CONSERVATION ANALYSIS

PURSUANT TO 10.1 OF THE AYER ZONING BYLAW

STRATTON HILL

STRATTON HILL ROAD
MAP 6, PARCELS 1, 2, 3, 7, 8 & 11 THROUGH 55

IN

AYER,
MASSACHUSETTS

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Groton, MA 01450

REVISED AUGUST 18, 2021
JUNE 30, 2021

6083

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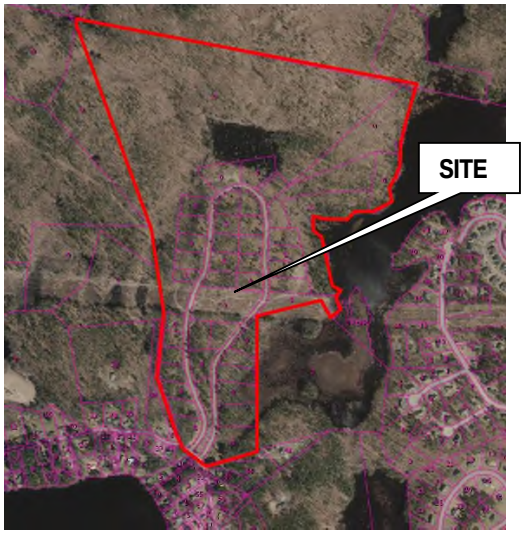
This Conservation Analysis has been prepared to supplement an Open Space Residential Development (OSRD) in accordance with section 10.1 of the Ayer Zoning Bylaw. This Conservation Analysis is based upon site inspections undertaken during the completion of survey and wetland delineation field work completed at various times throughout 2020 and 2021. A final site inspection was completed on June 25, 2021. Please refer to the previously submitted Development Impact Statement for details regarding prior assessments of the site.

As noted in the Site Location & Regional Setting, below, the area associated with the subdivision of the property has previously been cleared with roadway and utilities, and stormwater infrastructure partially installed.

1.0 Site Location & Regional Setting

The property (referred to herein as "the site") is located on the northerly side of Wright Road with access approximately 2000-feet east of Snake Hill Road. The site extends from Wright Road to the Groton Town Line at the northerly boundary of the property. The site contains Stratton Hill Road with the lots created by the subdivision (see Middlesex Registry of Deeds plan 829 of 2005). The subdivision was partially completed, and the site can be accessed through the graded roadway associated with the subdivision. Utilities for the subdivision were also partially installed with the development area cleared of trees and portions of the stormwater and sewer infrastructure installed. The site is identified as Ayer Assessor's Map 6, Parcels 1, 2, 3, 7, 8, and 11 through 55.

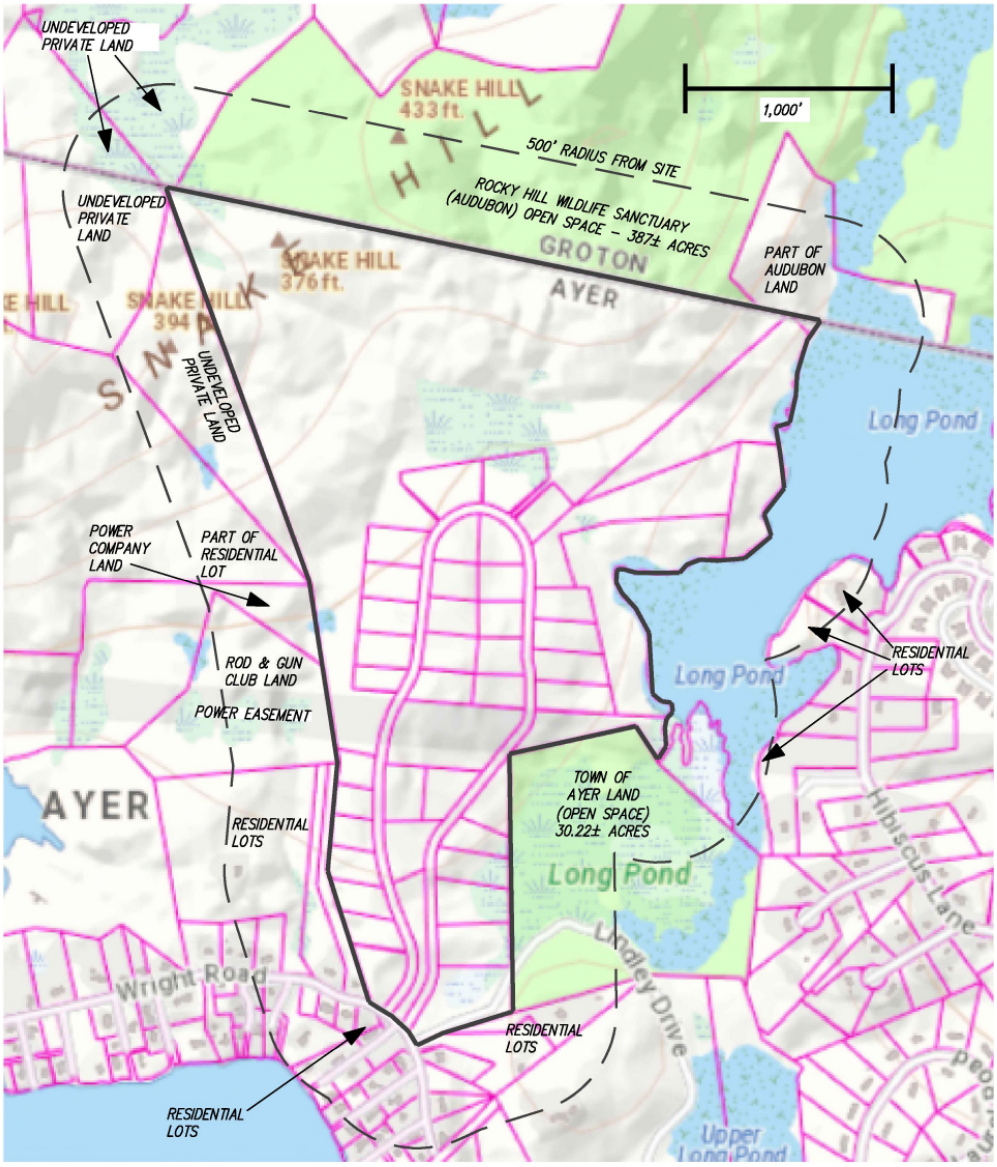


Massachusetts GIS Map

The site is bisected by a utility line cut located within a 350-foot wide easement. This area contains multiple transmission lines and has been subject to clearing and maintenance associated with the overhead power transmission lines. A gravel access road is present below the utility lines along with several spurs with evidence of being utilized by ATVs and recreational vehicles. With the exception of the utility line cut and cleared area for the Stratton Hill subdivision, the site is vacant woodland.

The site consists of wooded, hilly terrain. 40.0% of the site has slopes less than 10%, 35.3% is between 10 and 20% and 23.7% of the site has slopes greater than 20%. A slope analysis of the site is depicted on the Topographic Exhibit Plan included within the appendix of this report. The site contains numerous ledge outcrops with much of the topography at the site controlled by bedrock. The high point of the site is in the northwest corner near Snake Hill at the Ayer/Groton Town Line.

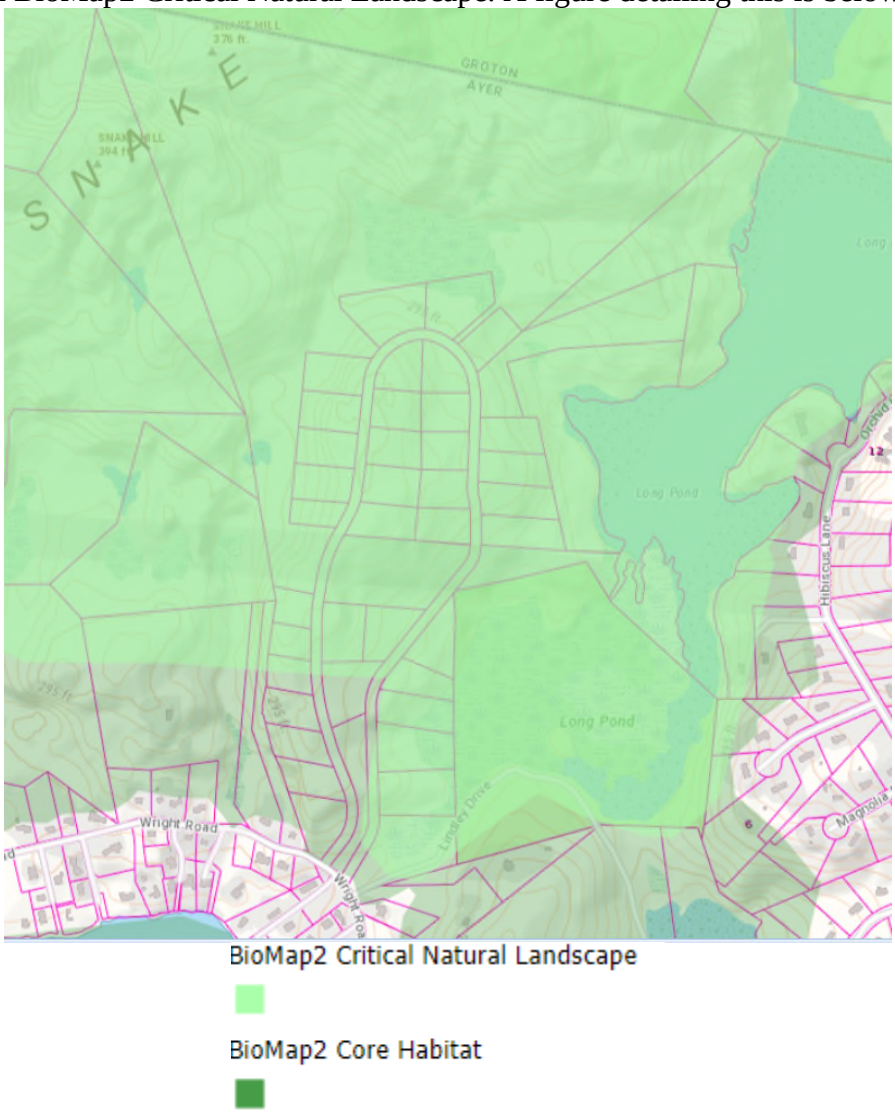
The site falls within the Zoning District Residence A-1. The abutting properties to the East and West are in the same district and consist of undeveloped woodlands and single-family homes on Wright Road. Directly South of the site is the Zoning District A-2 where there are numerous single-family homes. The North side of the property abuts the Groton town line which contains undeveloped woodland and the Rocky Hill Wildlife Sanctuary. A site context map indicating uses within 500-feet of the site is below:



MassGIS Statewide Basemap with abutting parcel information per Town of Ayer & Groton GIS

The site does not contain any Zone I's, IWPA's or Zone II's. The site is not located within the Town of Ayer Aquifer Protection Overlay District.

The entirety of the site is located within the Petapawag ACEC. This ACEC extends from the New Hampshire state line to Sandy Pond Road, south of the site. NHESP data shows The entirety of the site is located within BioMap2 Core Habitat with a portion of the site being located within BioMap2 Critical Natural Landscape. A figure detailing this is below:



BioMap2 Habitat per MassGIS Oliver

The site abuts three (3) separate open space areas. Specifically, the Ayer Rod and Gun property west of the site, the Rocky Hill Wildlife Sanctuary (387 acres) north of the site, and Town of Ayer land (30.2 acres) at the southerly end of Long Pond.

2.0 Water Resources

Dillis and Roy Civil Design Group (formerly known as Ducharme & Dillis Civil Design Group) field delineated the edge of wetland resource areas at the site through the analysis of soil, vegetation, and hydrology. Wetland Resource areas west, north, and east of Stratton Hill Road are subject to an Order of Resource Area Delineation (ORAD) issued by the Ayer Conservation Commission under Mass DEP file number 100-445. This includes the southern side of a large

beaver pond north of Stratton Hill Road and wetlands along the edge of Long Pond, east of the site along with Bordering Vegetated Wetlands (BVW) west of the partially constructed subdivision road. Please refer to the Abbreviated Notice of Resource Area Delineation (ANRAD) and associated ORAD for details regarding this area.

Long Pond is located east of the site. The eastern shore of the pond has been subject to residential development. The western side of the pond, adjacent to the site, is largely undeveloped. Woodland with both the bank of the pond and BVW located above the bank exists throughout much of the eastern side of the site. The forested wetland throughout much of this area is dominated by red maple *(Acer rubrum)*, northern arrowwood *(Viburnum recognitum)*, high-bush blueberry *(Vaccinum corymbosum)*, cinnamon fern *(Osmunda cinnamomea)*, and sensitive fern *(Onoclea sensibilis)*. As the area transitions to upland a variety of oaks and white pine become abundant with Canada mayflower *(Maianthemum candense)*.

North of the partially constructed subdivision road is a large beaver pond with several beaver lodges located within it. A beaver dam is present on the eastern side of the pond with an intermittent stream flowing east, to Long Pond. The limits of resource areas associated with this are also subject to an ORAD under DEP file number 100-455.

A cart road is present west of the beaver pond. The cart road generally divides the drainage areas on the site with this area with flowing to the southwest, towards the utility line cut and Wright Road. A BVW was field delineated within this are with much of the limits of wetland resource areas confined by ledge outcrops. Four (4) unmapped potential vernal pools were identified within this series of wetlands and are identified by the ORAD issued for the site.

The western series of wetlands also extends northwest, towards the Groton Town Line, within this area. Similar to the western BVW near the partially constructed subdivision road, much of this resource area is also confined by ledge outcrops.

The limits of BVW on the site and associated buffer zone have been depicted on the Primary Conservation Area Plan contained within the appendix.

3.0 Anthropogenic Features

As noted within the site and regional settings, the site is bisected by a 350-foot wide utility easement with numerous utility poles and transmission lines. This area runs perpendicular to and through the partially constructed subdivision road. With the exception of the area associated with the previously approved subdivision for the site, the area is wooded with no remnant foundations observed during site inspections.

4.0 Soil Types

NRCS soil survey shows the site contains several soil types due to bedrock and glacial action. Notably combinations of Charlton series, Hollis series, and rock outcrop are present.

Charlton series consists of gently sloping to steep, deep (5+ feet), well drained soils on uplands where the relief is affected by the underlying bedrock. The surface is very stony or extremely stony, except where stones have been removed; and there are stones below the surface.

Hollis series consists of gently sloping to very steep, shallow (<20"), somewhat excessively drained soils on bedrock controlled upland. Hollis soils have friable fine sandly loam surface soils and subsoil with moderate or moderately rapid permeability. Rock outcrops are common, and many areas have stones and boulder on the surface.

With most of the site consisting of well drained soils, the wetland areas consist more of the Freetown series soils with deep, very poorly drained organic soils. Charlton and Hollis series soils are generally suitable for development whereas Freetown soils are generally in wetlands, and because of wetness and low strength they are not suitable for development.

The soil map and soil type descriptions have been included within the appendix of this analysis.

5.0 Environmentally Protected Areas

The proposed project site falls within a few environmentally protected areas. The site contains some wetland areas which all have an associated buffer zone. The entire site falls within the Natural Heritage and Endangered Species Program (NHESP) Priority Habitat of Rare Species and is sited as and Area of Critical Environmental Concern (ACEC). Lastly, a portion of the site falls within a FEMA Zone A from Long Pond.

