaw when they are filled with melt water and breeding wood frogs start calling. April is generally a good month to visit vernal pools in New York (earlier to the south and later to the north). Repeat visits to the same vernal pool as the water draws down increases the chances of seeing the full array of characteristic vernal pool species at different stages of their life cycle.

Characteristics Most Useful for Identification

Individual vernal pools are typically small (<0.5 acre), are surrounded by upland forest with trees that overhang the pool, providing a continuous leaf litter substrate, and are generally sparsely vegetated and fishless. The presence of animals categorized as obligate vernal pool species (species that depend upon vernal pool habitat for their survival) helps confirm the identification.

Elevation Range

Known examples of this community have been found at elevations between 50 feet and 1890 feet.

Similar Ecological Communities

Coastal plain pond: In New York, coastal plain ponds are restricted to Long Island and are most common in the Central Pine Barrens. The ponds are generally larger than vernal pools and reveal a distinct zonation of vegetation on the pond shore as the water draws down. Coastal plain ponds may hold water throughout the year and larger examples may support fish. Vernal pools are typically small (<0.5 acre), are surrounded by upland forest with trees that overhang the pool, and are generally sparsely vegetated and fishless.

Pine barrens vernal pond: Individual vernal pools are typically small (1 acre), surrounded by fire-adapted pine barren communities, and the vegetation is usually well-developed and distinct from vernal pool vegetation. The two communities are similar in that they provide habitat for many of the same animals that depend on seasonally flooded depressions to breed.

Intermittent stream: Vernal pools form in depressions with no inlet or outlet. Intermittent streams flow down hill in a linear streambed. Both are ephemeral aquatic communities that usually dry up as the season progresses and they share many species that depend on intermittent flooding.

Eutrophic pond: Eutrophic ponds are permanently flooded and usually never completely draw down. Eutrophic ponds usually have an inlet and outlet, and support fish.

Characteristic Species

Trees > 5m

Red Maple (*Acer rubrum*)
Yellow Birch (*Betula alleghaniensis*)
White Ash (*Fraxinus americana*)
Green Ash (*Fraxinus pennsylvanica*)
White Oak (*Quercus alba*)
Swamp White Oak (*Quercus bicolor*)
Pin Oak (*Quercus palustris*)
Eastern Hemlock (*Tsuga canadensis*)
Slippery Elm (*Ulmus rubra*)

Shrubs 2-5m

Spicebush (*Lindera benzoin*)
Pitch Pine (*Pinus rigida*)
Highbush Blueberry (*Vaccinium corymbosum*)

Shrubs < 2m

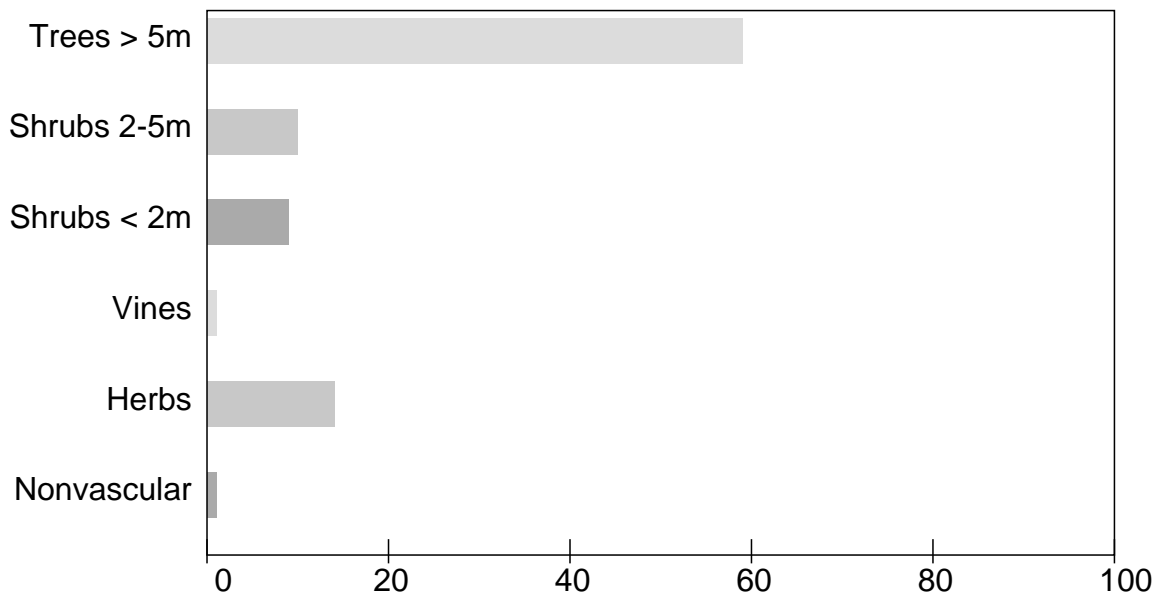
Common Buttonbush (*Cephalanthus occidentalis*)
Sheep-laurel (*Kalmia angustifolia*)
Mountain Holly (*Nemopanthes mucronatus*)

Herbs

False Nettle (*Boehmeria cylindrica*)
Hoary Sedge (*Carex canescens*)
Tussock Sedge (*Carex stricta*)
Needle Spikerush (*Eleocharis acicularis*)
Lesser Duckweed (*Lemna minor*)
Sensitive Fern (*Onoclea sensibilis*)
Canada Clearweed (*Pilea pumila*)
Marsh Fern (*Thelypteris palustris*)

Nonvascular

Leucobryum glaucum
Sphagnum spp.



This figure helps visualize the structure and "look" or "feel" of a typical vernal pool. Each bar represents the amount of "coverage" for all the species growing at that height. Because layers overlap (shrubs may grow under trees, for example), the shaded regions can add up to more than 100%.

International Vegetation Classification System Associations

This New York natural community encompasses all or part of the concept of the following International Vegetation Classification (IVC) natural community associations. These are often described at finer resolution than New York's natural communities. The IVC is developed and maintained by NatureServe.

Eastern Woodland Vernal Pool (CEGL006453)

Additional Resources

Links

Woodland Pool Conservation (NYS DEC)

<http://www.dec.ny.gov/lands/52325.html>

Vernal Pools (EPA)

<https://www.epa.gov/wetlands/vernal-pools>

Vernal Pool Association

http://www.vernalpool.org/vernal_1.htm

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This guide was authored by D.J. Evans

Woodland Pool Wildlife

a photo identification guide

New York State
Department of
Environmental
Conservation



This guide includes the group of wildlife that depends on woodland pools for breeding (mole salamanders, wood frog and fairy shrimp) and a number of other animals that use pool habitat for different life activities. More comprehensive guides to wildlife, vernal pools and wetland plants may be needed to identify the rich diversity of life that thrives in this habitat.

Mole Salamanders

These pool-breeding salamanders live in the forest and spend much of their time underground.



Spotted salamander

Ambystoma maculatum

Gray to black with yellow spots in 2 rows along back

Size: adult length is usually 5.0-8.0 inches in total length (TL)

Eggs: firm masses of 50-200 clear or white eggs, attached to twigs or stems



Jefferson salamander

Ambystoma jeffersonianum

Gray to brown with pale blue to white flecked underside

Size: adult length is usually 4.0-7.0 inches in TL, large and robust

Eggs: masses of 20-30 eggs, often sausage shaped

NOTE: Hybrids of Jefferson and blue-spotted salamanders are common and have features of both species.



Blue-spotted salamander

Ambystoma laterale

Coloring resembles enamelware pots, black with blue-silver flecks

Size: adult length is usually 3.0-5.0 inches in TL, slender bodied

Eggs: laid singly, in small clusters, or in sheets on pool bottom



Marbled salamander

Ambystoma opacum

Dark with silver-gray (females) to white (males) with bands on back

Size: adult length is usually 3.5-4.0 inches in TL, stout bodied

Eggs: between 50-200 laid in fall in dry pool bed

The Woodland Pool Conservation Program is part of a larger NYSDEC Hudson River Estuary Program initiative to partner with local communities to conserve the diversity of plants, animals and habitats that sustain the health and resiliency of the entire estuary watershed. For more information, contact: Laura Heady, Biodiversity Outreach Coordinator, at 845-256-3061 (ltheady@gw.dec.state.ny.us), or visit <http://www.dec.ny.gov/lands/52325.html>.



Cornell University



Wood frog

Rana sylvatica



Adult

by Michael Barnhart



Adults in amplexus

by Steve Chorvas

Orange to dark brown with dark "mask" from each eye to tympanum

Size: adult length is usually 1.5-3.0 inches

Eggs: > 1,000 in a 2.5-4.0--inch diameter mass, often laid communally in "rafts"

Fairy shrimp

Anostracan species



Female

by Laura Heady



Male

by Meredith Taylor

Variable in color with stalked eyes; swim upside down in pools from late winter to early spring

Size: adult length is usually 0.5-1.5 inches

Eggs: carried in a brood pouch, eventually released

Signs of Pool Breeding

The presence of spermatophores, egg masses and developing amphibians in woodland pools indicate breeding activity.



by Mike Rubbo

Spermatophores

are tiny "sperm packets" left by male salamanders on the bottoms of pools.



by Laura Heady

Wood frog egg masses

do not have an outer matrix like salamander egg masses.



by Laura Heady

Wood frog larvae

hatch early and are often the only frog tadpoles seen in pools in the spring.



by Laura Heady

Spotted salamander egg masses

are very firm.



by Mike Rubbo

Jefferson salamander egg masses

are often long and attached to vegetation.



by Laura Heady

Salamander larvae

have external gills, unlike frog larvae.

