

**Revised
Natural Community Assessment
for
Antrim Wind Energy Project
Town of Antrim
Hillsborough County, New Hampshire**

Prepared for:

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January 2012
**Revised August 2012 and
Revised July 2015**

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ATTACHMENTS

Attachment 1 Natural Community Map

1.0 INTRODUCTION

On behalf of Cptklo "Y kpf "Gpgti { LLC, TRC j cu'prepared Natural Community Assessment ("NCA") for a proposed wind energy project site ("Site"), located in the Town of Antrim, Hillsborough County, New Hampshire. This NCA was done in accordance with the "Natural Communities of New Hampshire, Second Edition" (Sperduto and Nichols 2011). The survey protocol and data forms were developed in consultation with the New Hampshire Natural Heritage Bureau (NHNHB). Through continued consultation with NHNHB, there was minor revision in August 2012 to the original report as filed with the SEC Application Docket No. 2012-01, submitted January 31, 2012. The revisions consisted of the removal of two community types from the mapping, including Rich Red Oak Rocky Woods and Temperate Acidic Cliff. Three other areas initially mapped as Semi-Rich Oak-Sugar Maple Forest have been changed to a similar community, Hemlock-Oak-Northern Hardwood Forest. "Vj g"eqpuwncvkqp"kp"4234"cnuq rnf "vq"cf gvgto kpcvkqp"d{ "P J P J D"vj cv'vj gtg'y gtg"pq'tctg'r rcpw'qt"gzgo r rct { "eqo o wplkgu'ctg" rkngr "vq"dg'hqwpf"qp"vj g"Rtqlgev'ukg0"Cf f kkpqcn'eqpuwncvkqp'r gthqo gf 'y kj 'vj g"P J P J D"kp"4237 cnuq"fgvgto kpgf "vj cv'pq'hwtvj gt'hgrf "uwxg{ "ku'pgeguuct { 0Ugg'Cwcej o gpv"3'hqt"eqpuwncvkqp f qewo gpwcvkqp0 "

2.0 PROJECT OVERVIEW

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, a collection and interconnection substation, approximately 3.6 miles of new access road and an operations and maintenance building. There will be no new transmission lines, other than collector system lines, constructed as part of this Project. It is expected that the total direct impact for the access roads, the turbine pads, staging areas, and work pads 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 ¾ of a mile to the north. Between the ridgeline and Route 9 is an existing transmission corridor containing both a 115kV transmission line and a 34.5kV distribution circuit; the proposed Project will interconnect with this existing transmission.

According to available historical information, the area was first developed with mills and farms along the North Branch River, which is located approximate a mile north of the ridges. The project area was once cleared for sheep farming, and numerous stonewalls were observed throughout and adjacent to the project site. After the decline of sheep farming in the area, the site has re-vegetated into a forested condition. Periodic timber harvesting has occurred throughout the entire area.

3.0 METHODS

A two-part approach was utilized to assess the natural communities in the vicinity of the proposed project. First, a desktop review of the readily available data for the project area was performed. Existing data reviewed included aerial photography, soils mapping, cover type, wetland and stream mapping, aspect and elevation, bedrock geology, ownership and land management and a review of data that was available from the NH Natural Heritage Bureau.

The second part of the natural community assessment included a field survey using a modified random point sampling protocol and data form developed in consultation with NHNH. Approximately 460 acres was surveyed and data was collected at 155 points. For documentation purposes a “Natural Community Reporting Form” was filled out along with digital photographs and a GPS point at each sampling location.

4.0 RESULTS

The site has a variety of cover types that are typical of the lower hills and slopes of the monadnocks of the Hillsboro Inland Hill and Plains subsection of southwestern New Hampshire. The cover types are in various stages of succession, ranging from managed scrub-shrub in an existing electric transmission line corridor and recently cleared forest to mature stands of hardwood and softwood northern hardwood forest. All of these areas have been described and classified to natural communities, with the disturbed early successional forest areas defined by what community type they will develop as they grow and progress toward mature stands. The classification of the site’s natural communities was done in accordance with the “Natural Communities of New Hampshire, Second Edition” (Sperduto and Nichols 2011). Areas such as managed ROW, recent clear cuts, and maintained roads have also been included as cover types.

The following table summarized the natural communities and cover types found in the survey area. Descriptions of the natural community are included below. The mapping of the natural communities in relation to the project layout is included in Attachment 4.

Table-1 Cover Types and Natural Communities in Project area.

| Natural Communities | Approximate Acres | Approximate % cover of assessment area |
|---|--------------------------|---|
| Hemlock - Beech - Oak - Pine Forest | 160.49 | 34.72% |
| Hemlock - Oak - Northern Hardwood Forest | 37.68 | 8.15% |
| Hemlock - Spruce - Northern Hardwood Forest | 93.7 | 20.28% |
| Northern Hardwood - Spruce - Fir Forest | 34.54 | 7.48% |
| Red Oak - Pine Rocky Ridge | 34.86 | 7.54% |
| Red Maple – Cinnamon Fern Swamp | 0.6 | 0.13% |
| Red Maple – Sensitive Fern Swamp | 1.0 | 0.22% |
| Red Maple – Sphagnum Basin Swamp | 3.2 | 0.69% |

| Natural Communities | Approximate Acres | Approximate % cover of assessment area |
|---|-------------------|--|
| Semi-Rich Oak - Sugar Maple Forest | 18.64 | 4.03% |
| Sugar Maple - Beech - Yellow Birch Forest | 57.1 | 12.36% |
| Existing Roads | 3.33 | 0.72% |
| Clearcut / Cleared Field | 10.64 | 2.3% |
| R.O.W. Clearing | 6.4 | 1.39% |

The descriptions of the natural communities observed during the survey are below; these descriptions are from “Natural Communities of New Hampshire Second Edition” (Sperduto and Nichols 2011).

Hemlock - Beech - Oak - Pine Forest:

This is a very common, broadly defined community found on glacial till and terrace soils of low to mid elevations in central and southern New Hampshire (with extensions into the White Mountains where it is uncommon). It is latitudinally, elevationally, and floristically transitional between northern hardwood forests and Appalachian oak - hickory forests. As with most upland forests of the region, single-tree wind throw is the primary natural disturbance, with occasional larger blow down patches from hurricanes. Both soil and disturbance related variation is apparent in species composition.

Soils are moderately to extremely well drained, dry-mesic to mesic loamy sands and sandy loams of varying degrees of stoniness and seasonal water availability. Source bedrock tends to be igneous or siliceous metamorphic rock producing acidic soils with low nutrient availability.

CHARACTERISTIC VEGETATION: *Tsuga canadensis* (hemlock), *Fagus grandifolia* (American beech), *Quercus rubra* (red oak), and *Pinus strobus* (white pine) are the primary mid to late successional tree species, and each is present in fully intergrading degrees of prominence. Since most examples in the state are early to mid successional, hemlock and beech may be present primarily in the understory or otherwise increase in prominence over time. At the extreme ends of the canopy-gradient, either hemlock or beech dominates to the exclusion of nearly all other tree species. Other abundant or frequent early to mid-successional tree species include *Betula papyrifera* (paper birch), *Acer rubrum* (red maple), and *A. pensylvanicum* (striped maple). Other occasional species that may be present in low abundance include *Prunus serotina* (black cherry), *Betula lenta* (black birch), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), *B. alleghaniensis* (yellow birch), and *B. populifolia* (gray birch). *Picea rubens* (red spruce) and *Abies balsamea* (balsam fir) are uncommon or absent. The understory woody and herbaceous plant association is distinct from northern hardwood and spruce - fir forest types. Good differential species that are found primarily in this community include *Hamamelis virginiana* (witch hazel) and *Gaultheria procumbens* (wintergreen). Species that are less frequent or abundant than in northern hardwoods include *Oxalis acetosella* (northern wood sorrel), *Huperzia lucidula* (shining clubmoss), *Lonicera canadensis* (Canadian honeysuckle), *Dryopteris campyloptera* (mountain wood fern), *Clintonia borealis* (bluebead lily), and

Streptopus spp. (twisted stalks). Other characteristic species, many of which also occur in northern hardwood forests, include *Aralia nudicaulis* (wild sarsaparilla), *Uvularia sessilifolia* (sessile-leaved bellwort), *Dryopteris intermedia* (intermediate wood fern), *Epifagus virginiana* (beech-drops), *Mitchella repens* (partridge-berry), *Trientalis borealis* (starflower), *Monotropa uniflora* (Indian pipes), and *Maianthemum canadense* (Canada mayflower). The globally rare *Isotria medeoloides* (small whorled pogonia)* is most often found in this forest type.