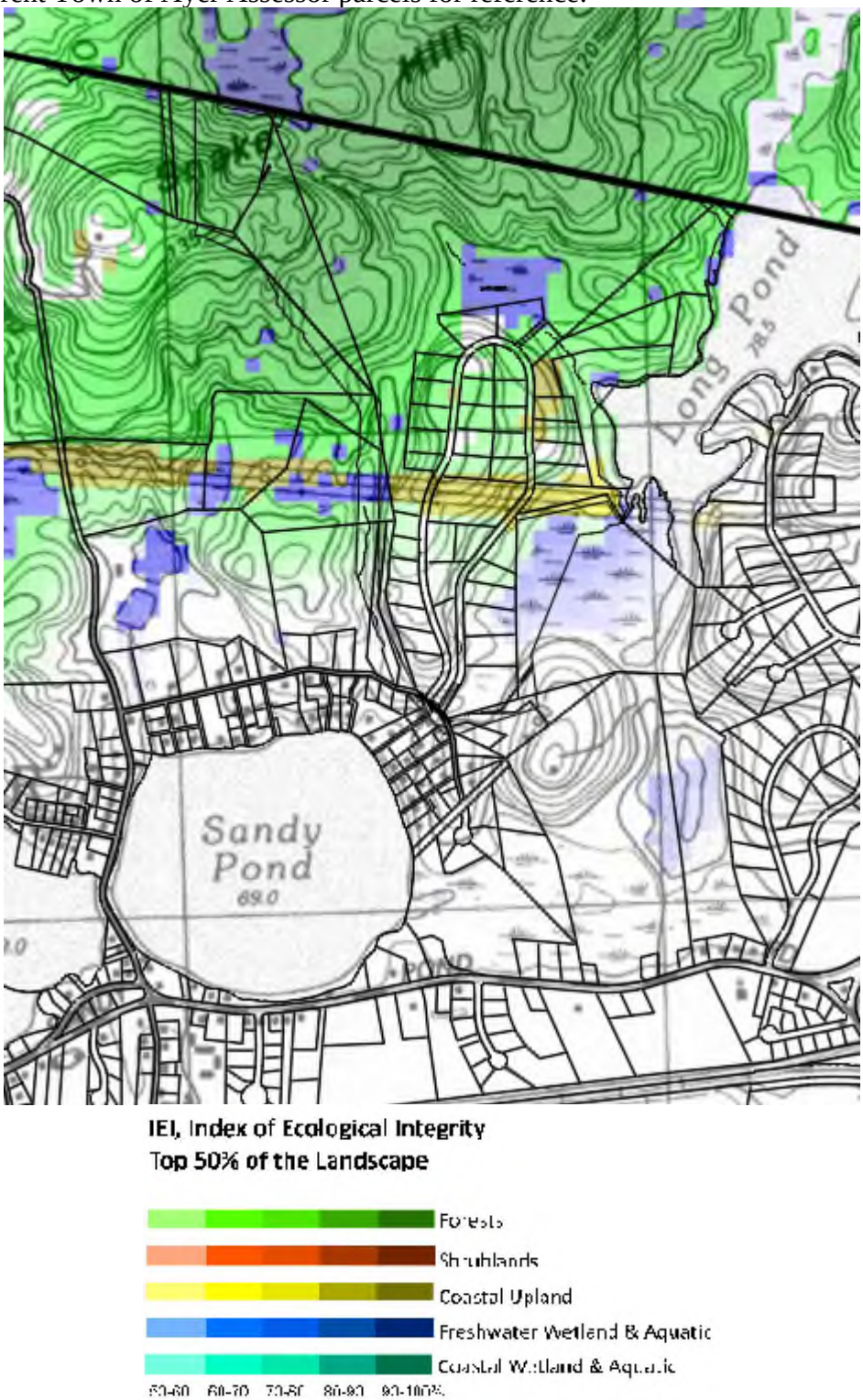
6.0 Wildlife Habitat

According to the Rare Herpetofaunal Investigation found in Appendix A, "The subject property contains numerous wetlands and ponds that had been previously documented as habitat for Blanding's turtle."[1] The study group also "noted and investigated habitat features present on the subject property that suggested the presence of other state listed rare species including spotted turtle, four-toed salamander..." [1]
Blanding's turtle is listed by the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (MNHESP) as 'Threatened' (Anon. 1992). Similarly, spotted turtle, four-toed salamander, and intricate fairy shrimp are listed by MNHESP as 'Species of Special Concern'."[1]

References:

1. Rare Herpetofaunal Investigation, Sand Pond Road, Groton Massachusetts. Oxbox Associates. January 30, 2004 (Appendix A)

A portion of the site has been mapped by the University of Massachusetts Conservation Assessment and Prioritization System (CAPS) as an area with higher ecological integrity. The existing wetland system provides a primary environmental corridor through the site and connection to areas mapped as higher ecological integrity. Specifically, the northwest corner of the site indicated in a darker green color on the CAPS map. Below is an image of the CAPS map with the current Town of Ayer Assessor parcels for reference:



UMASS CAPS Index of Ecological Integrity (IEI) Town of Ayer, MA with Town of Ayer Assessor Parcels

7.0 Areas for Conservation

High Priority Areas for Conservation:

Areas deemed to be of high priority for conservation include the northwest corner of the site as this area has been subject to minimal human activity. The area contains second growth deciduous forest with a BVW confined by ledge outcrops and rising topography towards Snake Hill. Trail access to this area appears feasible through the use of existing cart roads along with extensions of existing cart roads. The potential for connection to undeveloped land to the north of the site also exists.

Also deemed to high priority are the BVW and associated buffer zone along the western boundary of the site. As noted in the Water Resources section of this report, four (4) unmapped potential vernal pools exists within the BVW on this portion of the site and this could form an extension of the high priority area noted on the northwest corner of the site.

Medium Areas for Conservation:

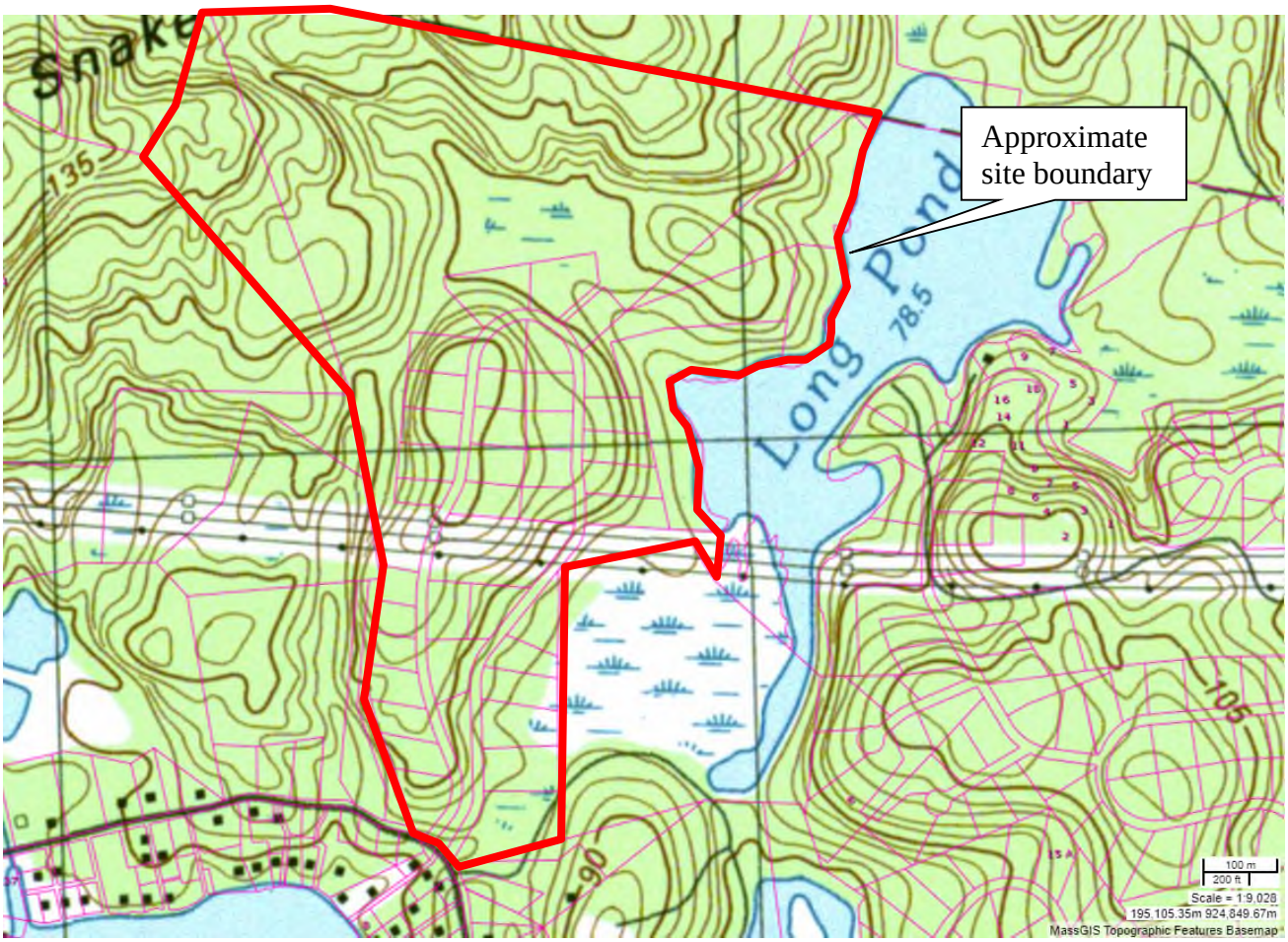
Medium priority areas consist of those that are not degraded and adjacent to high priority areas. This is primarily the area north of the beaver pond, extending east to the BVW and bank associated with Long Pond. Much of this area consist of a mixed growth deciduous forest with sparse understory. A cart road is present near long pond which appears to be accessed north of the site.

Low Priority Areas for Conservation:

Low priority areas for conservation comprise the currently degraded areas, areas subject to recent human alteration, and the utility line cut. This area consists of the partially constructed subdivision road along with the previously cleared lots. Earth moving activities have previously removed topsoil within portions of this area.

The utility cut bisecting the site and area immediately surrounding it was also identified as a low priority. While it does provide a potential east to west corridor through the site, it is occupied by several transmission lines with evidence of routine clearing of vegetation and maintenance.

