

VERNAL POOL REPORT

**For
Antrim Wind Energy Project
Town of Antrim
Hillsborough County, New Hampshire**

Prepared for:

**Antrim Wind Energy, LLC
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Prepared by:

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TABLE OF CONTENTS

1.0	Introduction.....	1
2.0	Vernal Pool Survey Methodology	3
2.1	General Field Survey Approach	4
2.2	Vernal Pool Species Observations.....	4
3.0	Vernal Pool field survey results	11
4.0	Vernal Pool Impacts	13
5.0	References.....	15

LIST OF FIGURES

Figure 1.	Project Location Map	2
Figure 2.	Vernal Pool Habitat Map.....	14

LIST OF TABLES

Table 1:	Summary of vernal pools within antrim windpark	11
Table 2:	Vernal Pool Characteristics	11

LIST OF APPENDICES

APPENDIX A – NATURAL RESOURCE SURVEY MAP

APPENDIX B – VERNAL POOL FIELD DATA
 Vernal Pool Field Data Forms
 Vernal Pool Site Photographs

1.0 INTRODUCTION

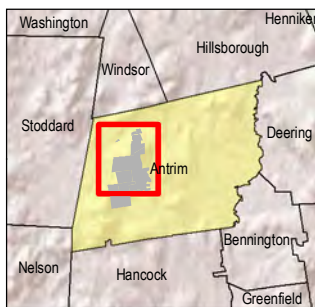
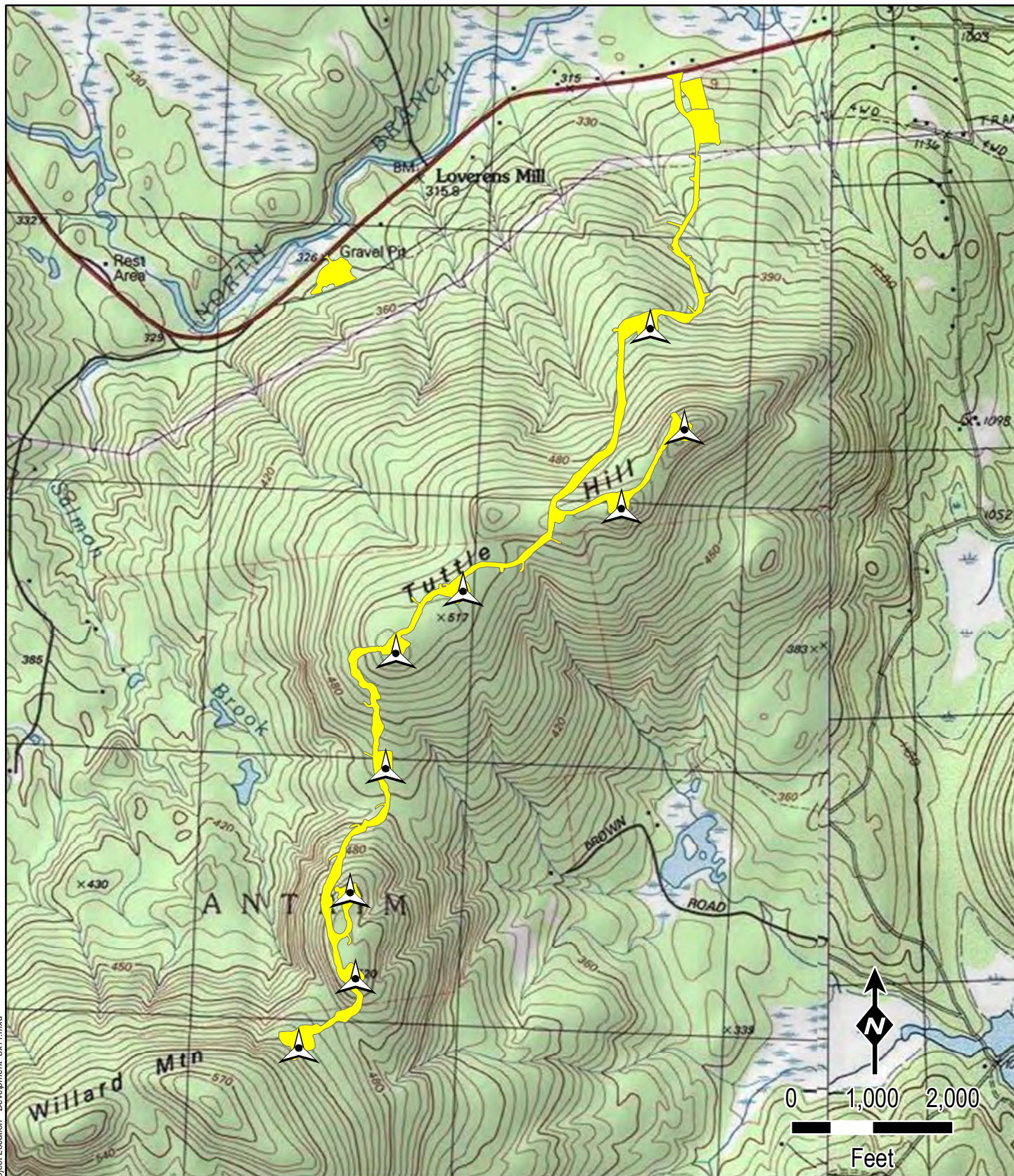
This vernal pool report has been prepared by TRC for Antrim Wind Energy, LLC (AWE) in support of state and federal environmental permit applications. Antrim Wind Energy LLC (AWE) is proposing to construct the Antrim Wind Energy Project (Project) on Tuttle Hill and Willard Mountain in the Town of Antrim, Hillsborough County, New Hampshire. The proposed Project is sited entirely on privately owned land that is leased by AWE. The proposed Antrim Wind Energy Project involves the construction of 9 wind turbines, an electrical collection system and interconnection substation, approximately 3.6 miles of new access road, and an operations and maintenance building. There will be no new electrical transmission lines, other than collector system lines, constructed as part of this Project. The total direct impact for the access roads, the turbine pads, and electrical collector system will be approximately 57.1 acres.

The proposed project is sited on the ridges of Tuttle Hill and Willard Mountain which are oriented east-northeast to west-southwest. The ridges are approximately parallel to NH Route 9, which is about $\frac{3}{4}$ of a mile to the north. Between the ridgeline and Route 9 is an existing transmission corridor containing both an 115kV transmission line and a 34.5kV distribution circuit; the proposed Project will interconnect with the existing 115kV line. See Figure 1 on the following page for a map of the Project area and Project elements.

TRC Environmental Corporation (TRC) was retained by AWE to identify and delineate vernal pools within the project area to support the design, or layout, of the proposed facilities. TRC has prepared this vernal pool report on behalf of AWE to support the submittal of a Joint Application for a Permit (a U.S. Army Corps of Engineers (ACOE) and New Hampshire State wetlands permit).

TRC conducted vernal pool surveys within an approximately 409 acre survey area during May 2nd, 5th and 9th of 2011. Follow up visits were made to each pool during early June to confirm their condition (i.e., watered or dry). Additional survey was also performed during September in approximately 53 acres added to the Project survey area in several discreet sections to provide for expanded project design options. An additional potential vernal pool was identified in this area, and follow-up surveys in spring 2015 confirmed this feature as a vernal pool.

The following sections describe the vernal pool field survey methodology utilized.



Legend



Proposed WTG Location



Proposed Disturbance Area

Antrim Wind Energy

ANTRIM WIND ENERGY PROJECT

ANTRIM, NH

Figure 1

Layout of Development

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1/29/2015

2.0 VERNAL POOL SURVEY METHODOLOGY

For the purposes of the field effort, TRC adopted the vernal pool definitions as described by the USACE Programmatic General Permit (PGP) for the State of New Hampshire and the NHDES Administrative Rules Env-Wt 101.99 for identifying vernal pools and vernal pool habitat along the Project corridor. With the exception of minor differences, each agency has a similar definition of what constitutes a vernal pool. Each respective definition is provided below.

According to the ACOE NHPGP, vernal pools and vernal pool habitat consists of:

*“VPs are confined basin depressions with water for two or more continuous months in the spring and/or summer, for which evidence of one of more of the following indicator vernal pools species: wood frogs (*Rana sylvatica*), mole salamanders (*Ambystoma* spp), and fairy shrimp (*Eubranchipus* spp) has been documented **OR** for which evidence of two or more of the following facultative organisms: caddisfly (*Trichoptera*) larvae casings, fingernail clams (*Sphaeriidae*), or amphibious snails (*Basammatophora*) and evidence that the pool does not contain an established reproducing fish population has been documented. Vernal pool habitat is the seasonal pool depression, seasonal pool envelope (100 FT radius from the VP edge) and seasonal pool terrestrial habitat (750 FT radius from the VP edge). The Corps will determine on a case-by-case basis which vernal pools are within their jurisdiction.”*

The NHDES wetlands Bureau defines a vernal pool in their Administrative Rules Env-Wt 101.106 as:

“a surface water or wetland, including an area intentionally created for purposes of compensatory mitigation, which provides breeding habitat for amphibians and invertebrates that have adapted to the unique environments provided by such pools and which:

- (a) Is not the result of on-going anthropogenic activities that are not intended to provide compensatory mitigation, including but not limited to:*
 - (1) Gravel pit operations in a pit that has been mined at least every other year; and*
 - (2) Logging and agricultural operations conducted in accordance with all applicable New Hampshire statutes and rules; and*
- (b) Typically has the following characteristics:*
 - (1) Cycles annually from flooded to dry conditions, although the hydroperiod, size, and shape of the pool might vary from year to year;*
 - (2) Forms in a shallow depression or basin;*
 - (3) Has no permanently flowing outlet;*
 - (4) Holds water for at least 2 continuous months following spring ice-out;*
 - (5) Lacks a viable fish population; and*
 - (6) Supports one or more primary vernal pool indicators, or 3 or more secondary vernal pool indicators.”*

Primary vernal pool indicators in NH include wood frogs, mole salamanders and fairy shrimp. Secondary indicators include species of aquatic insects including the larvae of caddisfly, dragonfly, and damselfly; fingernail clams and certain aquatic beetles; and other specific species that inhabit vernal pools.

TRC utilized a comprehensive vernal pool survey protocol and field data forms found in the document “Identification and Documentation of Vernal Pools in New Hampshire”, published by the New Hampshire Fish and Game Department Nongame and Endangered Wildlife Program (NHFGD 1997). In general, field surveys were conducted during the recommended timeframes for identifying amphibian egg masses and tabulating egg mass abundance. Peak breeding for wood frogs is generally earlier in the season, typically mid to late April, than that of the spotted and blue-spotted salamanders (ambystomid salamanders), typically in early May (Hunter & Calhoun 1999). Seasonal and weather conditions were also considered when applying these recommended survey timeframes as amphibian breeding can vary based on springtime conditions. For example, experiencing a cold spring versus a warm, wet spring could delay amphibian breeding for as much as two weeks and vice versa. Therefore, TRC attempted to conduct the surveys in early May of 2011 to capture the overlap of peak breeding of both the wood frogs and spotted salamanders.