Hemlock - oak - northern hardwood forest:

This is a common mixed coniferous - deciduous forest of middle elevations (800–1,500 ft. elevation) in central New Hampshire. It also occurs as more isolated patches on mesic sites in southern parts of the state, and in valley-bottom settings in the mountains (locally to 2,000 ft. elevation). The canopy is characterized by a mix of classic northern hardwood species such *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), and *Fagus grandifolia* (American beech), along with *Tsuga canadensis* (hemlock). *Quercus rubra* (red oak) and *Pinus strobus* (white pine) are also typically present, but diminish in abundance in examples in the mountains or at higher elevations.

This community is found primarily on moderately well to well drained soils (occasionally somewhat poorly drained) of coarser parent materials, particularly compact till and firm ablation tills and sometimes on outwash, kame-terraces, and shallow-to-bedrock soils. Soils are generally acidic and moderately nutrient poor.

CHARACTERISTIC VEGETATION: Hemlock and beech are the primary late-successional tree species. Red oak and yellow birch are often present as associates. Hemlock and/or beech may only be present in the understory in successional examples. Other trees are less constant and more variable in prominence including sugar maple, white pine, *Fraxinus americana* (white ash), *Acer rubrum* (red maple), *Picea rubens* (red spruce), and *Abies balsamea* (balsam fir).

The most consistent plants in the shrub layer are *Acer pensylvanicum* (striped maple) and *Viburnum lantanoides* (hobblebush) but they are typically somewhat sparse. Herbs that are more abundant or frequent than in typical northern hardwoods include *Medeola virginiana* (Indian cucumber-root), *Mitchella repens* (partridge-berry), and *Coptis trifolia* (goldthread).

Hemlock - spruce - northern hardwood forest:

This forest community is characterized by a canopy of *Tsuga canadensis* (hemlock) and *Picea rubens* (red spruce), with a variable component of northern hardwoods including *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), and *Fagus grandifolia* (American beech). It is found at moderate elevations between spruce-fir and transition hardwood-conifer forests, ranging from less than 1,000 ft. up to 2,000 ft. It also occurs on river and kame terrace sites where former and current stream channels cut through terraces of different elevations, moisture levels, and sediment textures.

Soils are typically mesic, moderately well to well drained, and generally more nutrient poor than northern hardwoods. They range from wet to dry compact tills or sandy sediments and outwash.

This community less frequently occurs on rocky outcrop substrates. Corresponding soil series include Adams, Colton, Au Gres, Salmon, Nicholville, Pillsbury, and Cabot.

CHARACTERISTIC VEGETATION: Hemlock and red spruce are dominant. Birches, particularly yellow birch more than *Betula papyrifera* (paper birch) and *Betula populifolia* (gray birch), are frequent and sometimes abundant. The dominant trees are typically found reproducing in the understory. *Abies balsamea* (balsam fir) may be present but is usually not prominent other than on the terrace flat variant described below. Yellow birch is frequent in both the overstory and understory while beech is occasional but not prominent.

The woody understory frequently contains *Viburnum lantanoides* (hobblebush) and *Acer pensylvanicum* (striped maple). Herbaceous plant composition is often different from one example to the next. However, northern plants such as *Oxalis acetosella* (northern wood sorrel), *Huperzia lucidula* (shining clubmoss), *Clintonia borealis* (bluebead lily), *Streptopus roseus* (rosey twisted stalk), and *Dryopteris campyloptera* (mountain wood fern) tend to be more abundant than in hemlock - hardwood forests without spruce. Other species common in nutrient poor soils and occurring here are *Aralia nudicaulis* (wild sarsaparilla), *Trillium undulatum* (painted trillium), *Dryopteris intermedia* (intermediate wood fern), *Lycopodium* spp. (clubmosses), *Trientalis borealis* (starflower), *Viburnum nudum* (witherod), and various mosses.

Northern hardwood - spruce - fir forest:

Northern hardwood spruce-fir forests are a transitional forest type found at intermediate elevation positions between sugar maple-beech-yellow birch forests and spruce-fir forests. They occur in cool, mesic, and typically rocky till or talus settings in the mountains with shallow rooting-depths. These forests generally have lower productivity, increased moisture availability, and a higher percent cover of herbaceous species compared to lower elevation forests. Soils are poor to very nutrient poor.

CHARACTERISTIC VEGETATION: *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech) are generally dominant, with abundant *Betula alleghaniensis* (yellow birch) and modest amounts of *Picea rubens* (red spruce) and/or *Abies balsamea* (balsam fir). Spruce and fir are generally in lower abundance than hardwoods, but they become dominant with increased elevation, where yellow birch or sometimes *Betula papyrifera* (paper birch) become the primary hardwoods. Sugar maple and beech disappear above 2,500 ft. elevation, leaving only the birches, spruce, and fir. *Sorbus americana* (American mountain ash), *Lonicera canadensis* (Canadian honeysuckle), *Acer spicatum* (mountain maple), and *Viburnum lantanoides* (hobblebush) often occur in the shrub layer. Understory plants are similar to those in the sugar maple-beech-yellow birch forest, but they may achieve higher average cover in this community, particularly *Dryopteris intermedia* (intermediate wood fern) and *D. campyloptera* (mountain wood fern). Common characteristic herbaceous species include *Oxalis acetosella* (northern wood sorrel) and *Clintonia borealis* (bluebead lily). Characteristic species more frequent or abundant in this type than in lower elevation hardwood forests include mountain ashes and Canadian honeysuckle.

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Red maple - sensitive fern swamp:

This is a common type of weakly minerotrophic red maple swamp characterized by a diverse assemblage of herbaceous species, relatively little *Sphagnum* moss, and saturated or seasonally saturated to seasonally flooded soils. The swamps range from small to large (10–100 acres) and typically occupy headwater basins that give rise to drainages or occur along drainages where seepage or non-channelized upland runoff contributes to the water budget. The community lacks seasonal over-bank flooding (as is typical of seasonally flooded red maple swamps) and is more minerotrophic than red maple-*Sphagnum* basin swamps. *Onoclea sensibilis* (sensitive fern) is a good indicator of minerotrophic conditions in this type. Subsurface groundwater discharge is likely in at least some of these swamps.