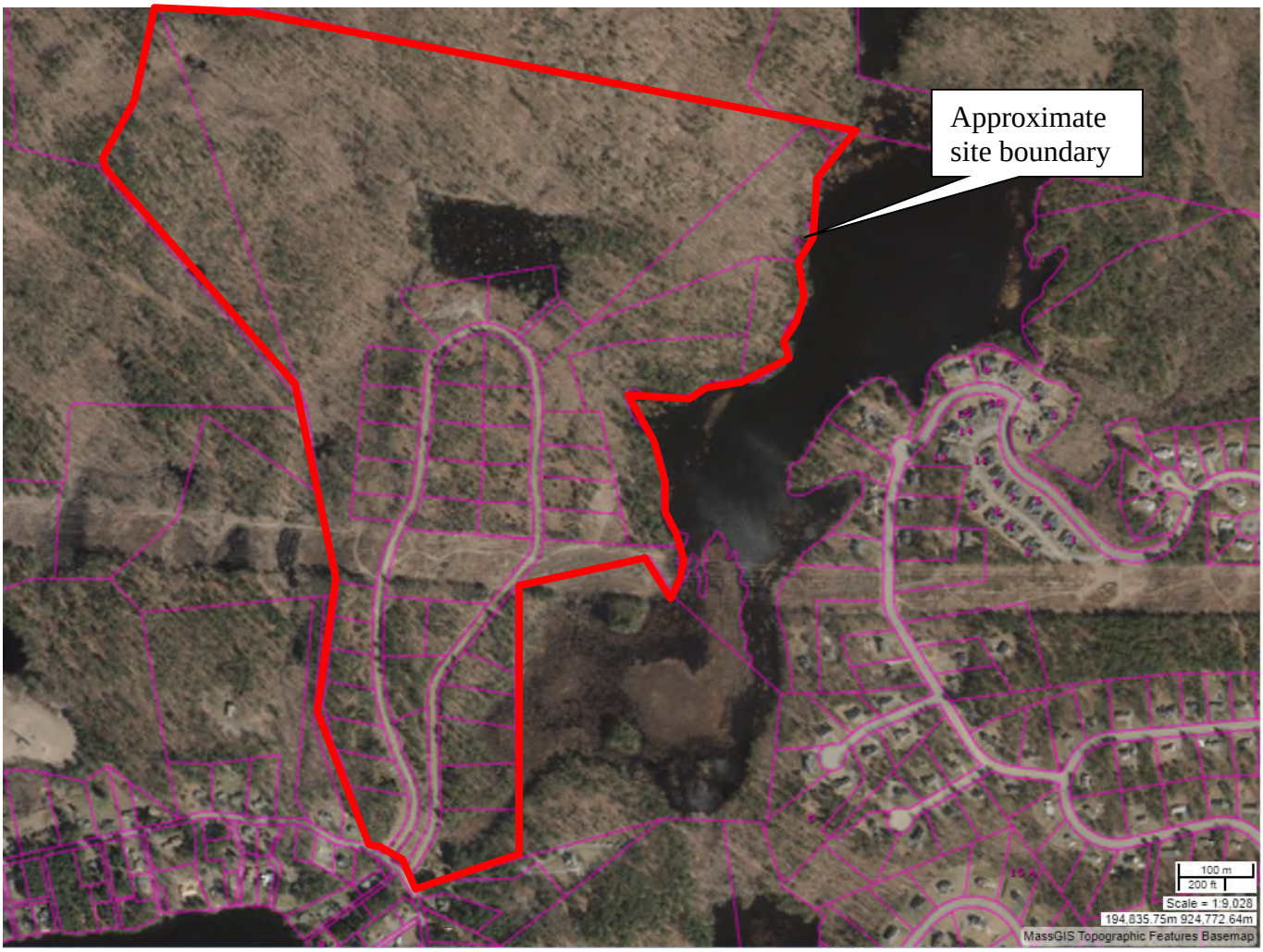
USGS Map



N

1988 USGS Ayer Quadrangle with tax parcel overlay
Source: MassGIS

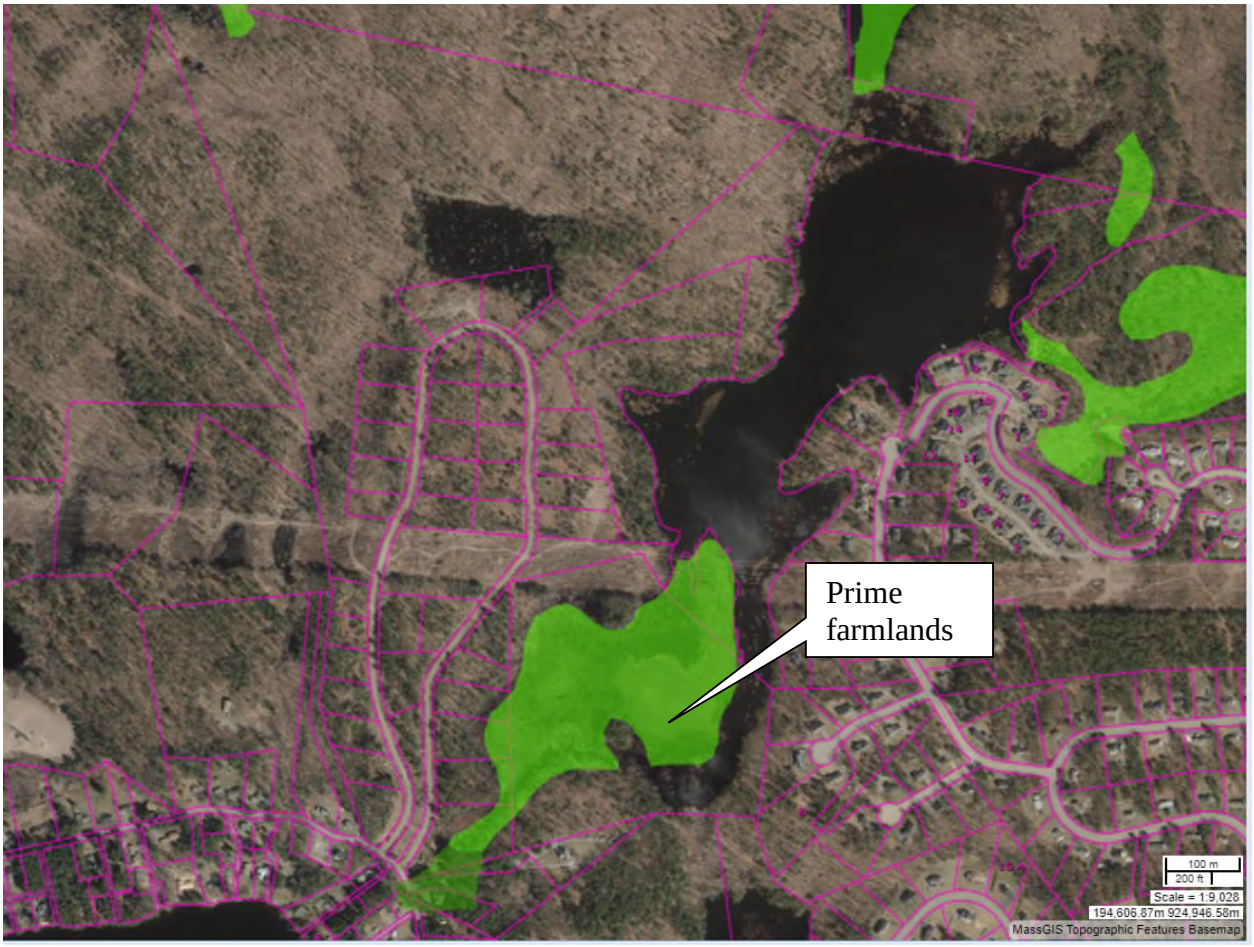
2019 Orthophoto



N

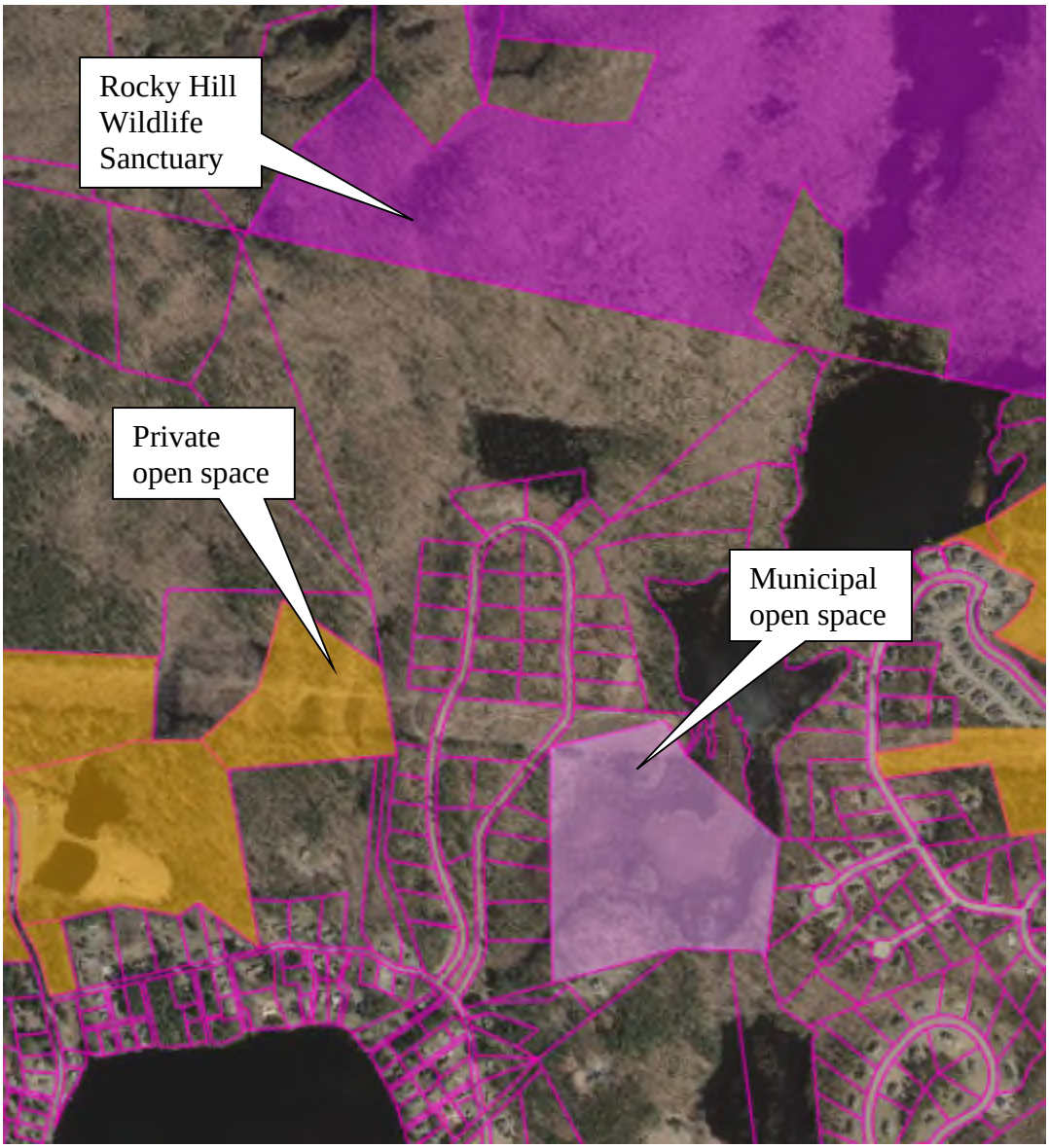
2019 USGS orthophoto with tax parcel overlay
Source: MassGIS

Prime Farmlands Map



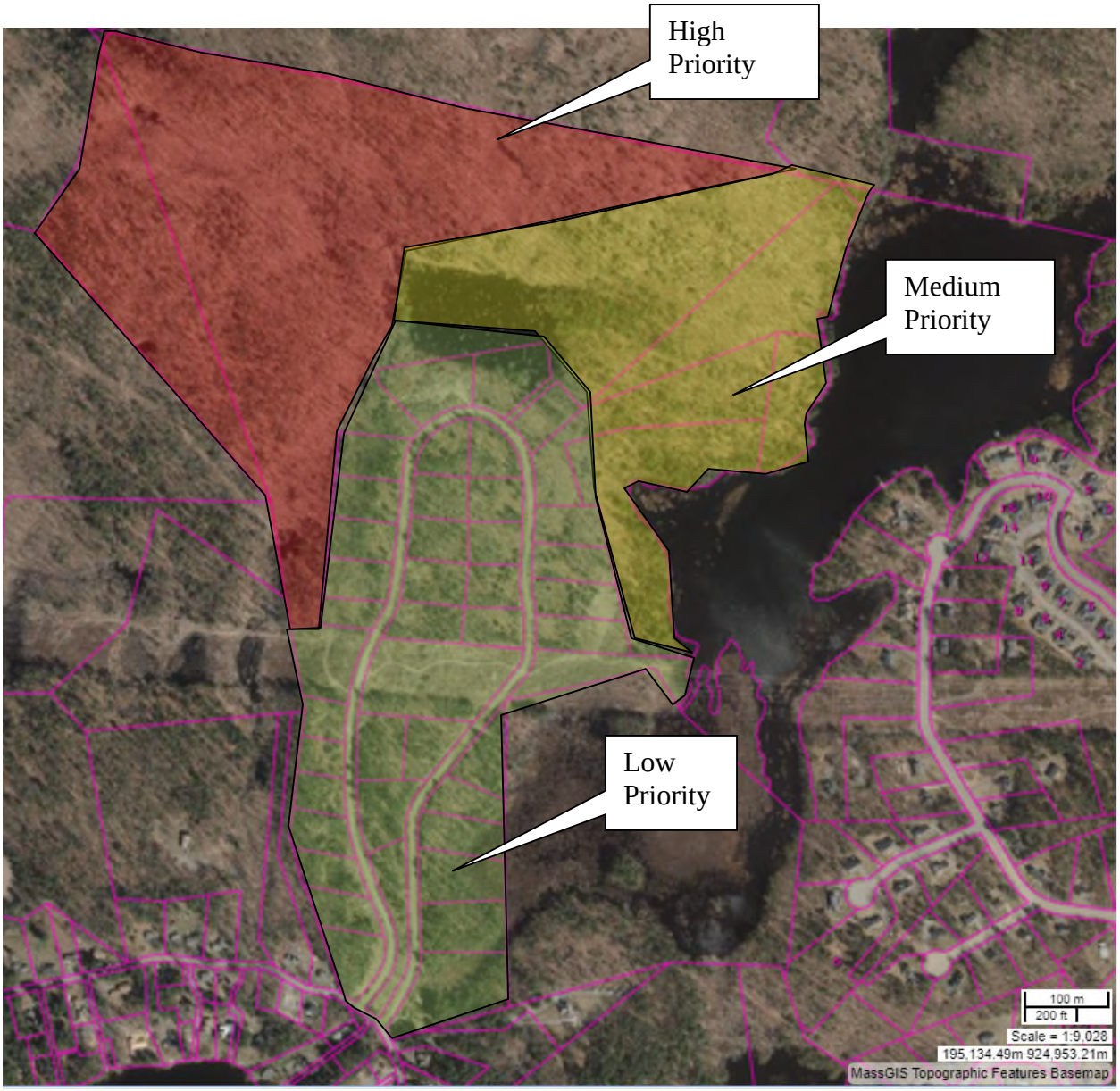
2019 USGS orthophoto with prime farmland indicated in green
Source: MassGIS

Open Space Map



2019 USGS orthophoto with existing open space
Source: MassGIS

Priority Conservation Areas Map



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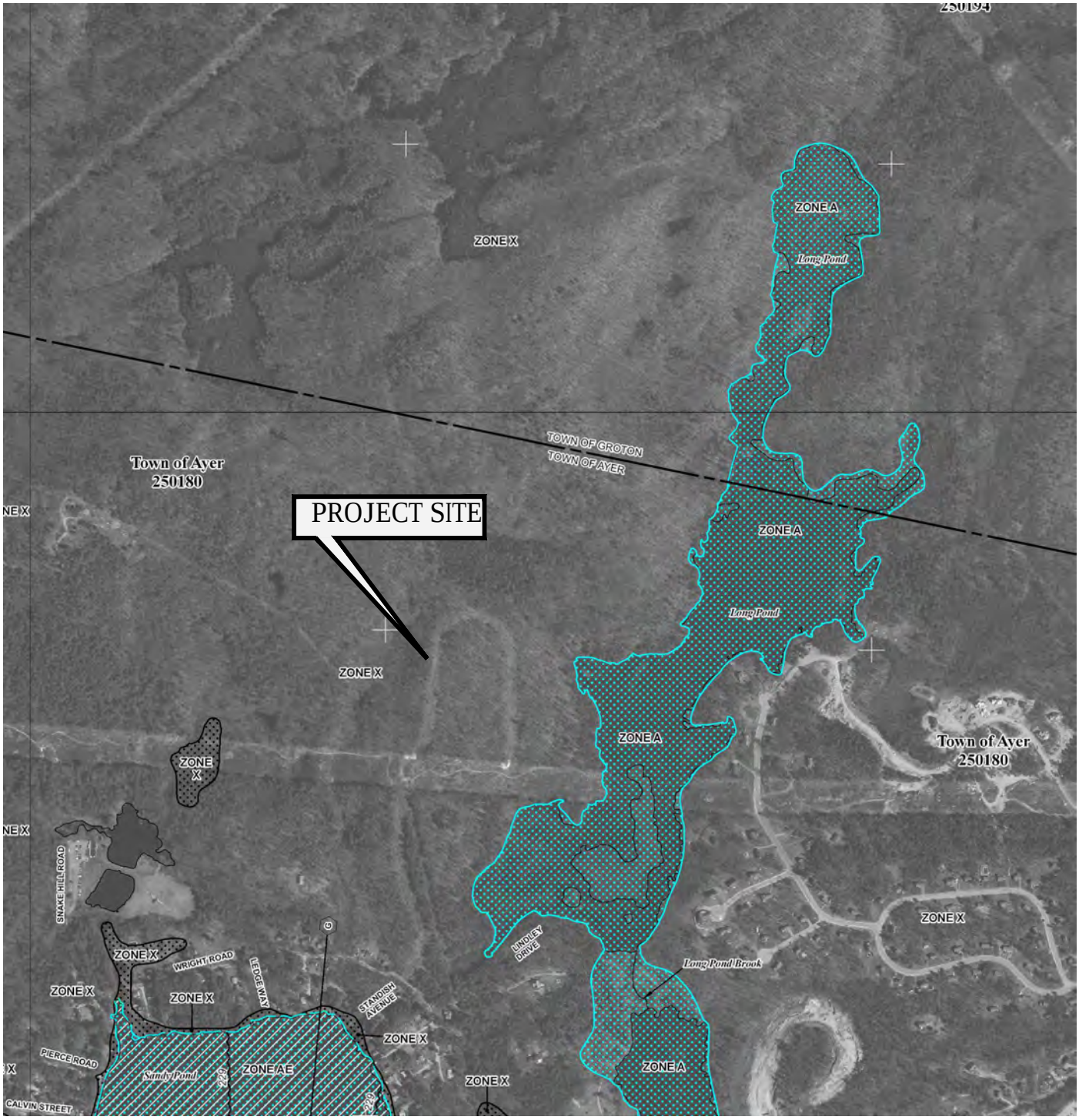
2019 USGS orthophoto with Priority Conservation Areas
Source: MassGIS



FLOOD MAP

1"=1,000' ±

Prepared By:

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References: FIRM - Flood Insurance Rate Map
Community-Panel Number: 25017C0208E

Prepared For: Fox Meadow Realty Corporation
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Appendix A – Rare Herpetofanual Investigation

OXBOW ASSOCIATES, INC.