More Woodland Pool Wildlife

These species may use woodland pools for foraging, resting, and/or breeding in addition to using other habitat types.

Spotted turtle

by Mike Rubbo



Spring peeper

by Ray Sussmann



American toad

by Laura Heady



Four-toed salamander

by Laura Heady



Blanding's turtle*

by Jaime Hazard



Spadefoot toad**

by Jesse W. Jaycox



Wood duck

by Mike Pogue



Red-spotted newt

by Laura Heady



* In the Hudson Valley, found in Dutchess County. ** In the Hudson Valley, found in Dutchess and Albany counties.

For more information: *The Amphibians and Reptiles of New York State* (Gibbs et al. 2007)
A Field Guide to the Animals of Vernal Pools (Kenney and Burne 2001).



Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

March 2009

Natural Heritage & Endangered Species Program's Guidelines for the Certification of Vernal Pool Habitat

Table of Contents:

- Section I. - NHESP Vernal Pool Fact Sheet
- Section II. - NHESP Certification Criteria & Documentation Requirements
- Section III. - NHESP Vernal Pool Field Observation Form

Background Information

The NHESP & Vernal Pool Certification:

The goal of the Natural Heritage & Endangered Species Program (NHESP) is to protect the state's native biological diversity with its highest priority being the protection of the state's roughly 435 native vertebrate, invertebrate, and plant species officially listed as Endangered, Threatened, or of Special Concern under the Massachusetts Endangered Species Act (M.G.L. c. 131A and implementing regulations 321 CMR 10.00).

The NHESP also administers the state's official vernal pool certification program. NHESP staff does not routinely survey and monitor vernal pools outside of rare species work and special vernal pool projects, but accepts certain biological and physical documentation submitted by outside scientists, resource managers, and other interested individuals and organizations as the basis for the possible certification of vernal pool habitat.

Why were the *Guidelines for the Certification of Vernal Pool Habitat* Revised in 2009?

Revisions to the *Guidelines* are designed to ensure consistency between the *NHESP certification criteria* and the *biological and physical criteria* of 'vernal pool habitat' in the WPA regulations (310 CMR 10.04, 10.57(1)(a)(3), 10.57(1)(b)(4), and 10.58(1)). The *Guidelines* have been modified to increase the confidence that pools that become certified provide essential breeding habitat for certain amphibians that require vernal pools. This is necessary, for example, because facultative vernal pool species use a variety of temporary and permanent wetlands and are not always reliable indicators of hydroperiod (two months inundation) or vernal pool habitat. The revised *Guidelines* address this by reducing the number of facultative species that can be used for certification. In addition, they enhance the requirements for documenting the physical and biological characteristics of a vernal pool (see sections II. and III. for specific changes). Overall, the revised *Guidelines* contribute to the defensible certification of vernal pool habitat in the variety of wetlands where they, in fact, occur.

www.mass.gov/nhesp



Natural Heritage & Endangered Species Program

1 Rabbit Hill Road, Westborough, MA 01581 Tel: (508) 389-6360 Fax: (508) 389-7890

Help Save Endangered Wildlife!

Contribute to the Natural Heritage & Endangered Species Fund.



Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

March 2009

NHESP Guidelines for the Certification of Vernal Pool Habitat

I. VERNAL POOL FACT SHEET

What Are Vernal Pools?

Vernal pools are temporary bodies of fresh water that provide important habitat for many vertebrate and invertebrate species. "Vernal" means spring, and indeed, many vernal pools are filled by spring rains and snowmelt, and then dry during the summer. However, many vernal pools are filled by autumn rains (i.e., "autumnal pools") and persist through the winter and others are semi-permanent and do not dry every year. Vernal pools are quite often very small and shallow; vernal pools that support rich communities of vertebrate and invertebrate animals may measure only a few yards across. However, vernal pools of several acres also occur throughout Massachusetts.

Where Are Vernal Pools Found?

Vernal pools are common in Massachusetts and occur in almost every town in the state. Vernal pools are found across the landscape where small woodland depressions, swales, or kettle holes collect spring runoff or intercept seasonally high groundwater tables. Although many people associate vernal pools with dry woodland areas, vernal pools also occur in meadows, river floodplains, interdunal swales, and large vegetated wetland complexes. Vernal pool habitat can occur where water is contained for more than two months in the spring and summer of most years and where no reproducing fish populations are present.

Why Are Vernal Pools Valuable?

Vernal pools constitute a unique and increasingly vulnerable type of wetland. Vernal pools are inhabited by many species of wildlife, some of which are totally dependent on vernal pools for their survival. Vernal pools do not support fish because they dry out annually or at least periodically. Some may contain water year round, but are free of fish as a result of significant drawdowns that result in extremely low dissolved oxygen levels. The wood frog (*Lithobates sylvaticus*) and the four local species of mole salamander (*Ambystoma* spp.) have evolved breeding strategies intolerant of fish predation on their eggs and larvae; the lack of established reproducing fish populations is essential to the breeding success of these species.

Other amphibian species, including the American toad (*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer*), and gray treefrog (*Hyla versicolor*), often exploit the fish-free waters of vernal pools but use a variety of different wetland types. Vernal pools also support rich and diverse invertebrate faunas. Some

Some state-listed species that may be found in vernal pools:

Species	Status ¹
Marbled salamander (<i>Ambystoma opacum</i>)	T
Blue-spotted salamander (<i>A. laterale</i>)	SC
Jefferson salamander (<i>A. jeffersonianum</i>)	SC
Eastern spadefoot toad (<i>Scaphiopus holbrookii</i>)	T
Blanding's turtle (<i>Emydoidea blandingii</i>)	T
Wood turtle (<i>Glyptemys insculpta</i>)	SC

¹Status pursuant to the MA Endangered Species Act: T = Threatened; SC = Special Concern.



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invertebrates, such as the fairy shrimp (*Eubbranchipus* spp.), are also dependent upon vernal pools. Invertebrates are both important predators and prey in vernal pool ecosystems. Vernal pools are an important habitat resource for many birds, mammals, reptiles and amphibians, including many species listed under the MA Endangered Species Act (M.G.L c.131A).

Vernal Pool Protection

Vernal pools became eligible for protection when the **Massachusetts Wetlands Protection Act regulations (WPA)** (310 CMR 10.00) were revised in 1987 to include ‘wildlife habitat’ as an interest protected under the WPA. Vernal pools became protected not as a specific wetland type, but rather a wetland function that provides important ‘wildlife habitat’. In accordance with the WPA, vernal pools are presumed present in jurisdictional wetland ‘Resource Areas’ only when mapped and certified by the Natural Heritage & Endangered Species Program (NHESP). Thus, the vernal pool certification program was established to register the locations of *all vernal pools, regardless of jurisdiction, that meet the biological and physical features of ‘Vernal Pool Habitat’ in the WPA*; i.e., those that provide essential breeding habitat for certain amphibians that require vernal pools (310 CMR 10.04, 10.57(1)(a)(3), 10.57(1)(b)(4), and 10.58(1)). Although the NHESP certifies vernal pool habitat, local conservation commissions and the Massachusetts Department of Environmental Protection (DEP) are responsible for the regulatory protection of vernal pools.

Other regulations have subsequently incorporated protections for *certified* vernal pools including: the **Massachusetts Surface Water Quality Standards** (314 CMR 4.00), **Massachusetts Environmental Code: Title 5** (310 CMR 15.00), **Massachusetts Forest Cutting Practices Act Regulations** (304 CMR 11.00), **Massachusetts 401 Water Quality Certification Regulations** (314 CMR 9.00), and some **local wetland bylaws**. These regulations extend protections to many certified vernal pools (CVPs) that may not be jurisdictional under the WPA. In addition, the WPA and Forest Cutting Practices Act regulations also provide protection to vernal pools that have not been certified if their occurrence is adequately documented during permit review.

The Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) protect certified vernal pools and *up to* 100 feet beyond the pool boundary by preventing alterations which would result in impairment of the wildlife habitat function of the CVP. In order to receive protection through the WPA, however, CVPs **must occur within a jurisdictional wetland ‘Resource Area’**. If in a ‘Resource Area’, protection extends to the CVP itself, as well as to the portion of the 100-foot zone surrounding the CVP (referred to as ‘Vernal Pool Habitat’) that is within a Resource Area. WPA protection of ‘Vernal Pool Habitat’ does not extend into non-jurisdictional upland or the buffer zone of a resource area. In summary, conservation commissions are empowered to prevent the impairment of the capacity of Vernal Pool Habitat to function as wildlife habitat.