2.1 General Field Survey Approach

Field surveys were conducted by a team of two qualified biologists familiar with vernal pool resources within New England. The team completed visual meanders surveys throughout the entire Project area. Each field crew was outfitted with the necessary field equipment to conduct a detailed survey and to thoroughly document each pool that was inventoried. Typical equipment consisted of hip/chest waders, polarized sunglasses, view tubes, dipnet, thermometer, fairy shrimp sampling equipment, and digital camera. For each pool, a standardized vernal pool determination field data form was completed, the vernal pool area was photo-documented, and the pool basin was located in the field using a global positioning system (GPS) unit. GPS data was specifically collected at the approximate perceived boundary of the highwater mark for all vernal pools exceeding approximately 10 feet in diameter.

2.2 Vernal Pool Species Observations

Egg mass surveys were conducted during the day time hours, preferably when the sun was out, between the hours of 9:00am to 3:00pm to the extent possible to maximize viewing opportunity within the pools. Two biologists began at one end of the pool and thoroughly searched the entire area simultaneously wading along the pool margin. The entire pool was searched (including the center) in this manner to ensure that all egg masses were tabulated. To reduce the possibility of overlooking or misidentifying egg masses, the field biologists worked together to observe, identify, and count egg masses. When agreement was reached regarding the species and number of egg masses within an individual pool, a data form and all other necessary pool documentation was completed (see Natural Resource Survey Map in Appendix A). As described in Section 2.0 above, each pool was examined twice during the survey period to document all vernal pool species utilizing the resource.

As with the egg mass surveys, surveys to document the presence/absence of fairy shrimp were also conducted concurrently. When optimal daytime conditions were not available or for pools with dark tannin stained water, field crews used dip nets and view tubes to search for fairy shrimp. When possible, sampling efforts were focused on sunny patches along the pool, as fairy shrimp often congregate in these areas.

Vernal pools were classified into one of three categories: (1) natural vernal pools; (2) potential vernal pools; and (3) non-jurisdictional features. The natural vernal pools were those pools as defined in Section 2.0 above that met the state criteria under the Administrative Rules. The potential pools were those pools that were identified outside of the indicator species breeding season as the scope of the project had changed after the initial vernal pool survey was performed. These pools had the abiotic characteristics as described in the state and federal definitions, but would require a visit in breeding season to confirm the presence of the indicator species use. The “non-jurisdictional feature” category included all other areas where amphibian breeding was documented but did not meet the state and federal definition of a vernal pool described in Section 2.0.

3.0 VERNAL POOL FIELD SURVEY RESULTS

Vernal pool surveys were conducted within the Project area on May 2nd, 5th and 9th of 2011, with additional survey conducted in extra project area performed in September 2011. A total of 7 features were identified within the Project area. Of these, 5 were identified as Natural Vernal pools, 1 as a potential vernal pool (located in September), and 1 feature was designated as a non-jurisdictional amphibian breeding area. Follow-up site visit in the spring 2012 confirmed the potential vernal pool as a natural vernal pool. Mapping of the pools is provided on the Natural Resource Survey Map in Appendix A, and the field data forms and site photographs for each feature are provided in Appendix B. An abbreviated summary of the vernal pool data is provided in Table 1 below.

TABLE 1: SUMMARY OF VERNAL POOLS WITHIN ANTRIM WINDPARK

Pool Type	No. of Features Within the Project Survey Corridor
Natural Vernal Pool	6
Non-jurisdictional Feature	1
TOTAL	7

A summary of the vernal pool characteristics for each pool is provided in Table 2 below. In summary, only VP4 contained significant numbers of egg masses. Vernal Pool Data Sheets are included in Appendix B.

TABLE 2: VERNAL POOL CHARACTERISTICS

Pool ID	Date Surveyed	Natural Setting (y/n)	Indicator Species Observed	Facultative Species Observed	Holds Water For At Least Two Months (y/n)	Associated Wetland
VP1	5/2/2011	Y	Spotted Salamander – 8 egg masses Wood Frog – 5 egg masses Green Frog - Vocalization	Green frog - Vocalization	Y	AN1
VP2	5/5/2011	Y	Spotted Salamander – 16 egg masses Wood Frog – 1 egg mass		Y	AN4
VP3	5/5/2011	Y	Spotted Salamander – 9 egg masses Wood Frog – 5 egg masses	Red-spotted newt - 1 adult	Y	AN5
VP4	5/5/2011	Y	Spotted Salamander – 55 egg masses Wood Frog – 4 egg masses		Y	AN25
VP5	5/9/2011	Y	Spotted Salamander – 10 egg masses		Y	AN24
VP6	5/9/2011	N	Spotted Salamander – 9 egg masses		N	Upland
VP7	9/27/2011 ; 5/5/2015	Y	Spotted Salamander – 5 egg masses		Y	AN38

Six of the pools observed occurred in natural isolated basins without an inlet or an outlet and no populations of predatory fish. Vernal Pools 1-5 and 7 are within isolated palustrine forested wetlands along the Tuttle Hill ridgeline and are located in depressions within the regional bedrock.

Vernal Pool 6 is located within a depression in an old woods road and is a man-made feature. This pool was also observed to be completely dry on June 6, 2011. No hydrophytic vegetation was observed in the vicinity of the pool depression and as a result is not a jurisdictional wetland. Therefore, the pool is considered a non-jurisdictional feature.

During the siting phase of the Project, several routing options were evaluated that were later rejected due to landowner or environmental concerns. During the spring and summer of 2011 when these particular route options were still under consideration, additional surveys for vernal pools were completed. As a result, one other feature Vernal Pool 7 (VP7) was identified within the current Project area. VP7 is located within an isolated forested wetland (Wetland AN38) west of proposed turbines 5 and 6. The wetland was observed to have an area of standing water approximately 1 foot deep and contained an abundance of shrubby vegetation, conducive of supporting egg attachment sites for pool breeding amphibians. An ephemeral outlet was observed draining to the northwest through a gap in the regional bedrock, but did not meet the criteria for a stream or wetland and did not have the necessary characteristics to support predatory fish populations. Follow-up survey of this pool in spring 2015 confirmed this feature as a natural vernal pool.

Although intensively surveyed for, no fairy shrimp were found or documented within any of the vernal pools. Furthermore, no rare or state-listed threatened or endangered species known to use vernal pools for at least one critical life stage were documented in any of the vernal pools found within the Project area. The field data forms and site photographs for these seven areas are provided in Appendix B.

4.0 VERNAL POOL IMPACTS

There are no impacts to vernal pool depressions. Impacts to vernal pools are indirect and are from road and turbine construction in areas adjacent to the pools. The indirect impacts to the 6 natural vernal pools (VP1-VP5 and VP7) were all assessed. In discussions with Mark Kern from the U.S. Environmental Protection Agency and David Keddell from the Army Corps (during a site visit to the vernal pools December 13, 2011), the assessment of impacts should consider the project footprint within 250 feet of the pools, and the area within 100 feet of the vernal pool depression. The upland and wetland area within 250 feet and adjacent to the vernal pool is defined as vernal pool “terrestrial habitat”, and the area within 100 feet of the pool is the vernal pool “envelope” (Calhoun and Klemens 2002; Calhoun and deMaynadier 2004). See Figure 2 for detailed maps of the vernal pools and the terrestrial habitat areas.

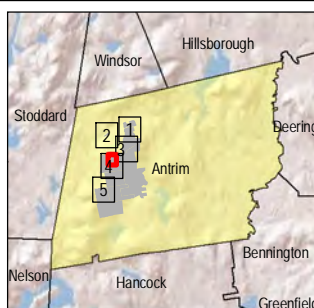
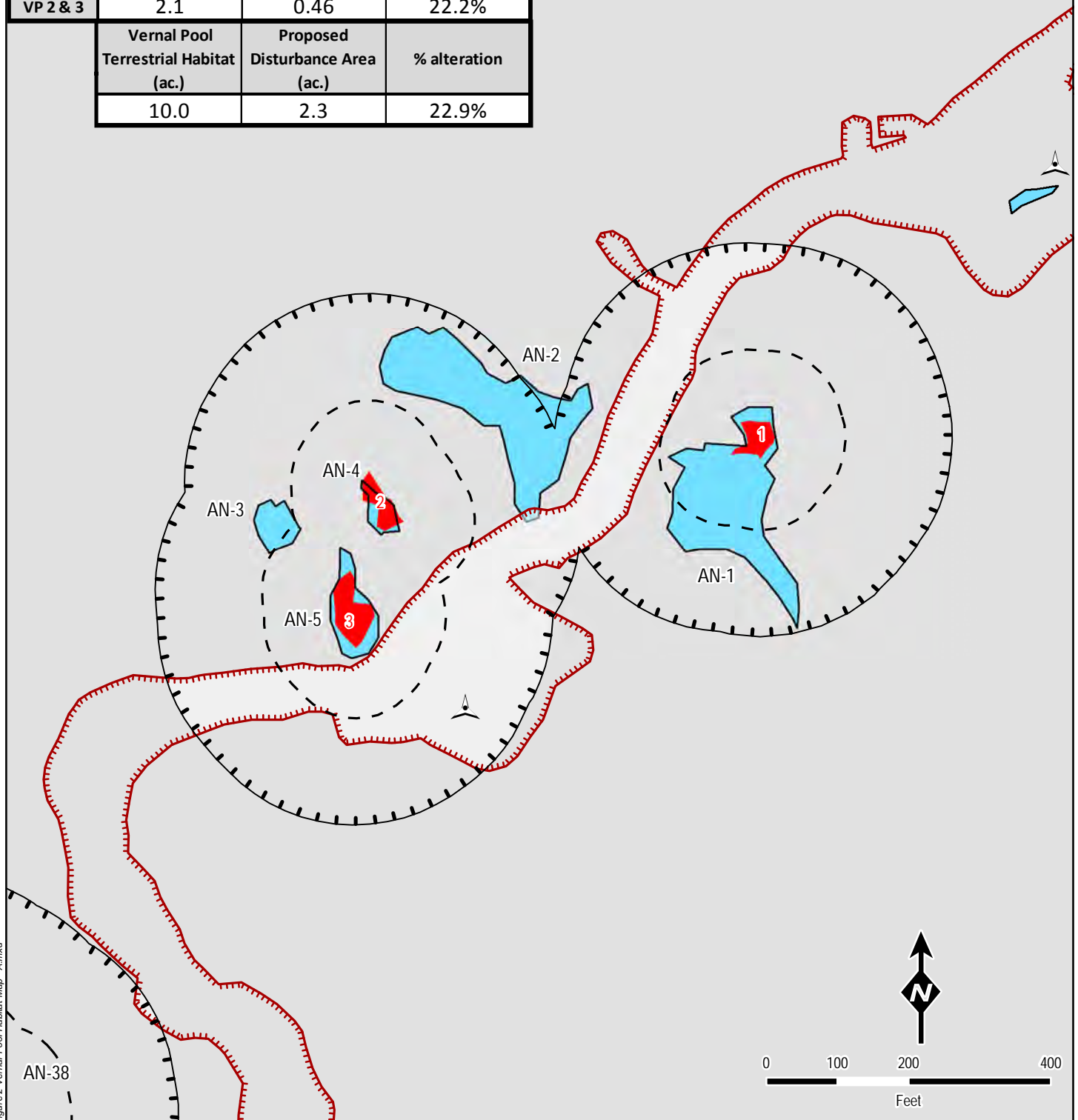
The vernal pools found on this site are in three distinct areas. Vernal pools 1, 2 and 3 are close to each other, and their terrestrial habitats overlap (“Habitat A”). Vernal pools 4 and 5 are also close to each other and their respective terrestrial habitat areas also overlap (“Habitat C”). Vernal pool VP7 terrestrial habitat does not overlap with any other vernal pool habitat (“Habitat B”).