Wetlands Delineation and Permitting Wildlife Studies Herpetology Vernal Pool Ecology

Rare Herpetofaunal Investigation
Sandy Pond Road
Groton, Massachusetts

Female Blanding's Turtle #2010, June 2003

Prepared for:

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January 30, 2004

Introduction

On behalf of the Moulton Construction Corporation and Shaw's Supermarkets, Inc., Oxbow Associates, Inc. (OA) conducted a rare herpetofaunal investigation on land located northwest of Sandy Pond Road in Groton, Massachusetts (see Figure 1). The property, in its entirely, is extensive (approximately 450 acres) and extends west of Sandy Pond Road into Ayer. OA's site investigation of this property was concentrated on, with Massachusetts Natural Heritage & Endangered Species Program (MNHESP) approval, the powerline easement and portions north and east thereof for the purpose of determining the extent of rare species habitat use in the vicinity of the proposed residential housing development and the proposed Shaw's retail center.

The subject property contains numerous wetlands and ponds that had been previously documented as habitat for Blanding's turtle (*Emydoidea blandingii*) by Umass-Amherst / Natural Heritage and Endangered Species Program (MNHESP) personnel, therefore, OA targeted this species in our trapping and tracking effort and site investigation (see Figure 2). In the process of trapping and searching for Blanding's turtle, OA noted and investigated habitat features present on the subject property that suggested the presence of other state listed rare species including spotted turtle (*Clemmys guttata),* four-toed salamander (*Hemidactylium scutatum*), and intricate fairy shrimp (*Eubranchipus intricatus*).

Figure 2. Blanding's Turtle #2010 in the Powerline East Pool (June 16, 2003)

Blanding's turtle is listed by the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (MNHESP) as "Threatened" (Anon. 1992). Similarly, spotted turtle, four-toed salamander, and intricate fairy shrimp are listed by MNHESP as "Species of Special Concern". These designations afford these species and their habitat protection under the rare wetlands wildlife performance standards of the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.59

Figure 3. Utility easement, view to the north from the PWP (June 2, 2003)

Figure 1. Wetland & Turtle Trap Locations
Sandy Pond Road, Groton MA

SCALE:	DATE:	PROJECT NUMBER:
1 : 10,000	January 2004	03-169-411

0 500 Meters

500 0 500 Feet

Universal Transverse Mercator Coordinate system Zone 18 North, North American Datum 1927
Grid provides UTM coordinates in meters. Grid interval in meters : 1000

- 2003 Turtle Trap Locations
- Approx. Eastern Wetland Locations
- Approx. Eastern Parcel Boundaries
- Approx. 2003 Study Area
- Approx. Trail Locations

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Wetlands Delineation and Permitting
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and under the Massachusetts Endangered Species Act (MESA), MGL Ch. 131A and regulations thereunder at 321 CMR 10.00.

Field investigations on the site were conducted by OA personnel from May 16, 2003 through October 31, 2003 under Scientific Collecting Permit #199.03SCRA issued by the MA Division of Fisheries and Wildlife (see Appendix A). A brief habitat description and the methodology employed by OA to assess population status and habitat use are discussed below. The results of our turtle study and recommendations regarding proposed site development are summarized in the context of applicable regulations for rare species protection.

Habitat Characteristics

Power Easement

The utility easement contains two sets of powerlines, that run from northwest to southeast (see Figure 1 & 3). The area within the power easement is open canopy, dominated by low scrub growth typical of maintained utility easements. There is steep rolling topography, rock outcrops, and two wetland areas located in this portion of the property. The Powerline West (PWP) and the Powerline East Wetlands (PEP) lie at least partially within the utility easement.

Northeastern Gravel Pits

There are two areas of disturbed upland (former gravel mines) located in the extreme northeastern portion of the site, near the junction of Route 119 and Sandy Pond Road (see

Figure 4. Eastern Gravel Pits (April 15, 2003)

Figure 5a. North Kettle Pool [NKP] (April 15, 2003)

Figure 5b. South Kettle Pool [SKP] (August 8, 2003)

Figure 4). Two kettle ponds (described below) lie to the adjacent southeast of the gravel pits.

The more easterly area is largely void of vegetation except for pioneer weed species. The western portion has remained relatively undisturbed longer and supports some woody vegetation. In addition, a large stockpile of topsoil supports lush herbaceous growth there.

Deep Open Water Areas

Kettle Pond North and Kettle Pond South ("**KPN**", and "**KPS**" respectively) are located in the eastern portion of the site near the intersection of Sandy Pond Road and Route 119. The ponds, which are separated by a forested ridge, are bowl-like topographic depressions that both held more than four feet of water in their deepest points during the course of our study (see Figures 5a and 5b). These ponds are vernal pools as defined by MANHESP guidelines however, they appear to remain flooded in most years. The two basins may be natural topographic features or they may have been enlarged or modified by previous activities. It appears they may have minimally been used as wash ponds for prior gravel operations nearby.

The Beaver Pond is a large, flooded, beaver-influenced wetland that lies south of the dirt road portion of Nate Nutting Road (see Figure 1). This vast wetland area marks the northwestern property boundary and although the inundated region can be classified as an open canopied, beaver swamp, standing dead trees rise from the standing water providing evidence that this area was previously forested. Beaver-felled trees are evident throughout this wetland and along its periphery.

Emergent Marshes

The **Powerline West Pool (PWP)** is a sedge and *Sphagnum* moss filled emergent marsh that bisects the power easement. This wetland area was observed to hold water during the summer of 2003 through late July and drains to the northeast during periods of high water. By early August, 2003, the PWP was mostly dry with the exception of scattered pockets of standing water.

Figure 6. Hoop trap in Highbush Blueberry Wetland (HWB) (June 16, 2003)

Two four-toed salamander nests were found within the eastern portion of the PWP in late May, 2003 while OA personnel was onsite tending turtle traps. This state-listed

species (Species of Special Concern) typically breeds in areas of forested swamp and/or vernal pools with very specific physical features. Such habitat features include hummocks, tussocks or banks, usually within an open canopy area, supporting sphagnum or other semi-aquatic moss in areas having flowing or standing water with an extended mean annual hydroperiod (i.e., flooded until August or September in most years). The PWP, was found to exhibit suitable requirements, i.e. moss hummocks within an open canopy wetland.

The **Highbush Blueberrry Wetland (HWB)** is hydrologically connected to the PWP and was differentiated by OA for trapping purposes. This wetland is situated southwest of the powerline easement. The vegetation in this dense shrub swamp is almost exclusively made up of highbush blueberry (*Vaccinium corymbosum*) and buttonbush (*Cephalanthus occidentalis*) (see Figure 6). There are numerous small areas of open standing water in this wetland and OA observed standing water in this wetland up to four feet deep in May and October 2003.

The **Powerline East Pool (PEP)**, a larger emergent marsh/scrub-shrub wetland, is located to the southeast of PWP (see Figure 7). Shrubs (buttonbush, highbush blueberry, winterberry [*Ilex verticillata*], mountain holly [*Nemopanthus mucronata*]) constitute most of vegetation in this wetland, however, mosses and sedges are also present in patches of open canopy. This wetland bisects the powerline easement and transitions into a forested wetland to the northeast of the easement. As in the PWP, PEP water levels had dramatically receded by the end of July with scattered pockets of standing water remaining thereafter.

Figure 7. Powerline East Pool (PEP) View to southeast (May 19, 2003)

The **Long Pond Marsh** is a large forested swamp with dense shrub understory with scattered areas of open water. This wetland is located south of the HWB wetland and is hydrologically connected to Long Pond that lies further to the south in Ayer (offsite).

Other Wetland Resources

There are numerous wetlands along the periphery of OA's study area that were examined during the course of our Blanding's turtle radio-telemetry work. These include **Sandy Pond Road Pool**, a shallow forested wetland located offsite to the south of Sandy Pond Road, **NE Nutting**, a forested wetland located immediately north of Nate Nutting Road, **Northern Powerline Wetland**, an extensive wetland located under the powerline easement, **Lone Wetland**, a linear forested wetland located to the west of the powerline easement, and

Indian Hill Swamp, a large red maple swamp located to the west of Indian Hill Road (see Figure 1).

Methods

OA obtained a Scientific Collecting Permit from the Massachusetts Division of Fisheries and Wildlife (MA DFW) for trapping, handling and radio-telemetry of rare species on the subject site (see Appendix A). In addition, rare and endangered species observation forms will be submitted to MNHESP, for the occurrence of rare species found on the site, in compliance with the permit requirements (see Appendix F).

Blanding's turtles prefer emergent marsh, shrub swamps and vernal pools as habitat. They are typically associated with large wetland systems or numerous clustered wetlands and/or vernal pools. They are known to travel long distances for nesting; up to and over one kilometer from aquatic habitat (Congdon, et al., 1983; B. Butler, pers. obs.). They specifically seek out sandy, well-drained, disturbed sites, such as gravel mining areas, agricultural fields and dunes in order to nest.

Spotted turtles, a more common species, normally inhabit shallow emergent marshes, vernal pools and forested swamps. Within these habitat types they typically have an association with an open canopy wetland having persistent flooding. This species' habitat has been observed by OA to overlap with that of Blanding's turtle in some locations. Additionally, this species has been observed to travel long distances for nesting, although rarely as far as Blanding's turtle (OA obs.). This species also seeks out disturbed areas for nesting and has been observed, by OA personnel, at other sites to nest within powerline easements.

OA used a number of methods to determine the presence of state-listed turtles on the site including: visual surveys, hand-capture techniques and baited trapping. These methods, especially baited trapping, are effective in demonstrating most species of native aquatic turtles. OA trapped in a total of five wetlands, including the Powerline East, Powerline West, Highbush Blueberry Wetland, Kettle Pond North, and Kettle Pond South for the presence of rare and common turtle species (see Figure 1). Baited hoop traps were deployed in at least two feet of water and were tended and re-baited every forty-eight hours throughout the trapping period.

Captured spotted and Blanding's turtles were sexed, measured, weighed, photographed and individually marked. Additionally, each captured adult Blanding's turtle was fitted with a two-stage radio-transmitter to allow OA to monitor their movement. All trapped painted (*Chrysemys picta*) and snapping (*Chelydra serpentina*) turtles were sexed and batch marked to allow for re-capture identification, and subsequently released.

Blanding's turtles fitted with radio-transmitters were monitored once per week during the pre-nesting season (May- early June), almost daily during nesting season (June-early July), and less frequently from July – October (7-14 day intervals). Field locations consisted of retrieving the individual frequencies assigned to specific animals and verifying their location within a particular wetland area. This was accomplished by triangulation (bearings from two points) or by direct radio-location when the individual was observed or pinpointed within one to several meters.

In addition to telemetric tracking, OA also patrolled apparently suitable nesting habitat during appropriate weather conditions on a near daily basis during the month of June 2003 in order to confirm nesting on the site. Specifically, we searched areas with patches of exposed sandy soil in upland areas that lacked a tree canopy cover. These areas include the entire length of the powerline easement within the study area and the eastern gravel pits adjacent to Route 119. These areas were searched systematically on foot near dusk for females not previously fitted with radios searching for nest sites. Thread bobbins were attached to females in upland areas in order for OA personnel to track their terrestrial movements and determine nest attempts or successful nests. Nests were covered with screens (predator exclosures) to protect them from mammalian predators, bicycles, and ATVs.

Results

OA conducted turtle trapping from mid-May through mid-July during 2003. During this time we conducted a total of one thousand seventy-one (1,071) trap- nights (see Tables 1 and 2). We captured four turtle species during the 2003 trapping including Blanding's turtle, spotted turtle, painted turtle and snapping turtle (see Table 2).

Table 1. Baited Hoop Trap Locus Data

Trapping Area	# of Trap Nights
Powerline East Pool	276
Powerline West Pool	154
Highbush Blueberry Wetland	183
Kettle Pond North	229
Kettle Pond South	229
Total	**1071**

Blanding's Turtles

A total of six adult Blanding's turtles (1 male, 5 females) and six juveniles were hand and trap captured by OA during the 2003 season (see Table 3). All animals hand or trap captured by OA were captured at the western limit of the study area in wetlands in close proximity to the powerline easement (see Appendices A-C). No Blanding's turtles were captured within the two kettle ponds, located in the northeastern portion of the property, despite 229 trap nights conducted in each of these wetlands (see Table 1). Furthermore, despite the 2001 and 2002 animal movements documented by the UMass Extension – MNHESP, no animals monitored by OA during the 2003 season were documented within the eastern portion of the study area, i.e. in the area of the proposed Shaw's retail center and proposed residential housing development. A brief discussion on each radio-telemetered animal's movement observed during the 2003 monitoring season are below.

Members of the UMass Extension-MNHESP study team provided OA with radio frequencies for tracking five additional animals previously captured in the vicinity of the study area. OA monitored three of these UMass animals that entered or crossed through our study area during the 2003 season. Altogether 13 animals were radio-telemetered (including the 3 of the 5 UMass turtles) during 2003. Two of the UMass animals never came near the area of interest.

Each turtle fitted with a radio-transmitter was radio located at least once every week from the time of capture through August. Females were monitored more frequently during the June nesting season. Animals were monitored less regularly during September and October (7-10 day intervals). Approximate GPS locations for each turtle were recorded and mapped. Additionally, radiolocations were tabulated and approximate minimum area polygons were drawn for each telemetered turtle (see Table 4). Female, male, and juvenile Blanding's turtle movements, can be seen in Appendices D, E, and F respectively.

Table 2. Turtle Capture Data

Trapping Area	Species Captured	Number of Individuals
Powerline East Pool (PEP)	Blanding's Turtle	6
	Spotted Turtle	14
	Snapping Turtle	5
Powerline West Pool (PWP)	Blanding's Turtle	2
	Spotted Turtle	10
	Snapping Turtle	1
Highbush Blueberry Wetland (HWB)	Blanding's Turtle	2
	Spotted Turtle	7
Kettle Pond North (KPN)	Painted Turtle	3
Kettle Pond South (KPS)	Painted Turtle	9
Powerline Easement *	Blanding's Turtle	2
	Painted Turtle	>3

*** Hand Capture Area**

Table 3. Blanding's Turtle Data

Capture Date	Capture Method	Capture Locus	Turtle #	Sex	CL (mm)	PL (mm)	CW_{max} (mm)	CD_{max} (mm)	Annuli*	Mass (g)
-	UMass	-	305	F	-	-	-	-	-	-
-	UMass	-	30	F	-	-	-	-	-	-
-	UMass	-	410	M	-	-	-	-	-	-
-	UMass	-	306	M	-	-	-	-	-	-
-	UMass	-	211	M	-	-	-	-	-	-
5/28/03	Hand	PWP	2003	M	234.4	221.5	155.5	93.6	20 ('73)	1664
6/2/03	Hoop	PEP	2004	J	119.2	120.6	90.9	48.8	10 ('93)	245
6/3/03	Hoop	PEP	2005	J	141.0	141.9	104.2	57.1	9 ('94)	398
6/4/03	Hoop	HBW	2020	J	91.4	89.2	67.4	35.6	6 ('97)	97.8
6/10/03	Hoop	PEP	522	J (F)	134.6	137.3	101.6	53.8	10 ('93)	352
6/13/03	Hoop	PEP	2010	F	217.5	212	145	94.1	smooth	1570
6/17/03	Hand	Rocky Hill	2030	F	219.9	217	148.8	96.2	smooth	1630
6/19/03	Hoop	PWP	2040	F	223.1	220.4	149.1	96.3	18('85)	1644
6/23/03	Hand	Rocky Hill	2050	F	194.2	190.6	132.5	82.5	smooth	1100
6/25/03	Hoop	PEP	2033	F	210.6	207.6	145.3	80.5	17-20	1591
6/27/03	Hoop	HBW	2002	J	94	89.2	68.8	36.5	6("97)	109.4
6/27/03	Hoop	PEP	525	J	118.5	113.9	87.3	45.8	7("96)	209.9

Annuli = growth rings on plastron approximate age of turtles. Parenthetic number is probable cohort year for that animal.
- = The UMASS Extension-MNHESP Turtles

Female Blanding's Turtle #30

This animal was first radio-located by OA in Sandy Pond Pool on June 2nd. Female #30 was recorded as staying within this wetland through June 19th. No signal was detected for this animal until the 11th of July when she returned to the. The UMass Extension-MNHESP team had reported that this turtle had migrated to the southeast (away from project area) in previous monitoring seasons for nesting.