CHARACTERISTIC VEGETATION: Tree cover ranges from 25% to more than 65% and consists of *Acer rubrum* (red maple), with lesser quantities of *Ulmus americana* (American elm) and other hardwoods, and few or no conifers. A diverse shrub layer is typical; *Ilex verticillata* (winterberry) is abundant and *Vaccinium corymbosum* (highbush blueberry) is usually present but less abundant than in nutrient-poor swamps. *Viburnum dentatum* (northern arrowwood), *Alnus incana* (speckled alder), and *Spiraea alba* (meadowsweet) are occasional. *Toxicodendron vernix* (poison sumac), *Toxicodendron radicans* (poison ivy), *Sambucus canadensis* (common elderberry), *Lindera benzoin* (northern spicebush), *Viburnum lentago* (nannyberry), and *Cornus amomum* (silky dogwood) may be present. Sensitive fern and *Carex stricta* (tussock sedge) are usually abundant or co-dominant herbs. Other species include *Impatiens capensis* (spotted touch-me-not), *Iris versicolor* (northern blue flag), *Lysimachia terrestris* (swamp candles), *Carex crinita* (drooping sedge), *Osmunda regalis* (royal fern), *Calamagrostis canadensis* (bluejoint), *Thalictrum pubescens* (tall meadow-rue), and *Viola* spp. (violets). *Osmunda cinnamomea* (cinnamon fern) is often present but not dominant throughout. *Carex bromoides* (brome sedge) is abundant in some examples. Mosses are often abundant and diverse, but *Sphagnum* moss typically comprises less than 5% cover, or is absent. Hummock-hollow topography ranges from absent to moderately well developed. Upland species found on large hummocks of more acidic basin swamps appear to be less abundant in these swamps [e.g., *Aralia nudicaulis* (wild sarsaparilla), *Mitchella repens* (partridge-berry), and *Quercus rubra* (red oak)]. Also, while this community is somewhat minerotrophic, plant species indicative of mineral-rich groundwater seepage are absent or sparse.

Red maple - red oak - cinnamon fern forest:

This community occurs in settings with somewhat poorly drained mineral soils, in transition zones between wetland and upland communities. It is dominated by hardwood trees, particularly red maple, oaks, and birches, with a relatively minor component of pine and hemlock. *Osmunda cinnamomea* (cinnamon fern) and tall wetland shrubs such as *Vaccinium corymbosum* (highbush blueberry) are present in moderate abundance (~1–15%). Other wetland plants are sparse. Coastal or southern examples may contain Appalachian oaks, hickories, and possibly black huckleberry, species that are absent from examples in central parts of the state.

Soils consist of sand, sandy loams, and silt loams, and typically have a dark brown or black A-horizon over B-horizon materials with mottling within ~30 cm of the surface. This community is typically somewhat poorly drained, and therefore intermediate and transitional to more well

drained upland forests and poorly or very poorly drained swamps. Soils series include Pipestone sand, Boxford silt loam, and possibly Raynham silt loam and Eldridge fine sandy loam.

CHARACTERISTIC VEGETATION: This community is differentiated from various mesic upland forests (e.g., mesic Appalachian oak-hickory forest and hemlock-beech-oak-pine forest) of central and southern NH by the presence of a few wetland species in low to moderate abundance, including cinnamon fern and highbush blueberry. *Acer rubrum* (red maple) and *Quercus rubra* (red oak) are usually present and often dominant, mixing with various combinations of *Betula alleghaniensis* (yellow birch), *B. lenta* (black birch), *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Q. velutina* (black oak), *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Pinus strobus* (white pine), and *Tsuga canadensis* (hemlock). *Gaylussacia baccata* (black huckleberry) can be abundant. Ferns such as *Thelypteris noveboracensis* (New York fern) are more abundant than in mesic Appalachian oak-hickory forests.

This community is similar in drainage class to the hemlock-cinnamon fern forest but lacks the prominence of hemlock. It is also similar to the red maple-elm-lady fern silt forest, but either lacks or has a lower abundance of *Athyrium filix-femina* (northern lady fern), *Onoclea sensibilis* (sensitive fern), and *Ulmus americana* (American elm).

Red maple - Sphagnum basin swamp:

This is a common type of red maple swamp that occurs in perched basins of till landscapes or other low, flat areas with small watersheds (typically only 1/4 to 1 square mile or less). While they are influenced by seasonal subsurface and ephemeral runoff from surrounding uplands, there are typically no perennial streams running into or through the basins and there is minimal influence of groundwater. The canopy is dominated by *Acer rubrum* (red maple), although other tree species are commonly present. The tall shrub and herb layers are moderately light to dense, and peat mosses (*Sphagnum* spp.) have moderately patchy to dense cover. Hummock and hollow topography is well developed.

Soils are acidic, nutrient-poor, very poorly drained Histosols (deep peat or muck >40 cm) or poorly to very poorly drained histic epipedons (O horizons are generally <20 cm). Although soils are generally saturated and have limited lateral movement of water, there is seasonal fluctuation resulting both from upland runoff in the spring and from evapotranspiration over the course of the growing season.

CHARACTERISTIC VEGETATION: The tree canopy is dominated by red maple. Other tree species that may be sub-dominant to occasional include *Betula alleghaniensis* (yellow birch), *Tsuga canadensis* (hemlock), *Pinus strobus* (white pine), and *Picea rubens* (red spruce). Swamps dominated by red spruce are considered red spruce swamps. Overstory hemlock and white pine cover increases in somewhat more well-drained swamps. *Nyssa sylvatica* (black gum) may also be present, but only in low cover (a greater abundance of black gum would indicate the black gum-red maple basin swamp community).

The shrub layer usually contains *Vaccinium corymbosum* (highbush blueberry) and *Ilex verticillata* (winterberry) as primary dominants, with lesser amounts of *Nemopanthus mucronatus* (mountain holly), *Viburnum dentatum* (northern arrowwood), *Ilex laevigata* (smooth winterberry), *Spiraea alba* (meadowsweet), *Chamaedaphne calyculata* (leatherleaf), and the short shrubs *Kalmia angustifolia* (sheep laurel) and *Rubus hispidus* (bristly dewberry). *Osmunda cinnamomea* (cinnamon fern) is typically common in the herbaceous layer, with lesser quantities of other herbs. *Carex trisperma* var. *trisperma* (three-seeded sedge), *Thelypteris palustris* (marsh fern), *Lycopus uniflorus* (common water horehound), *Carex folliculate* (follicled sedge), and *C. canescens* (silvery sedge) are frequently present in low abundance. Upland herbs may occupy hummocks; these species include *Aralia nudicaulis* (wild sarsaparilla), *Coptis trifolia* (goldthread), and *Gaultheria procumbens* (wintergreen). *Sphagnum* mosses are usually dominant or abundant in hollows and on lower sides of hummocks and include *Sphagnum fallax*, *S. girgensohnii*, and *S. papillosum*, among others. Wetter hollows in somewhat open swamps may have a greater abundance of species such as silvery sedge and *Calla palustris* (wild calla).

Red oak - pine rocky ridge:

This is the most common rocky ridge community type between 1,000 and 2,000 ft. elevation in southern and central New Hampshire, though it also occurs as high as 2,200 ft. elevation on warm, south-facing slopes of the Saco River valley in the White Mountains. It is characterized by a scattered, moderately short or stunted tree canopy of *Quercus rubra* (red oak) (25–60% cover and 15–40 ft. tall), a significant short shrub layer (25–70% cover), and a usually sparse to moderately dense herb layer (<1–70% cover). Rock exposures generally cover 25–50% of the ground surface. These communities are fire-prone, and many have fire histories. Fire may be important for regenerating oak on these sites over the long-term and plays an important role in maintaining the structure, composition, and physical features of this community (e.g., shallow rocky soils with frequent outcrops). The open woodland structures and ridgeline positions often create good views at these sites, and they are therefore popular hiking destinations.

Ecologically, this community is very similar to the Appalachian oak - pine rocky ridge and shares many of the same species. However, it is distinguished by the absence of definitively southern and Appalachian species generally found below 1,000–1,300 ft., by the occasional presence of a few northern or higher elevation species, and by the prominence of red oak. Red oak is a broadly adapted temperate species, most abundant on dry sites where trees of mesic sites cannot survive. In New Hampshire, it grows well on mid elevation ridges and mountains, while most other oaks become scarce above 1,000 ft. This community also overlaps elevationally with red pine rocky ridges, with which it may sometimes intergrade.