There are no state regulations in New Hampshire, other than wetland protection rules, to regulate development within and adjacent to vernal pools. The Army Corps does regulate impacts to vernal pools as a type of special wetland through Section 404 of the Clean Water Act. The Army Corps Programmatic General Permit No: NAE-2007-461 (PGP) for the State of New Hampshire states that applicants must minimize surrounding upland impacts to the greatest extent practicable, with the effort to minimize impacts being commensurate with the value of the VP. The Army Corps PGP also recommends that impacts should be excluded from the vernal pool envelope and that certain guidelines for vernal pool management are followed, which suggest that the developed area (such as gravel surfaces) is kept to less than 25% of the terrestrial habitat area (Calhoun and Klemens 2002).











A gravel road and turbine pad is found within vernal pool Habitat A and a small portion of road is found within Habitat B. Analysis demonstrates that the impact to Habitat A terrestrial habitat is 2.3 acres of the 10 acre terrestrial habitat area, or 22.9% of the total terrestrial habitat area. Vernal pool 1 envelope impact is .01 acre of a 1.2 acre envelope area, or 1.1% of the envelope. Vernal pools 2 and 3 envelope impact is 0.46 acres to a 2.1 acre envelope area, or 22.2% of the envelope. Impact to Habitat B is approximately 0.02 acres of the 4.9 acre terrestrial habitat area, or 0.4% of the total terrestrial habitat area. There is no impact to Habitat B (VP7) vernal pool envelope. There is no impact to the terrestrial habitat or envelope of Habitat C.

The level of impact to the terrestrial habitat areas is below the recommended 25% developed area threshold. There is, however some impact to the vernal pool envelope area. These impacts are mitigated by the gravel road not being open to public vehicle traffic and as such will have a very limited volume of traffic and a very low potential to impact any vernal pool species crossing the road. Narrow gravel roads are also not significant barriers to amphibians, and will not hinder movement of the animals through the area. It is anticipated that the proposed development of this area will have no impact on the productivity of these vernal pools.

	Vernal Pool Envelope (ac.)	Proposed Disturbance Area (ac.)	% alteration
VP 1	1.2	0.01	1.1%
VP 2 & 3	2.1	0.46	22.2%
	Vernal Pool Terrestrial Habitat (ac.)	Proposed Disturbance Area (ac.)	% alteration
	10.0	2.3	22.9%




Legend

-  Proposed WTG Location
-  Proposed Disturbance Area
-  Vernal Pool
-  Vernal Pool Envelope (100')
-  Vernal Pool Terrestrial Habitat (250')
-  Wetlands
-  Wetland Boundary
-  Perennial Stream
-  Intermittent Stream
-  Drainage
-  Stream Label
-  Wetland Label



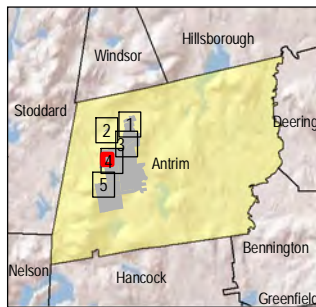
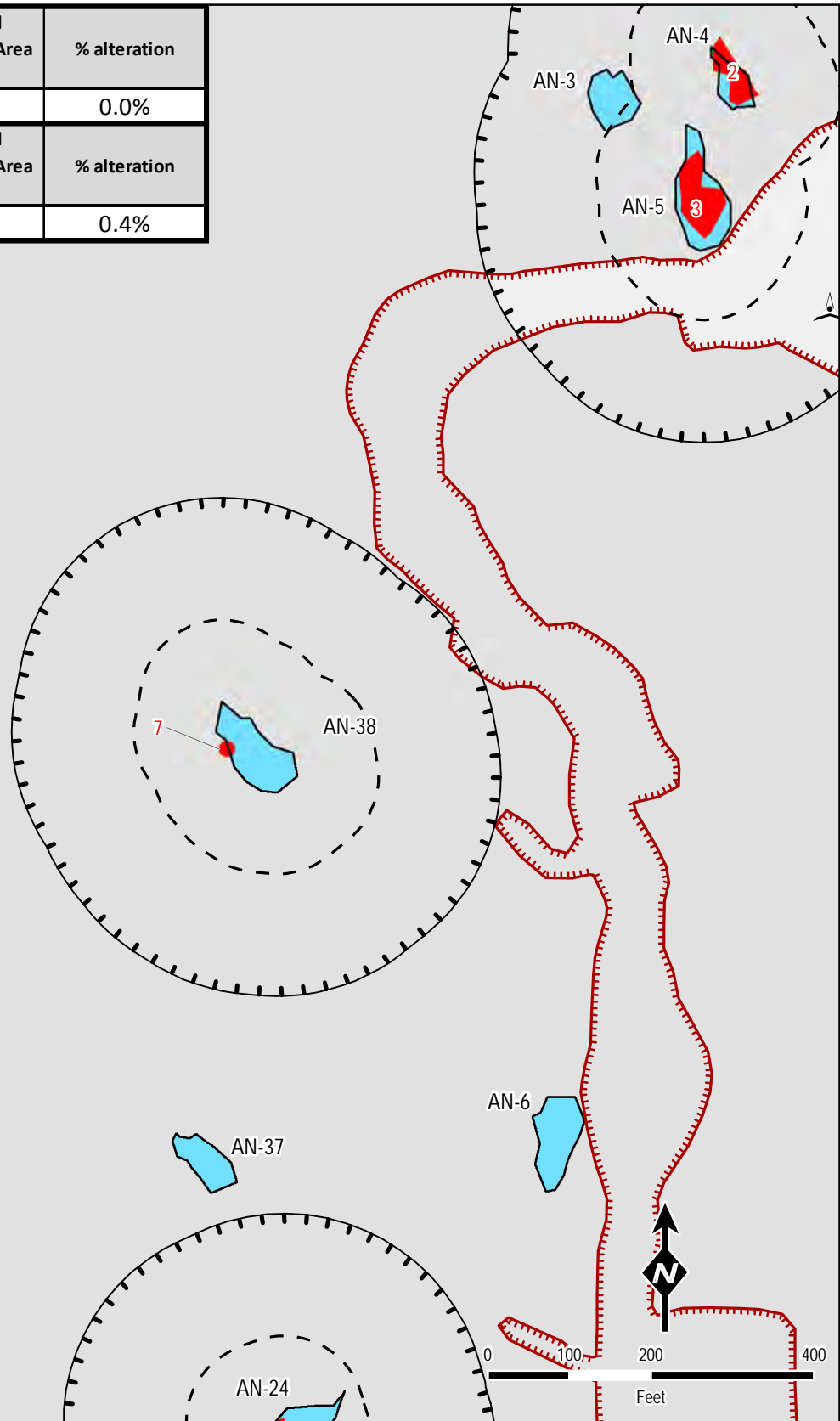
ANTRIM WIND ENERGY PROJECT ANTRIM, NH

Figure 2 Vernal Pool Habitat Map Habitat A

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	Vernal Pool Envelope (ac.)	Proposed Disturbance Area (ac.)	% alteration
VP 7	1.5	0	0.0%
	Vernal Pool Terrestrial Habitat (ac.)	Proposed Disturbance Area (ac.)	% alteration
	4.9	0.02	0.4%



Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Vernal Pool Envelope (100')
- Vernal Pool Terrestrial Habitat (250')
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label



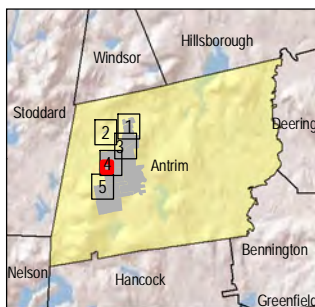
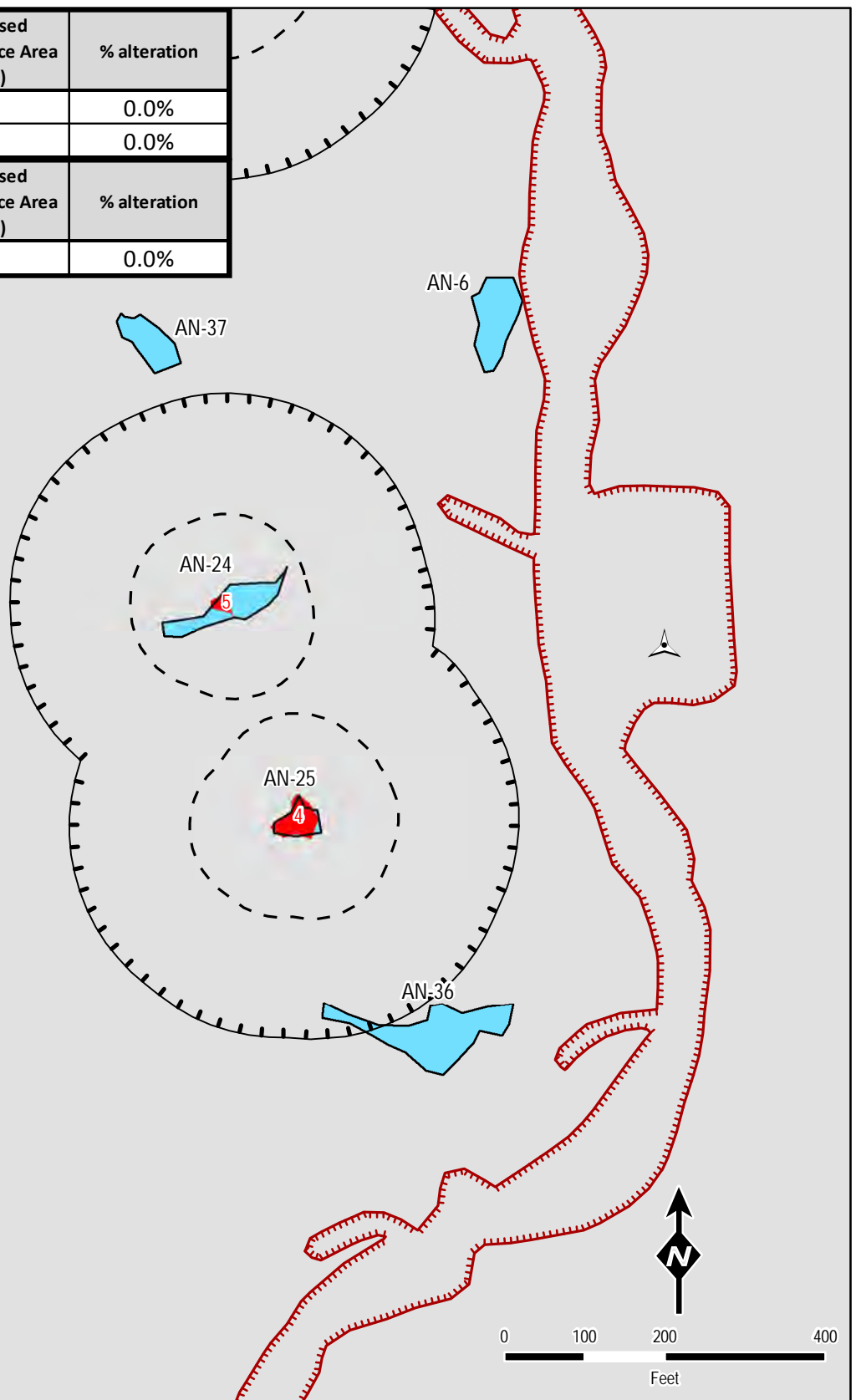
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Figure 2 Vernal Pool Habitat Map Habitat B













