Wetland and Biological Assessment
Proposed Photovoltaic Installation

117 Oil Mill Road
Waterford, Connecticut

Submitted To:
BL Companies

Prepared By:
Eric Davison
Davison Environmental

June 6, 2018

CONTENTS

APPENDICES

1.0 INTRODUCTION

A proposed photovoltaic installation (i.e., solar field) is proposed on a 152.23 acres property located at 117 Oil Mill Road in Waterford ("property" or "site"). Please refer to Figure 1 - *Location Map* and Figure 2 - *Aerial Map* in Appendix 1.

Davison Environmental, LLC biologists, soil scientists and wetland scientists conducted site visits from December 2017 through May 2018 in order to delineate the wetlands and watercourses, evaluate the characteristics of the wetlands and watercourses and wildlife habitats, and survey for vernal pools.

2.0 EXISTING ENVIRONMENT

2.1 General Site Characteristics

The site lies within the coastal ecoregion, approximately 4,000 feet northeast of the Niantic River, a tidal waterway. The site lies within two watersheds with the east-southeast portions of the site draining east into Stony Brook, and the northern portions of the site draining into Mill Brook. A small segment of Mill Brook flows through the northern portions of the property.

The site is largely forested, apart from a segment of Eversource utility right-of-way running roughly east-west across the northern portion of the site. Topography is rolling to rugged, with areas of large bedrock outcroppings and shallow-to-bedrock soils.

2.2 Wetlands and Watercourses

The wetlands were delineated in December of 2017 by Registered Soil Scientists Eric Davison and James Cowen. This work was conducted according to the requirements of the CT Inland Wetlands and Watercourses Act (P.A. 155). Wetlands are defined as areas of poorly drained, very poorly drained, floodplain, and alluvial soils, as delineated by a soil scientist. Watercourses are defined as bogs, swamps, or marshes, as well as lakes, ponds, rivers, streams, etc., whether natural or man-made, permanent or intermittent.

The wetland delineation work is described in Appendix 2 – *Wetland Delineation Report*, which includes a description of the soil types present on the site.

<u>Wetland Descriptions</u>

Two wetlands occur on the site, denoted as Wetland 1 and Wetland 2. Wetlands are illustrated on Figure 3 – *Wetlands, Vernal Pools and Rare Species* and their characteristics are summarized in Table 1.

Wetland 1 includes Oil Mill Brook, as well as those wetlands that drain to Oil Mill Brook. Wetland 1 is the larger of the two wetlands, occupying much of the northwest corner of the site. The wetland occurs in several "fingers" that extend from west to east into the hillside. At two locations, the woods road and utility right-of-way, there are existing culvert and fill crossings that bifurcate the wetland.

Wetland 2 is a single narrow wetland finger that extends onto the site from the east. Wetland 2 lies on a very steep rocky/bouldery slope. The wetland drains to the east into a broad wetland valley that borders on Stony Brook.

From a hydrologic perspective, both wetlands are classified as *hillside groundwater slope wetlands*. Hillside groundwater slope wetlands are wetlands that develop on hillsides, where groundwater discharges to the surface as springs and seeps. Throughout the upland-wetland interface visible groundwater discharge zones (i.e., seeps) are present. A key feature of these wetlands, from a water quality perspective, are the pronounced bedrock and boulder outcroppings where cold well-oxygenated groundwater discharges from fractured bedrock and glacial till.

Table 1: Wetland descriptions

Wetland	Type	Cover Type	Hydrology
1	Hillside groundwater slope; including and tributary to Oil Mill Brook	Forested (predom.), scrub-shrub within utility ROW	Seasonally saturated & perennial stream
2	Hillside groundwater slope; tributary to Stony Brook	Forested	Seasonally saturated

Wetland vegetation is similar in both wetlands, with variability occurring within wetland microhabitats. The tree layer consists of red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*), green ash (*Fraxinus pensylvanica*) and American elm (*Ulmus americana*).

The shrub layer includes mountain laurel (*Kalmia latifolia*), winterberry (*Ilex verticillata*) and pepperbush (*Clethra alnifolia*) along with the invasive non-native Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*).

The herb layer includes skunk cabbage (*Symplocarpus foetidus*), false hellebore (*Veratrum viride*), sphagnum moss, cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), clearweed (*Pilea pumila*), sensitive fern (*Onoclea sensibilis*) and the invasive non-native Japanese stiltgrass (*Microstegium vimineum*).

Wetland Functions and Values

The functions and values are summarized in Table 2. The *Highway Methodology* recognizes the following 13 separate wetland functions and values: groundwater recharge/discharge, floodwater storage, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, sediment/shoreline stabilization, wetland wildlife habitat, recreational value, educational/scientific value, uniqueness, visual/aesthetic quality and threatened and endangered species habitat.

The degree to which a wetland provides each of these functions is determined by one or more of the following factors: landscape position, substrate, hydrology, vegetation, history of disturbance, and size. Each wetland may provide one or more of the listed functions at significant levels. The determining factors that affect the level of function provided by a wetland can often be broken into two categories. The effectiveness of a wetland to provide a specified function is generally dependent on factors within the wetland whereas the opportunity to provide a function is often influenced by the wetland's position in the landscape as well as adjacent land uses. For example, a depressed wetland with a restricted outlet may be considered highly effective in trapping sediment due to the long residence time of runoff water passing through the system. If this wetland is located in gently sloping woodland, however, there is no significant source of sediment in the runoff therefore the wetland is considered to have a small opportunity of providing this function.

Table 2: Summary of Wetland Functions and Values

Wetland Functions and Values	Groundwater Recharge/Discharge	Sediment/Shoreline Stabilization	Floodflow Alteration	Fish & Shellfish Habitat	Sediment/Toxicant/ Pathogen Retention	Nutrient Removal/Attenuation	Production Export	Wildlife Habitat	Recreation	Educational/Scientific Value	Uniqueness/Heritage	Visual Quality/Aesthetics	Listed Species Habitat
1	P	P	P	P	S	S	S	S	S	S	P	P	Y
2	P	U	P	S	S	S	S	S	S	S	P	P	N

Suitability
P = principal function
S = secondary function
U = function unlikely to be provided at a significant level
N = none present based on lack of current CT DEEP NDDB records and lack of observations during site surveys

2.3 Upland Habitats

Two upland habitat types are present, old field (managed utility ROW) and mixed hardwood forest. Old field habitat occurs solely within the Eversource ROW, and totals approximately five acres. The remainder of the site (147 acres) consists of mixed hardwood forest.

During the spring of 2018, the site was logged. Most of the larger trees (ca. over 15 inches d.b.h.) were removed, leaving the tree canopy open in many areas. This is a temporal disturbance, and over time, the tree density will recover. In the interim, a subtle shift in breeding bird species can be expected, favoring species which prefer larger forest openings, such as the Baltimore oriole and great-crested flycatcher.