CHARACTERISTIC VEGETATION: Several tree species are more abundant and frequent in this community than in Appalachian oak-pine rocky ridges. These include occasional to abundant *Pinus resinosa* (red pine), occasional *Prunus pensylvanica* (pin cherry), and infrequent *Picea rubens* (red spruce). *Pinus strobus* (white pine) is common. Frequent characteristic shrubs include *Vaccinium angustifolium* (lowbush blueberry) (nearly constant), *V. myrtilloides* (velvet-leaf blueberry), *Gaylussacia baccata* (black huckleberry), *Juniperus communis* (ground juniper), *Diervilla lonicera* (bush honeysuckle), *Gaultheria procumbens* (wintergreen), and *Comptonia peregrina* (sweet fern). *Arctostaphylos uva-ursi* (bearberry) is infrequent on lower elevation

examples. Characteristic and frequent herbaceous species include the lawn forming *Carex lucorum* (distant sedge) as well as *Deschampsia flexuosa* (common hairgrass) (nearly constant), *Pteridium aquilinum* (bracken), *Schizachyrium scoparium* (little bluestem), *Corydalis sempervirens* (pale corydalis), *Danthonia spicata* (poverty oat-grass), *Maianthemum canadense* (Canada mayflower), *Solidago bicolor* (silverrod), *Melampyrum lineare* (cow-wheat), and *Carex foenea* (bronzy sedge). Lichens and mosses are abundant on rocks.

Higher elevation examples (1,400–1,900 ft.) have more red spruce, *Sibbaldiopsis tridentata* (three-toothed cinquefoil), and *Sorbus* spp. (mountain ashes), whereas lower elevation examples have southern species such as distant sedge, ground juniper, and *Aureolaria pedicularia* var. *intercedens* (fern-leaved false foxglove). Lower elevation examples may also contain species such as *Corydalis sempervirens* (pale corydalis) and *Arctostaphylos uva-ursi* (bearberry). Appalachian trees and shrubs notably absent from or sparse in this community include *Pinus rigida* (pitch pine), oaks other than red oak, hickories, *Juniperus virginiana* (eastern red cedar), *Gaylussacia frondosa* (dangleberry), and *Sassafras albidum* (sassafras).

Semi-rich oak - sugar maple forest:

This community occurs at low elevations in central and southern New Hampshire, mostly below 1,500 ft. It forms on sites that are somewhat drier than semi-rich mesic sugar maple forests, and can contain significant amounts of Appalachian species such as *Carya* spp. (hickories), *Ostrya virginiana* (ironwood), *Fraxinus americana* (white ash), and other southern or drier site species. Oaks, sugar maple, and white ash dominate with a moderate to well developed woody understory and a scattered to moderately abundant herb layer. It is distinguished from more nutrient-poor forest types by having species indicative of weakly enriched conditions, and from rich mesic forests by the absence of strong enrichment indicators (see below). It also lacks many of the rare and uncommon species diagnostic of rich rocky wood communities such as *Carex platyphylla* (flat-leaved sedge), *C. retroflexa* (reflexed sedge)*, *Saxifraga virginiana* (early saxifrage), *Ranunculus fascicularis* (early buttercup)*, *Aster patens* (skydrop aster)*, certain *Arabis* spp. (rock-cresses)*, *Aureolaria virginica* (downy false-foxglove)*, *Lespedeza virginica* (slender bush-clover)*, *Pycnanthemum incanum* (hoary mountain mint)*, *Paronychia canadensis* (smooth-forked chickweed)*, *Anemone thalictroides* (rue anemone)*, *Asclepias quadrifolia* (four-leaved milkweed)*, *Asplenium platyneuron* (ebony spleenwort), and *Woodsia obtusa* (blunt-lobed woodsia)*.

Soils are well to moderately well drained fine sandy loams, loams, or silt loams with a very shallow hemic O horizon (1–2 cm+), shallow very dark gray to brown A horizons (2–10 cm), and brown to yellowish brown upper B-horizons. Moisture availability ranges from dry-mesic to mesic and may be at least seasonally drier than most rich mesic forests. Bedrock includes types that are mafic or have intermediate base-cation content such as diorites and gabbros, and the Elliot, Berwick and Kittery Formations. Some sites have silty soils associated with riverine or marine deposits. Settings range from flat to moderately sloped terrain or colluvial positions at slope bases.

CHARACTERISTIC VEGETATION: This community is characterized by a moderately diverse tree canopy dominated by a combination of *Acer saccharum* (sugar maple), *Quercus rubra* (red

oak), and white ash. *Pinus strobus* (white pine) is frequent. *Tilia americana* (basswood), *Betula lenta* (black birch), and *Prunus serotina* (black cherry) occur in some examples, and are occasionally abundant. *Tsuga canadensis* (hemlock) is occasional but never dominant (<15%), and *Fagus grandifolia* (American beech) is infrequent and not abundant. Ironwood is often abundant or dominant in the understory, and *Carpinus caroliniana* (musclewood) is occasionally abundant. Among these trees sugar maple, ash, basswood, ironwood, and musclewood are usually indicative of at least somewhat enriched conditions.

Tall shrubs include an abundance of *Viburnum acerifolium* (maple-leaved viburnum) and lesser amounts and constancy of *Hamamelis virginiana* (witch hazel), *Viburnum dentatum* (northern arrowwood), *Corylus cornuta* (beaked hazel-nut), and in disturbed examples, *Berberis* spp. (barberries).

Any combination of three or more of the following semi-rich differential species will distinguish this community from more acidic forests: *Polystichum acrostichoides* (Christmas fern), *Anemone americana* (blunt-lobed hepatica), *Polygonatum pubescens* (hairy Solomon's seal), *Carex blanda*, *C. laxiflora*, and *C. laxiculmis* (wide-leaved sedges), *Actaea rubra* (red baneberry), *Desmodium glutinosum* (cluster-leaved tick-trefoil), *Phegopteris hexagonoptera* (broad beech fern), *Viola rotundifolia* (round-leaved violet), *Tiarella cordifolia* (foamflower), and *Toxicodendron radicans* (poison ivy). Most sites have only a few of these differential species. The following species may be found in more mesic microhabitats: *Arisaema triphyllum* (Jack-in-the-pulpit), *Onoclea sensibilis* (sensitive fern), *Osmunda claytoniana* (interrupted fern), *Circaea alpina* (small enchanter's nightshade), *Viola* spp. (violets), and *Geum canadense* (white avens).

Other characteristic species that may be present (and are not restricted to enriched conditions) include *Mitchella repens* (partridge-berry) (often abundant), *Dryopteris carthusiana* (spinulose wood fern), *Trientalis borealis* (starflower), *Athyrium filix-femina* (lady fern), *Uvularia sessilifolia* (sessile-leaved bellwort), *Solidago caesia* (blue-stemmed goldenrod), *Maianthemum canadense* (Canada mayflower), *Aralia nudicaulis* (wild sarsaparilla), and *Monotropa uniflora* (Indian pipes).

Sugar maple - beech - yellow birch forest:

This is the most common hardwood forest type in northern New Hampshire. It is dominated by *Acer saccharum* (sugar maple), *Fagus grandifolia* (American beech), and *Betula alleghaniensis* (yellow birch). It is transitional to high-elevation spruce-fir forests at higher elevations and lowland spruce-fir forests, hemlock-spruce-northern hardwood forests, or hemlock-beech-oak-pine forests at lower elevations. Small windthrow gaps of one to many trees are the primary disturbance in these forests. Yellow birch is successful in establishing itself in these gaps, and although it is not as shade tolerant as beech and sugar maple, it is long-lived and consequently an important late-successional dominant (approximately 200–380 years).

Rapid and high-density growth of *Prunus pensylvanica* (pin cherry) can occur from buried seeds in clearcut and other large-gap disturbance patches. Pin cherry is an important nutrient-sink on these sites, effectively retaining nutrients and organic matter within the system.