Vernal pools that are not certified may also be protected by local conservation commissions or the DEP if credible scientific evidence is presented prior to the end of the appeals period for a Superseding Order of Conditions (OOC) issued by the DEP. A conservation commission, or the DEP on appeal, can incorporate protective conditions into an OOC that would prevent the impairment of the wildlife habitat value of the pool and its 100 foot ‘Vernal Pool Habitat’ if the pool is not certified.

The WPA is administered by local conservation commissions under the jurisdiction of the DEP, either of which **should be contacted** for all questions related to the regulatory protection of certified and potential vernal pools.

Each DEP Regional Office has Vernal Pool Liaison(s) who can be contacted at these locations:

NORTHEAST REGIONAL OFFICE	SOUTHEAST REGIONAL OFFICE	CENTRAL REGIONAL OFFICE	WESTERN REGIONAL OFFICE
Wayne Lozzi 203B Lowell Street Wilmington, MA 01887 (978) 694-3200	Daniel Gilmore OR Christopher Ross 20 Riverside Drive Lakeville, MA 02347 (508) 946-2700	Jennifer Gensel 627 Main Street Worcester, MA 01608 (508) 792-7650	Karen Hirschberg OR Tim McKenna 436 Dwight Street Springfield, MA 01103 (413) 748-1100

The Massachusetts Surface Water Quality Standards (SWQS) (314 CMR 4.00), administered by the DEP, implement Section 401 of the federal Clean Water Act at the state level. When a project proposes discharges of solid or liquid fill in a wetland under federal jurisdiction, a permit must be obtained from the Army Corps of Engineers. In accordance with the SWQS, the project proponent must first obtain a Water Quality Certification from the DEP, under the **Massachusetts 401 Water Quality Certification Regulations** (314 CMR 9.00), that states that the discharge complies with the federal Clean Water Act. The SWQS classify CVPs as Outstanding Resource Waters (ORW) for which no new or increased discharge of pollutants, including solid fill or storm water, is allowed, and any existing discharge must cease, or be treated with the highest and best practical methods. Generally, a CVP will be protected from the discharge of fill as an ORW, even if the CVP is not subject to WPA jurisdiction as a state wetland.

The Massachusetts Environmental Title 5 (310 CMR 15.00) regulates the siting and construction of subsurface sewage disposal (septic) systems in the state. A system's septic tank and distribution box must be located a minimum of 50 feet, and the leaching field a minimum of 100 feet, from the boundary of a CVP. The setback for the leach fields can be reduced if hydrogeologic data demonstrates the pool is hydraulically up-gradient from the proposed system.

The Massachusetts Forest Cutting Practices Act Regulations (304 CMR 11.00) protect CVPs from certain forestry impacts. Harvesting requirements limit cutting to no more than 50% of the trees within 50 feet of a CVP. They also require that trees or tree tops not be felled in CVPs, and restrict the use of pools as staging areas or skidder trails. Guidelines, similar to the regulations, are established for activities planned near uncertified vernal pools identified by consulting foresters.

Town Wetlands and Zoning By-laws are used by many municipalities to enhance protections to vernal pools. While the details of by-laws are town specific, they are generally intended to increase protection to vernal pools beyond that afforded by the WPA.

The Vernal Pool Boundary

The shallow edges of vernal pool habitat represent one of the most ecologically valuable portions of these habitats. These areas are generally the first to thaw in the spring and provide access to the pool for the earliest breeding species. These shallow water zones also tend to be significantly warmer than the deeper portions of a vernal pool throughout the spring. Egg masses of early breeding amphibians benefit from the warmer water temperatures at the pool edges that promote rapid egg development.

The boundary of vernal pool habitat must incorporate these shallowest reaches of the pool. When there is no distinct and clear topographic break at the edge of a pool, the maximum observed or recorded extent of flooding represents the ecological boundary of the vernal pool. This boundary is evident and should be delineated by leaf staining and other indicators of hydrology outside of the mean annual high water period (March through early April in most cases).

The NHESP does not establish a **physical, on-the-ground vernal pool boundary during the certification process**. The WPA allows a project proponent to submit an opinion as to the extent of a CVP that is based upon a total run-off from a statistical 2.6 inch rainfall in 24 hours, but it should also include groundwater inputs to the basin at the beginning of the spring amphibian breeding season (see DEP DWW Policy 85-2). The DEP has stated in its policies that groundwater inputs should not be overlooked in these calculations because otherwise it could result in a total volume considerably smaller than the basin holds in any given spring.

How Can Vernal Pools Be Certified?

The NHESP administers the official vernal pool certification program and accepts certain biological and physical documentation submitted by outside scientists, resource managers, and other interested

individuals and organizations as the basis for the possible certification of vernal pool habitat. People interested in vernal pool certification should:

1. Download the NHESP *Guidelines for the Certification of Vernal Pool Habitat, March 2009* and the Vernal Pool Field Observation Form from www.nhesp.org. Please *read and understand the Guidelines before* collecting data and completing the form.

Certification is based on evidence that a pool provides important wildlife habitat consistent with 'Vernal Pool Habitat' in the WPA. Wildlife that use vernal pools are generally divided into two groups:

Obligate Species: vertebrate and invertebrate species that require vernal pools for all or a portion of their life cycle and are unable to successfully complete their life cycle without vernal pools.

Facultative Species: vertebrate and invertebrate species that frequently use vernal pools for all or a portion of their life cycle, but are able to successfully complete their life cycle in other types of wetlands.

Obligate species serve as *direct* indicators of vernal pool habitat because they require at least two months of flooded conditions and the absence of established, reproducing fish populations. When breeding evidence of obligate species is documented, it is not necessary to prove there is no established fish population.

Facultative amphibian species serve as *indirect* indicators of vernal pool habitat. Documentation of the appropriate facultative amphibian species does not ensure certification; evidence documenting there is no established, reproducing fish population must also be submitted. Additionally, the physical documentation (e.g., pool photos, descriptive notes) submitted must demonstrate the pool possesses the physical characteristics necessary to sustain a vernal pool environment (e.g., depth, size, vegetation).

2. Fill out a Vernal Pool Field Observation Form. Attach the physical and biological documentation and the maps as required by the *Guidelines*. Submit the packet to the NHESP for review.

The NHESP does not field visit pools prior to certification but relies on the submittal of accurate information and clear documentation of both the biological and physical evidence. If the documentation is inconclusive additional documentation may be requested or the pool may not be certified. Once it is determined that a vernal pool meets the certification criteria in the *Guidelines*, it will be officially certified by NHESP and the observer, conservation commission, DEP regional office, and landowner (if known) are formally notified.

The NHESP strongly recommends that landowner permission be obtained prior to collecting certification documentation. It is the sole responsibility of an individual providing vernal pool certification information to ensure that all activities associated with gathering said information comply with law.

Certified Vernal Pool Maps

- **GIS Data layers** of Certified Vernal Pools (updated biannually) and Potential Vernal Pools are available through the MassGIS Online Data Viewer ('Oliver') at www.mass.gov/mgis/mapping.htm → "Oliver" - The MassGIS Online Data Viewer → Launch Oliver or Install Java → Login → Zoom to area of interest → Add Layers → Conservation/Recreation → Natural Heritage Data → NHESP Certified Vernal Pools → Potential Vernal Pools.
- NHESP's town-wide '**Priorty Habitat & Estimated Habitat**' maps (published biennially) include CVPs and are available for public viewing at the offices of conservation commissions, planning boards, and building inspectors, and at MassGIS at www.mass.gov/mgis/cvp.htm.
- NHESP's **Massachusetts Natural Heritage Atlas** (updated biennially) is available at most town libraries and from NHESP at cost.

NHESP - Vernal Pool Certification
MA Division of Fisheries & Wildlife
1 Rabbit Hill Road
Westborough, MA 01581
For Certification Questions call 508-389-6360



Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

March 2009

NHESP Guidelines for the Certification of Vernal Pool Habitat

II. CERTIFICATION CRITERIA & DOCUMENTATION REQUIREMENTS

Please read and understand the **CERTIFICATION CRITERIA** and **DOCUMENTATION REQUIREMENTS** in the following sections before submitting Vernal Pool Field Observation Form(s) and supporting documentation.

Certification Criteria

Vernal pool certification is possible only after the appropriate **biological** AND **physical** criteria have been met and documented by one of the two certification methods described below:

A) OBLIGATE SPECIES METHOD

Biological Criteria

- Breeding evidence of obligate amphibian species OR the presence of fairy shrimp (see table on pg. II.2).

AND

Physical Criteria

- Evidence of a pool with no permanently flowing outlet (i.e., photo of the pool holding water).

B) FACULTATIVE AMPHIBIAN SPECIES METHOD

Biological Criteria

- Breeding evidence of 2 or more facultative amphibian species (see table on pg. II.2).

AND

Physical Criteria

- Evidence of a pool with no permanently flowing outlet (i.e., photo of the pool holding water).