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	Vernal Pool Envelope (ac.)	Proposed Disturbance Area (ac.)	% alteration
VP 4	1.1	0	0.0%
VP 5	0.9	0	0.0%
	Vernal Pool Terrestrial Habitat (ac.)	Proposed Disturbance Area (ac.)	% alteration
	6.5	0	0.0%




Legend

-  Proposed WTG Location
-  Proposed Disturbance Area
-  Vernal Pool
-  Vernal Pool Envelope (100')
-  Vernal Pool Terrestrial Habitat (250')
-  Wetlands
-  Wetland Boundary
-  Perennial Stream
-  Intermittent Stream
-  Drainage
-  Stream Label
-  Wetland Label



ANTRIM WIND ENERGY PROJECT ANTRIM, NH

Figure 2 Vernal Pool Habitat Map Habitat C

Produced by: 

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5.0 REFERENCES

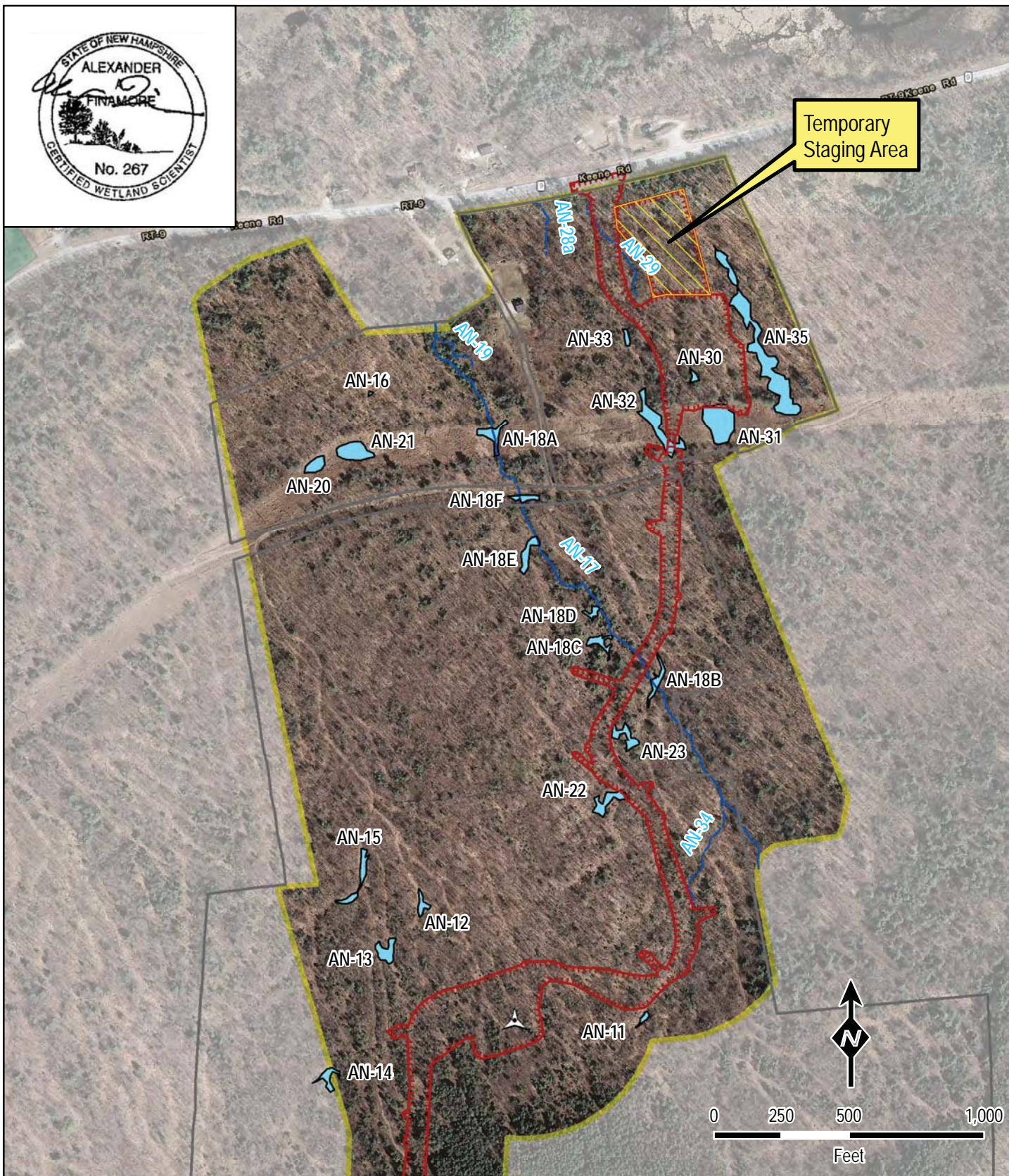
- Calhoun, A. J. K. and P. deMaynadier. 2004. Forestry habitat management guidelines for vernal pool wildlife. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.
- Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practice: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservations Society, Bronx, New York.
- Identification and Documentation of Vernal Pools in New Hampshire. Anne Tappan, Ed. NH Fish & Game Department, Nongame and Endangered Wildlife Program. 1997.
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APPENDIX A

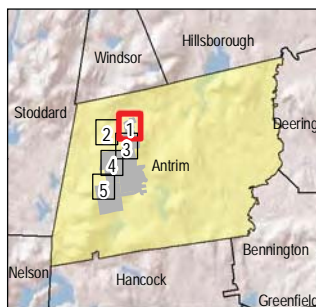
Natural Resource Survey Map



Temporary
Staging Area



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Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Project Parcels
- Existing Conserved Lands
- Resource Survey Area
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label

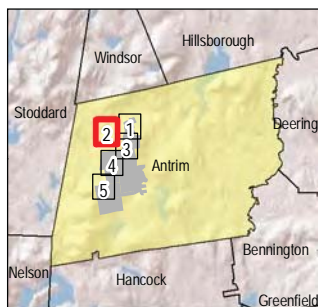
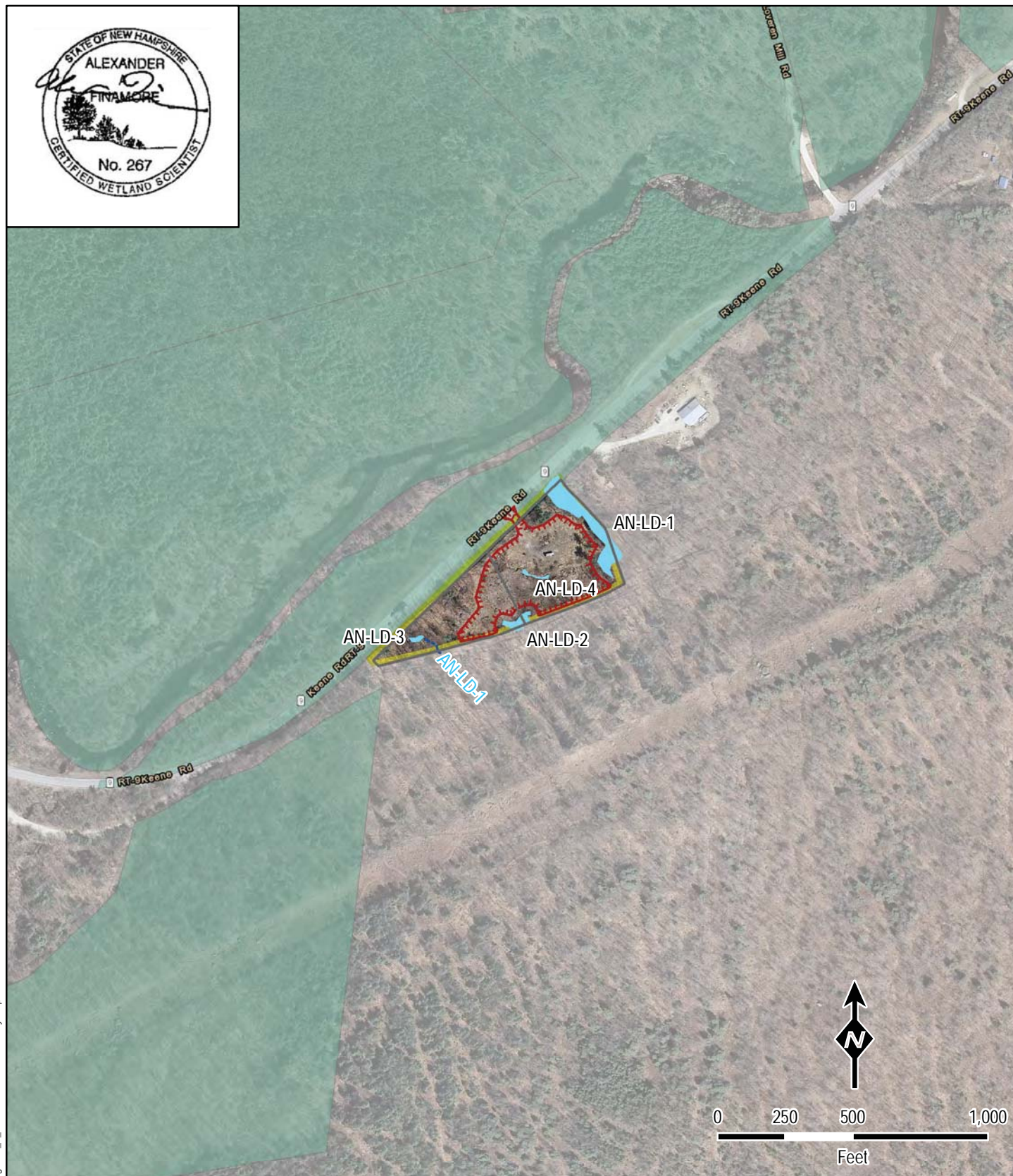
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**ANTRIM WIND
ENERGY PROJECT**
ANTRIM, NH