Mixed hardwood forest habitat is comprised largely of black oak (*Quercus velutina*), red oak (*Quercus rubra*), black birch (*Betula lenta*), white oak (*Quercus alba*), hickories (*Carya*), ash (*Fraxinus spp.*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), sassafras (*Sassafras albidium*) and tulip tree (*Liriodendron tulipifera*). The shrub layer is dominated by mountain laurel (*Kalmia latifolia*), and also includes witchhazel (*Hamamelis virginiana*).

Old field habitat is comprised primarily of dense mountain laurel, with dense vines of greenbriar (*Smilax rotundifolia*), grape (*Vitis sp.*), the invasive Asiatic bittersweet (*Celastrus orbiculatus*), sweet fern (*Comptonia peregrina*), as well as tree saplings of some of the above-noted species.

3.0 WILDLIFE

The wildlife discussion focuses on species considered to be of high conservation priority in Connecticut as designated in the 2015 Connecticut Wildlife Action Plan (WAP) and those that have State listing status. The WAP was created to establish a framework for proactively conserving Connecticut's fish and wildlife, including their habitats. The WAP identifies species of "Greatest Conservation Need" (GCN) and prioritizes those species into three categories in descending order of significance from "most important to "very important" and finally "important".

For many species, this wildlife assessment is habitat-based, with no detailed surveys conducted. Targeted field surveys included vernal pool and wetland-dependent species conducted from mid-April through mid-May. This work focused primarily on vernal pool identification but included cover and visual searching, and dip-netting throughout site wetlands. Bird species observed during that work were also recorded as discussed in Section 3.3.

This assessment does not address all biota that inhabit the site (e.g., bats, insects). Rather, the goal of the study was to focus on those species most likely to be adversely impacted from a change in land use. These include amphibians and reptiles which have low mobility and dispersal capabilities, as well as breeding birds of conservation concern within the State.

3.1 Herpetofauna and Vernal Pools

Reptiles and amphibian species observed during field surveys are listed in Table 3.

Table 3: Amphibians and reptiles observed

Common Name	Scientific Name	CT WAP Status	State-listed Status
Spotted Salamander	*Ambystoma maculatum*	I	NL
Four-toed Salamander	*Hemidactylium scutatum*	NL	NL
Redback Salamander	*Plethodon cinereus*	NL	NL
American Toad	*Anaxyrus americanus*	NL	NL
Spring Peeper	*Pseudacris crucifer*	NL	NL
Green Frog	*Lithobates clamitans*	NL	NL
Wood Frog	*Lithobates sylvaticus*	I	NL
Two-lined Salamander	*Eurycea bislineata*	NL	NL
Eastern Ribbonsnake	*Thamnophis sauritus*	VI	SC
Garter Snake	*Thamnophis sirtalis*	NL	NL
CT Wildlife Action Plan (CT WAP) Status: I = important; VI = very important; MI = most important; NL = not listed State-listed Status: E = endangered; T = threatened; SC = species of special concern; NL = not listed			

One state-listed species, the eastern ribbon snake (*Thamnophis sauritus*), was observed within Wetland 1 along the utility ROW (see Figure 3). The ribbon snake inhabits a variety of shallow water aquatic habitats, favoring open grassy or shrubby areas bordering on streams and wooded swamps (Klemens, 1993).

A vernal pool survey of the Site was conducted. Calhoun and Klemens (2002) provides the following operational definition of vernal pools:

Vernal pools are seasonal bodies of water that attain maximum depths in the spring or fall, and lack permanent surface water connections with other wetlands or water bodies. Pools fill with snowmelt or runoff in the spring, although some may be fed primarily by groundwater sources. The duration of surface flooding, known as hydroperiod, varies depending upon the pool and the year; vernal pool hydroperiods range along a continuum from less than 30 days to more than one year. Pools are generally small in size (<2 acres), with the extent of vegetation varying widely. They lack established fish populations, usually as a result of periodic drying, and support communities dominated by animals adapted to living in temporary, fishless pools. In the region, they provide essential breeding habitat for one or more wildlife species including

Ambystomid salamanders (Ambystoma spp., called "mole salamanders" because they live in burrows), wood frogs (Rana sylvatica), and fairy shrimp (Eubranchipus spp.).

Vernal pool physical characteristics can vary widely while still providing habitat for indicator species. "Classic" vernal pools are natural depressions in a wooded upland with no hydrologic connection to other wetland systems. Manmade depressions such as quarry holes, old farm ponds and borrow pits can also provide similar habitat. Often, vernal pools are depressions or impoundments within larger wetland systems. These vernal pool habitats are commonly referred to as "cryptic" vernal pools.

Several species of amphibians depend on vernal pools for reproduction and development. These species are referred to as indicator vernal pool species and their presence in a wetland during the breeding season helps to identify that area as a vernal pool.

While wetlands are extensive, due to the site's landscape position on a broad slope these wetlands consist largely of headwater wetlands/drainageways. The sloping topography limits prolonged standing water capable of supporting vernal pools.

Breeding by two vernal pool indicator species, the wood frog (*Lithobates sylvaticus*) and the spotted salamander (*Ambystoma maculatum*), was noted at three locations, referred to as Vernal Pools 1 through 3, as illustrated on Figure 3 and summarized in Table 4.

Table 4: Amphibians and reptiles observed

Common Name	Scientific Name	Observations		
		Pool 1	Pool 2	Pool 3
Spotted Salamander	*Ambystoma maculatum*	4 egg masses	14	17 egg masses
Wood Frog	*Lithobates sylvaticus*	Larvae	1 wood frog mass; larvae	Not present

All three pools are cryptic in nature. While forest is abundant onsite and within the surrounding landscape, the limiting factor for vernal pool amphibians is the lack of seasonally flooded wetlands. As a result, the three identified breeding pools are quite small, and the hydrology shallow and somewhat marginal with respect to the length of the hydroperiod. All three pools are small in extent, and average ponding depths are shallow (i.e., less than 8 inches), and the depth of ponding is limited, due largely to topography.

Pool 2 was nearly completely dry, with only a roughly 6' x 6' area of standing water remaining. Based on these observations, this pool may not be productive in drier years. While pools 1 and 2 occur in natural depressions within larger wetland systems, Pool 3 is located on the upslope side of an existing woods road crossing, and likely was created by the installation of this road. While in some cases this can create a "decoy" breeding situation, in this case the upslope groundwater discharge appears to provide adequate water supply for successful larval development.