Soils are moderately well drained fine sandy loams. Soils form from till derived from granitic igneous rocks and metamorphic rocks such as schist and gneiss, yielding soils with relatively low mineral nutrient content. Soils tend to be drier than in rich mesic forests and high-elevation spruce - fir forests, but more mesic than at sites with increased beech cover.

CHARACTERISTIC VEGETATION: Sugar maple and beech are the primary mid- and late successional dominants, with yellow birch next in importance. Other seral hardwood species are common or occasional and include *Betula papyrifera* (paper birch), *Acer pensylvanicum* (striped maple), *A. spicatum* (mountain maple), and *Fraxinus americana* (white ash). *Viburnum lantanoides* (hobblebush) is frequent and often abundant in the shrub layer. *Lonicera canadensis* (Canadian honeysuckle) may be present but is infrequent and more likely to be encountered in more enriched and/or moist forests. *Dryopteris intermedia* (intermediate wood fern) is frequent and often abundant in the herbaceous layer, particularly at higher elevations. *Dryopteris campyloptera* (mountain wood fern), largely absent from lower elevation forests, is frequent but usually less abundant than intermediate wood fern. *Huperzia lucidula* (shining clubmoss) is frequent and generally more abundant than in lower elevation forests.

Other characteristic species with high constancy include *Clintonia borealis* (bluebead lily), *Maianthemum canadense* (Canada mayflower), *Oxalis acetosella* (northern wood sorrel), *Trientalis borealis* (starflower), *Aster acuminatus* (whorled aster), and *Uvularia sessilifolia* (sessile-leaved bellwort). Occasional (low constancy) species include *Aralia nudicaulis* (wild sarsaparilla), *Trillium erectum* (wakerobin), *T. undulatum* (painted trillium), *Streptopus roseus* (rosey twisted stalk), *Cinna latifolia* (drooping woodreed), *Thelypteris noveboracensis* (New York fern), *Solidago macrophylla* (large-leaved goldenrod), and *Medeola virginiana* (Indian cucumber-root).

Shrubs that may be present in low cover include *Diervilla lonicera* (bush honeysuckle), *Vaccinium angustifolium* (lowbush blueberry), *Spiraea alba* (meadowsweet), *Kalmia angustifolia* (sheep laurel), *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), *Rubus* spp. (brambles), and *Amelanchier* spp. (shadbushes).

Scattered saplings or stunted older trees can occur on benches or other areas where soil accumulates. These include *Betula papyrifera* (paper birch), *Quercus rubra* (red oak), *Pinus strobus* (white pine), *Populus tremuloides* (quaking aspen), *Populus grandidentata* (big-toothed aspen), *Juniperus virginiana* (eastern red cedar), *Acer saccharum* (sugar maple), and *Picea rubens* (red spruce).

5.0 REFERENCES

Sperduto, D.D. and William F. Nichols. 2011. Natural Communities of New Hampshire. 2nd Ed. NH Natural Heritage Bureau, Concord, NH. Pub. UNH Cooperative Extension, Durham, NH.

ATTACHMENT 1

*****NJ PJ D'F qewo gpvcvkqp

Memo



NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Dana Valteau, TRC Environmental Corp.
14 Gabriel Drive
Augusta, ME 04330

From: Amy Lamb, NH Natural Heritage Bureau

Date: 6/11/2015 3:14:08 PM (valid for one year from this date)

Re: Review by NH Natural Heritage Bureau

NHB File ID: NHB15-1904

Town: Antrim

Location: Tax Maps: Maps 212, 235, 236, 239;
Lots 212-7, 30&34; 235-14; 236-1&2;
239-1

Description: The project is a wind power project located along Tuttle Hill.

cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: NHB requests surveys for the endangered plant species and exemplary natural community indicated below. Please send the requested information to: Amy.Lamb@dred.nh.gov. Please coordinate with Kim Tuttle of NH Fish & Game for wildlife concerns.

Invertebrate Species

| | State ¹ | Federal | Notes |
|--|--------------------|---------|--|
| Ebony Boghaunter (<i>Williamsonia fletcheri</i>) | SC | -- | Contact the NH Fish & Game Dept (see below). |

Natural Community

| | State ¹ | Federal | Notes |
|-----------------------------------|--------------------|---------|--|
| Inland Atlantic white cedar swamp | -- | -- | Changes to the hydrology of the wetland are the greatest threat facing the cedar swamp. Damming which causes pooling for extended periods can flood and drown existing trees, and drainage that results in lower water levels can lead to invasion by other species that can out compete -- and eventually eliminate -- Atlantic white cedar trees. Increased nutrient input from stormwater runoff could also deleteriously impact this acidic, low-nutrient plant community. |

Plant species

| | State ¹ | Federal | Notes |
|--|--------------------|---------|--|
| Canada shore quillwort (<i>Isoetes riparia</i> var. <i>canadensis</i>) | E | -- | Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level. |

Vertebrate species

| | State ¹ | Federal | Notes |
|---|--------------------|---------|--|
| Marsh Wren (<i>Cistothorus palustris</i>) | -- | -- | Contact the NH Fish & Game Dept (see below). |

Memo



NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

Wood Turtle (*Glyptemys insculpta*)

SC

--

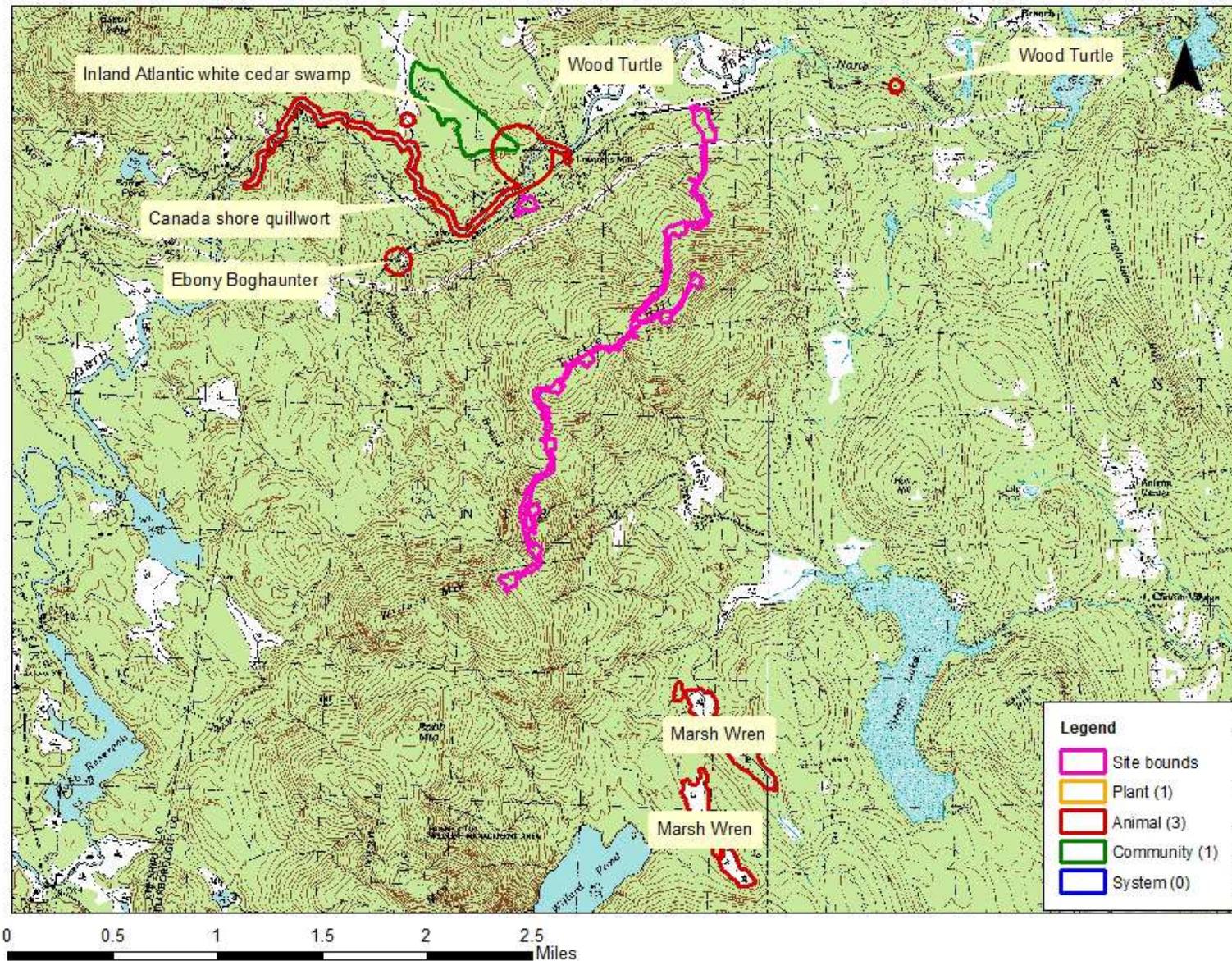
Contact the NH Fish & Game Dept (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