Natural Resource Survey Map
Map 1 of 5

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Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Project Parcels
- Existing Conserved Lands
- Resource Survey Area
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label

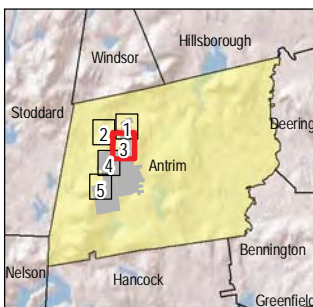
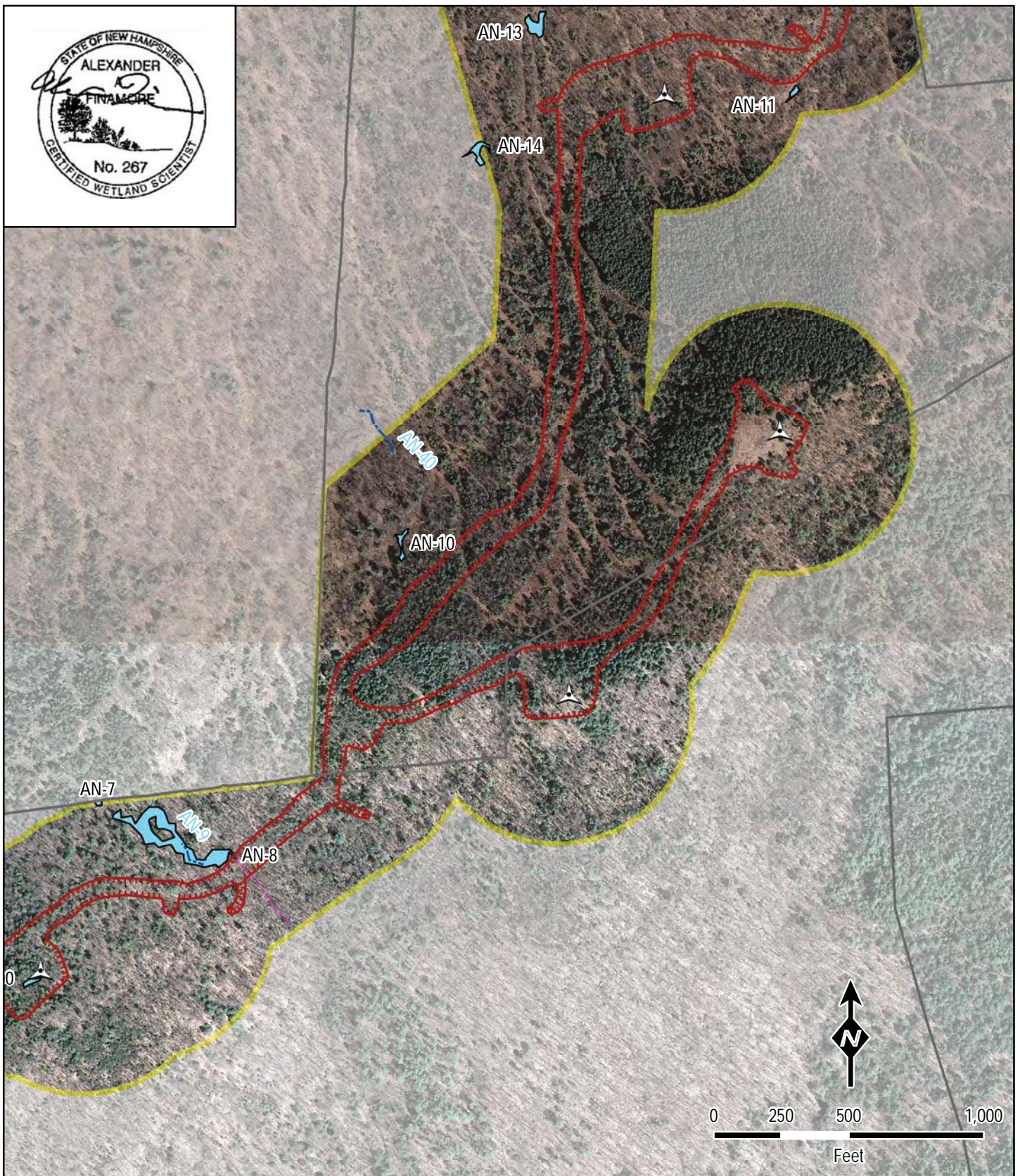
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Natural Resource Survey Map
Map 2 of 5

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Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Project Parcels
- Existing Conserved Lands
- Resource Survey Area
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label

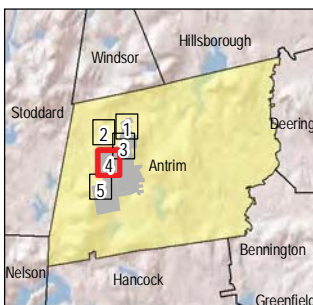
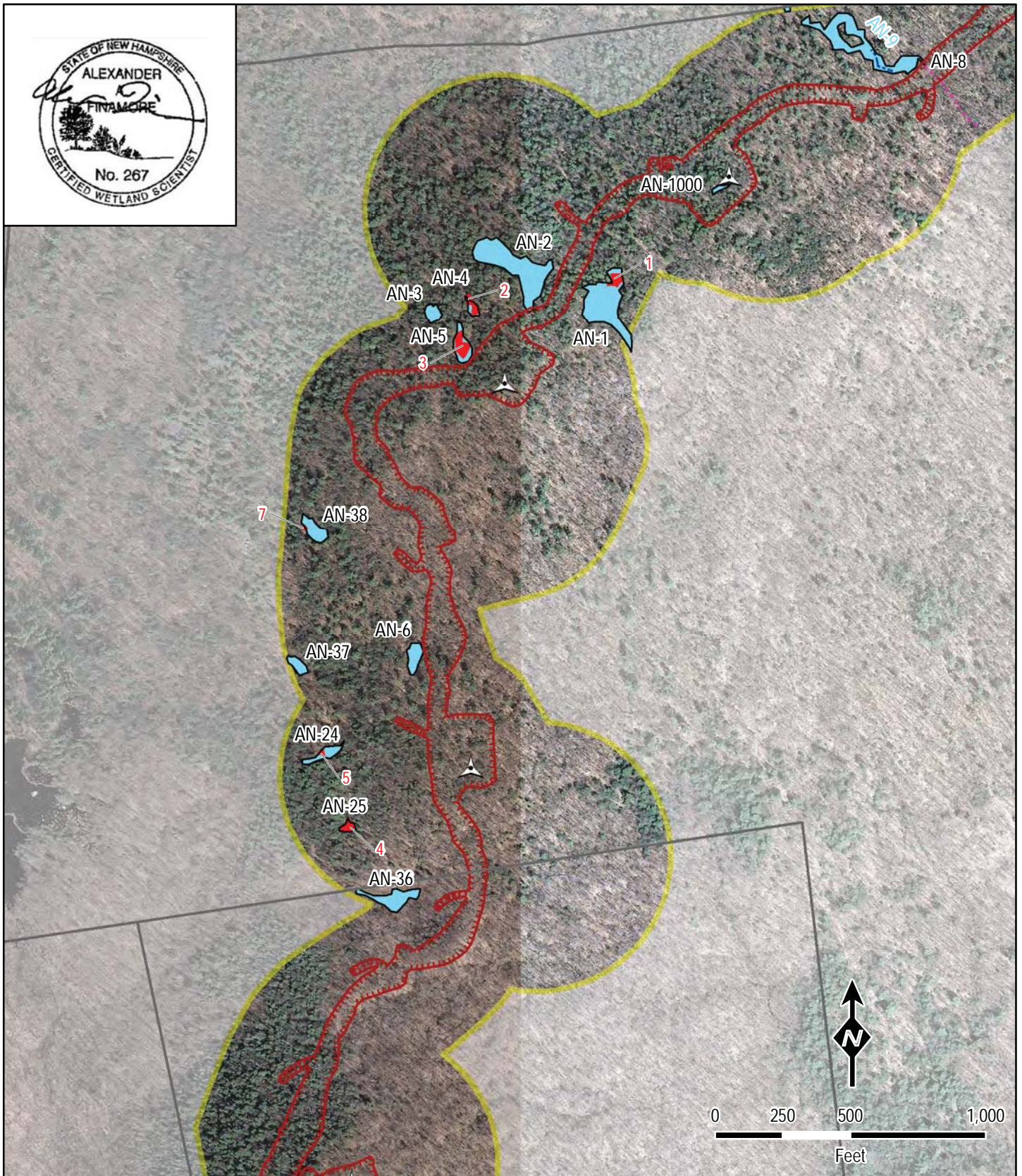
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ANTRIM WIND ENERGY PROJECT ANTRIM, NH

Natural Resource Survey Map
Map 3 of 5

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Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Project Parcels
- Existing Conserved Lands
- Resource Survey Area
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label