Female Blanding's Turtle #2030

OA captured this gravid female June 17th on land within the powerline easement apparently searching for a suitable nest location. This animal was fitted with a radio and immediately released on the site. It remained on land within the powerline easement and completed nesting on June 24th. After nesting, this animal was radio-located within the PEP on June 25th and was then found within the NE Nutting Wetland, offsite to the north of the study area. Female #2030 moved south into the Lone Wetland on October 17th and was detected there again on October 28th. This animal was not radio-located within any wetlands or within the upland to the east of the PEP during the 2003 season (see Appendix B).

Table 4. Blanding's Turtle Minimum Habitat Use

Turtle #	Sex	Total m^2	Acres	Straight Line Movement (m)
# 30	F	N/A	N/A	N/A
# 211	M	71,946	17.78	599
# 305	F	N/A	N/A	N/A
# 306	M	106,662	26.36	902
# 410	M	56,137	13.87	953
# 522	Juv (F)	45,335	11.20	615
# 525	Juv	N/A	N/A	N/A
# 2002	Juv	N/A	N/A	N/A
# 2003	M	124,800	30.84	727
# 2004	Juv	33,865	8.37	908
# 2005	Juv	91,853	22.70	1,231
#2007	M	N/A	N/A	N/A
# 2010	F	171,871	42.47	1,837
# 2020	Juv	153,609	37.96	915
# 2030	F	544,527	134.56	1,890
# 2033	F	89,599	22.14	760
#2040	F	125,050	30.90	898
# 2050	F	105,872	26.16	1,649
Mean		**132,394**	**32.72**	
Total overlapping Habitat Area:		**1,055,373**	**260.79**	
Cumulative Habitat Area		**1,721,126**	**425.30**	

N/A: Information not available due to the lack of extensive locus data

Female Blanding's Turtle #2033

This animal was captured within the PEP on June 25th and radio-located within the same wetland through the 27th. On the 28th the female was observed in the upland power easement south of the PEP. This animal nested on June 29th within the powerline easement, south of the PEP and north of Rocky Hill (see Appendix B) and returned to the PEP. From July 10th through September 17th the animal was recorded in the Long Pond Marsh, however during several attempts no signal was obtainable from this animal indicating it may have been in very deep water or wandered further to the south in the period. By October 6th this female had returned to the PEP, where she remained through October 28th. This animal was not radio-located within any wetlands or within the upland to the east of the PEP during the 2003 season.

Female Blanding's Turtle #2040

This female was first captured in the PWP on June 19th. OA observed this animal move north into the upland easement on June 23rd. After nesting on June 25th, just south of Nate Nutting Road, the female moved northwest into the NE

Nutting Wetland. The animal remained in NE Nutting Wetland until July 10th when it was radio-located within the Beaver Pond. This turtle remained in the Beaver Pond through September 24th and was radio-located within the HWB wetland where she remained through October 28th. This animal was not radio-located within any wetlands or within the upland to the east of the PEP during the 2003 season.

Female Blanding's Turtle #2050

OA captured this gravid female June 23rd on land within the powerline easement apparently searching for a suitable nest location. She was fitted with a radio-transmitter, released and subsequently nested at the top of Rocky Hill on June 24 (see Appendix B for nest location). She was radio-located within the wooded upland north of the PEP on the following day. By June 27, this animal had moved to NE Nutting wetland and by August 1 was documented in the Northern Powerline Wetland. From August 11th through the 20th OA radio-located this animal within the Lone Wetland and subsequently in the Beaver Pond on August 25 through September 15th. From September 24th until our final 2003 telemetric data collection date on October 28th, female #2050 was located within the Lone Wetland, offsite to the northwest. This animal was not radio-located within any wetlands or within the upland to the east of the PEP during the 2003 season (see Appendix B).

Female Blanding's Turtle #2010

Caught on June 13th in the PEP, this female remained in this wetland for a brief time (until June 16th). On the 17th this animal was observed in the upland, within the powerline easement, south of PEP. The female was determined to be gravid in mid June and it moved within the powerline easement for seven consecutive days. On June 24th OA observed this animal nesting within the powerline easement on the top of a large rock outcropping (see Appendix B for nest location). After nesting, this animal was radio-located within PEP on June 25th and within the Beaver Pond on July 2nd. It remained in the Beaver Pond through August 20th and was subsequently radio-located in the Lone Wetland on August 25th, where it remained through October 28th. This animal was not radio-located within any wetlands or within the upland to the east of the PEP during the 2003 season (see Appendix B).

Male Blanding's Turtle #211

This male was fitted with a radio by UMass Extension staff prior to 2003 and was radio-located for the first time by OA in the Long Pond Marsh on May 19, 2003. This animal was next recorded within PWP on June 2nd, where it remained through the 9th of June. Male #211 seemingly returned to the Long Pond Marsh and remained from June 13th to October 28. This animal's movement during the 2003 season was limited to wetlands located to the west of the powerline easement. More accurate locations for this animal were presumably obtained by UMass staff during 2003.

Male Blanding's Turtle #305

The UMass Extension-MNHESP provided OA with the frequency of this animal however; no signal was detected within or immediately adjacent to our study area despite repeated attempts to locate the turtle from mid May through the end of October, 2003.

Male Blanding's Turtle #306

This male was also fitted with a radio by UMass Extension staff prior to 2003 and was monitored by UMass during the 2001 and 2002 seasons (see Appendix C for prior movement data provided by UMass). The 2001 data includes radio locations of this animal within KPN and KPS pools as well as the Sandy Pond Road Pool, to the east of the subject property.

During 2002 (UMass data) and 2003 (OA data) this animal did not enter or approach the proposed development envelope. OA monitored this animal during the 2003 season when it was found exclusively to the west of the study area. This animal spent a majority of the 2003 growing season within various areas of the Beaver Pond. This animal remained in this wetland from May 19th through August 25th. From this date until the end of October Male #306 was radio-located in the Indian Hills Wetland, offsite to the far west. This animal was not found with the eastern portion of the site, within the study area during our 2003 monitoring.

Male Blanding's Turtle #410

Male #410 was also fitted with a radio by UMass Extension staff prior to 2003. OA first found a signal for this animal within the Beaver Pond on June 13th, 2003. This Blanding's turtle was only located two other times throughout the season. These occurrences were on June 19th and July 14th within the Beaver Pond and Long Pond Marsh respectively. According to the UMass 2002 data, this animal was found in wetlands to the southwest of the Beaver Pond during the 2002 season (see Appendix C). This animal was not found within the eastern portion of the site, within the study area during our 2003 monitoring.

Male Blanding's Turtle #2003

This animal was trap-captured in the PWP on May 28th. On the second of June Male #2003 was radio-telemetered in the PEP where it remained briefly until the fourth. By June 6th, this animal was radio-located in the Long Pond Marsh and on the 9th was found within the Beaver Pond where it remained until the end of October. This animal's movement during 2003 was limited to the western portion of the study area and it was not radio-located within any wetlands to the east of the PEP.

Juvenile Blanding's Turtle #522

Animal #522 was trap captured by OA within the PEP on June 11th and radio-located within this wetland until June 20th. This juvenile was next detected on July 2nd in the Long Pond Marsh, where it remained until October 6th. This

animal apparently moved into the HWB wetland by the 17th of October and was detected there again on the 28th of that month.

Juvenile Blanding's Turtles #525 and #2002

At the time these two juveniles were captured (June 27, 2003) OA did not have appropriately sized radios in acceptable frequency ranges to attach to these small animals. Therefore, no additional movement data was collected for these two juvenile animals.

Juvenile Blanding's Turtle #2004

Juvenile #2004 was trap captured in early June, 2003 within the PEP where it spent almost the entire 2003 growing season. This animal was located in the forested region of this wetland on a few occasions but for the most part remained in the powerline easement portion until September 15. This animal was radio-located by OA on September 24 within the Beaver Pond where it remained until the end of October and presumably overwintered there. This animal was not radio-located within any wetlands to the east of the PEP (see Appendix D).

Juvenile Blanding's Turtle #2005

This juvenile was first caught in the PEP on June 6th and remained there until the 9th. This animal was radio-located within the Long Pond Marsh on June 13th where it remained until mid July. On July 20th, this animal was radio-located in the Beaver Pond to the northwest of the Long Pond Marsh. This juvenile was last positively documented within the Beaver Pond on August 20th, but OA did receive a weak signal from its radio transmitter (this animal had a small transmitter with lower power output than the adult animals) in late October from the direction of the Lone Wetland, offsite to the northwest. This animal was not radio-located within any wetlands to the east of the PEP during the 2003 season (see Appendix D).

Juvenile Blanding's Turtle #2020

Juvenile #2020 was captured within the HWB wetland on June 4th. The animal was radio-located within the Long Pond Marsh on June 16th and apparently remained there until October 28th. On a few occasions during OA's site visits we were unable to pickup this animals frequency and OA attributes these lapses of signal detection to movement into southern portions of this vast wetland.

Nesting

OA documented five Blanding's turtle nests within the powerline easement during the 2003 season (see Table 5). All five of the animals hand or trap captured within the study area and subsequently radio-telemetered nested in the powerline easement (see Appendix B). Four of the five Blanding's turtle nests successfully hatched yielding a total of twenty-four hatchlings that were subsequently released in the PEP. The fifth nest laid by #2040 had not hatched by October 6 and upon excavation OA determined that the nest had been infiltrated by a large number of roots that had desiccated the eggs.

Table 5: Blanding's Nest Data

Turtle #	Area	# Total Eggs	# Dud Eggs	# Live Hatchlings	# Predated Eggs	Nest Date	Date Hatched
2030	Ridge	15	1	14	0	June 24	Sept 4
2010	Ridge	5	2	3	0	June 24	Sept 24
2050	Ridge	6	1	4	1	June 24	Sept 8
2033	S. of PEP	3	0	3	0	June 30	Sept 9
2040	S. of Nutting	11	11*	0	0	June 25	---

*** Egg mortality due to roots / desiccation**

Apparently at least one additional female nested (or attempted) on the powerline as three loose Blanding's turtle eggs were discovered scattered about on the surface during nesting patrols. These may have been dropped by a female disrupted by a predator during nest construction whose endocrine state had initiated contraction of the oviducts.

In addition to the documented Blanding's turtle nesting within the powerline easement, OA also observed female spotted and painted turtles within the easement during June. Most of the animals were observed walking within the easement and a few (painted turtles) were observed digging. See Appendix B for documented locations of painted turtle nest attempts.

Despite OA's dedicated nightly patrols of the eastern gravel pits adjacent to Route 119 during appropriate throughout June, OA did not find any Blanding's turtle females or predated Blanding's nests in this area during the 2003 study. OA's observations of nesting and nest-seeking painted turtles during this effort as well as our interception of naïve female Blanding's turtles simultaneously on the powerline strongly suggest that the gravel pits are not regularly utilized by Blanding's turtles for nesting habitat (see Appendix B).

Spotted Turtles

OA captured a total of thirty-one (31) spotted turtles during the 2003 trapping effort (see Table 6). Animals were captured in the following wetlands in corresponding quantities: PWP - 17, PEP - 7, and HWB - 7. Twenty-seven of these were trap-captured and three were hand captured within various wetlands while OA personnel were checking traps. One female was hand captured on land within the powerline easement on June 19 where it was presumably searching for a suitable nest site.

OA captured a total of eleven female, fifteen male and five juvenile spotted turtles during the trapping effort. The relative high density of spotted turtles located on

this property is most likely due to the large amount of suitable habitat types, most notably the open canopy habitat provided by the powerline easement. This area contains a large amount of suitable wetland habitat including ephemeral wetlands, emergent marsh and forested swamp. In addition, there is abundant suitable nesting habitat, on the powerline easement, in close proximity to wetland habitat. Also, a lack of competition from a large number of painted and snapping turtles that would be found in other types of wetlands (floodplains wetlands, permanent ponds, or lakes) was displayed through our trapping effort. Low inter-specific competition, the mosaic of wetland types, and plentiful nesting habitat all contribute to exemplary habitat conditions for spotted turtle feeding, migration, aestivation, and nesting.

Table 6. Spotted Turtle Capture Data

Capture Date	Capture Method	Capture Locus	Turtle #	Sex	Carapace Length (mm)	Plastron Length (mm)	Carapace Width $_{max}$ (mm)	Carapace Depth $_{max}$ (mm)	Annuli	Mass (g)
5/31/03	Trap 2	PWP2	1	F	118.4	110.3	89.4	48.7	23	240
5/31/03	Trap 2	PWP2	2	M	102.1	92.4	76.3	38.0	12	137
5/31/03	Trap 2	PWP2	3	M	106.0	91.7	78.7	37.6	15+	160
6/02/03	Trap 4	PWP2	4	M	119.8	103.0	90.1	39.9	16+	198
6/02/03	Trap 4	PWP2	5	M	113.6	99.6	83.3	41.3	14+	184
6/02/03	Trap 2	PWP2	6	F	125.7	117.2	92.9	47.8	16	262
6/06/03	Trap 2	PWP2	7	M	117.5	100.0	83.9	40.1	15	186
6/06/03	Hand	PWP	8	F	95.0	86.2	73.4	35.1	10	110
6/09/03	Trap 22	HBW	20	Juv	68.8	61.3	61.1	25.8	4	46
6/09/03	Trap 3	PEP	9	F	100.6	94.2	78.0	37.3	8	132
6/09/03	Trap 4	PEP	407	F	121.5	112	93.6	44.4	22	263
6/09/03	Trap 17	PWP	10	M	119.9	113	88.4	40.0	14+	184
6/11/03	Trap 6	PEP	40	Juv	92.3	85.2	74.5	33.0	6	107
6/11/03	Trap 19	PWP	11	F	115.2	110	86.6	45.6	15	238
6/11/03	Trap 26	HBW	21	M	117.4	103	92.0	42.1	16	223
6/13/03	Trap 18	PWP	223	F	112.1	106.3	89.0	46.7	20+	241
6/13/03	Trap 18	PWP	30	Juv (M)	117.6	100.1	88.4	41.9	24	214
6/13/03	Trap 26	HBW	12	M	93.5	83.6	72.3	35.0	8	107
6/16/03	Hand	PEP	16	M	124.2	102.9	91.9	42.0	14	232
6/16/03	Trap 19	PWP	13	M	130.3	115.1	95.4	43.9	17+	244
6/16/03	Trap 19	PWP	14	M	113.4	99.7	83.0	40.0	14	181
6/16/03	Trap 19	PWP	15	M	133.5	115.0	100.6	43.9	25+	281
6/16/03	Trap 6	PEP	17	F	118.7	111.6	86.2	47.1	15	235
6/19/03	Hand	Power Easement	18	F	121.3	112	86.2	47.6	17	184
6/23/03	Trap 17	PWP	220	F	119.1	109	89.2	47.5	15	258
6/27/03	Trap 24	HBW	20A	M	111.3	97.7	86.3	38.6	17	173
6/30/03	Trap 24	HBW	21	M	111.4	95.9	82.7	39.1	10+	189
6/30/03	Trap 22	HBW	22	Juv (F)	73.2	67.9	62.4	29.1	8	59
7/07/03	Hand	PEP	23	M	107	96	79.8	40.2	11	159
7/10/03	Trap 25	HBW	25	F	114.1	105	83.8	45.8	16	203
7/14/03	Trap 7	PEP	30	Juv	75.5	69.7	63.5	29.9	4	66.1

Annuli = growth rings on plastron approximate age of turtles

Amphibian and Vernal Pool Species

During the turtle trapping conducted within the kettle ponds, OA observed and documented the presence of several obligate and facultative vernal pool species. Species documented within Kettle Pond North include spotted salamander (*Ambystoma maculatum,* obligate species), caddisfly larvae (*Limnephilidae sp.,* facultative species), wood frog tadpoles (*Rana sylvatica,* obligate species), intricate fairy shrimp (*Eubranchipus intricatus,* obligate and state-listed rare

species, see Figure 8). Kettle Pond South contained intricate fairy shrimp and a plethora of green frogs (*Rana clamitans*). Gray treefrog (*Hyla versicolor,* facultative species) were also heard calling from within and in the vicinity of the kettle ponds during May, 2003.