NHB15-1904



New Hampshire Natural Heritage Bureau - Animal Record

Ebony Boghaunter (*Williamsonia fletcheri*)**Legal Status**

Federal: Not listed
State: Special Concern

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2003: Area 1: Species observed on 5/30.

General Area:

General Comments:

Management

Comments:

Location

Survey Site Name: Salmon Brook
Managed By: The Nature Conservancy #2

County: Hillsborough

Town(s): Antrim

Size: 7.7 acres

Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions:

Dates documented

First reported: 2003-05-30

Last reported: 2003-05-30

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Community Record

Inland Atlantic white cedar swamp

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Not ranked (need more information)
State: Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Excellent quality, condition and landscape context ('A' on a scale of A-D).
Comments on Rank: This site is probably the best, largest and most viable remaining cedar swamp in the western part of the state. It should remain among the highest conservation priorities in the state.

Detailed Description: 2006: Community observed and photographed. 2004: Community observed and photographed. 1993: *Chamaecyparis thyoides* (Atlantic white cedar) is the dominant tree with both *Acer rubrum* (red maple) and *Picea rubens* (red spruce) present in abundance. *Picea mariana* (black spruce) is scattered and less abundant. Occasionally, *Pinus strobus* (white pine) and *Betula alleghaniensis* (yellow birch) are also found. Dominant shrub species are *Gaylussacia baccata* (black huckleberry), *Nemopanthus mucronatus* (mountain holly), *Ilex laevigata* (smooth winterberry), and *Kalmia angustifolia* (sheep laurel). Common boreal components present are *Chamaedaphne calyculata* (leatherleaf), *Gaultheria hispida* (creeping snowberry), and *Ledum groenlandicum* (Labrador tea). The herbaceous layer is fairly abundant, although richness is somewhat limited. *Osmunda cinnamomea* (cinnamon fern), *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Sarracenia purpurea* (pitcher-plant) and *Carex trisperma* (three-seeded sedge) are commonly present. Sphagnum species are abundant. 1990: Has *Chamaecyparis thyoides* (Atlantic white cedar) to 14 inches dbh and a few larger individuals, abundant in areas away from streams. *Picea mariana* (black spruce), *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and *Acer rubrum* (red maple) also occur. Lesser amounts of *Pinus strobus* (white pine).

General Area: 1993: Soil type is a mucky peat, with the peat deposits averaging <1 meter. The soil is permanently saturated with a couple of obvious watercourses present. The pH of the groundwater is quite acidic with a range of 3.8-4.0. 1990: Purest and largest cedar around open black spruce bog (90 percent, 10-14 inches average range). Other areas 50-80 percent. Basin is surrounded by gradually sloping uplands which are punctuated by a number of small cliffs. 1961 (Baldwin): a fairly large boggy swamp with *Chamaecyparis thyoides* (Atlantic white cedar). Contains 6 stands of cedar.

General Comments: 1997: New community boundaries mapped based on 1993 field work. 1990: Encroaching urban development.

Management

Comments:

Location

Survey Site Name: Loverens Mill Cedar Swamp

Managed By: Loverens Mill Preserve

County: Hillsborough

Town(s): Antrim

Size: 51.3 acres

Elevation: 1080 feet

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: From Hillsboro, take Rte. 9 south ca. 5 miles south to Holmes Hill Road. Turn right (north) onto Holmes Hill. Park on the right immediately after crossing the bridge over the river, at the TNC preserve sign kiosk. After ca. 900 feet there will be a gravel road on the left. This is the trailhead. Take the marked trail on this road, up past the old mill, and look for a turnoff to the right. Proceed down this trail (N-NW). The cedar swamp is at the bottom of the basin, to the north.

Dates documented

First reported: 1961

Last reported: 2006-06-13

New Hampshire Natural Heritage Bureau - Animal Record

Marsh Wren (*Cistothorus palustris*)**Legal Status**

Federal: Not listed
State: Not listed

Conservation Status

Global: Demonstrably widespread, abundant, and secure
State: Not ranked (need more information)

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2002: 5 observed on 6/18, 1 seen gathering nesting material.

General Area:

General Comments:

Management

Comments:

Location

Survey Site Name: Willard Pond, NE of
Managed By:

County: Hillsborough

Town(s): Antrim

Size: 66.0 acres

Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions:

Dates documented

First reported: 2002-06-18

Last reported: 2002-06-18

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.



NEW HAMPSHIRE NATURAL HERITAGE BUREAU

DRED - DIVISION OF FORESTS & LANDS
172 PEMBROKE ROAD, CONCORD, NH 03301
(603) 271-2214

To: Dana Valleau, Environmental Specialist, TRC

From: Amy Lamb, Ecological Information Specialist, NHB

Date: June 26, 2015

Subject: Re: NHB15-1904, NHB10-0644: Antrim Wind Energy, LLC

This is a follow-up to NHB15-1904, which indicated the presence of an exemplary natural community, an Inland Atlantic white cedar swamp, and a state endangered plant, Canada shore quillwort (*Isoetes riparia var. canadensis*), close to the proposed project area. The report also indicated the presence of three wildlife species; please note that the Natural Heritage Bureau does not provide comments regarding wildlife, and that there must be consultation with the NH Fish and Game Department for all wildlife concerns.

In the NHB15-1904 review, we requested that the project area be surveyed for the occurrence of the rare species and natural community within the project area. After this initial recommendation, it came to my attention that community mapping had occurred throughout the project area, through consultation with Melissa Coppola under project number NHB10-0644. Based on the results of those surveys, NHB does not find it likely that the natural community and rare plant identified in NHB15-1904 would be found on the property. As such, NHB no longer recommends a survey for Canada shore quillwort or Inland Atlantic white cedar swamp in the project area.

We look forward to continued communication throughout the SEC process. Please send us any additional application materials as they become available, and include us in any future communications regarding the subject project.



NEW HAMPSHIRE NATURAL HERITAGE BUREAU

DRED - DIVISION OF FORESTS & LANDS

PO Box 1856 -- 172 PEMBROKE ROAD, CONCORD, NH 03302-1856

(603) 271-2214

To: Site Evaluation Committee

From: Melissa Coppola, Environmental Information Specialist

Date: August 2, 2012

Subject: Final Report: Site Evaluation Committee #2012-01
Application for Antrim Wind Energy, LLC

The Natural Heritage Bureau (NHB), under the auspices of the NH Native Plant Protection Act of 1987 (RSA 217-A), has reviewed the application materials for Antrim Wind Energy, LLC.