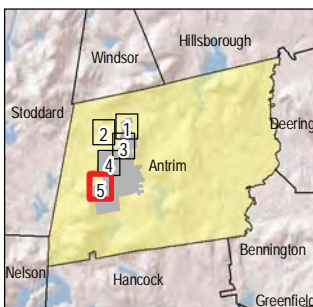
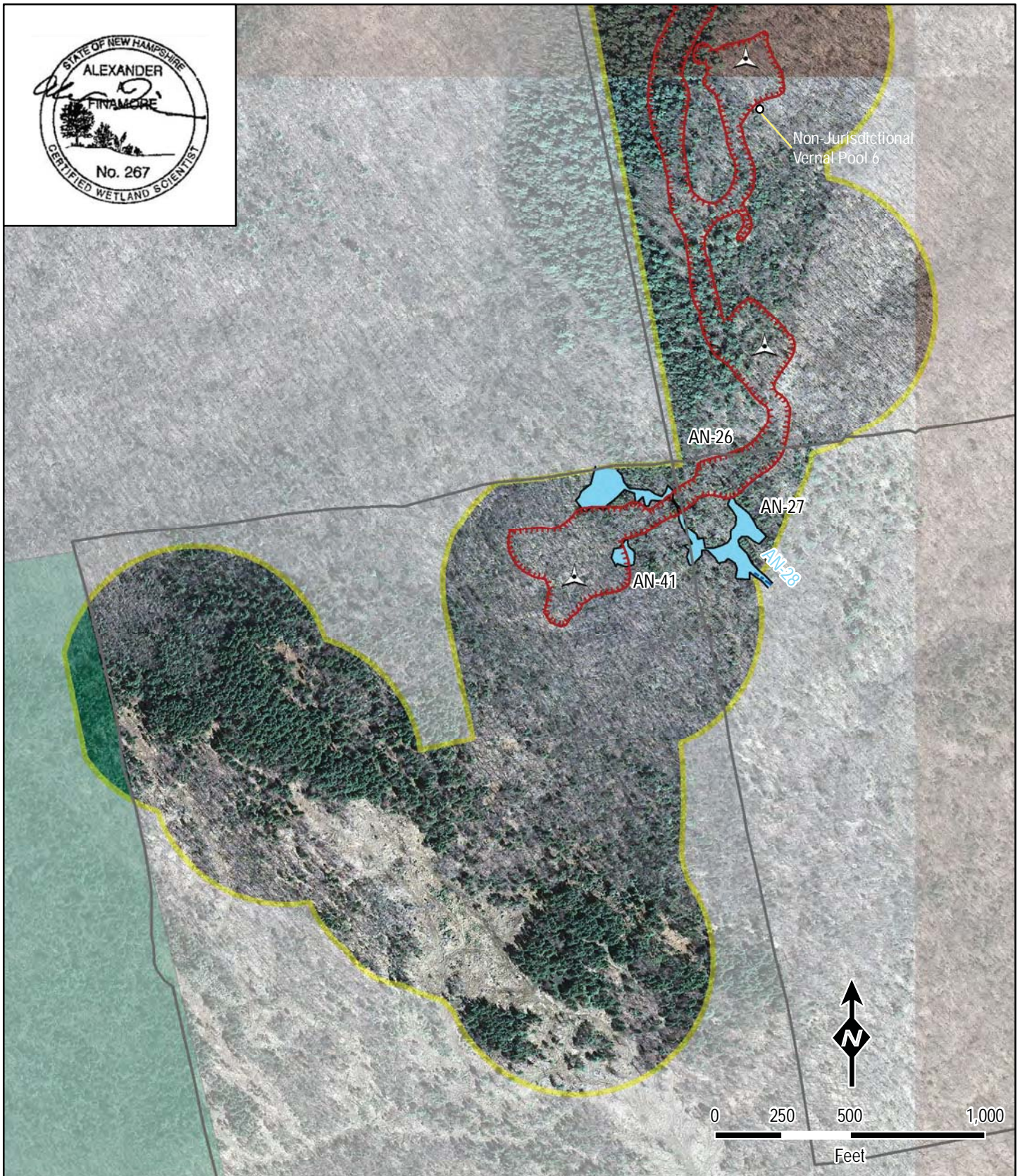
Antrim Wind Energy

ANTRIM WIND ENERGY PROJECT ANTRIM, NH

Natural Resource Survey Map
Map 4 of 5

Produced by: CTRC

7/6/2015



Legend

- Proposed WTG Location
- Proposed Disturbance Area
- Vernal Pool
- Project Parcels
- Existing Conserved Lands
- Resource Survey Area
- Wetlands
- Wetland Boundary
- Perennial Stream
- Intermittent Stream
- Drainage
- Stream Label
- Wetland Label

Antrim Wind Energy

ANTRIM WIND ENERGY PROJECT ANTRIM, NH

Natural Resource Survey Map
Map 5 of 5

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APPENDIX B

Vernal Pool Field Data Forms & Vernal Pool Site Photographs

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

VP-1

Observer's name Jim Bolduc & Alex Finnmore Phone number (207) 879-1930 EXT 143

Address 400 Southborough Drive South Portland, ME

Location of pool Tuttle Hill Anttrim, NH

GPS (if available): Latitude N 43° 03.454 Longitude W 072° 01.082 Datum _____

Photos attached 2 pool 1 animals

Date: 5/2/11 Time start 2:10 Time end 2:45

Weather overcast 60°F Pool size 20' x 50' Water depth 2-8
Pond = 14°C ☐ measured ☒ estimated

SPECIES	Spotted Salam	Wood frog	Green frog				
adult							
vocalization			1				
amplexus							
courtship							
spermatophores							
eggs	8 masses	5 masses					
tadpoles/larvae							
juveniles							

Comments: _____

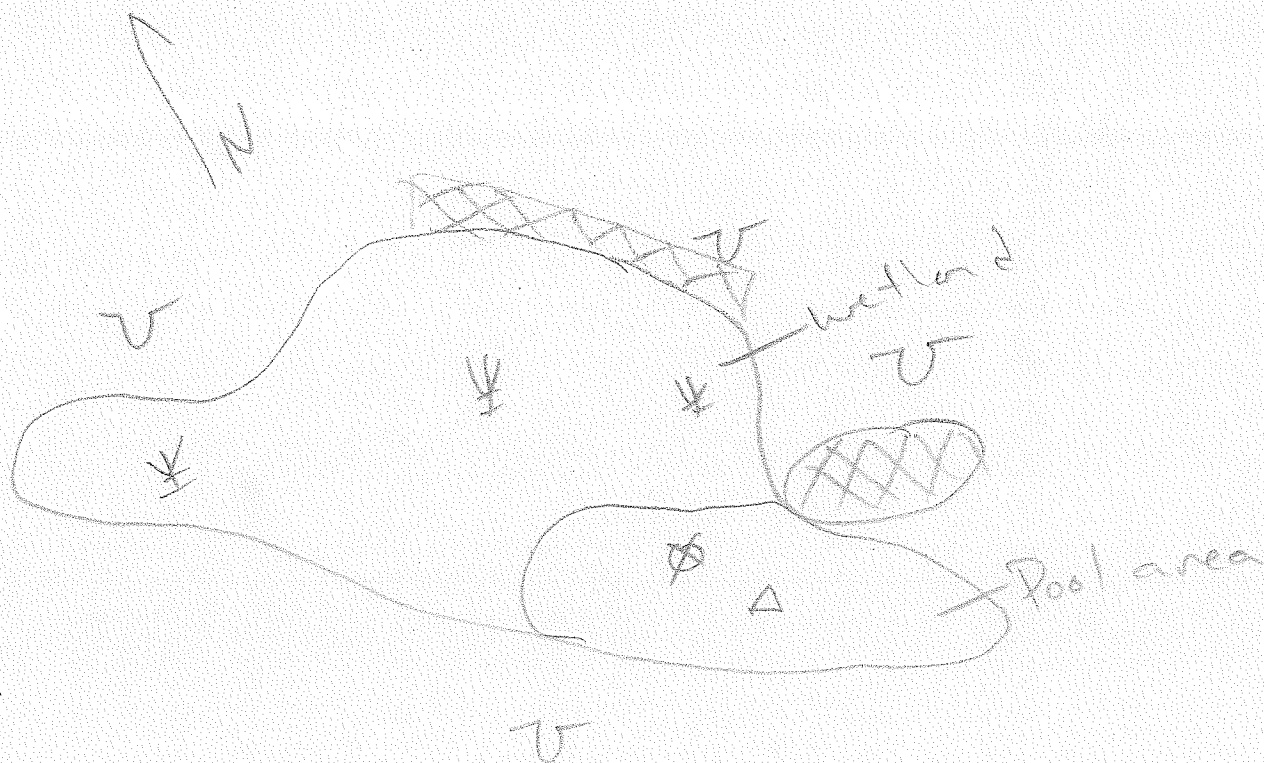
Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.



⊗ - WF

Δ - SS

⊗ - ledge

VP-1

VP-1

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location Tuttle Hill, Andover, NH Observer JB + AP

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
☐ bottomland-isolated (pool in a floodplain, not in a wetland)
☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)

HABITAT: (estimate % of type)

- 50% woodland (specify type) ☐ deciduous ☐ coniferous ☒ mixed
☐ agriculture or open fields
☐ gravel pit
☐ residential
☐ roadside
☒ other shrubland

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees
☐ moderate overstory, <50% shrubs and/or trees
☐ open site with grasses, forbs, scattered shrubs

COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing larvae (estimate % of type).

- 20% shrubs
☐ emergent vegetation (i.e. grass, cattails)
few branches, twigs (in pool or overhanging into water)
☐ submergent vegetation
80% sphagnum moss
☐ other

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
☐ mud/soft sediment
☒ leaf litter 90%
☐ submergent vegetation
☐ emergent vegetation

DOMINANT PLANTS, LIST: (optional)

Ace rub, vac cor, Black spruce
Sphagnum, car sp., Osm cin

COMMENTS:

Pit + mound surrounded by mossy wetland
w/ eggs mature

Attach location documentation.

Photo 1 - south
Photo 2 - west
Photo 3 - spotted
Photo 4 - wood frog

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

- ☒ flooded pool visit
 ☐ photos included
- ☐ dry, drying pool visit
 ☐ photos included
- ☒ field map of pool
- ☐ written directions to pool
- ☐ USGS map, photo copy
- ☐ ONE of the following, indicating pool location:
 ☐ tax assessors map
 ☐ detailed location information
- ☒ Evidence of vernal pool indicator species (check all present):
- ☐ fairy shrimp
 ☒ wood frog
 ☐ chorus
 ☐ amplexus
 ☒ egg mass
 ☐ tadpoles
- ☒ salamander (spotted, Jefferson, blue-spotted)
 ☐ courtship
 ☒ spermatophores
 ☐ egg mass
 ☐ larvae
- ☒ Photos of indicator species
- ☒ Documentation forms and maps submitted to both:
 ☐ town conservation commission
 ☐ Nongame and Endangered Wildlife Program, NH Fish
 and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name Jim Bolduc & Alex Finamore

Address 400 Southborough Drive
South Portland, ME 04106

Phone number (207) 879-1930 EXT 143

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP1



VP1 wood frog eggs



VP1 spotted salamander eggs



VP1



VP1 second visit June 2011



VP1 second visit June 2011

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

Observer's name JB + AF Phone number _____

Address _____

Location of pool Tottle Hill Antrum

~~ADP83~~ GPS (if available): Latitude 43 03.436 Longitude 76 01.200 Datum NAD83

Photos attached 2 pool 2 animals

Date: 5-5-2011 Time start 11:30 Time end _____

Weather Scattered Showers Pool size 20 x 40 Water depth 9"

☐ measured ☒ estimated

Water Temp
90C

SPECIES	WFE	SS					
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs	1	16					
tadpoles/larvae							
juveniles							

Comments: _____

Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location

Tuttle Hill, Antirion

Observer

JB + AF

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
☐ bottomland-isolated (pool in a floodplain, not in a wetland)
☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)

Isolated Red maple Swamp (very small)

HABITAT: (estimate % of type)

- 100% ☒ woodland (specify type) ☐ deciduous ☐ coniferous ☒ mixed
☐ agriculture or open fields
☐ gravel pit
☐ residential
☐ roadside
☐ other

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees
☐ moderate overstory, <50% shrubs and/or trees
☐ open site with grasses, forbs, scattered shrubs

COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing arvae (estimate % of type).