3.2 Natural Diversity Database Review (NDDB)

The Connecticut Department of Energy and Environmental Protection's Natural Diversity Database (NDDB) program mapping was reviewed. The most recent mapping dated December 2017, shows no existing NDDB records overlapping the site.

3.3 Breeding Bird Inventory

While no targeted breeding season bird surveys were conducted, all species observed from late April through mid-May were recorded as noted in Table 5. Many of these species can reasonably be expected to breed on the site due to the presence of suitable habitat. For the remainder of species noted in Table 5, they are considered potential breeders, developed utilizing a habitat-based catalog of known breeding birds in Connecticut. The primary source utilized was *The Atlas of Breeding Birds of Connecticut* [1] which is the result of a five-year study (1982-1986) of all bird species known to breed in the State. This study is the most comprehensive review to date of Connecticut's breeding birds. Additional resources utilized include DeGraaf and Yamasaki (2001). An initial inventory of potential breeding birds was generated solely based on the presence of suitable habitat. That list was then refined by considering such factors as bio-geographical distribution, the presence or absence of critical habitat features and minimum patch size requirements

The site lies within an approximately 750 acre block of contiguous forest stretching between I-395, I-95, Route 85 and Cross Road. Within that forest block, there is only a minor intrusion of non-forested habitat within the roughly 100-foot wide utility ROW that traverses the site. The principal species expected to breed on the site are forest-dwelling birds, including those species requiring forest "interior", generally defined regionally as forest that lies a minimum of 300ft from non-forested areas. These include a number of neotropical migratory songbirds of high-conservation priority, both in Connecticut as well as regionally. Examples include the wood thrush (*Hylocichla mustelina*) and scarlet tanager (*Piranga olivacea*).

[1] Bevier, L. R. (Ed.). Atlas of Breeding Birds of Connecticut. 1994. Bulletin 113. State Geological and Natural History Survey of Connecticut. 461 p.

Table 5: Observed and Potential Breeding Birds

Common Name	Scientific Name	Observed (anticipated breeder)	Conservation Status
American Redstart	*Setophaga ruticilla*		
American Woodcock	*Scolopax minor*		MI
Barred Owl	*Strix varia*		
Baltimore Oriole	*Icterus galbula*	Observed	I
Black-and-white Warbler	*Mniotilta varia*		I
Black-billed cuckoo	*Coccyzus erythropthalmus*	Observed	VI
Black-capped Chickadee	*Parus atricapillus*	Observed	
Blue Jay	*Cyanocitta cristata*		
Blue-gray Gnatcatcher	*Polioptila caerulea*		
Blue-winged Warbler	*Vermivora pinus*	Observed	MI
Broad-winged Hawk	*Buteo platypterus*		VI
Brown Creeper	*Certhia americana*		I
Brown-headed Cowbird	*Molothrus ater*		
Canada Warbler	*Wilsonia canadensis*		I
Carolina Wren	*Thryothorus ludovicianus*		
Chestnut-sided Warbler	*Dendroica pensylvanica*		VI
Common Yellowthroat	*Geothlypis trichas*		
Downy Woodpecker	*Picoides pubescens*		
Eastern Wood-Pewee	*Contopus virens*	Observed	I
Gray Catbird	*Dumetella carolinensis*	Observed	
Great Crested Flycatcher	*Myiarchus crinitus*	Observed	
Great Horned Owl	*Bubo virginianus*		
Hairy Woodpecker	*Picoides villosus*		
Hermit Thrush	*Catharus guttatus*	Observed	I
Hooded Warbler	*Wilsonia citrina*		
Indigo Bunting	*Passerina cyanea*		VI
Louisiana Waterthrush	*Seiurus motacilla*		I
Northern Cardinal	*Cardinalis cardinalis*		
Ovenbird	*Seiurus aurocapillus*	Observed	I
Pileated Woodpecker	*Dryocopus pileatus*		
Prairie Warbler	*Dendroica discolor*		MI
Red-bellied Woodpecker	*Melanerpes carolinus*	Observed	
Red-eyed Vireo	*Vireo olivaceus*	Observed	
Red-shouldered Hawk	*Buteo lineatus*		
Red-tailed Hawk	*Buteo jamaicensis*		
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Observed	I
Rufous-sided Towhee	*Pipilo erythrophthalmus*	Observed	MI
Scarlet Tanager	*Piranga olivacea*	Observed	VI
Song Sparrow	*Melospiza Melodia*		
Tufted Titmouse	*Parus bicolor*	Observed	
White-breasted Nuthatch	*Sitta carolinensis*		
White-eyed Vireo	*Vireo griseus*		I

Table 5 continued……			
Common Name	Scientific Name	Observed (anticipated breeder)	Conservation Status
Wild Turkey	*Meleagris gallopavo*		
Wood Thrush	*Hylocichla mustelina*	Observed	MI
Worm-eating Warbler	*Helmitheros vermivorus*		VI
Yellow Warbler	*Dendroica petechia*		
Yellow-throated Vireo	*Vireo flavifrons*	Observed	

3.4 Fisheries and Aquatic Resources

The site contains a segment of Oil Mill Brook, along with wetlands that drain directly to both Oil Mill Brook and Stony Brook. Both streams are tributary to the Niantic River, a tidal waterway draining to Long Island Sound.

While no fisheries surveys were conducted in the onsite sections of Mill Brook, fisheries data available from the CT DEEP fisheries program was queried. Available data shows the presence of wild brook trout (*Salvelinus fontinalis*) in the downstream sections of both Oil Mill Brook and Stony Brook. Brook trout are an indicator of high water quality, requiring cold well-oxygenated waters, with temperatures not exceeding the upper 60s Fahrenheit.

4.0 PROJECT IMPACTS

4.1 Impacts to Wetlands, Streams and Water Quality

No direct wetland impacts are proposed. The existing woods road will be improved but does not require alteration in a manner that will require additional fill or wetland disturbance. Therefore, the focus of impact mitigation measures relates to downstream water quality impacts that can occur when forest is converted to development without the implementation of appropriate best management practices. The following recommendations are aimed at minimizing secondary impacts to wetlands and watercourses.

1. The principal mitigation measures to insure no adverse impacts to downstream aquatic resources should be the implementation of a no disturbance buffer around wetlands and watercourses. Recognizing the sensitivity of these headwater wetlands, and the significance of downstream resources for wildlife and recreation, I would recommend a minimum 200-foot buffer around wetlands, with the first 100-feet being a no disturbance zone where existing forest remains intact. The second 100-feet should remain non-impervious (i.e., no solar panels) but can include stormwater management features and associated grading.

2. Management of stormwater should promote infiltration, as the runoff from solar array fields in general considered clean with respect to significant pollutant loads. This will help to insure there are no thermal impacts to downstream resources.