AND

- Evidence that there is no established, reproducing fish population (i.e., photo of the pool dry).

The **Obligate Species Method** is the most direct way to certify a vernal pool. If documentation submitted is inconclusive, or if the physical documentation appears to show inappropriate habitat, the pool may not be certified or additional documentation may be requested. Since **facultative amphibians** can use a variety of wetland habitats it is especially important when using this method that the pool photos demonstrate the physical characteristics necessary to sustain a vernal pool environment (e.g., depth, size, vegetation). If there is any doubt, the NHESP may require additional evidence.

THE NHESP STRONGLY RECOMMENDS THAT LANDOWNER PERMISSION BE OBTAINED PRIOR TO COLLECTING CERTIFICATION DOCUMENTATION. IT IS THE SOLE RESPONSIBILITY OF AN INDIVIDUAL PROVIDING VERNAL POOL CERTIFICATION INFORMATION TO ENSURE THAT ALL ACTIVITIES ASSOCIATED WITH GATHERING SAID INFORMATION COMPLY WITH LAW.

www.mass.gov/nhesp



Natural Heritage & Endangered Species Program

1 Rabbit Hill Road, Westborough, MA 01581 Tel: (508) 389-6360 Fax: (508) 389-7890

Help Save Endangered Wildlife!

Contribute to the Natural Heritage & Endangered Species Fund.

A. Obligate Species Method ~ Biological and Physical Criteria & Evidence Accepted for Certification:

BIOLOGICAL CRITERIA		PHYSICAL CRITERIA	
Obligate Species Accepted - one or more of the following	Breeding Evidence Accepted - one or more of the following from at least one obligate species must be documented by photos, video, or audio (chorusing)	Physical Features Accepted	Physical Evidence Accepted
Wood frog <i>(Lithobates sylvaticus)</i> Spotted salamander <i>(Ambystoma maculatum)</i> Blue-spotted salamander * <i>(A. laterale)</i> Jefferson salamander * <i>(A. jeffersonianum)</i> Marbled salamander * <i>(A. opacum)</i>	Adult wood frogs - <ul style="list-style-type: none"> Full chorus (calls constant, continuous, & overlapping) - map location of chorus (pool) and site where recording was taken; <u>OR</u> 5+ mated pairs <u>OR</u> Adult salamanders - <ul style="list-style-type: none"> Congressing <u>OR</u> Spermatophores <u>OR</u> Marbled salamander attending a nest <u>OR</u> Egg masses - <ul style="list-style-type: none"> TOTAL of 5 egg masses - any combination, regardless of species <u>OR</u> 1 egg mass of a MESA-listed salamander or nest and eggs of marbled salamander <u>OR</u> Larvae - <ul style="list-style-type: none"> Any number of larvae <u>OR</u> Transforming juveniles - <ul style="list-style-type: none"> Still in pool with tail and/or gill remnants. 	Pool with no permanently flowing outlet.	Good quality photos or video of the entire pool holding water including any inlets or outlets (e.g., any streams, culverts, etc.). See 'Tips for Photographing Evidence Required for Vernal Pool Certification' on page 4.
Fairy shrimp <i>(Anostraca: Eubrachipus)</i>	Photo or video of adult specimen(s).	Same as above.	Same as above.

*Species listed under the Massachusetts Endangered Species Act Regulations (MESA) (321 CMR 10.90). If observed, please document and fill out a *Rare Animal Observation Form* (available at www.nhesp.org) to be submitted to the NHESP.

B. Facultative Amphibian Species Method ~ Biological and Physical Criteria & Evidence Accepted for Certification:

BIOLOGICAL CRITERIA		PHYSICAL CRITERIA	
Facultative Species Accepted - two or more of the following	Breeding Evidence Accepted - one or more of the following from at least two facultative species must be documented by photos, video, or audio (chorusing)	Physical Features Accepted	Physical Evidence Accepted
Spring peeper <i>(Pseudacris crucifer)</i> Gray treefrog <i>(Hyla versicolor)</i> American toad <i>(Anaxyrus americanus)</i> Fowler's toad <i>(Anaxyrus fowleri)</i>	Adults – <ul style="list-style-type: none"> Full chorus (calls constant, continuous, & overlapping) - map location of chorus (pool) and site where recording was taken; <u>OR</u> 5+ mated pairs <u>OR</u> Egg masses – <ul style="list-style-type: none"> Any number of egg masses <u>OR</u> Larvae – <ul style="list-style-type: none"> Any number of larvae <u>OR</u> Transforming juveniles – <ul style="list-style-type: none"> Still in pool with tail remnants. 	Pool with no permanently flowing outlet. <u>AND</u> Evidence that there is no established, reproducing fish population.	Good quality photos or video of the entire pool holding water including any inlets or outlets (e.g., any streams, culverts, etc.). <u>AND</u> Good quality photos or video of the entire pool dry. See 'Tips for Photographing Evidence Required for Vernal Pool Certification' on page 4.

Documentation Requirements

Documentation of the biological and physical evidence listed in the **CERTIFICATION CRITERIA** (pg. II.2, A and/or B) must be submitted for official certification of a vernal pool. Photographic prints are the preferred method of documentation but video of evidence or audio recording of chorusing frogs or toads are acceptable. Field notes are encouraged and helpful, but are not accepted as the sole source of evidence.

A. BIOLOGICAL DOCUMENTATION – Photos, Video, or Audio of Amphibian Breeding Evidence or Fairy Shrimp:

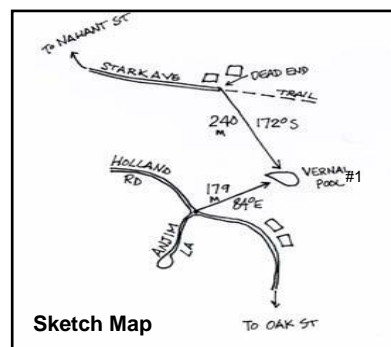
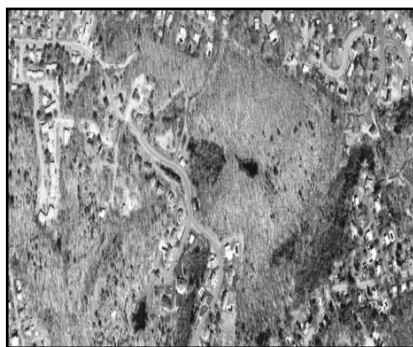
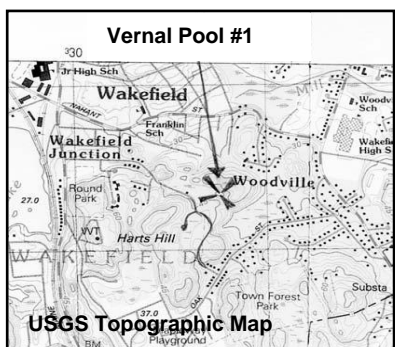
- Photos, video, or audio must be of suitable quality (resolution, focus, clarity, indicators of scale (e.g., coin, lens cap, ruler)) so species identification can be confirmed. Please see *“Tips for Photographing Evidence Required for Vernal Pool Certification”* (pg. II.4).
- Photos, video, or audio must be labeled with pool location (town), pool name or tracking # (e.g. VP#1, Elm St. VP), date taken, & observer's name.
- Each individual egg mass or mated pair required for certification (e.g., all 5 wood frog egg masses) must be photographed or videotaped. If more than the minimum required number is observed, photo the required number, and count or estimate the total number and indicate this on the Vernal Pool Field Observation Form.
- Only audio tapes of full amphibian choruses (calls are constant, continuous & overlapping) are accepted (see Protocol Description at: <http://www.pwrc.usgs.gov/naamp/>) provided the location of chorusing (i.e., exact pool location) and the location of your recording site are accurately mapped.
- Documentation must be collected within 3 years prior to submittal to NHESP.

B. PHYSICAL DOCUMENTATION – Photos or Video of Pool Holding Water and Dry:

- Photograph(s) or video of the entire pool including any inlets or outlets (e.g., any streams, culverts) are required and must be of suitable quality (resolution, focus, scale) so pool features can be reliably assessed. One or more identifying landmarks (e.g., stand of trees, stumps, boulders, rock walls, etc.) to authenticate the pool location must be included. If unable to photograph the entire pool in a single photo, take a “panorama” series. Please see *“Tips for Photographing Evidence Required for Vernal Pool Certification”* (pg. II.4).
- Photo(s) or video must be labeled with pool location (town), pool name or tracking # (e.g. VP#1, Elm St. VP), date taken, & observer's name.
- Documentation must be collected within 3 years prior to submittal date to NHESP.