Figure 8. Head of *Eubranchipus intricatus* documented from both kettle ponds.

As mentioned previously in the Habitat Characteristics Section, OA documented three four-toed salamander nests within the eastern portion of the PWP in late May, 2003 while OA personnel was onsite tending turtle traps.

Conclusions & Regulatory Implications

Blanding's Turtle

OA demonstrated that at least 15 Blanding's turtles were on the site during the 2003 growing season utilizing seasonally and permanently flooded wetlands and nesting habitat located within the powerline easement. Our results indicate that Blanding's turtles inhabit many of the site's western wetlands and utilize much of the area within power easement for nesting. OA did not observe any Blanding's turtle activity within the property bounds east-northeast of the power easement. The kettle ponds were trapped extensively and the eastern gravel pits were examined thoroughly during nesting season, yet no Blanding's turtles were observed in the eastern portions of the site.

Although Male 306 had a cluster of documented sightings in the vicinity of Sandy Pond Road during 2001, during 2002 and 2003 its activities were exclusively to the south and west of the power line. During 2003 this animal ventured further to the west than any of the other telemetered animals.

The polygons for female Blanding's turtle movement in Appendix B show straight lines between nest loci and the NE Nutting wetland that enter the periphery of the residential project site. No observations of animals were actually made within the subdivision site and we suspect that these animals actually took routes to the NE Nutting wetland other than the straight line vector shown; potentially along the open canopy powerline easement.

An additional animal was brought to our attention near the commencement of the field work. This was a male Blanding's turtle, reportedly retrieved from Rte. 119 in Groton in the vicinity of the A-1 Fuels gasoline station just west of the subject property. This animal had been held in captivity illegally through the summer until the finder contacted Massachusetts Fisheries and Wildlife in October. We retrieved the animal that was apparently malnourished. Blood work indicated the animal had normal liver and kidney function and white blood cell count. With this

information we felt reasonably confident to release the animal and placed it in BWB, equipped with a two-stage transmitter, with two other hibernating study animals. This animal had not been previously marked by OA or UMass staff.

Spotted Turtle

Our results indicate that a large population of spotted turtles inhabit many of the same wetlands in the western portion of the site where Blanding's turtle were documented in 2003. As with Blanding's turtle, spotted turtles were not documented utilizing either of the kettle ponds (KPN or KPS) or the eastern gravel pits for nesting during the 2003 season.

In our experience, spotted turtles use only a small portion of available uplands in a given year and spend most of their time within jurisdictional wetlands. According to Milam (1997), spotted turtles used a small fraction of available uplands for aestivation at two study sites in Massachusetts when monitored for multiple years, 19 of 88% and 7 of 52% of available upland forest, respectively for two populations. Furthermore, in our experience most aestivating animals select locations within approximately 100 feet of a wetland. Considering these statistics and given the apparent absence of spotted turtles within the site's eastern wetlands, it is therefore unlikely that spotted turtles would utilize the uplands near the eastern site limits.

Four-toed Salamander

The documentation of breeding four-toed salamander, a state-protected species of "Special Concern" with the PEP Wetland in the western portion of the study area has no state regulatory implications for the proposed developments in the eastern portion of the site. MNHESP has established a 450-foot horizontal zone from the breeding loci of four-toed salamanders, as an area within which there is a presumed regulatory taking of animals. The 450-foot horizontal zone (as seen in Appendix E) projected by the nests documented in 2003 should not impact the proposed development located in the eastern portion of the site.

We did not observe suitable breeding habitat for this species in association with the northeastern kettle ponds, nor an isolated wetland in the interior of the proposed residential area. The presence of this species within the powerline in conjunction with two other state listed species demonstrates the ecological diversity fostered by such landscape features.

Intricate Fairy Shrimp

The documentation of intricate fairy shrimp, a state-protected species of "Special Concern", within the two kettle ponds in the eastern portion of the site is a significant finding in that this species is very uncommonly documented despite recent dedicated surveys. This wholly aquatic organism does not utilize upland habitat during its life history. What determines the specific distribution of this species remains incompletely understood. The near permanent hydroperiod of these ponds may be a factor. Other attributes may include subtleties of water

chemistry or local geology, land use history, geographic location in relation to other populations or numerous other factors. Any proposed disturbance in the vicinity of these two pools should be designed so as to avoid direct or indirect impact to the pool basins. Impacts to avoid include those to water quality or quantity (hydroperiod) or insolation and thermal budget of the basins.

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Appendices

Appendix A. Scientific Collecting Permit

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

2003

SCIENTIFIC COLLECTING PERMIT FOR REPTILES AND AMPHIBIANS

OXBOW ASSOCIATES
BRIAN O. BUTLER
P.O. BOX 971
ACTON, MA 01720

PERMIT#: 199.03SCRA
DATE: 05/19/2003

SUBPERMITTEE(S): S. SMYERS, C. KAVALAUSKAS, D. BUTLER, M. WIERBONICS, B. MANSON, B. CHAPIN AND P. SAENGER

is (are) hereby authorized, in accordance with the provisions of Section 4, Chapter 131 and 131A of the Massachusetts General Laws, to remove from the wild within the Commonwealth, subject to conditions set forth below, the following species and numbers:

MAY CAPTURE AND RELEASE ALL SPECIES OF TURTLES AS PART OF SITE EVALUATION FOR PRESENCE OF BLANDING TURTLE. RARE ANIMAL OBSERVATION FORM MUST BE SUBMITTED TO NHESP FOR EACH STATE-LISTED SPECIES FOUND, INCLUDING ALL TELEMETRY DATA.

The following method(s) of taking is (are) hereby authorized:

HOOP TRAP AND HAND CAPTURE

Collection activities under this permit shall be restricted to the following locations, subject to the approval of private landowners:

PARCEL SOUTHWEST OF BOSTON POST ROAD AND NORTHWEST OF SANDY POND ROAD,

All specimens secured under this permit shall be donated to the following institution:

RELEASED ON SITE

No specimens taken under authority of this permit may be sold. No specimens may be transferred to another not duly licensed.

This permit or a copy thereof shall be carried at all times by the permittee and ant subpermittee(s) while engaged in the activities authorized herein.

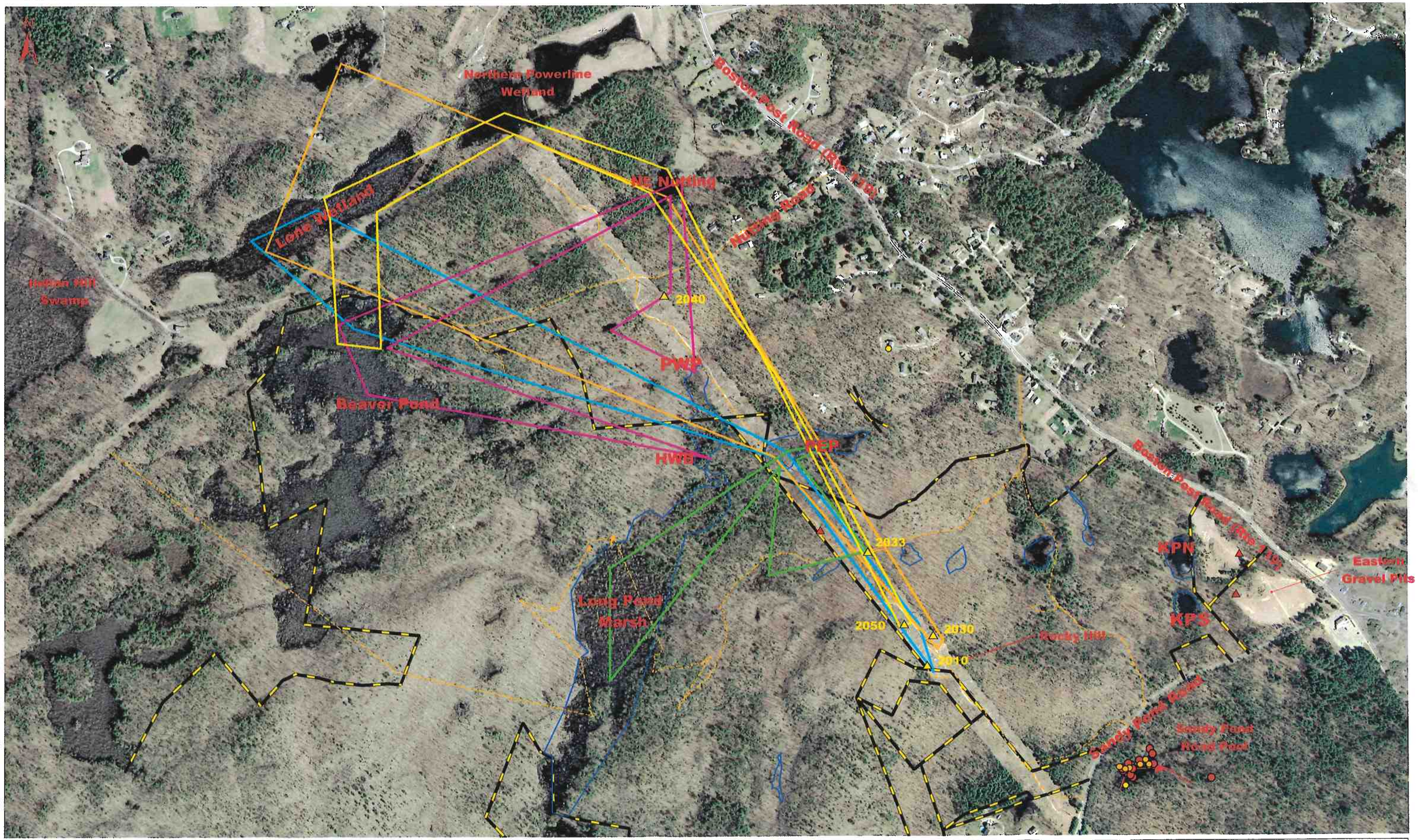
This permit does not absolve the permittee from compliance in full with any and all other applicable federal, state, and local requirements, including the acquisition of a federal endangered species permit if required.

Upon expiration of this permit, a complete report detailing all collection activities shall be filed with this office and must include a listing of all species taken, numbers of specimens, and the disposition of same.

This permit, unless sooner revoked for cause, shall expire on December 31 of the year of issue.

Wayne F. MacCallum, Director

Division of Fisheries & Wildlife
251 Causeway Street, Suite 400, Boston, MA 02114-2104
Phone: (617) 626-1590 Fax: (617) 626-1517 Web: www.masswildlife.org
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement



Appendix B. Female Blanding's Turtle Movement Data & Turtle Nest / Nest Attempt Locations
Sandy Pond Road, Groton MA

SCALE:	DATE:	PROJECT NUMBER:
1 : 8,000	January, 2004	03-169-411

200 0 200 Meters
400 0 400 Feet

Universal Transverse Mercator Coordinate system Zone 18 North, North American Datum 1927
Grid provides UTM coordinates in meters. Grid interval in meters : 1000

- Approx. Eastern Wetland Locations
- Approx. Eastern Parcel Boundaries
- Approx. Trail Locations
- 2003 Blanding's Turtle Nest
- 2003 Painted Turtle Nest Attempts

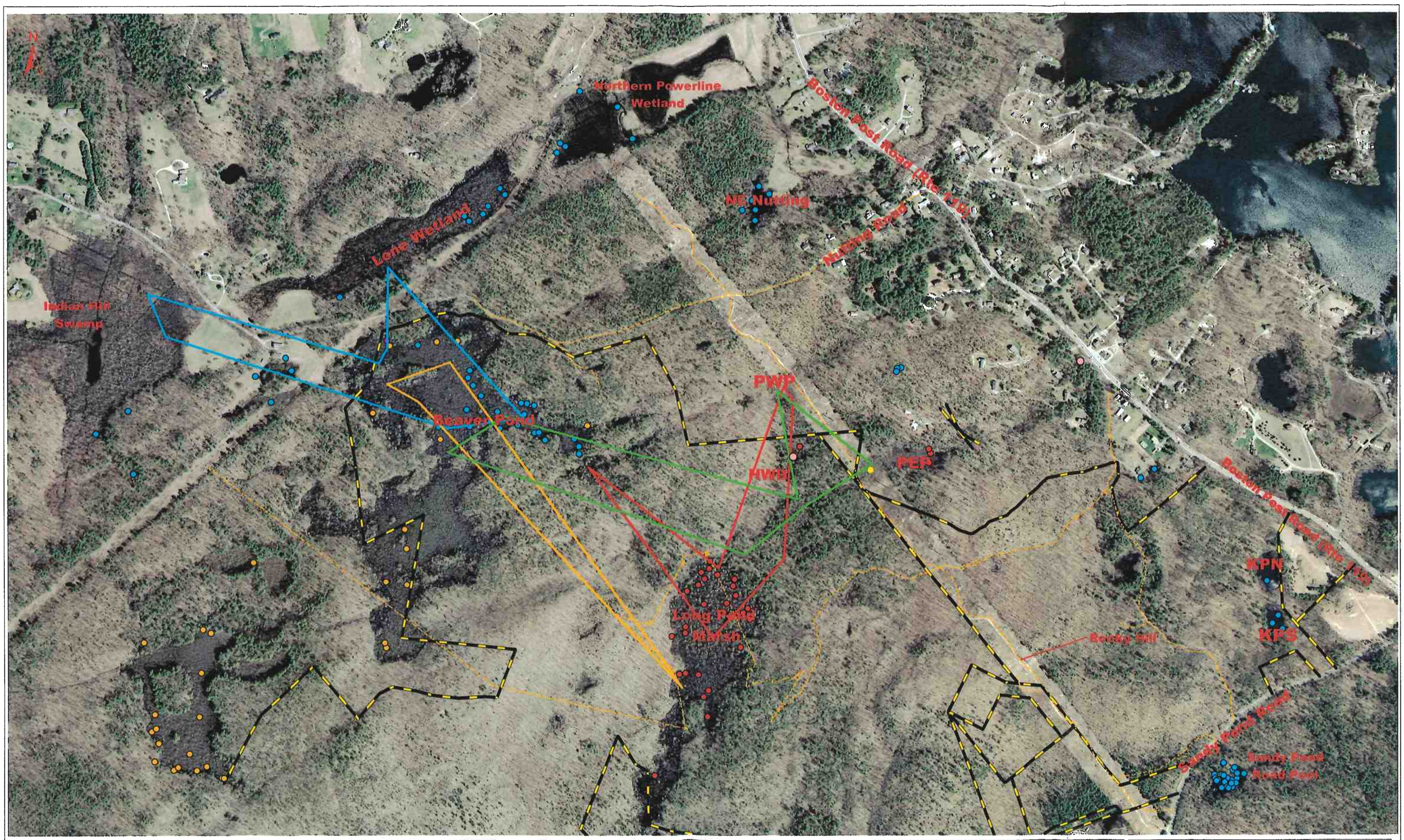
UMass 2001 & 2002 Females
- F305
- F321
- HN1 (unk)