NHB had requested a final site visit during the growing as a last review step. This site review was conducted on 13 July 2012. The purpose of the visit was to search for a state-listed plant species within a few targeted natural community types with greater potential for rare species. No rare plant species were observed during the surveys.

Based on the observations made during the site visit and the application materials provided, NHB has determined that it is unlikely that the proposed wind facility will impact rare plants species or exemplary natural communities.

Memo



NH NATURAL HERITAGE BUREAU

To: James Kenworthy, Eolian Renewable Energy, LLC
55 Fleet St.
Portsmouth, NH 03801

From: Melissa Coppola, NH Natural Heritage Bureau

Date: 3/22/2010 (valid for one year from this date)

Re: Review by NH Natural Heritage Bureau

NHB File ID: NHB10-0644

Town: Antrim

Project type: Roads, Driveways, Bridges: Road construction, etc.

Location: Tax Maps: 212-030, 212-027, 212-034, 211-004, 235-014

cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: NHB has concerns about potential impacts to the exemplary natural community. Please send detailed site plans to mcoppola@dred.state.nh.us for further review.

Natural Community

Inland Atlantic white cedar swamp

State¹

--

Federal

--

Notes

Changes to the hydrology of the wetland are the greatest threat facing the cedar swamp. Damming which causes pooling for extended periods can flood and drown existing trees, and drainage that results in lower water levels can lead to invasion by other species that can out compete -- and eventually eliminate -- Atlantic white cedar trees. Increased nutrient input from stormwater runoff could also deleteriously impact this acidic, low-nutrient plant community.

Vertebrate species

Wood Turtle (*Glyptemys insculpta*)

State¹

SC

Federal

--

Notes

Contact the NH Fish & Game Dept (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

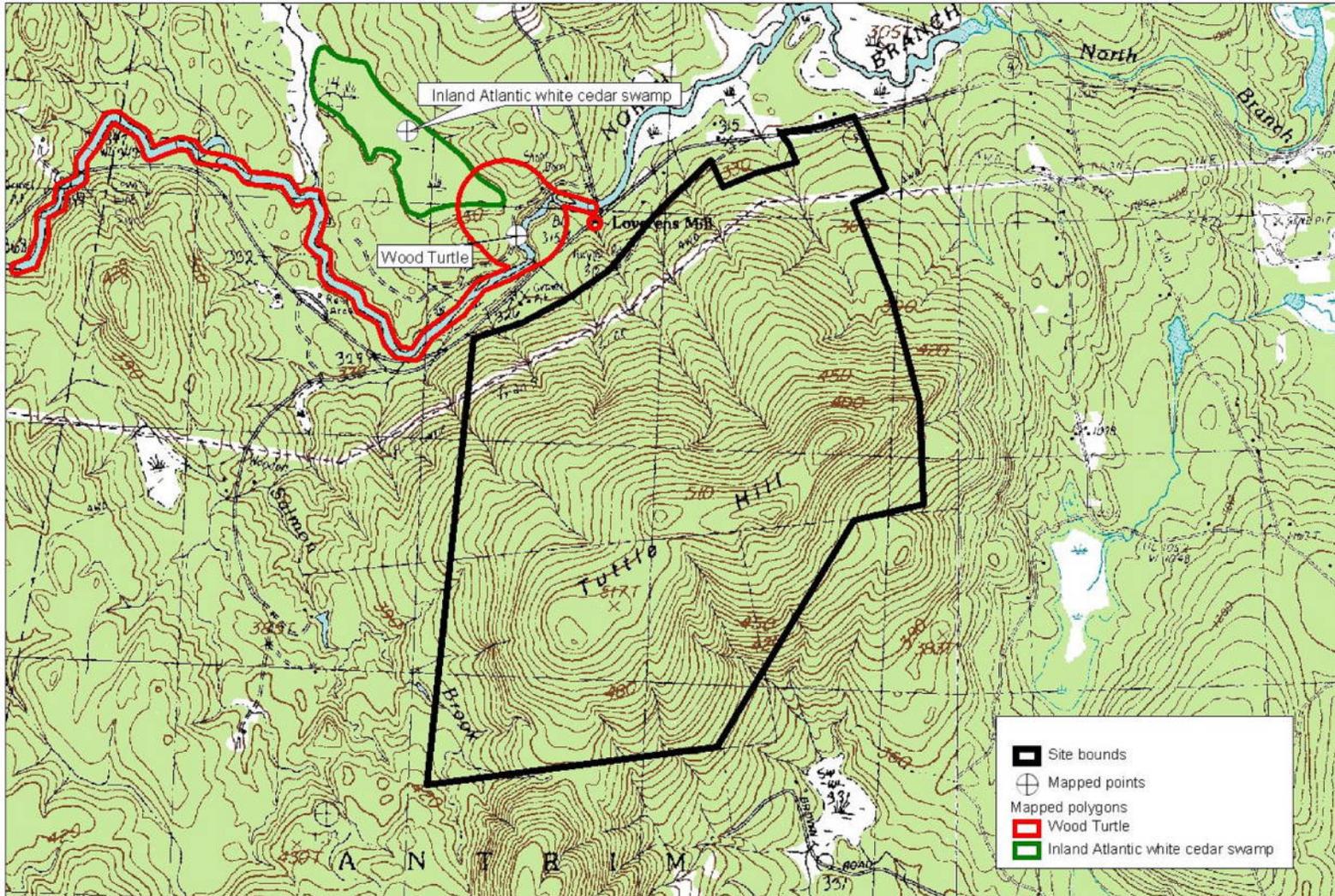
Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. For some purposes, including legal requirements for state wetland permits, the fact that no species of concern are known to be present is sufficient. However, an on-site survey would provide better information on what species and communities are indeed present.

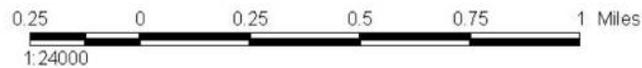


Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



*Historical record



New Hampshire Natural Heritage Bureau - Community Record

Inland Atlantic white cedar swamp

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Not ranked (need more information)
State: Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Excellent quality, condition and landscape context ('A' on a scale of A-D).
Comments on Rank: This site is probably the best, largest and most viable remaining cedar swamp in the western part of the state. It should remain among the highest conservation priorities in the state.

Detailed Description: 2006: Community observed and photographed. 2004: Community observed and photographed. 1993: *Chamaecyparis thyoides* (Atlantic white cedar) is the dominant tree with both *Acer rubrum* (red maple) and *Picea rubens* (red spruce) present in abundance. *Picea mariana* (black spruce) is scattered and less abundant. Occasionally, *Pinus strobus* (white pine) and *Betula alleghaniensis* (yellow birch) are also found. Dominant shrub species are *Gaylussacia baccata* (black huckleberry), *Nemopanthus mucronatus* (mountain holly), *Ilex laevigata* (smooth winterberry), and *Kalmia angustifolia* (sheep laurel). Common boreal components present are *Chamaedaphne calyculata* (leather-leaf), *Gaultheria hispidula* (creeping snowberry), and *Ledum groenlandicum* (Labrador-tea). The herbaceous layer is fairly abundant, although richness is somewhat limited. *Osmunda cinnamomea* (cinnamon fern), *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Sarracenia purpurea* (pitcher-plant) and *Carex trisperma* (three-seeded sedge) are commonly present. Sphagnum species are abundant. 1990: Has *Chamaecyparis thyoides* (Atlantic white cedar) to 14 inches dbh and a few larger individuals, abundant in areas away from streams. *Picea mariana* (black spruce), *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and *Acer rubrum* (red maple) also occur. Lesser amounts of *Pinus strobus* (white pine).