C. MAPPING REQUIREMENTS - THREE types of maps are required for certification and the pool locus must be clearly delineated and identified (your pool name or tracking #) on each map:

1. **U.S. Geological Survey topographic map** (copy) (1:24,000 or 1:25,000 scale) - topos can be downloaded from MassGIS at www.mass.gov/mgis/mapping.htm - scroll down to “Browser Based Mapping Applications”, then to “Quick Links” and select “USGS Topographic Maps”.
2. **Color orthophotos** (copy) (1:12,000 scale or better) - orthophotos can be downloaded from MassGIS at www.mass.gov/mgis/mapping.htm - scroll down as described above and select “Color Ortho Imagery 2005”.
3. **One additional map or form of location data** to help clarify the pool's location, as follows:
 - **Sketch map** - directions and distances from landmark(s), readily identifiable in the field, should be marked and clearly described on the map; if submitting a breeding chorus, the location of the chorus (pool) and recording site can be delineated on this map, OR
 - **Assessors map** - available from local tax assessor's offices, include the map and parcel #'s, OR
 - **Professional survey, OR**
 - **GPS longitude/latitude coordinates.**



Tips for Photographing Evidence Required for Vernal Pool Certification¹

The biological and physical evidence required for vernal pool certification must be documented by photos and/or video (or audio for frog/toad chorusing) of suitable quality (resolution, focus, indicators of scale) so species identification can be confirmed and pool features be reliably assessed. Because this often requires close-up photographs in generally poor lighting conditions, some general “**rules of thumb**” are included below to help you produce good photos/video:

- Cameras that compensate for low light conditions and close-up focusing provide the best photos; most digital cameras are capable of this but fixed focus cameras (i.e., “point and shoot”) typically do not focus closer than 2-4 feet (if used carefully they usually produce suitable photos).
- Hold the camera as steady as possible or use a tripod to avoid blurred images.
- Take several photos, or extra photos using different backgrounds and light settings, to be certain you end up with a clear photo.
- Process or view your photos immediately so you can return to the pool for better photos, if needed.

POOL Photos (Physical Evidence)

Photographs of the vernal pool need to be clear and show as much of the pool as possible.

- They must include a landmark to authenticate the pool location (e.g., stand of trees, stump, a boulder, rock wall, etc.).
- If unable to photograph the entire pool in a single photo, try to photograph the pool in a “panorama” series.
- When photographing pools ‘holding water’, also include photos of any inlets or outlets (e.g., streams, culverts) observed entering or leaving the pool.

ORGANISM Photos (Biological Evidence)

Biological evidence from the pool needs to be documented by photographs/video that confirms **amphibian breeding** (i.e., mated pairs of frogs/toads, congressing salamanders, spermatophores, egg masses, larvae, or transforming juveniles) or the presence of **fairy shrimp** (see Certification Criteria for specific requirements).

- **Mated pairs** of wood frogs and **congressing salamanders** typically need to be photographed at night. A flash can sometimes illuminate the water surface, impeding the view underwater, so a flashlight can be used to illuminate subjects underwater.
- **Spermatophores** are found on the bottom of the pool. Reflections on the surface can sometimes block underwater images and can be eliminated in two ways: 1) position an object (or person) to cast a shadow over the area you are photographing, or 2) use a polarizing filter on your camera.
- To photograph **egg masses**, place a light-colored background (e.g., yellow foam meat tray, Frisbee, white board) behind the masses so they are clearly visible against the dark water and more easily identifiable; they should not be removed from the water and only minimally disturbed. Also try and include something in the photo for scale (e.g., backing tray with measurement markings, a hand, net, etc.).
- **Larvae** and **fairy shrimp** usually need to be briefly removed from the pool to be photographed. Place larvae or fairy shrimp in a small container (e.g., margarine tub, foam meat tray, clear plastic baggie) *filled with pool water* or photograph in your hand.
 - a. **Salamander larvae** - place in container filled with pool water and photograph from above to clearly show the gills and, if possible, a side view of the body.
 - b. **Wood frog tadpoles** - photograph in or out of water but positioned to show the belly (i.e., gut coiling) and gold flecking over the belly and sides.
 - c. **Fairy shrimp** - place in white or clear container filled with pool water and photograph.
 - d. **Transforming juveniles** – photograph so tail and/or gill remnants are visible; photos should be taken from above and/or a side view for proper identification.

¹Based on *Wicked Big Puddles: A Guide to the Study and Certification of Vernal Pools*, 3rd Edition (March 2003) by Leo P. Kenney, Vernal Pool Association (www.vernalpool.org) and is used with permission.

SPECIES *State-listed species	Dates	COURTING ADULTS	Dates	SPERMATOPHORES	Dates	# EGG MASSES	Dates	SALAMANDER LARVAE	Dates	TRANSFORMING JUVENILES
Spotted salamander										
Blue-spotted salamander *										
Jefferson salamander *										
Marbled salamander *										
Unidentified Mole salamander										
SPECIES	Dates	# MATED PAIRS (≥ 5 pairs)	Dates	Full Chorus (calls continuous & overlapping)	Dates	# EGG MASSES	Dates	TADPOLES	Dates	TRANSFORMING JUVENILES
Wood frog										
TOTAL(S)										

Instructions (continued)

4. Certification by the Facultative Amphibian Method - provide photo, video, or audio (chorusing) of the required breeding evidence and photo(s) or video of the pool holding water **AND** dry.

6. Provide information to help distinguish the pool & assess its features.

7. All required biological & physical evidence must be documented by good quality photos, video, or audio.

8. Indicate the 3 required maps submitted.

4. Biological Evidence: *Facultative Amphibians*

Breeding evidence¹ of ≥ 2 species must be documented by photos, video, or audio.

BREEDING AMPHIBIANS	DATE OBSERVED month/day/year	BREEDING EVIDENCE ¹ OBSERVED
Spring peeper		
Gray treefrog		
American toad		
Fowler's toad		

Breeding evidence¹ includes: full breeding choruses (call constant & overlapping), ≥ 5 adults in amplexus, any # of egg masses, tadpoles, and/or transforming juveniles in pool.

5. Rare Wetland Species

Were MESA-listed species observed using this pool?

☐ Yes ☐ No

If yes, please submit a Rare Animal Observation Form with photo & map to the NHESP (available at www.nhesp.org).

6. Description of Pool and Surroundings ~ Please describe to the best of your ability and knowledge.

Dimensions (please include measurements or estimates):

Approx. Length: _____ Approx. Width: _____ Approx. Maximum Depth: _____

Describe distinctive features (roads, structures, boulders, foot trails, vegetation types, etc.) which are visible from or near the pool that would help someone recognize it.

Origin of the pool (check): ☐ Natural depression ☐ Human-made pool/ditch ☐ Created wetland/pool ☐ Other or Unknown (describe) _____

The pool's hydroperiod is most likely: ☐ Seasonal (drying out in most years) ☐ Semi-permanent (drying partially in most years) ☐ Permanent

Describe any inlet or outlets to/from the pool and their permanence (e.g., streams, culverts, etc).

Land use in vicinity of pool (approx. 100 ft from pool edge – check all that apply): ☐ upland forest ☐ forested wetlands ☐ emergent marsh/scrub-shrub wetland
☐ agricultural/grassland/meadow ☐ residential/commercial ☐ other _____

7. Documentation Submitted – Label with pool name or tracking #, town, date taken, observer's name.

☐ Photo(s) ☐ Video ☐ Audio
☐ Obligate Species ☐ Facultative Species ☐ Pool Holding Water ☐ Dry Pool

9. Property Owner Information – Landowner information is optional & is available from local tax assessor's offices.

Name _____

Address _____

Town _____ State _____ Zip _____ Assessors Map/Pcl# _____ (if known)

10. Observer Information & Signature – Must be filled out & signed.

Name _____

Address _____

Town _____ State _____ Zip _____

Telephone _____ E-mail _____

I hereby certify under the pains and penalties of perjury that the information contained in this report is true and complete to the best of my knowledge.

Signature _____ Date _____

Signature of Adult, if Observer is under 18 years of age _____

All submissions and supporting documents will be retained by the NHESP and, with the exception of information for MESA-listed species and the identity of minors, are available to interested parties under the Public Records Law.

8. Maps Submitted

Pool locus must be delineated & identified with your pool name or tracking #.

3 REQUIRED MAPS:

☐ USGS Topographic Map - 1:24,000 or 1:25,000 or better
☐ Color orthophoto - 1:12,000 or better

and ≥ 1 of the following:

☐ Assessor's map (Map and Plot #)
☐ Professional survey
☐ Sketch map - with directions and distances from permanent landmarks
☐ GPS longitude/latitude coordinates:
 Latitude = _____
 Longitude = _____

SEND COMPLETED, SIGNED FORM & SUPPORTING DOCUMENTATION TO:

NHESP - Vernal Pool Certification
MA Division of
Fisheries & Wildlife
1 Rabbit Hill Rd.
Westborough, MA 01581

For questions call 508-389-6360

New Jersey's Vernal Pools

by Jason Tesaro
Assistant Zoologist



What Are Vernal Pools?

Vernal pools are confined wetland depressions, either natural or man-made, that hold water for at least two consecutive months out of the year, and are devoid of breeding fish populations. Here in New Jersey, the rural portions of the Skylands, Piedmont, and Coastal Plain landscapes are home to the majority of our vernal pools. These unique ecosystems provide habitat to many species of amphibians, insects, reptiles, plants, and other wildlife.