UMass 2001 & 2002 / OA 2003Female
- F30

OA Female Polygons
- 2010
- 2030
- 2033
- 2040
- 2050

Groton

OXBOW ASSOCIATES, INC.
Wetlands Delineation and Permitting
Wildlife Studies * Herpetology
Vernal Pool Ecology
P.O. BOX 971
ACTON, MASSACHUSETTS 01720-0971
PHONE: (978)929-9058
FAX: (978)635-1892
WEB: WWW.OXBOWASSOCIATES.COM



Appendix C. Male Blanding's Turtle Movement Data
Sandy Pond Road, Groton MA

SCALE:	DATE:	PROJECT NUMBER:
1 : 8,000	January 2004	03-169-411

200 0 200 Meters

400 0 400 Feet

Universal Transverse Mercator Coordinate system Zone 18 North, North American Datum 1927
Grid provides UTM coordinates in meters. Grid interval in meters : 1000

Approx. Eastern Wetland Locations
Approx. Eastern Parcel Boundaries
Approx. Trail Locations

UMass 2001 & 2002 Males
M211
M325
M327

M2007 Found by Others & Released Into HWB by OA

2003 OA Male Polygons
306
410
2003
211

UMass 2001 & 2002 Males
306
410

Groton

OXBOW ASSOCIATES, INC.
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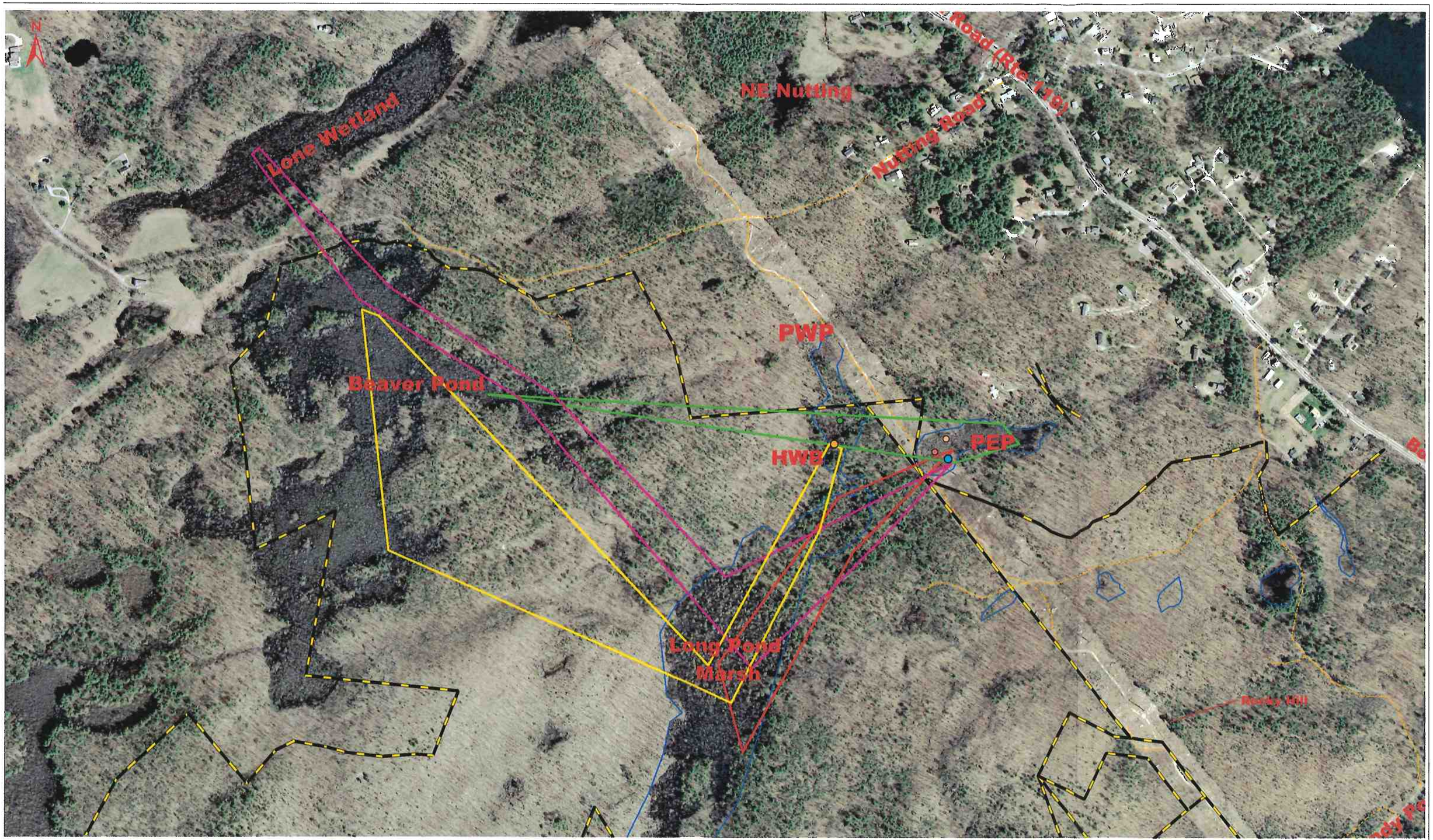

Appendix D. Juvenile Blanding's Turtle Movement Data
Sandy Pond Road, Groton MA

SCALE:	DATE:	PROJECT NUMBER:
1 : 6,000	January 2004	03-169-411

0 200 Meters

300 0 300 Feet

Universal Transverse Mercator Coordinate system Zone 18 North, North American Datum 1927
Grid provides UTM coordinates in meters. Grid interval in meters : 1000

- Approx. Eastern Wetland Locations
- Approx. Eastern Parcel Boundaries
- Approx. Trail Locations

UMass 2001 & 2002 Juveniles
- J323
- J326
- J340

2003 OA Juvenile Polygons
- 522
- 2004
- 2005
- 2020

2003 OA Juveniles
- 525
- 2002

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Vernal Pool Ecology
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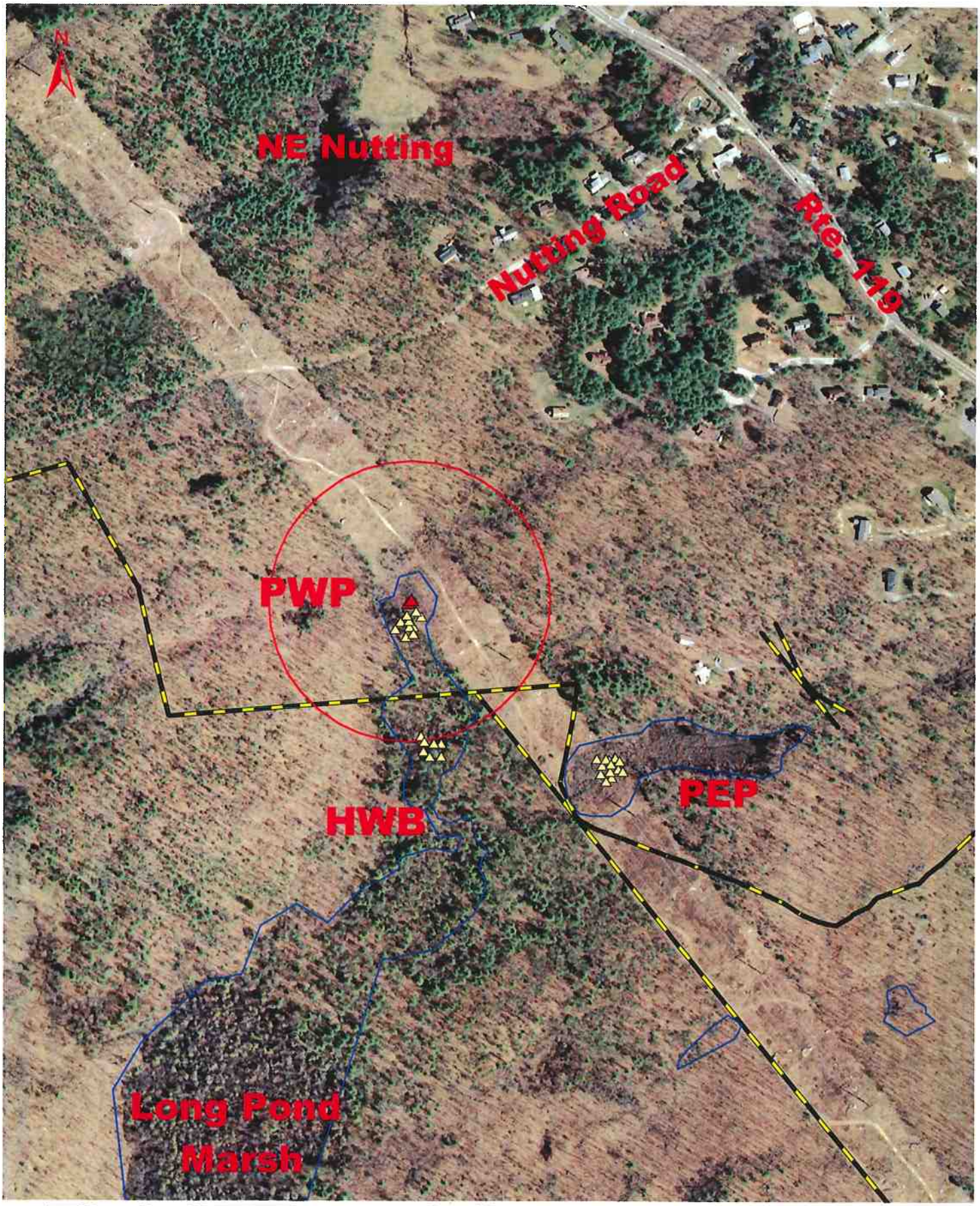
ACTON, MASSACHUSETTS 01720-0971
PHONE: (978)929-9058
FAX: (978)635-1992
WEB: WWW.OXBOWASSOCIATES.COM



Appendix E. Spotted Turtle Capture Loci & Four-toed Salamander Nests
Sandy Pond Road, Groton MA

SCALE:	DATE:	PROJECT NUMBER:
1 : 5,000	January 2004	03-169-411

Approx. Eastern Wetland Locations
Approx. Eastern Parcel Boundaries
2003 Spotted Turtle Capture Loci
2003 Four-toed Salamander Nests
450 ft. Four-toed Salamander Offset

200 0 200 Feet

Universal Transverse Mercator Coordinate system Zone 18 North, North American Datum 1927
Grid provides UTM coordinates in meters. Grid interval in meters : 1000

OXBOW ASSOCIATES, INC.
Wetlands Delineation and Permitting
Wildlife Studies * Herpetology
Vernal Pool Ecology
P.O. BOX 971
ACTON, MASSACHUSETTS 01720-0971
PHONE: (978)929-9058
FAX: (978)635-1892
WEB: WWW.OXBOWASSOCIATES.COM

Appendix F. Rare Species Reporting Forms

(required under the scientific collecting permit issued by the Division of Fisheries & Wildlife)

Natural Heritage &
Endangered Species
Program

Rare Animal Observation Form

* Species name (scientific or common): Emydoidea blandingii

* Date and time of observation: First observed May 28, 2003

Amount of time spent surveying area: Active trapping the area for the presence of rare species (approx. 1071 trap nights)

In order for this form to be processed, the sections preceded by an asterisk (*) must be completed.

* Town: Groton County: Middlesex Waterbody: Unnamed emergent marsh

* Please attach a photocopy of the appropriate section of a USGS topo map (or similar map if a topo map is unavailable) with the site of the observation marked. Please indicate available or occupied habitat and extent of population, if known. Indicate area searched including negative results (i.e. apparently suitable habitat was or was not surveyed). USGS (7 5 or 15) Topographic Map- Name: Ayer, Massachusetts

* Describe how to get to the site using obvious permanent landmarks such as a road intersection (measuring to at least the nearest 1/10 mile). The site is located in the town of Groton, east of Route 119, south of Sandy Pond Rd., and north of Nate Nutting Rd. Wetlands are within a power easement area and may be accessed via Nate Nutting Rd.

* Number, age, and sex of individuals: 13 animals total. (2 males, 5 females, and 6 juveniles)
See attached sheet for capture loci, ages and measurement details.

Please describe how age and sex were determined: Age was based on the number of annuli and size. Sex was based on the concave (male) or flat (female) plastron.

Evidence of reproduction (e.g., eggs, nests, carrying food to young, copulation): Five nests were recorded within upland areas of the subject property.

Behavioral notes (e.g., crossing the road, basking): 1 male was hand captured near Route 119. 2 females were hand-captured while searching for suitable nesting conditions in the upland of the power easement. The remaining turtles were captured in baited hoop traps in emergent marshes under Permit #199.03SCRA.

* Photographs taken? Y If Y, please submit one clear photograph.

* Specimen taken? N If Y, where will the specimen be deposited: _____

* ID is based on what (e.g., sculpted shell, flight pattern): ID was based on the size of the animal, domed carapace, and long, yellow neck.

Have you observed this species at this site in previous years? _____ If Y, please give details: This species has been observed in this area in previous years by others - UMass Extension - NHESP personnel

Commonwealth of Massachusetts
Division of Fisheries and Wildlife, Route 135, Westborough, MA 01581 (508) 792-7270 ext. 200
http://www.state.ma.us/dfwele

Describe the habitat where the species is located. List dominant vegetation, size of the habitat, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, aspect. Also, if possible provide information on the surrounding land use. See attached site description for wetland characteristics.

Associated species: Clemmys guttata (spotted turtle), Chelydra serpentina (snapping turtle), Hemidactylium scutatum(4-toed salamander), Castor canadensis (beaver), Rana clamitans (green frog)

Alteration of ecological processes (e.g., damming, logging, rip-rapping of stream)? N If Y, describe: _____

Observed or potential threats to the species or its habitat at this site: All-terrain vehicle use within the power easement.

Landowner's name and address, if known: Fox Meadow Realty Corporation, Sandy Pond Road Groton

Additional comments: Scientific Collecting Permit was issued by the Division of Fisheries and Wildlife $199.03SCRA. Eleven Blanding's turtles have been fitted with radio-transmitters.