3. The stormwater management measures should be designed so that there is no increase in peak stormwater flows OR total volume discharging from the site.

4. Where possible, such as in low use areas of the array field, utilize seed mixes that are more beneficial for wildlife and water quality (i.e., require less mowing and reduced use of fertilizers and pesticides), such as:

    a. "No mow" fescue blend (source: www.prairienursery.com); or

    b. New England Conservation and Wildlife Mix (source: http://newp.com/catalog/seed-mixes/#wildlife).

4.2 Impacts to Wildlife and Habitats

The total limits of disturbance resulting from the project are approximately 90 acres. A portion of those disturbance limits will remain as native vegetation but will need to be cleared of trees to reduce shading of the arrays. These areas, if managed appropriately, can have significant wildlife benefits by providing early-successional edge habitat. To promote such habitat, these areas should be mowed/cleared no more than once per year. All clearing should occur between October 15th and March 1st, to prevent impacts to wildlife.

Breeding Bird Impact Assessment

Land development can impact breeding birds via direct habitat loss as well as degradation of habitats adjacent to development, resulting from what is commonly referred to as the "edge effect". The edge effect refers to habitats which are degraded as a result of their adjacency to developed or non-forested habitats. This results from several factors, including habitat avoidance due to noise or visual disturbances, increased rates of predation or brood parasitism caused by improved habitat conditions for predators (e.g., raccoons), and nest parasites (i.e., brown-headed cowbirds. In the northeast region, the edge effect is generally considered to extend approximately 300 feet outward from a developed area. Within this zone, breeding productivity is often diminished and disturbances associated with the adjacent development can result in outright avoidance by nesting birds.

Using Geographic Information System (GIS) software to analyze the most recent aerial photography available (2016, source USDA), it was determined that the site is part of an approximately 750-acre forest block situated between I-395, I-95, Route 85 and Cross Road. Therefore, the site's forests are part of a larger "core forest". Forest areas designated as "core" are those that exceed 250 acres and are configured in such a way that they include “interior” areas that are greater than 300 feet away from non-forested areas.

The total limits of tree clearing are 90 acres. The resulting habitat loss will render the site largely uninhabitable for forest-dwelling birds. Beyond the areas converted from forest to solar field, forest within approximately 300-feet of the proposed clearing limits will be diminished with respect to supporting forest-dwelling birds because of the impacts associated with the edge affect. Additionally, the overall 750-acre forest block will be fragmented, and the habitat value diminished. This is exacerbated by the fact that the site lies roughly within the center of the overall 750-acre forest block, which will have a particular affect on the portions of the forest block that lie to the west (west of the site towards I-95, north to Oil Mill Road) as this area will be fragmented into a small forest patch less than 100 acres.

Forest fragmentation remains the single largest threat to the suite of priority birds that occur within the IBA. Forest-interior birds have experienced population declines in small nature preserves throughout the northeastern United States and are considered to be extremely sensitive to human disturbance (Butcher et al. 1981; Bushman and Therres 1988; Askins et al. 1990; Friesen et al. 1995).

Most of the songbirds showing these declines share two characteristics: they are long-distance migrants that breed in the north temperate zone and spend the winter in the tropics, and they are specialized forest species that typically do not nest in non-wooded habitats (Askins 1995). The two primary causes of these declines are habitat fragmentation on the temperate breeding grounds and destruction of wintering habitat in the tropics (Robbins et al. 1989; Askins et al. 1990; Penhollow and Stauffer 2000). These species are “area sensitive” meaning they are less abundant in smaller woodlands than in large, unfragmented forests (Robbins et al. 1989; Wilcove and Robinson 1990; Askins 1994).

The reproductive success of area-sensitive species may be lower in fragmented forests because brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) and nest predation are more prevalent near forest edges (Askins et al. 1990; Paton 1994; Rich et al. 1994).

Studies have shown that total forest cover, forest composition and forest fragmentation can affect the abundance and distribution of migratory, forest-nesting birds (Mortberg, 2001; Villard *et al.* 1999; Andren 1996). In the 2015 *Connecticut State of the Birds,* Connecticut College professor and noted ornithologist Robert Askins concluded that “in order to sustain a diversity of specialized forest birds, we need to protect some large areas of continuous or nearly continuous forest.”

Impacts to Eastern Ribbonsnake

The primary habitat for ribbonsnake includes the site's wetlands, although non-wetland habitats bordering wetlands (i.e., within a few hundred feet) also represent suitable habitat. The species was noted in Wetland 1, in early-successional wetlands within the utility ROW, which is likely the favored habitat for this species on the site.

The onsite portions of Wetland 2 represent sub-optimal habitat as they are deeply forested and consist of steep, bouldery groundwater discharge zones.

The proposed 200-foot wetland buffer, along with the fact that no disturbance is proposed within the utility ROW, is expected to be protective of the primary habitat for ribbonsnake.

5.0 REFERENCES

Connecticut Environmental Conditions Online (CTECO) (http://www.cteco.uconn.edu/)

Bevier, L. R. (Ed.). Atlas of Breeding Birds of Connecticut. 1994. Bulletin 113 State Geological and Natural History Survey of Connecticut.

Calhoun, A.J.K and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

DeGraaf, R.M., and Yamasaki, M. 2001. New England Wildlife, habitat, natural history and distribution. University Press of New England.

Dowhan, J. and R. J. Craig. 1976. Rare and Endangered Species of Connecticut and Their Habitats. State Geological and Natural History Survey of Connecticut.

Klemens, M.W. 1993. Amphibians of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut, Bulletin 112.

Mitsch, W.J. and Gosselink, J.G. 2007. Wetlands, fourth edition. John Wiley and Sons, Inc.

U.S. Army Corp of Engineers. 1995. The Highway Methodology Workbook – Wetland Functions and Values: A Descriptive Approach.

Askins, R. A. 1995. Hostile landscapes and the decline of migratory songbirds. Science 267:1956-1957.

Robbins, C. S., D. K. Dawson, and B. A. Dowell. 1989a. Habitat area requirements of breeding forest birds of the middle Atlantic states. Wildlife Monographs 103, 34 pp.

Penhollow, M. E. and D. F. Stauffer. 2000. Large-scale habitat relationships of neotropical migratory birds in Virginia. Journal of Wildlife Management 64(2): 362-373.

Wilcove, D. S. and S. K. Robinson. 1990. The impact of forest fragmentation on bird communities in eastern North America. Pages 319-331 in A. Keast, (editor). Biogeography and ecology of forest bird communities. SPB Academic Publishing, The Hague, Netherlands.

Askins, R. A. 1994. Open corridors in a heavily forested landscape: Impact on shrubland and forest-interior birds. Wildlife Society Bulletin 22: 339-347.