- 15 ☒ shrubs
 25 ☒ emergent vegetation (i.e. grass, cattails)
 25 ☒ branches, twigs (in pool or overhanging into water)
 20 ☒ submergent vegetation
 20 ☒ sphagnum moss
☐ other

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
☐ mud/soft sediment
 100 ☒ leaf litter
☐ submergent vegetation
☐ emergent vegetation

DOMINANT PLANTS, LIST: (optional)

Ace rub, Vase cor, sp. lat

COMMENTS:

Isolated pool in pocket of ledge near Top of mt.

Attach location documentation.

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

- ☒ flooded pool visit
 _____ photos included
- _____ dry, drying pool visit
 _____ photos included
- ☒ field map of pool
- _____ written directions to pool
- _____ USGS map, photo copy
- _____ ONE of the following, indicating pool location:
 _____ tax assessors map
 _____ detailed location information
- ☒ Evidence of vernal pool indicator species (check all present):
- _____ fairy shrimp
- ☒ wood frog
- _____ chorus
- _____ amplexus
- ☒ egg mass
- _____ tadpoles
- ☒ salamander (spotted, Jefferson, blue-spotted)
- _____ courtship
- _____ spermatophores
- ☒ egg mass
- _____ larvae
- ☒ Photos of indicator species (4)
- _____ Documentation forms and maps submitted to both:
- _____ town conservation commission
- _____ Nongame and Endangered Wildlife Program, NH Fish
 and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name Jim Bolduc + Alex Finamore

Address _____

Phone number _____

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP2 wood frog eggs



VP2 spotted salamander eggs



VP2



VP2



VP2 second visit June 2011

VP-3

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

Observer's name JB + AF Phone number _____

Address _____

Location of pool Tottle Hill - Antrim

GPS (if available): Latitude 43° 03.414 Longitude 72° 01.202 Datum NAD 83

Photos attached 2 pool 2 animals

Date: 5-5-2011 Time start 12:00 Time end 12:40

Weather Scattered Showers 55° Pool size 40 x 50 Water depth 8"
☐ measured ☒ estimated

12-Aug-11

Water temp 10°C

SPECIES	WF	SS	Red Newt				
adult			1				
vocalization							
amplexus							
courtship							
spermatophores							
eggs	5	9					
tadpoles/larvae							
juveniles							

Comments: _____

Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

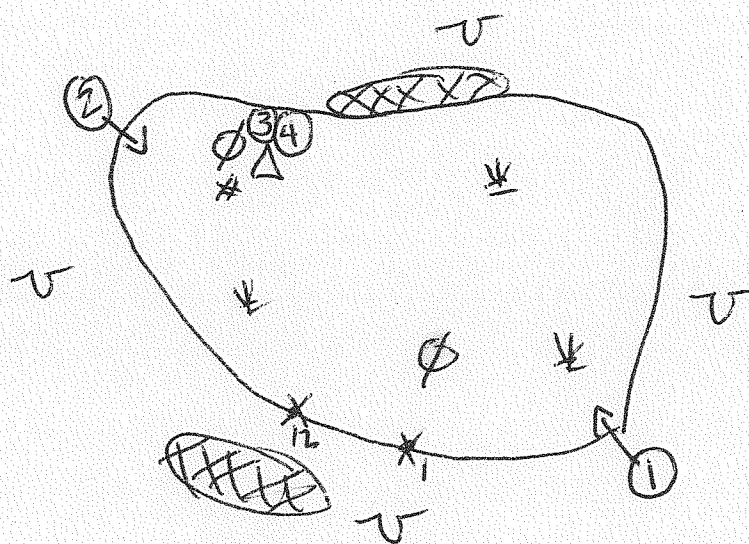
SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.

VP-3

Flags 1-12



⊙ = SS

△ = WF

- Red Neut

⊗ = ledge outcrop

① ↓ Photo location (+ direction)

VP-3

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location ToHle Hill - Andrim Observer JB + AF

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
 - ☐ bottomland-isolated (pool in a floodplain, not in a wetland)
 - ☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)
- isolated + small

HABITAT: (estimate % of type)

- 100 woodland (specify type) ☐ deciduous ☐ coniferous ☒ mixed
- ☐ agriculture or open fields
- ☐ gravel pit
- ☐ residential
- ☐ roadside
- ☐ other

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees
- ☐ moderate overstory, <50% shrubs and/or trees
- ☐ open site with grasses, forbs, scattered shrubs


COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing arvae (estimate % of type).

- 15 shrubs
- 50 emergent vegetation (i.e. grass, cattails)
- 10 branches, twigs (in pool or overhanging into water)
- ☐ submergent vegetation
- 20 sphagnum moss
- ☐ other

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
- ☐ mud/soft sediment
- 50 leaf litter
- ☐ submergent vegetation
- 50 emergent vegetation

DOMINANT PLANTS, LIST: (optional)

COMMENTS:  Isolated pool in ledge pocket near summit (Turbine 4)

Attach location documentation (Ace rub, Sci cyp, Sphagnum, Spi lat, car sp.)
Vac cor

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

- ☒ flooded pool visit
 ☒ photos included
- ☐ dry, drying pool visit
 ☐ photos included
- ☐ field map of pool
- ☐ written directions to pool
- ☐ USGS map, photo copy
- ☐ ONE of the following, indicating pool location:
 ☐ tax assessors map
 ☐ detailed location information
- ☒ Evidence of vernal pool indicator species (check all present):
 ☐ fairy shrimp
 ☒ wood frog
 ☐ chorus
 ☐ amplexus
 ☒ egg mass
 ☐ tadpoles
- ☒ salamander (spotted, Jefferson, blue-spotted)
 ☐ courtship
 ☒ spermatophores
 ☐ egg mass
 ☐ larvae
- ☒ Photos of indicator species
- ☐ Documentation forms and maps submitted to both:
 ☐ town conservation commission
 ☐ Nongame and Endangered Wildlife Program, NH Fish
 and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name Jim Bolduc + Alex Finamore

Address _____

Phone number _____

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP3 wood frog eggs



VP3 spotted salamander eggs



VP3



VP3



VP3 second visit June 2011

VP-4
Flags 1-10

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

Observer's name JR + AF Phone number _____

Address _____

Location of pool Between Title Hill + Willard Mnt. - Antrim

GPS (if available): Latitude 43° 03.127 Longitude 72° 01.310 Datum NAD83

Photos attached 2 pool 2 animals

Date: 5-5 Time start 8:15 Time end 2:15

Weather Partly cloudy 55° Pool size 50x40 Water depth 16"

☐ measured ☒ estimated

water temp
10°C

SPECIES	WF	SS					
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs	4	55					
tadpoles/larvae							
juveniles							

Comments: _____

Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

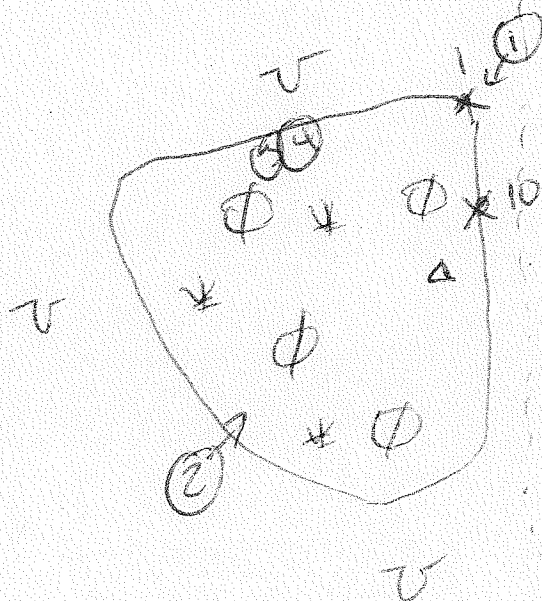
SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.

VP-4
Flags 1-16

← ATU trail



⊗ = SS

△ = WF

* = wetland

v = upland

① Photo location (w/ direction)

VP-4

VP-4

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location Between Tottle Hill + W. Wood rd

Observer JB + AF

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
- ☐ bottomland-isolated (pool in a floodplain, not in a wetland)
- ☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)

Hemlock swamp

HABITAT: (estimate % of type)

- 100 woodland (specify type) ☐ deciduous ☐ coniferous ☒ mixed
- ☐ agriculture or open fields
- ☐ gravel pit
- ☐ residential
- ☐ roadside
- ☐ other

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees (Hemlock)
- ☐ moderate overstory, <50% shrubs and/or trees
- ☐ open site with grasses, forbs, scattered shrubs

COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing arvae (estimate % of type).

- 5 shrubs
- 5 emergent vegetation (i.e. grass, cattails)
- 40 branches, twigs (in pool or overhanging into water)
- ☐ submergent vegetation
- ☐ sphagnum moss
- ☐ other

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
- ☐ mud/soft sediment
- 100 leaf litter
- ☐ submergent vegetation
- ☐ emergent vegetation

DOMINANT PLANTS, LIST: (optional)

Ace rub, Tso can, Osmcin

COMMENTS:

Adjacent to ATV trail

Attach location documentation.

VP-4

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

- ☒ flooded pool visit
☒ photos included (x 4)
- ☐ dry, drying pool visit
☐ photos included
- ☐ field map of pool
- ☐ written directions to pool
- ☐ USGS map, photo copy
- ☐ ONE of the following, indicating pool location:
☐ tax assessors map
☐ detailed location information
- ☒ Evidence of vernal pool indicator species (check all present):
- ☐ fairy shrimp
- ☒ wood frog
- ☐ chorus
- ☐ amplexus
- ☒ egg mass
- ☐ tadpoles
- ☒ salamander (spotted, Jefferson, blue-spotted)
- ☐ courtship
- ☐ spermatophores
- ☒ egg mass
- ☐ larvae
- ☒ Photos of indicator species
- ☐ Documentation forms and maps submitted to both:
- ☐ town conservation commission
- ☐ Nongame and Endangered Wildlife Program, NH Fish and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name Jim Bolduc + Alex Finamore

Address _____

Phone number _____

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP4 spotted salamander eggs



VP4 spotted salamander eggs



VP4



VP4



VP4 second visit June 2011

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

VP-5

5-flags

Observer's name JB-AF Phone number _____

Address _____

Location of pool Between Tuttle Hill & Willard Mt

GPS (if available): Latitude 43° 03.169 Longitude 72° 01.319 Datum NAD 83

Photos attached 2 pool 1 animals

Date: 5-9-2011 Time start 9:00 Time end 9:25

Weather Sunny ~60° Pool size 15x25 Water depth 6"
☐ measured ☒ estimated

Water temp 10°C

SPECIES	SS						
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs	10						
tadpoles/larvae							
juveniles							