Vernal pools come in an array of forms: isolated depressions within upland forests, seasonally flooded meadows, floodplain swamps, abandoned gravel pits or quarries, and even derelict swimming pools. However, no matter what the structure or genesis of the pool is, all vernal pools either dry out completely or draw down to very shallow levels that are unsuitable for fish. Fish are highly predatory on amphibian eggs and larvae. Over the course of evolution, several species of salamanders and frogs exploited these fish-less water bodies. Today, these species exhibit "hard-wired" instincts and behaviors that are geared exclusively towards fish-free vernal habitats.

Amphibians that are dependent upon vernal pools are known as "[obligate vernal pool breeders](#)". In New Jersey there are seven species - two frogs and five salamanders - that fit this category. Another 14 species of New Jersey's amphibians also use vernal pools for breeding, but unlike the 'obligate' species, these species can successfully reproduce in habitats that contain fish. These species are known as "[facultative vernal pool breeders](#)".

Obligate and Facultative Vernal Pool Breeding Amphibians

Obligate Vernal Pool Breeding Amphibians:

Eastern tiger salamander (*Ambystoma t. tigrinum*) **ENDANGERED**
Marbled salamander (*A. opacum*) **SPECIAL CONCERN**
Spotted salamander (*A. maculatum*)
Jefferson salamander (*A. jeffersonianum*) **SPECIAL CONCERN**
Blue-spotted salamander (*A. laterale*) **ENDANGERED**
Wood frog (*Rana sylvatica*)
Eastern spadefoot toad (*Scaphiopus holbrookii*)

Facultative Vernal Pool Breeding Amphibians:

Green frog (*Rana clamitans melanota*)
Bullfrog (*Rana catesbeiana*)
Pickerel frog (*Rana palustris*)



Southern leopard frog (*Rana utricularia*)
 Carpenter frog (*Rana virgatipes*) **SPECIAL CONCERN**
 Northern spring peeper (*Pseudacris crucifer*)
 Northern cricket frog (*Acris crepitans*)
 New Jersey chorus frog (*Pseudacris triseriata kalmii*)
 Upland chorus frog (*Pseudacris triseriata ferarium*)
 Northern gray treefrog (*Hyla versicolor*)
 Southern gray treefrog (*Hyla chrysocelis*) **ENDANGERED**
 Pine barrens treefrog (*Hyla andersonii*) **ENDANGERED**
 Four-toed salamander (*Hemidactylium scutatum*)
 Long-tailed salamander (*Eurycea l. longicauda*) **THREATENED**

In addition to amphibians, there are several reptiles that inhabit vernal pools on a seasonal basis, primarily to eat the eggs and larvae of amphibians:

Wood turtle (*Clemmys insculpta*) **THREATENED**
 Spotted turtle (*Clemmys guttata*) **SPECIAL CONCERN**
 Mud turtle (*Kinosternon subrubrum*)
 Eastern painted turtle (*Chrysemys p. picta*)
 Common snapping turtle (*Chelydra s. serpentina*)

Vernal Pool Protection in New Jersey

New Jersey has recently adopted legislation to protect vernal pools. Although the NJ Freshwater Wetlands Protection Act has been in place since 1989, it has done little to protect vernal pools because wetlands smaller than 1 acre (many vernal pools in NJ are ~ 0.25 acre) are exempt from the regulatory protection. Thus prior to the rule, vernal pools could be filled, drained, or modified with a general permit. The new vernal pool (or 'vernal habitat,' as it is known in regulatory language) regulations protect vernal pools that are known meet the following certification criteria:



- Occurs in a confined basin depression without a permanently flowing outlet.
- Provides documented habitat for obligate or facultative vernal habitat species (these species are identified in N.J.A.C. 7:7A, Appendix 1).
- Maintains ponded water for at least two continuous months between March and September of a normal rainfall year.
- Free of fish populations throughout the year, or dries up at some time during a normal rainfall year.

For further information on New Jersey's vernal pool certification process go to:

www.state.nj.us/dep/landuse/announce/announce.html

The Vernal Pool Survey Project

Through grants provided by the U.S. Fish and Wildlife Service and the DEP's Division of Science, Research and Technology, the ENSP initiated the Vernal Pool Survey Project in November of 2000. The main objectives of this project are to map and inventory vernal pools

statewide and determine the status, range and distribution of [obligate \(dependent upon\) vernal pool amphibians](#). Because staff resources are limited, the ENSP is relying primarily on trained volunteers to conduct herptile surveys at vernal pools. As data is collected on vernal pools, the information is integrated into the land use regulatory databases of the Department of Environmental Protection to implement vernal pool protection.

A Call for Vernal Pool Volunteers

This coming March we will hold our second set of vernal pool training seminars, which will include both a lecture covering vernal pool ecology, protection, and species identification, as well as a field trip to a vernal pool to demonstrate survey techniques. At each training, volunteers can select a survey area, which can be either specific pools or tracts of land containing complexes of pools. ENSP staff will provide maps of selected areas, data collection sheets and a variety of educational materials to help you locate the pool and identify the various amphibians and reptiles you may encounter. Survey efforts will be focused between February and June, which is when amphibian activity at vernal pools is at its peak.



Because the protection of vernal pools depends upon the documentation of certain amphibians and reptiles, we encourage anyone who cares about wildlife and these sensitive, biologically rich wetland habitats to become a volunteer. We at the ENSP can't do it alone! Please stay tuned to this web page to see when and where this year's seminars will take place.

How Does the DEP Implement Vernal Pool Protection?

The primary way in which DEP's [Land Use Regulation Program](#) (LURP) is implementing vernal pool protection is through cross-referencing land use permit applications with mapping of certified vernal pools. When a permit is applied for, LURP staff will review maps showing all locations of certified vernal pools.



Projects proposed in vernal pools may need to be redesigned to avoid adversely impacting them or the permit may potentially be denied. However, this protection can only be applied to vernal pools that have been certified. Thus, vernal pool protection in New Jersey is highly dependent upon the generation of a comprehensive map of all the certified vernal pools in the state.

The other method in which DEP intends to protect vernal pools is through Landscape Mapping. This statewide digital mapping, available online since fall 2001, contains critical habitat for all of New Jersey's endangered, threatened, and special concern animals. The intended purpose of this mapping is to guide sensible land use planning at the state, county and municipal level. Once

mapped and inventoried, vernal pools will be incorporated as a data layer into these critical habitat maps.

Identifying Vernal Pools - <http://www.dbcrrsa.rutgers.edu/ims/vernal>

The critical process of locating potential vernal pools for survey begins at the Center for Remote Sensing and Spatial Analysis (CRSSA) lab at Cook College, Rutgers University. Using a collection of computer-aided analysis techniques and field surveys, GIS (Geographic Information Systems) analysts have been delineating potential vernal pool locations in New Jersey. The Center has compiled a number of GIS abiotic data layers (including soils, wetlands, glacial sediment, and bedrock geology information) to be used in conjunction with digital elevation models and color aerial photographs to identify on-screen regions where vernal pools are likely to occur. Vernal pool likelihood is based on existing vernal pool locations. Various GIS methods have been used to identify and rank areas in each data layer based on vernal pool occurrence. This procedure, which seems to identify areas where large vernal pools are likely to occur, is followed by intensive on-screen scanning of 1-meter digital aerial photographs used to locate smaller potential vernal pool locations.



While this research is performed, an interactive Internet mapping site has been developed to enable volunteers and the public to locate potential vernal pools and, in general, introduce those interested to the project. The site features digital aerial photographs as well as other mapping resources aimed at assisting users unfamiliar with aerial imagery. Find this exciting vernal pool information at <http://www.dbcrrsa.rutgers.edu/ims/vernal>.

Initial efforts by CRSSA focused on the northern Ridge and Valley and Highlands (Skylands) regions, with 840 and 728 pools identified, respectively. Since this early estimate, an additional 1,580 potential pools have been identified in the north. The Piedmont province boasts 2,043 possible pools. In the south of the state, the Coastal Plain may be home to 6,853 pools, 4,947 of which are in the Outer Coastal Plain and the remainder in the Inner Coastal Plain. Fieldwork begins with a “groundtruthing” process to find the potential vernal sites and see if they are actually vernal. ENSP biologists, CRSSA staff, and volunteers armed with topographic maps and handheld GPS (Global Positioning System) units have surveyed well over 500 sites across the state. The success rate for groundtruthing is high, with nearly 80% accuracy.

Photo Credits:

Photo Credits:

Marbled salamander - Tony McBride

Pine Barrens Treefrog - Tony McBride

Spotted salamander (juvenile) - Tony McBride

All vernal pools: NJDF&W-ENSP

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Vernal Pools

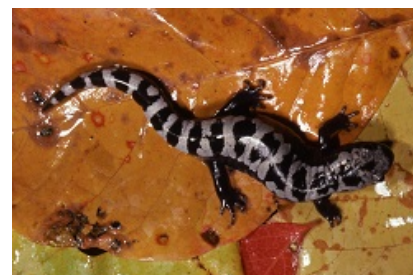
Vernal Pool Animals

Vernal pools are unique wetland habitats where some of the state's most recognizable reptiles and amphibians can be found. Vernal pools are small, shallow wetlands that do not have a permanent inlet or outlet of water flow. They fill in the fall or spring when rain or snowmelt drains into shallow depressions, and can retain water due to non-porous soils. Vernal pools only hold water for part of the year and experience a drying phase every year or every few years, usually in late summer.