Rich, A. C., D. S. Dobkin, and L. J. Niles. 1994. Defining forest fragmentation by corridor width: The influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. Conservation Biology 8: 1109-1121.

Paton, P. W. 1994. The effect of edge on avian nest success: How strong is the evidence? Conservation Biology 8: 17-26.

Rich, A. C., D. S. Dobkin, and L. J. Niles. 1994. Defining forest fragmentation by corridor width: The influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. Conservation Biology 8: 1109-1121.

Mortberg, U.M. 2001. Resident bird species in urban forest remnants: landscape and habitat perspectives. Landscape Ecology, Vol. 16, No. 3, pp. 193-203.

Villard, M.A., M.K. Trzcinski and G. Merriam. 1999. Fragmentation effects on forest birds: Relative influence of woodland cover configuration on landscape occupancy. Conservation Biology, Vol. 13, No. 4, pp. 774-783

Andren, H. 1996. Population responses to habitat fragmentation: statistical power and the random sample hypothesis. Oikos, Vol. 76, pp. 235-242.

Environment Canada. 2004. How Much Habitat is Enough? (Second Edition), A Framework for Guiding Habitat Rehabilitation in the Great Lakes Areas of Concern.

Butcher, G. S., W. A. Niering, W. J. Barry and R. H. Goodwin. 1981. Equilibrium biogeography and the size of nature preserves: an avian case study. Oecologia 49:29-37.

Bushman, E. S. and G. D. Therres. 1988. Habitat management guidelines for forest interior birds of coastal Maryland. Maryland Department of Natural Resources, Wildlife Technical Bulletin 88-1, Annapolis, Maryland.

Askins, R. A., J. F. Lynch and R. Greenberg. 1990. Population declines in migratory birds in eastern North America. Current Ornithology 7:1-57.

Friesen, L. E., P.F. J. Eagles and R. J. Mackey. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9:1408-1414.

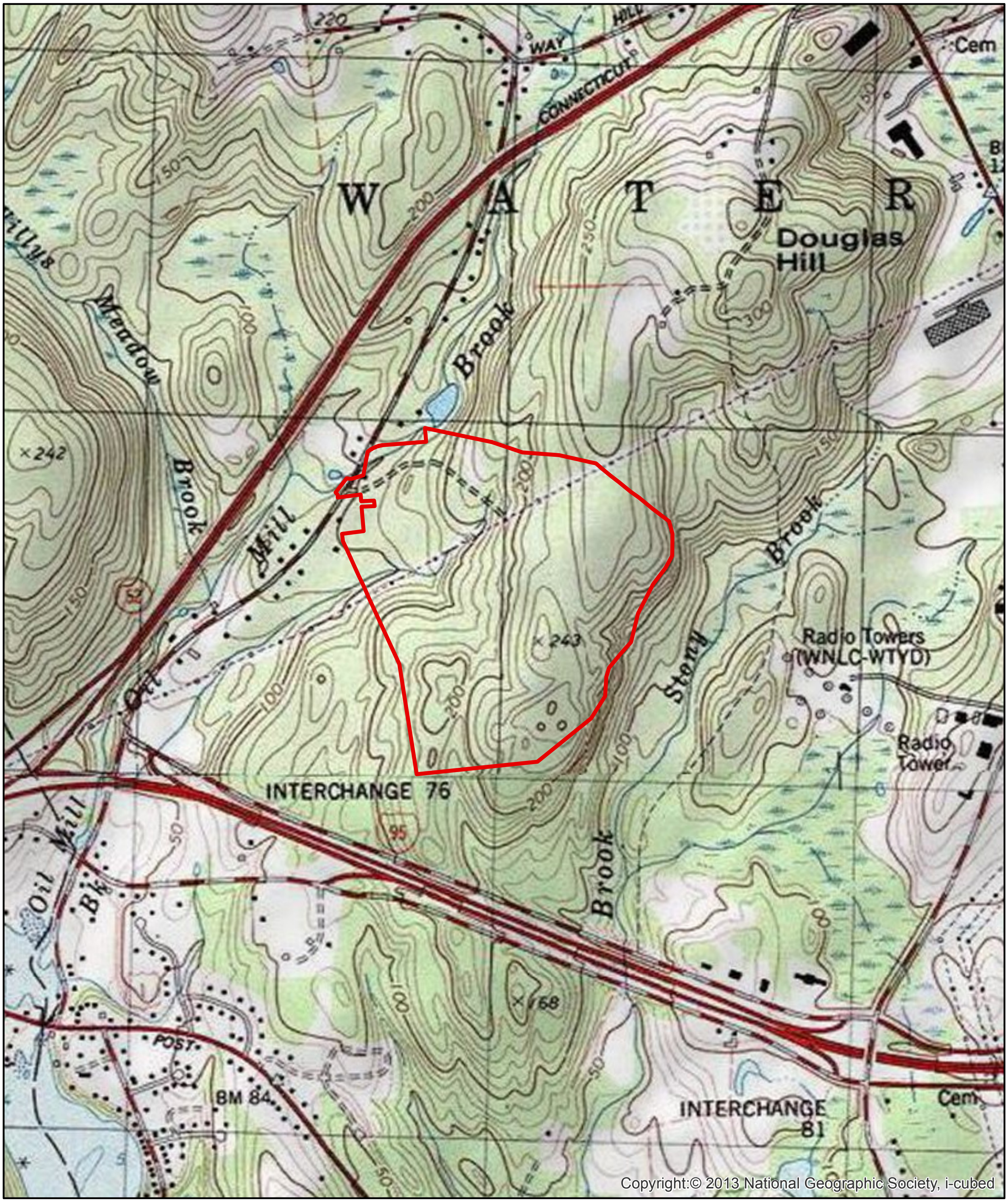

FIGURE 1:
Location Map
Oil Mill Road
Waterford, CT

Property Boundary (approximate)

Topographic map (USGS) showing the approximate location of the parcel boundary as taken from the CT DEEP parcel dataset. This map is intended for general planning purposes only. It contains no authoritative data.

N

0 250 500 1,000 Feet

Davison Environmental, LLC
10 Maple Street
Chester, CT
860-803-0938
www.davisonenvironmental.com

FIGURE 2:
Aerial Map
Oil Mill Road
Waterford, CT

Property Boundary (approximate)

CT Orthophotography (2016) showing the approximate location of the parcel and watercourse boundaries as taken from the CT DEEP Parcel and Hydrography datasets respectively. This map is intended for general planning purposes only. It contains no authoritative data.