General Area: 1993: Soil type is a mucky peat, with the peat deposits averaging <1 meter. The soil is permanently saturated with a couple of obvious watercourses present. The pH of the groundwater is quite acidic with a range of 3.8-4.0. 1990: Purest and largest cedar around open black spruce bog (90 percent, 10-14 inches average range). Other areas 50-80 percent. Basin is surrounded by gradually sloping uplands which are punctuated by a number of small cliffs. 1961 (Baldwin): a fairly large boggy swamp with *Chamaecyparis thyoides* (Atlantic white cedar). Contains 6 stands of cedar.

General Comments: 1997: New community boundaries mapped based on 1993 field work. 1990: Encroaching urban development.

Management
Comments:

Location

Survey Site Name: Loverens Mill Cedar Swamp
Managed By: Loverens Mill Preserve

| | |
|----------------------|----------------------------------|
| County: Hillsborough | USGS quad(s): Stoddard (4307211) |
| Town(s): Antrim | Lat, Long: 430433N, 0720142W |
| Size: 51.3 acres | Elevation: 1080 feet |

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: From Hillsboro, take Rte. 9 south ca. 5 miles south to Holmes Hill Road. Turn right (north) onto Holmes Hill. Park on the right immediately after crossing the bridge over the river, at the TNC preserve sign kiosk. After ca. 900 feet there will be a gravel road on the left. This is the trailhead. Take the marked trail on this road, up past the old mill, and look for a turnoff to the right. Proceed down this trail (N-NW). The cedar swamp is at the bottom of the basin, to the north.

Dates documented

First reported: 1961

Last reported: 2006-06-13

Kimball, Ben, et al. 2006. Field visit to Loverens Mill Cedar Swamp Preserve on June 13.

Sperduto, D. & N. Ritter. 1994. Atlantic White Cedar Wetlands of New Hampshire. Environmental Protection Agency, Boston, MA.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status

Federal: Not listed
State: SC

Conservation Status

Global: Apparently secure but with cause for concern
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2008: Area 11603: 1 adult seen.2006: Area 11693: 1 adult seen.2005: Area 12135: 1 adult seen.2002: Area 12069: 1 observed.

General Area: 2005: Area 12135: Crossing highway towards North Branch of Contoocook River.2002: Area 12069: Near cedar swamp.

General Comments:
Management
Comments:

Location

Survey Site Name: Loverens Mill
Managed By: The Nature Conservancy #2

County: Hillsborough
Town(s): Antrim
Size: 84.4 acres

USGS quad(s): Stoddard (4307211)
Lat, Long:
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2008: Area 11603: TNC property at Loverens Mill Road.2002: Area 12069: Loverens Mill property near trail to cedar swamp.

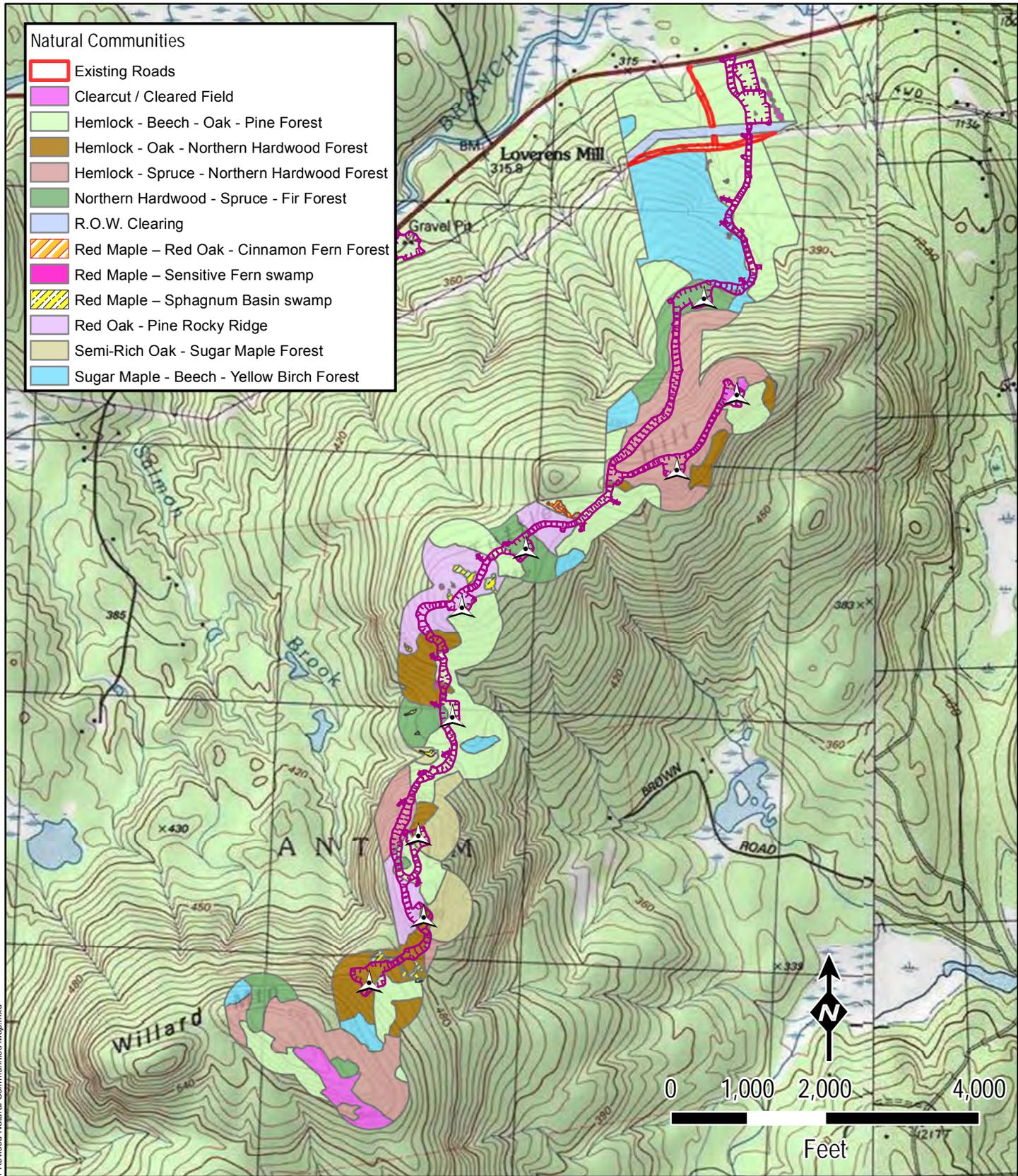
Dates documented

First reported: 2002-07-28 Last reported: 2008-06-01

ATTACHMENT 4

NATURAL COMMUNITY MAP

- Natural Communities**
-  Existing Roads
 -  Clearcut / Cleared Field
 -  Hemlock - Beech - Oak - Pine Forest
 -  Hemlock - Oak - Northern Hardwood Forest
 -  Hemlock - Spruce - Northern Hardwood Forest
 -  Northern Hardwood - Spruce - Fir Forest
 -  R.O.W. Clearing
 -  Red Maple – Red Oak - Cinnamon Fern Forest
 -  Red Maple – Sensitive Fern swamp
 -  Red Maple – Sphagnum Basin swamp
 -  Red Oak - Pine Rocky Ridge
 -  Semi-Rich Oak - Sugar Maple Forest
 -  Sugar Maple - Beech - Yellow Birch Forest



V:\PROJECTS\AUGUSTA\Eolian\ANTRIM\Attachment 1 Revised Natural Communities Map.mxd



Legend

-  Proposed WTG
-  Proposed Disturbance Area

Hillsboro and Stoddard 7.5-Minute USGS Topographic Quadrangles



ANTRIM WIND ENERGY PROJECT
ANTRIM, NH

Attachment 2

Revised Natural Communities Map

Produced by: 

7/7/2015