Because their aquatic habitats are temporary, animals that depend on seasonal pools are adapted for both aquatic and terrestrial habitats at different life stages. These animals also benefit from the dry phase, because it prevents year-round water-dependent animals like fish from living in the pools. Fish prey heavily on eggs and larvae, and without seasonal pools some species would not be able to compete and reproduce. Although there are obvious challenges for an animal using an aquatic environment that disappears for part of the year, the benefit is a habitat free from predation by fish.



Mixed shrub herb, Mt. Cydonia. Credit: Betsy Leppo



Marbled salamander (*Ambystoma opacum*)
Credit: Jack Ray

Indicator Species

Vernal pools support wildlife that would not be successful in permanent waters. Animals that require temporary aquatic habitats for reproduction and development of their young are called vernal pool indicator species. Some sources refer to them as vernal pool obligates. Pennsylvania's large and secretive mole salamanders are all vernal pool indicators, along with two other frogs and several species of small freshwater crustaceans. These animals use seasonal pools almost exclusively during some stage of their life cycle.

Pennsylvania's Vernal Pool Indicator Animals

- Marbled Salamander (*Ambystoma opacum*)
- Spotted Salamander (*Ambystoma maculatum*)
- Jefferson Salamander (*Ambystoma jeffersonianum*)
- Blue-spotted Salamander (*Ambystoma laterale*)
- Wood Frog (*Lithobates sylvaticus*)
- Eastern Spadefoot (*Scaphiopus holbrookii*)
- Fairy Shrimp (*Eubrachyus* spp.)
- Clam Shrimp: Euroamerican clam shrimp (*Limnadia lenticularis*), diversity clam shrimp (*Eulimnadia diversa*)



Fairy shrimp (*Eubrachyus vernalis*). Credit: Jack Ray

Vernal pool indicators have developed different strategies for coping with the periodic drying of their wetland habitats. Some amphibian species travel to vernal pools to lay their eggs shortly after the first spring rains. Other species, such as fairy shrimp and clam shrimp, leave eggs in the bottom of the pool that can withstand drying out in the summer and freezing in the winter. Young vernal pool invertebrates and amphibians (most are called larvae) must grow quickly once they hatch from the egg in the spring. As spring turns to summer, water evaporates and the pool gradually shrinks in size until it disappears. The larvae must transform into terrestrial adults before the pool dries up.

Eighty five percent of vernal pool amphibians return each year to breed in the pond where they were born (Colburn, 2004). They will bypass other pools that provide suitable habitat and cross obstacles such as roads and other forms of human disturbance in order to return to the pool of their birth. This fidelity by individual amphibians to a particular pool is an important consideration when determining how to protect a species as a whole.

Facultative Species

Many animals take advantage of the resources vernal pools provide, but do not require them for survival. These 'facultative species' may breed in seasonal pools, or simply use them as a place to forage for food and find shelter.

Facultative species have physical or behavioral adaptations that allow them to successfully utilize seasonal pools but they can also survive in permanent wetland habitats. Some examples include the red spotted newt, northern spring peeper, American toad, wood turtle, and spotted turtle.



A diagnostic 'X' crosses the back of a spring peeper. Credit: Charlie Eichelberger

After the Pool Dries

Adult and recently metamorphosed invertebrates and amphibians will leave the vernal pool and head into the surrounding landscape. Although they need seasonal pools to reproduce and for their young to grow, adults spend the summer, fall, and winter in the uplands around the pools where they find food, shelter, and overwintering sites.

While their exact habitat needs vary, all vernal pool species benefit when a pool and its surrounding uplands (500-1,000 feet or more) are naturally vegetated and have a minimum of human disturbances.



Woody debris on the ground creates foraging sites where amphibians can find food and also provides protection from the heat of summer and cold of winter. Credit: Betsy Leppo



Adult spotted salamander (*Ambystoma maculatum*). Credit: Charlie Eichelberger



PNHP is a partnership between The Department of Conservation and Natural Resources, the Western Pennsylvania Conservancy, the Pennsylvania Game Commission, and the Pennsylvania Fish and Boat Commission.

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APPENDIX B

Vernal Pool Data Sheets

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/08/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-A Field Map Sheet Number: 1 Nearest Road(s): Powerline Rd

Property Owner Information (Name): GEORGE MATHES

Estimated Pool Depth (inches): 3-5 Approximate Pool Length (feet): 40 Approximate Pool Width (feet): 15

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: None apparent

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult wood frog seen in pool, adult green frog seen on edge of pool

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frog (adult)

Additional Notes:

Just south of an open agricultural field
in a narrow portion of forest

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/08/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-B Field Map Sheet Number: 3 Nearest Road(s): S LIME KILN RD

Property Owner Information (Name): ALBION ROD & GUN CLUB INC

Estimated Pool Depth (inches): 3-7 Approximate Pool Length (feet): 57 Approximate Pool Width (feet): 45

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: No

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Potential for amphibian breeding habitat, but none observed at time of survey

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		May connect to PFO wetland to east at some times of year
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool		✓	

Additional Notes:

Adult unidentified frogs and gray treefrogs observed in forested wetland ~700 feet to east.

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/09/2018 Observer Name(s): SAMUEL BEGUIN
 Vernal Pool ID: VP-C Field Map Sheet Number: 11 Nearest Road(s): CUSHING RD / OAK ORCHARD RD
 Property Owner Information (Name): ALVIN SMITH
 Estimated Pool Depth (inches): 5-8 Approximate Pool Length (feet): 40 Approximate Pool Width (feet): 20
 Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____
 Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)
 Inlets or Outlets Present?: May connect to ephemeral stream/ditch to southeast
 Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Potential for amphibian breeding habitat, though none observed at time of survey

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		May have some connectivity with nearby stream during some times of year, likely not long
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttreassing/watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool		✓	

Additional Notes:

Agricultural field immediately to south
East of proposed turbine T13

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/09/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-D Field Map Sheet Number: 11 Nearest Road(s): OAK ORCHARD RD

Property Owner Information (Name): ALVIN SMITH

Estimated Pool Depth (inches): 5-7 Approximate Pool Length (feet): 50 Approximate Pool Width (feet): 40

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: No, though may connect to nearby forested wetland

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult wood and green frogs observed in pool

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		May connect at some times to nearby forested wetland to east
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttreassing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frog (adult)

Additional Notes:

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/09/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-E Field Map Sheet Number: 11 Nearest Road(s): OAK ORCHARD RD

Property Owner Information (Name): JUSTIN WEESE

Estimated Pool Depth (inches): 24-36⁺ Approximate Pool Length (feet): 300 Approximate Pool Width (feet): 50

Pool Origin (circle): Natural depression ☒ Human-made pool/ditch ☐ Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) ☐ Semi-permanent (partial drying most years) ☐ Permanent (does not dry) ☒

Inlets or Outlets Present?: May drain to an ephemeral stream/ditch to west

Adjacent Land Use (circle): ☒ Upland Forest ☒ Forested Wetland ☒ Agricultural Fields ☐ Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult green and pickerel or leopard frogs along southern edge; tadpoles observed in shallows; spring peepers heard calling nearby

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		Though may connect to an ephemeral stream/ditch to west
Standing water pools present	✓		Large and deep > 3 ft in places
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		adult frogs and tadpoles

Additional Notes:

Quite deep, substantial in size; may be a casted pond, but provides amphibian breeding habitat; surrounded by forest; large forested wetland ~500 ft to northeast

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/09/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-F Field Map Sheet Number: 11 Nearest Road(s): OAK ORCHARD RD

Property Owner Information (Name): JUSTIN WEESE

Estimated Pool Depth (inches): 5-8 Approximate Pool Length (feet): 80 Approximate Pool Width (feet): 30

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: No, but likely connects at times to nearby stream and wetland

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Many adult frogs along edges

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		Likely connects to nearby stream and larger forested wetland sometimes
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		many adult frogs along edges

Additional Notes:

Large forested wetland nearby to northeast/northwest

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/10/2018 Observer Name(s): SAMUEL BEGUIN

Vernal Pool ID: VP-G Field Map Sheet Number: 18 Nearest Road(s): OAK ORCHARD RD (98)

Property Owner Information (Name): JOHN R. BATCHELLOR

Estimated Pool Depth (inches): 36-48⁺ Approximate Pool Length (feet): 70 Approximate Pool Width (feet): 40

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): unknown

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: Yes, one outlet on eastern side, but constrained and likely ephemeral

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Spring peepers heard calling; adult frogs along edges

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	One outlet on eastern edge, but blocked with debris (no fish), likely ephemeral stream
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		Spring peepers, adult frogs

Additional Notes:

Likely associated with human activities, though unclear if entirely created, or natural depression; large and deep

Heritage Wind Energy Facility – Vernal Pool Survey Data SheetDate Observed: 5/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAUVernal Pool ID: VP-H Field Map Sheet Number: 21/22 Nearest Road(s): ROOT RDProperty Owner Information (Name): JUDITH T. FREEMAN TRUSTEstimated Pool Depth (inches): 4-8 Approximate Pool Length (feet): 200 Approximate Pool Width (feet): 30Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)Inlets or Outlets Present?: NoAdjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____**Biological Evidence (Obligate and/or Facultative Amphibians):**Potential for amphibian breeding habitat; none observed at time of survey

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool		✓	

Additional Notes:

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAU

Vernal Pool ID: VP-I Field Map Sheet Number: 16 Nearest Road(s): ROOT RD

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 5-8 Approximate Pool Length (feet): 200+ Approximate Pool Width (feet): 35

Pool Origin (circle): Natural depression ☐ Human-made pool/ditch ☒ Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) ☐ Semi-permanent (partial drying most years) ☒ Permanent (does not dry) ☐

Inlets or Outlets Present?: May connect to streams/ditches and larger forested wetland

Adjacent Land Use (circle): Upland Forest ☒ Forested Wetland ☒ Agricultural Fields ☐ Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult wood frogs in/along pool

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		<input checked="" type="checkbox"/>	Likely connects to larger forested wetland and ditch to east (though likely no fish)
Standing water pools present	<input checked="" type="checkbox"/>		
Sparse/no vegetation within pool	<input checked="" type="checkbox"/>		
Water-stained leaves present	<input checked="" type="checkbox"/>		
Moss trim lines/buttressing/watermarks on nearby trees	<input checked="" type="checkbox"/>		
Connectivity to adjacent upland forest habitat	<input checked="" type="checkbox"/>		
Biological indicator species present in or near pool	<input checked="" type="checkbox"/>		wood frogs (adults)

Additional Notes:

One of a series of vernal pools that were likely agricultural drainage ditches; have reverted to forest/forested wetland

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5 / 11 / 2018 Observer Name(s): SAMUEL BEGUIN, JOAN HECKLAU

Vernal Pool ID: VP-J Field Map Sheet Number: 16 Nearest Road(s): Root Rd

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 12⁺ Approximate Pool Length (feet): 250⁺ Approximate Pool Width (feet): 40

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: May connect to forested wetland and for ditch to east

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult wood frogs in/along pool

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	Likely connects to larger wetland to east
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frogs (adults)

Additional Notes:

One of a series of vernal pools that were likely agricultural drainage ditches; now forest / forested wetland

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAU

Vernal Pool ID: VP-K Field Map Sheet Number: 16 Nearest Road(s): ROOT RD

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 12+ Approximate Pool Length (feet): 250+ Approximate Pool Width (feet): 40+

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: Likely connects to forested wetland to east

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Wood frog adults

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frogs (adults)

Additional Notes:

Another former ag. ditch, now forest / forested wetland
(see VP-I and VP-J)

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: ⁰⁵ 7/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAW
 Vernal Pool ID: VP-L Field Map Sheet Number: 16 Nearest Road(s): ROOT RD

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 12+ Approximate Pool Length (feet): 360+ Approximate Pool Width (feet): 50+

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe):

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: Likely connects to forested wetland to east

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other:

Biological Evidence (Obligate and/or Facultative Amphibians):

Wood frog adults seen

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frogs (adults)

Additional Notes:

Another former ag. drainage ditch; now forest/forested wetland
 forested wetland

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAU

Vernal Pool ID: VP-M Field Map Sheet Number: 16 Nearest Road(s): ROOT RD

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 12⁺ Approximate Pool Length (feet): 250⁺ Approximate Pool Width (feet): 40-50

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: Likely connects to forested wetland to east

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Wood frog adults seen

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		wood frogs

Additional Notes:

Another prior farm drainage ditch;
now forest / forested wetland

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5 / 11 / 2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAU

Vernal Pool ID: VP-N Field Map Sheet Number: 16 Nearest Road(s): ROOT RD

Property Owner Information (Name): PAUL M. COUCH

Estimated Pool Depth (inches): 12+ Approximate Pool Length (feet): 200+ Approximate Pool Width (feet): 40+

Pool Origin (circle): Natural depression ☐ Human-made pool/ditch ☒ Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) ☐ Semi-permanent (partial drying most years) ☒ Permanent (does not dry) ☐

Inlets or Outlets Present?: Likely connects to forested wetland to east

Adjacent Land Use (circle): Upland Forest ☒ Forested Wetland ☒ Agricultural Fields ☐ Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Wood frog adults observed

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		<input checked="" type="checkbox"/>	
Standing water pools present	<input checked="" type="checkbox"/>		
Sparse/no vegetation within pool	<input checked="" type="checkbox"/>		
Water-stained leaves present	<input checked="" type="checkbox"/>		
Moss trim lines/buttressing/ watermarks on nearby trees	<input checked="" type="checkbox"/>		
Connectivity to adjacent upland forest habitat	<input checked="" type="checkbox"/>		
Biological indicator species present in or near pool	<input checked="" type="checkbox"/>		wood frogs (adults)

Additional Notes:

Another prior ag. drainage ditch; now reverting to forest / forested wetland

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5 / 11 / 2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAU

Vernal Pool ID: VP-0 Field Map Sheet Number: 10 Nearest Road(s): Rt. 98 (Quaker Hill Rd)

Property Owner Information (Name): DEBBIE REUMANN

Estimated Pool Depth (inches): 24+ Approximate Pool Length (feet): 70 Approximate Pool Width (feet): 70

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: Yes, ditches and forested wetland connect

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Not observed

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)		✓	Connects to other ditches / forested wetland (but there are constructed → no fish)
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool		✓	

Additional Notes:

Large, open, and deep; connects to other ditches; round
contains algal growth, foul smelling black muck

Heritage Wind Energy Facility – Vernal Pool Survey Data Sheet

Date Observed: 5/11/2018 Observer Name(s): SAMUEL BEGUIN, JOHN HECKLAW
 Vernal Pool ID: VP-P Field Map Sheet Number: 10 Nearest Road(s): Rt. 98 (QUAKER HILL RD)

Property Owner Information (Name): GLK FARMS, LLC

Estimated Pool Depth (inches): 24⁺ Approximate Pool Length (feet): 40 Approximate Pool Width (feet): 30

Pool Origin (circle): Natural depression Human-made pool/ditch Other (describe): _____

Pool Hydroperiod (circle): Seasonal (dries out most years) Semi-permanent (partial drying most years) Permanent (does not dry)

Inlets or Outlets Present?: None

Adjacent Land Use (circle): Upland Forest Forested Wetland Agricultural Fields Other: _____

Biological Evidence (Obligate and/or Facultative Amphibians):

Adult green frogs observed in pool

Vernal Pool Characteristic	Yes	No	Notes
Hydrologically isolated (no fish access)	✓		
Standing water pools present	✓		
Sparse/no vegetation within pool	✓		
Water-stained leaves present	✓		
Moss trim lines/buttressing/ watermarks on nearby trees	✓		
Connectivity to adjacent upland forest habitat	✓		
Biological indicator species present in or near pool	✓		adult green frogs

Additional Notes:

Round, deep, isolated; seems to be highly
suitable amphibian breeding habitat; nearby
larger forested wetland to south

APPENDIX C

Representative Photographs



Photo 1

View looking west-northwest
at vernal pool VP-A (May 8,
2018).



Photo 2

View looking east-northeast
at vernal pool VP-B (May 8,
2018).

Heritage Wind Project

Town of Barre, Orleans County, New York

Appendix C: Representative Photographs

Sheet 1 of 8



Photo 3

View looking north-northeast at vernal pool VP-C (May 9, 2018).



Photo 4

View looking north-northeast at vernal pool VP-D (May 9, 2018).

Heritage Wind Project

Town of Barre, Orleans County, New York

Appendix C: Representative Photographs

Sheet 2 of 8



Photo 5

View looking north at vernal pool VP-E (May 9, 2018).



Photo 6

View looking south-southwest at vernal pool VP-F (May 9, 2018).

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Photo 7

View looking southwest at vernal pool VP-G (May 10, 2018).



Photo 8

View looking northwest at vernal pool VP-H (May 11, 2018).

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Photo 9

View looking west-northwest at vernal pool VP-I (May 11, 2018).



Photo 10

View looking west at vernal pool VP-J (May 11, 2018).

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Photo 11

View looking east at vernal pool VP-K (May 11, 2018).



Photo 12

View looking east-northeast at vernal pool VP-M (May 11, 2018).

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Photo 13

View looking west-northwest at vernal pool VP-N (May 11, 2018).



Photo 14

View looking west at vernal pool VP-O (May 11, 2018).

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Photo 15

View looking southwest at vernal pool VP-P (May 11, 2018).



Photo 16

Wood frog (*Lithobates sylvaticus*) observed near vernal pool VP-N (May 11, 2018).

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