N

0 125 250 500 Feet

Davison Environmental, LLC
10 Maple Street
Chester, CT
860-803-0938
www.davisonenvironmental.com

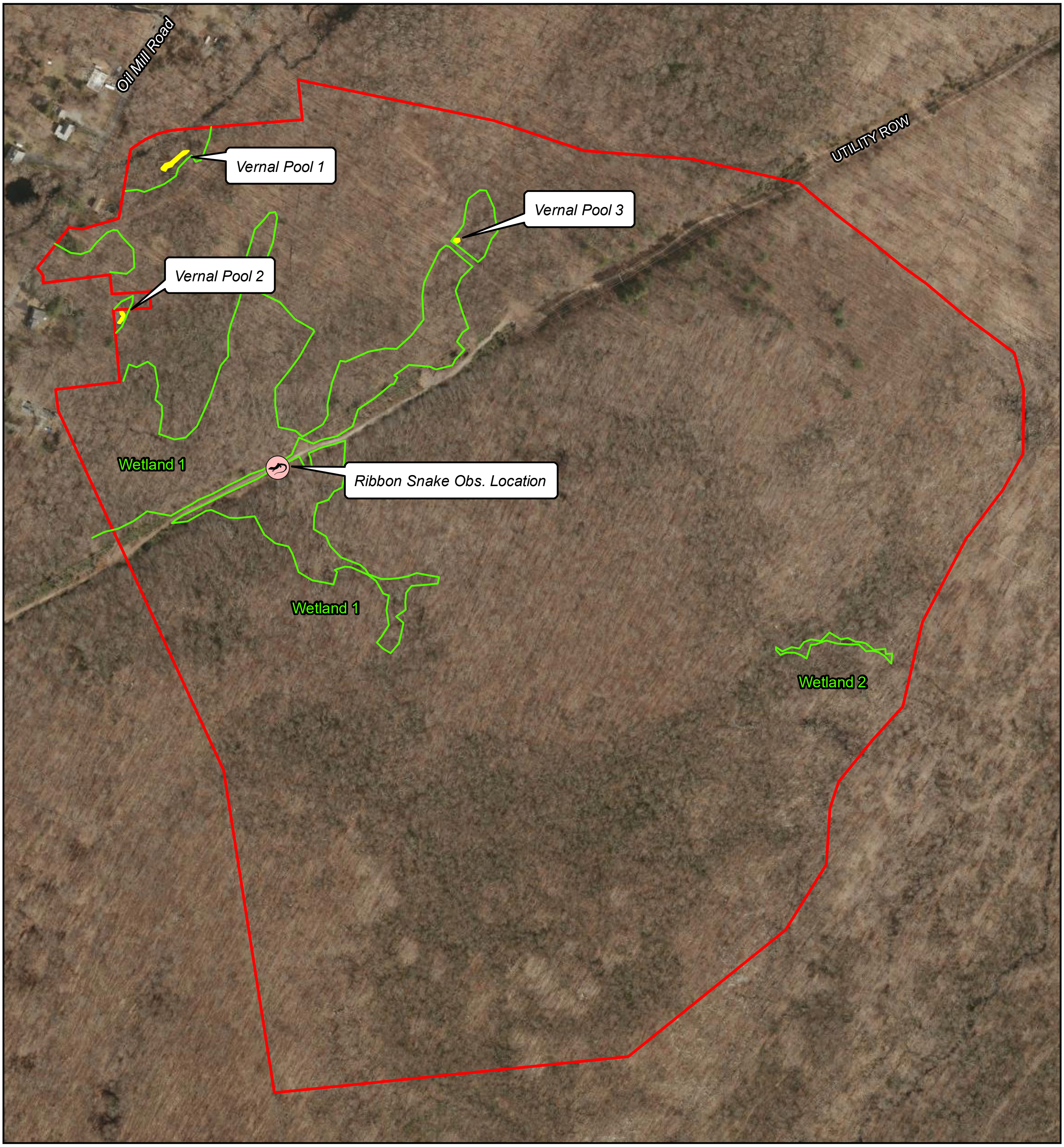

Figure 3:
Wetlands, Vernal Pools & Rare Species

Oil Mill Road
Waterford, CT

Legend

Parcel Boundary

wetland boundary

Vernal Pool

Map Description

The location and extent of features illustrated are approximate only. This map is intended for illustrative purposes only. It contains no authoritative data.

SCALE

0 212.5 425 Feet

N

Davison Environmental, LLC
10 Maple Street
Chester, CT 06412
860-803-0938

DAVISON ENVIRONMENTAL

Appendix 2 – Wetland Delineation Report

DAVISON ENVIRONMENTAL

10 Maple Street
Chester, CT 06412
860-803-0938
www.davisonenvironmental.com

Biodiversity Studies • Wetland Delineation & Assessment • Habitat Management • GIS Mapping • Permitting • Forestry

WETLANDS / WATERCOURSES DELINEATION REPORT

Date of Work: *12/19 through 12/22, 2017*

Project Location: *Oil Mill Road, Waterford*

Client:
Bill Fries
BL Companies

IDENTIFICATION OF WETLANDS AND WATERCOURSES RESOURCES

Wetlands and watercourses present on property? Yes ☒ No ☐

Wetlands:		Watercourses:		Identification Method:	
Inland Wetlands	☒	Perennial Streams	☒	Auger and Spade	☒
Tidal Wetlands	☐	Intermittent Watercourses	☐	Backhoe Pits	☐

Numbering Sequences:

1X-35X	184-196
1-102	197-210
103-109	110-124
125-183 (includes 157-1 through 157-25)	

Wetland Plant Communities Present:

Forest ☒
Sapling/Shrub ☒
Wet Meadow ☐
Marsh ☐
Upland/Streamside ☐

Definitions and methodology for identification of state regulated wetlands & watercourses

Wetlands and watercourses are regulated in the State of Connecticut General Statutes, Chapter 440, sections 22a-28 to 22a-45. The Statutes are divided into the Inland Wetlands and Watercourses Act (sections 22a-36 to 22a-45) and the Tidal Wetlands Act (sections 22a-28 to 22a-35). Inland Wetlands "means land, including submerged land, not regulated pursuant to sections 22a-28 to 22a-35, inclusive, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey, as may be amended from time to time, of the National Resources Conservation Service (NRCS) of the United States Department of Agriculture" section 22a-38(15). Watercourses "means rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private which are contained within, flow through or border upon this state or any portion thereof, not regulated pursuant to sections 22a-28 to 22a-35, inclusive. Intermittent watercourses shall be delineated by a defined permanent channel and bank and the occurrence of two or more of the following characteristics: (A) Evidence of scour or deposits of recent alluvium or detritus, (B) the presence of standing or flowing water for a duration longer than a particular storm incident, and (C) the presence of hydrophytic vegetation" section 22a-38(16). Tidal Wetlands are defined as "those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marsh, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all of the following" (includes plant list) section 22a-29(2).