Comments: _____

Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

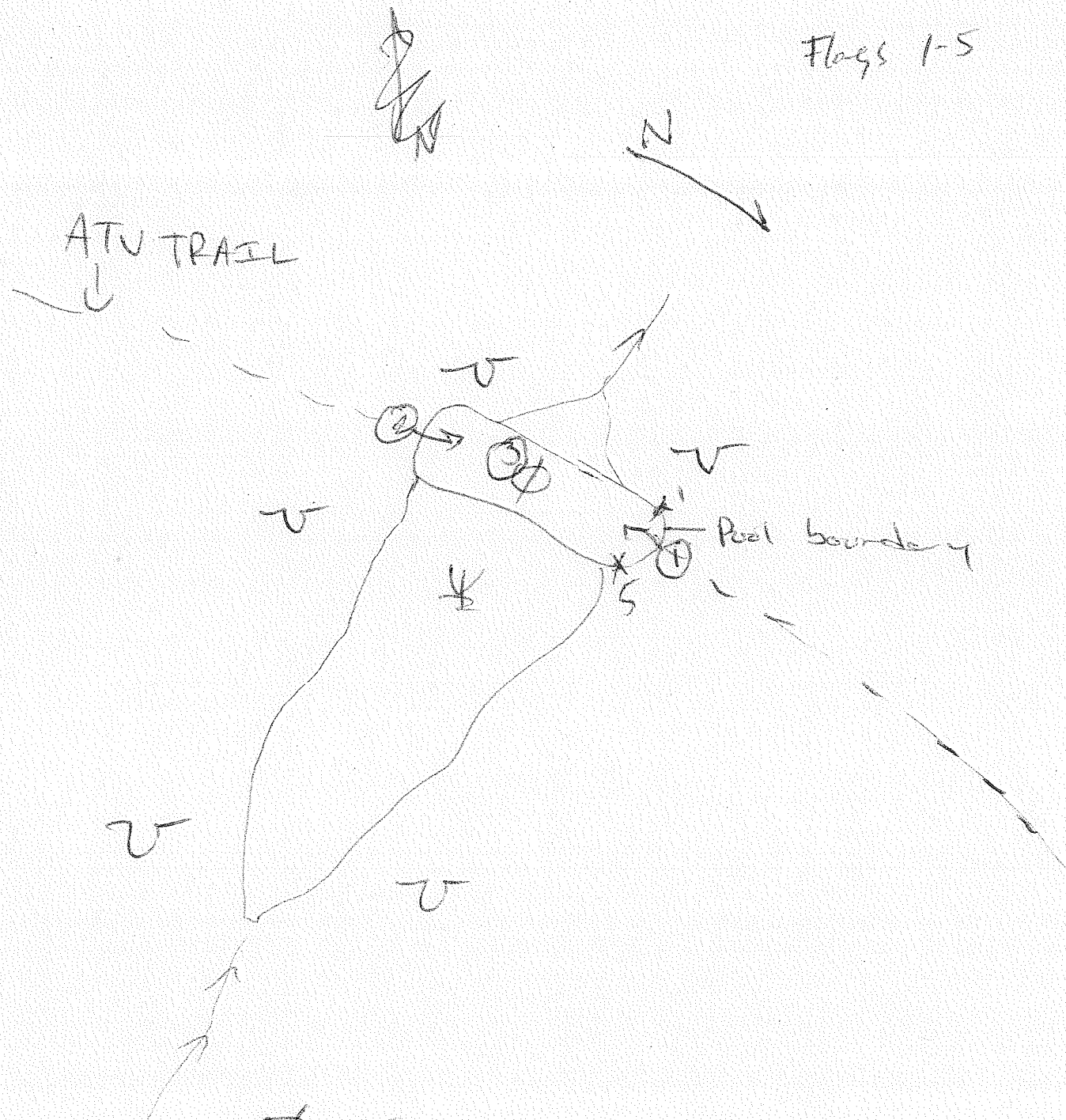
SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.

VP-5

Flags 1-5



⊙ - ss eggs

① photo location + direction

VP-5

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location Between Tottle Hill + wetland Observer JB + AF

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
- ☐ bottomland-isolated (pool in a floodplain, not in a wetland)
- ☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)

Seep

HABITAT: (estimate % of type)

- 100 woodland (specify type) ☐ deciduous ☐ coniferous ☒ mixed
- ☐ agriculture or open fields
- ☐ gravel pit
- ☐ residential
- ☐ roadside
- ☐ other

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees
- ☐ moderate overstory, <50% shrubs and/or trees
- ☐ open site with grasses, forbs, scattered shrubs

COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing arvae (estimate % of type).

- ☐ shrubs
- ☐ emergent vegetation (i.e. grass, cattails)
- 10 branches, twigs (in pool or overhanging into water)
- ☐ submergent vegetation
- ☐ sphagnum moss
- ☐ other

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
- ☐ mud/soft sediment
- 100 leaf litter
- ☐ submergent vegetation
- ☐ emergent vegetation

DOMINANT PLANTS, LIST: (optional)

COMMENTS: In ATV trail where wetland Seep crosses

Attach location documentation.

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

- ☒ flooded pool visit
- ☒ 2 photos included
- ☐ dry, drying pool visit
- ☐ photos included
- ☐ field map of pool
- ☐ written directions to pool
- ☐ USGS map, photo copy
- ☐ ONE of the following, indicating pool location:
 - ☐ tax assessors map
 - ☐ detailed location information
- ☒ Evidence of vernal pool indicator species (check all present):
 - ☐ fairy shrimp
 - ☐ wood frog
 - ☐ chorus
 - ☐ amplexus
 - ☐ egg mass
 - ☐ tadpoles
 - ☒ salamander (spotted, Jefferson, blue-spotted)
 - ☐ courtship
 - ☐ spermatophores
 - ☒ 10 egg mass
 - ☐ larvae
- ☒ Photos of indicator species
- ☐ Documentation forms and maps submitted to both:
 - ☐ town conservation commission
 - ☐ Nongame and Endangered Wildlife Program, NH Fish and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name Jim Bolduc + Alex Finamore

Address _____

Phone number _____

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP5 spotted salamander eggs



VP5



VP5



VP5 second visit June 2011

VERNAL POOL DOCUMENTATION (PART 1 OF 2)

VP-6
Rugs 1-3

Observer's name SB+ AF Phone number _____

Address _____

Location of pool Willard mt

GPS (if available): Latitude 43° 02.870 Longitude 72° 01.279 Datum NAD83

Photos attached 2 pool 1 animals

Date: 5-9-11 Time start 10:15 Time end 10:25

Weather Sunny ~ 65° Pool size 10 x 20 Water depth 5"

☐ measured ☒ estimated

water temp
13°C

SPECIES	SS						
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs	9						
tadpoles/larvae							
juveniles							

Comments: In old relic farm rd.

Date: _____ Time start _____ Time end _____

Weather _____ Pool size _____ Water depth _____

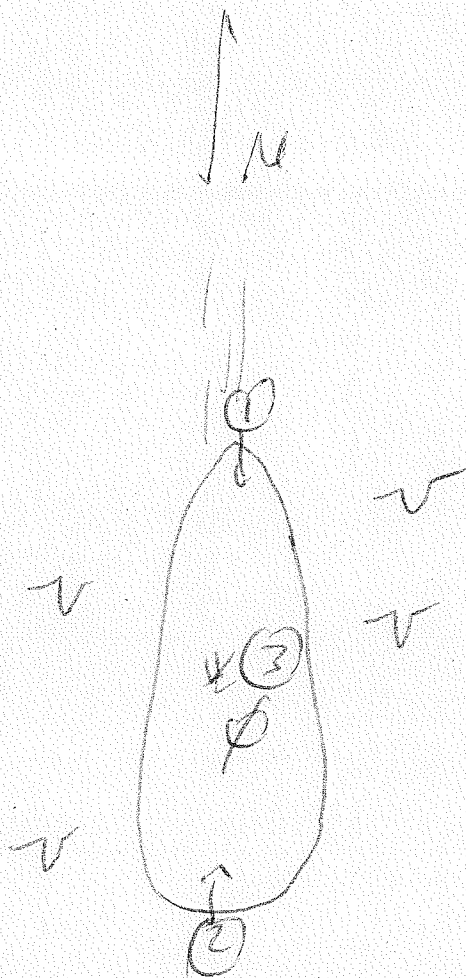
SPECIES							
adult							
vocalization							
amplexus							
courtship							
spermatophores							
eggs							
tadpoles/larvae							
juveniles							

Comments: _____

Use the back of the sheet for sketch/field map of the pool.

VP-6

Flays 1-5



$\phi = SS \text{ eq. 2.1}$

① = Pic
↓

← old farm road

VERNAL POOL HABITAT DOCUMENTATION (Part 2 of 2)

Pool Location willow mudObserver JP + AF

SITE/ TYPE:

- ☐ upland-isolated (pool not associated with a wetland)
☐ bottomland-isolated (pool in a floodplain, not in a wetland)
☒ wetland complex (pool within or associated with a larger wetland habitat, i.e. red maple swamp, marsh, pond edge, other)

Isolated w/in old farm rd

HABITAT: (estimate % of type)

- ☒ woodland (specify type) ☒ deciduous ☐ coniferous ☐ mixed
☐ agriculture or open fields
☐ gravel pit
☐ residential
☐ roadside
☐ other _____

OVERSTORY:

- ☒ heavy overstory, >50% shrubs and/or trees
☐ moderate overstory, <50% shrubs and/or trees
☐ open site with grasses, forbs, scattered shrubs

COVER: Any material in the pool that can provide egg attachment sites and offer concealment to aquatic adults and/or developing arvae (estimate % of type).

- ☐ shrubs
☐ emergent vegetation (i.e. grass, cattails)
☒ branches, twigs (in pool or overhanging into water)
☐ submergent vegetation
☐ sphagnum moss
☐ other _____

BOTTOM: (estimate % of types composing bottom surface)

- ☐ sand
☐ mud/soft sediment
☒ leaf litter
☐ submergent vegetation
☐ emergent vegetation

DOMINANT PLANTS, LIST: (optional)

Frag gra

COMMENTS:

Attach location documentation.

VERNAL POOL DOCUMENTATION COVER SHEET

Include with documentation for each vernal pool.

☒ flooded pool visit
☒ 2 photos included

☐ dry, drying pool visit
☐ photos included

☐ field map of pool

☐ written directions to pool

☐ USGS map, photo copy

☐ ONE of the following, indicating pool location:

- ☐ tax assessors map
☐ detailed location information

☒ Evidence of vernal pool indicator species (check all present):

- ☐ fairy shrimp
☐ wood frog
☐ chorus
☐ amplexus
☐ egg mass
☐ tadpoles

- ☒ salamander (spotted, Jefferson, blue-spotted)
☐ courtship
☐ spermatophores
☒ 9 egg mass
☐ larvae

☒ 1 Photos of indicator species

☐ Documentation forms and maps submitted to both:

- ☐ town conservation commission
☐ Nongame and Endangered Wildlife Program, NH Fish
and Game Department, 11 Hazen Drive, Concord, NH 03301

Reporter's name _____

Address _____

Phone number _____

Thank you for participating in the vital process of protecting the resources of your community and the state.



VP6



VP6 spotted salamander eggs



VP7



VP7