WETLAND SOIL TYPES

Wetland soils on the site consist of the Ridgebury, Leicester and Whitman complex as well as Raypol soils. Ridgebury, Leicester and Whitman is an undifferentiated mapping unit consisting of two poorly drained (Ridgebury and Leicester) and one very poorly drained (Whitman) soil developed on glacial till in depressions and drainageways in uplands and valleys. Their use interpretations are very similar, and they typically are so intermingled on the landscape that separation is not practical. The Ridgebury and Leicester series have a seasonal high water table at or near the surface (0-6") from fall through spring. They differ in that the Leicester soil has a more friable compact layer or hardpan, while the Ridgebury soils have a dense to very dense compact layer. The Whitman soil has a high water table for much of the year and may frequently be ponded.

The Raypol series consists of very deep, poorly drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to gently sloping soils in shallow drainageways and low-lying positions on terraces and plains. The soils have a water table at or near the surface much of the year.

NON-WETLAND SOILS

The non-wetland soils were not examined in detail, except as was necessary to determine the wetland boundary. Non-wetland soils consist of the Agawam series, the Ninigret and Tisbury complex, the Charlton-Chatfield complex, the Canton and Charlton complex, the Paxton and Montauk complex and the Hollis-Chatfield-rock outcrop complex.

The Agawam series consists of very deep, well drained soils formed in a loamy mantle over sandy, water deposited materials. They are level to steep soils on outwash plains and high stream terraces. Most areas are on slopes that are less than 15 percent. Steeper slopes are on terrace escarpments and steep sides of gullies in dissected outwash plains.

The Ninigret series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to strongly sloping soils on glaciofluvial landforms, typically in slight depressions and broad drainageways. The soil has a seasonal high water table.

The Tisbury series consists of very deep, moderately well drained loamy soils. They are nearly level and gently sloping soils on outwash plains and terraces, typically in slight depressions and broad drainageways. Slope ranges from 0 to 3 percent. Permeability is moderate in the surface layer and subsoil and rapid or very rapid in the substratum. Tisbury soils are nearly level and gently sloping soils on terraces and outwash plains. The soils formed in a silty eolian deposits over stratified sandy and gravelly outwash materials derived from a variety of acid rocks.

The Charlton series is a very deep, well drained loamy soil formed in friable till. They are nearly level to very steep soils on till plains and hills. Depth to bedrock and the seasonal high water table is commonly more than 6 feet.

The Chatfield series consists of moderately deep, well drained, and somewhat excessively drained soils formed in till. They are nearly level to very steep soils on glaciated plains, hills, and ridges. Slope ranges from 0 to 70 percent. Crystalline bedrock is at depths of 20 to 40 inches. The soils formed in a moderately thick mantle of glacial till overlying granite, gneiss, or schist bedrock. Rock outcrops are rare to common and are limited to the more resistant bedrock.

The Canton series consists of very deep, well drained soils formed in a loamy mantle underlain by sandy glacial till. They are on nearly level to very steep glaciated plains, hills, and ridges. Slope ranges from 0 to 35 percent. Permeability is moderately rapid in the solum and rapid in the substratum. The soils developed in a fine sandy loam mantle over acid sandy glacial till of Wisconsin age derived mainly from granite and gneiss and some fine-grained sandstone.

The Hollis series consists of shallow, well drained and somewhat excessively drained soils formed in a thin mantle of glacial till derived mainly from gneiss, schist, and granite. They are nearly level to very steep upland soils on bedrock controlled hills and ridges. Depth to hard bedrock ranges from 10 to 20 inches. Bedrock outcrops vary from few to many.

The Paxton series consists of well drained loamy soils formed in subglacial till. The soils are very deep to bedrock and moderately deep to a densic contact (known locally as hardpan). They are nearly level to steep soils on till plains, hills, and drumlins. The depth to the densic contact and material is commonly 20 to 40 inches but the range includes 18 to 40 inches. Depth to bedrock is commonly more than 6 feet. Rock fragments range from 5 to 35 percent by volume.

The Montauk series consists of very deep, well drained soils formed in glacial till derived primarily from granitic materials. These soils are on upland till plains and moraines. Slope ranges from 0 to 35 percent. The landscape in some areas has many closed depressions, some of which are filled by perennial ponds or wet spots. The soils formed in thick moderately coarse or medium textured glacial till mantles underlain by firm sandy till. Some areas have very stony or extremely stony surfaces. The potential for runoff is low to high. Permeability is moderate or moderately rapid in the solum and slow or moderately slow in the substratum.

NOTES:

A sketch map illustrating the delineated wetlands is attached (see Figure 1). This map is intended for illustrative purposes only.

Respectfully submitted,

Eric Davison

Certified Professional Wetland Scientist
Registered Soil Scientist

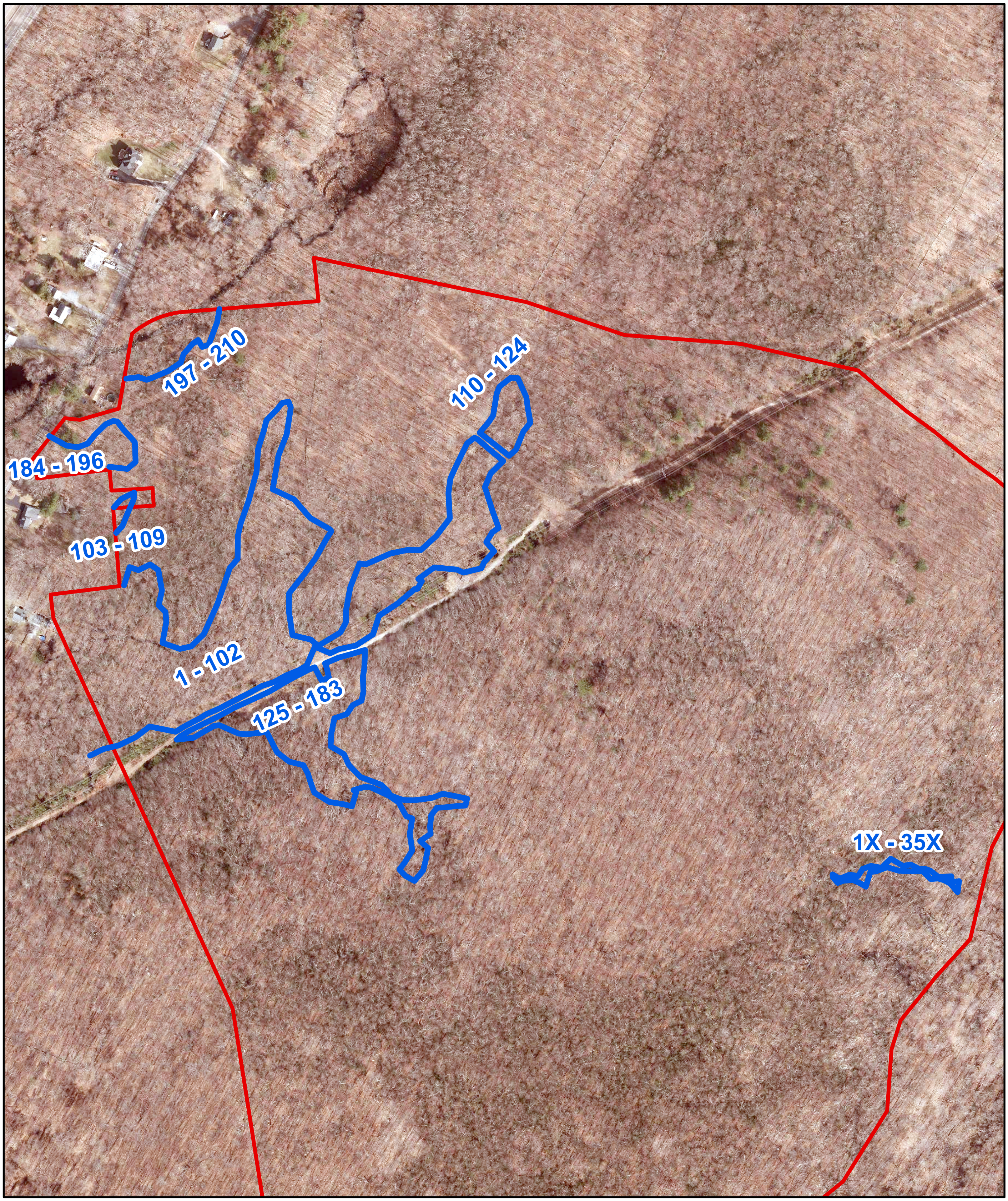

FIGURE 1
Aerial Map
Oil Mill Rd.
Waterford, CT

Wetland Boundaries

Parcel Boundary (Approx)

Orthophotography (2016) showing the approximate location of the parcel boundary as take from the CT parcel. Wetland locations as collected by Davison Envrionmental.This map is intended for general planning purposes only. It contains no authoritative data.

Davison Environmental, LLC
10 Maple Street
Chester, CT
860-803-0938
www.davisonenvironmental.com

DAVISON ENVIRONMENTAL

Appendix 3 – Site Photographs

Photo 1: Vernal Pool 1

Photo 2: Vernal Pool 2

Photo 3: Vernal Pool 3

Photo 4: Wetland 1

Photo 5: Wetland 1

Photo 6: Utility ROW

Photo 7: upland forest

Photo 8: upland forest

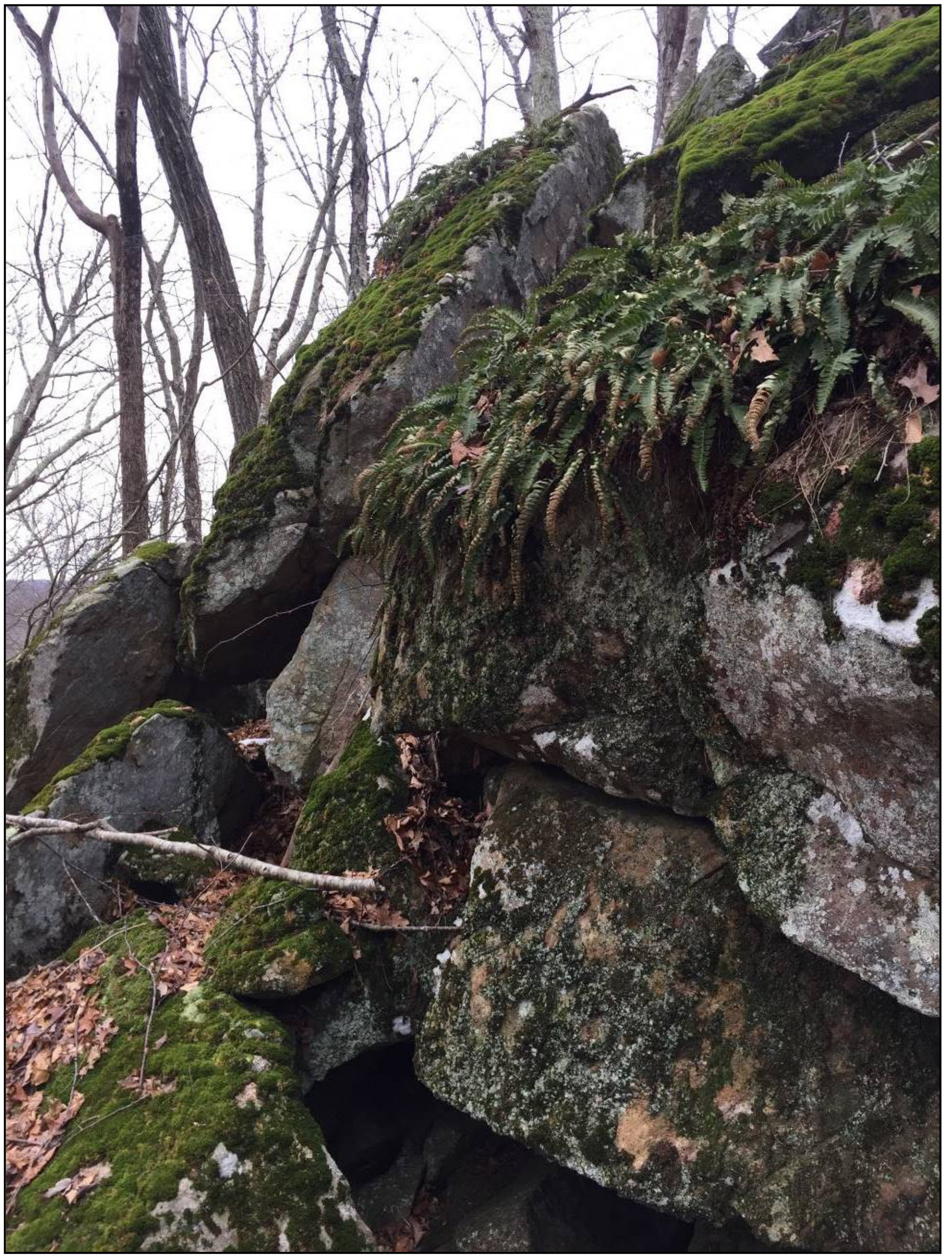

Photo 9: bedrock and boulder outcroppings occur throughout the site