* Observer Information: Name: Oxbow Associates, Inc. Personnel Phone Number: 978-929-9058
Address: Oxbow Associates P.O. Box 971, Acton, MA 01720
Affiliation/Qualifications: _____

* Form Filled Out By: Name: Brett Manson, Oxbow Associates, Inc. Phone Number: 978-929-9058
(if different from above) Address: Oxbow Associates P.O. Box 971, Acton, MA 01720
Affiliation/Qualif. Oxbow Associates field technician, B.S. degree

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

* Signature: Brett Manson Date: 1/15/04

Please submit this form and all supporting documentation (USGS map, photo, etc.) to:
Natural Heritage and Endangered Species Program
MA Division of Fisheries and Wildlife
Route 135
Westborough, MA 0 15 81
(508) 792-7270 ext. 200

Revised 5/98

Natural Heritage &
Endangered Species
Program

Rare Animal Observation Form

* Species name (scientific or common): Spotted turtle *(Clemmys guttata)*

* Date and time of observation: 1st Observation 5/31/03

Amount of time spent surveying area: Active trapping the area for the presence of rare species (approx. 1071 trap nights)

In order for this form to be processed, the sections preceded by an asterisk (*) must be completed.

* Town: Groton County: Middlesex Waterbody: Unnamed emergent marshes

* Please attach a photocopy of the appropriate section of a USGS topo map (or similar map if a topo map is unavailable) with the site of the observation marked. Please indicate available or occupied habitat and extent of population, if known. Indicate area searched including negative results (i.e. apparently suitable habitat was or was not surveyed). USGS (7 5 or 15) Topographic Map- Name: Ayer, Massachusetts

* Describe how to get to the site using obvious permanent landmarks such as a road intersection (measuring to at least the nearest 1/10 mile). The site is in the town of Groton east of Route 119, south of Sandy Pond Rd., and north of Nate Nutting Rd. Wetlands are within a power easement area and may be accessed via Nate Nutting Rd.

* Number, age, and sex of individuals: 31 turtles total (11 females, 15 males, 5 juveniles)
See attached sheet for capture loci, ages and measurement details.

Please describe how age and sex were determined: Age was determined based on the number of annuli and sex was determined based on the shape of the pastron.

Evidence of reproduction (e.g., eggs, nests, carrying food to young, copulation): A number of turtles were observed searching for suitable nesting conditions in the upland of the power easement during June.

Behavioral notes (e.g., crossing the road, basking): Animals were trap-captured in various wetlands, hand captured while basking and observed seeking nesting sites in the upland power easement.

* Photographs taken? Y If Y, please submit one clear photograph.

* Specimen taken? N If Y, where will the specimen be deposited:

* ID is based on what (e.g., sculpted shell, flight pattern): ID is based on the spotted pattern on the carapace.

Have you observed this species at this site in previous years? N If Y, please give details:

Commonwealth of Massachusetts
Division of Fisheries and Wildlife, Route 135, Westborough, MA 01581 (508) 792-7270 ext. 200
http://www.state.ma.us/dfwele

Describe the habitat where the species is located. List dominant vegetation, size of the habitat, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, aspect. Also, if possible provide information on the surrounding land use. See attached site description for wetland characteristics.

Associated species: Hemidactylium scutatum (4-toed salamander), Emydoidea blandingii (Blanding's turtle), Chelydra serpentina (snapping turtle), Rana clamitans (green frog)

Alteration of ecological processes (e.g., damming, logging, rip-rapping of stream)? N If Y, describe:

Observed or potential threats to the species or its habitat at this site: All-terrain vehicle use within the power easement

Landowner's name and address, if known: Fox Meadow Reality Corporation, Sandy Pond Road Groton

Additional comments: Scientific Collecting Permit was issued by the Division of Fisheries and Wildlife $199.03SCRA.

* Observer Information:
Name: Oxbow Associates, Inc. Personnel Phone Number: 978-929-9058
Address: Oxbow Associates P.O. Box 971, Acton, MA 01720
Affiliation/Qualifications:

* Form Filled Out By:
(if different from above)
Name: Brett Manson, Oxbow Associates, Inc. Phone Number: 978-929-9058
Address: P.O. Box 971, Acton MA 01720 / brett@oxbowassociates.com
Affiliation/Qualif. Oxbow Associates, Inc, field tech., B.S. degree

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

* Signature: Brett Manson Date: 1/15/04

Please submit this form and all supporting documentation (USGS map, photo, etc.) to:
Natural Heritage and Endangered Species Program
MA Division of Fisheries and Wildlife
Route 135
Westborough, MA 0 15 81
(508) 792-7270 ext. 200

Revised 5/98

Natural Heritage &
Endangered Species
Program

Rare Animal Observation Form

* Species name (scientific or common): Intricate fairy shrimp *(Eubranchipus intricatus)*

* Date and time of observation: June 4, 2003

Amount of time spent surveying area: Dip-net surveys were conducted for approximately 3 hours while personnel were on-site trapping for turtle species.

In order for this form to be processed, the sections preceded by an asterisk (*) must be completed.

* Town: Groton County: Middlesex Waterbody: Unnamed kettle ponds

* Please attach a photocopy of the appropriate section of a USGS topo map (or similar map if a topo map is unavailable) with the site of the observation marked. Please indicate available or occupied habitat and extent of population, if known. Indicate area searched including negative results (i.e. apparently suitable habitat was or was not surveyed). USGS (7 5 or 15) Topographic Map- Name: Ayer, Massachusetts

* Describe how to get to the site using obvious permanent landmarks such as a road intersection (measuring to at least the nearest 1/10 mile). The site is in the town of Groton and is located northwest of the Route 119/Sandy Pond Road intersection. Ponds can be accessed by a gated dirt road that passes through two large gravel pits.

* Number, age, and sex of individuals: n/a

Please describe how age and sex were determined: n/a

Evidence of reproduction (e.g., eggs, nests, carrying food to young, copulation): Females were observed with eggs.

Behavioral notes (e.g., crossing the road, basking):

* Photographs taken? Y If Y, please submit one clear photograph.

* Specimen taken? Y If Y, where will the specimen be deposited: Doug Smith - UMass Amherst

* ID is based on what (e.g., sculpted shell, flight pattern): ID is based on the elongated antennal appendages.

Have you observed this species at this site in previous years? N If Y, please give details:

Commonwealth of Massachusetts
Division of Fisheries and Wildlife, Route 135, Westborough, MA 01581 (508) 792-7270 ext. 200
http://www.state.ma.us/dfwele

Describe the habitat where the species is located. List dominant vegetation, size of the habitat, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, aspect. Also, if possible provide information on the surrounding land use. The ponds, which are separated by a geographic incline, are formed by bowl-like topographic depressions that both held at least eight feet of water in their deepest points during the summer and fall of 2003.

Associated species: Rana clamitans (green frog), Chrysemys picta (painted turtle)

Alteration of ecological processes (e.g., damming, logging, rip-rapping of stream)? N If Y, describe:

Observed or potential threats to the species or its habitat at this site:

Landowner's name and address, if known: Fox Meadow Realty Corporation, Sandy Pond Road Groton

Additional comments:

* Observer Information:
Name: Oxbow Associates, Inc. Personnel Phone Number: 978-929-9058
Address: Oxbow Associates P.O. Box 971, Acton, MA 01720
Affiliation/Qualifications:

* Form Filled Out By:
(if different from above)
Name: Brett Manson, Oxbow Associates, Inc. Phone Number: 978-929-9058
Address: P.O. Box 971, Acton MA 01720 / brett@oxbowassociates.com
Affiliation/Qualif. Oxbow Associates, Inc, field tech., B.S. degree

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

* Signature: Brett Manson Date: 1/15/04

Please submit this form and all supporting documentation (USGS map, photo, etc.) to:
Natural Heritage and Endangered Species Program
MA Division of Fisheries and Wildlife
Route 135
Westborough, MA 0 15 81
(508) 792-7270 ext. 200

Revised 5/98

Natural Heritage &
Endangered Species
Program

Rare Animal Observation Form

* Species name (scientific or common): Four-toed Salamander *(Hemidactylium scutatum)*

* Date and time of observation: 5/28/03

Amount of time spent surveying area: approximately 10 minutes

In order for this form to be processed, the sections preceded by an asterisk (*) must be completed.

* Town: Groton County: Middlesex Waterbody: Unnamed emergent marsh

* Please attach a photocopy of the appropriate section of a USGS topo map (or similar map if a topo map is unavailable) with the site of the observation marked. Please indicate available or occupied habitat and extent of population, if known. Indicate area searched including negative results (i.e. apparently suitable habitat was or was not surveyed). USGS (7 5 or 15) Topographic Map- Name: Ayer, Massachusetts

* Describe how to get to the site using obvious permanent landmarks such as a road intersection (measuring to at least the nearest 1/10 mile). The site is in the town of Groton east of Route 119, south of Sandy Pond Rd., and north of Nate Nutting Rd. Wetlands are within a power easement area and may be accessed via Nate Nutting Rd.

* Number, age, and sex of individuals: Two nests were observed (each comprised of single egg clutches)

Please describe how age and sex were determined: Eggs were observed

Evidence of reproduction (e.g., eggs, nests, carrying food to young, copulation): Eggs were observed

Behavioral notes (e.g., crossing the road, basking): Eggs were located in sphagnum hummocks within an open canopy wetland

* Photographs taken? N If Y, please submit one clear photograph.

* Specimen taken? N If Y, where will the specimen be deposited:

* ID is based on what (e.g., sculpted shell, flight pattern): ID is based on the color, shape, size and location of the eggs

Have you observed this species at this site in previous years? N If Y, please give details:

Commonwealth of Massachusetts
Division of Fisheries and Wildlife, Route 135, Westborough, MA 01581 (508) 792-7270 ext. 200
http://www.state.ma.us/dfwele

Describe the habitat where the species is located. List dominant vegetation, size of the habitat, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, aspect. Also, if possible provide information on the surrounding land use. Both breeding loci were observed in a sedge and sphagnum moss filled emergent marsh that bisects the power easement just south of Nate Nutting Rd. This wetland area was observed to hold water during the summer of 2003 from at least May through late July and was observed to flow to the northeast during periods of high water. By early August 2003, the wetland was mostly dry with the exception of scattered pockets of standing water.

Associated species: Clemmys guttata (spotted turtle), Emydoidea blandingii (Blanding's turtle), Rana clamitans (green frog)

Alteration of ecological processes (e.g., damming, logging, rip-rapping of stream)? N If Y, describe: _____

Observed or potential threats to the species or its habitat at this site: _____

Landowner's name and address, if known: Fox Meadow Reality Corporation, Sandy Pond Road Groton

Additional comments: _____

* Observer Information:

Name: Oxbow Associates, Inc. Personnel Phone Number: 978-929-9058

Address: Oxbow Associates P.O. Box 971, Acton, MA 01720

Affiliation/Qualifications: _____

* Form Filled Out By:

(if different from above)

Name: Brett Manson, Oxbow Associates, Inc. Phone Number: 978-929-9058

Address: P.O. Box 971, Acton MA 01720 / Brett@oxbowassociates.com

Affiliation/Qualif. Oxbow Associates, Inc, field tech., B.S. degree

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

* Signature: Brett Manson Date: 1/15/04

Please submit this form and all supporting documentation (USGS map, photo, etc.) to:
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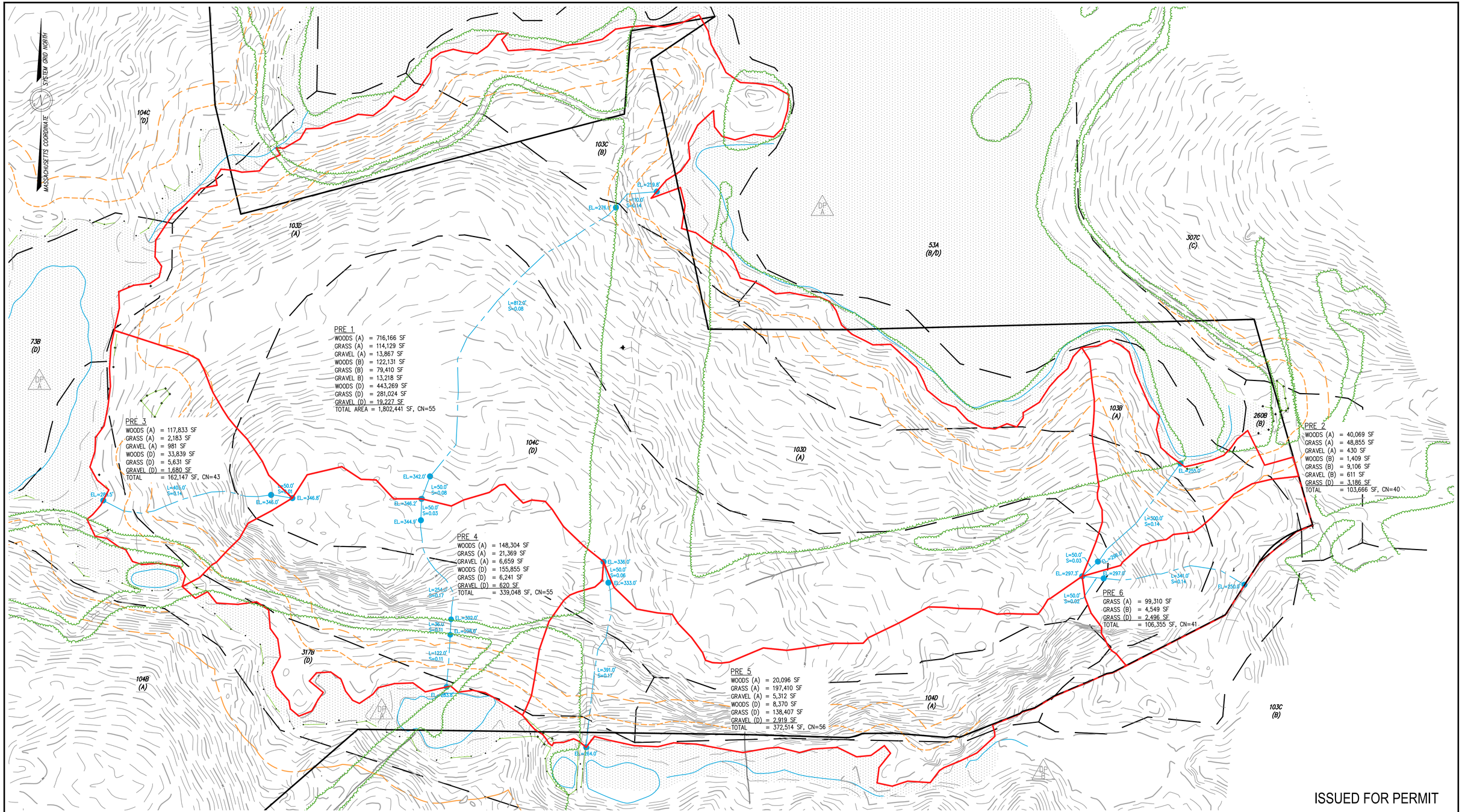
MA Division of Fisheries and Wildlife
Route 135
Westborough, MA 0 15 81
(508) 792-7270 ext. 200

Revised 5/98

Appendix B – Watershed Map



ISSUED FOR PERMIT

RESERVED FOR REGISTRY USE

DILLIS & ROY
CIVIL DESIGN GROUP
CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1
LUNENBURG, MA 01462
PHONE: (978) 779-6091
www.dillisandroy.com

PLAN REVISIONS

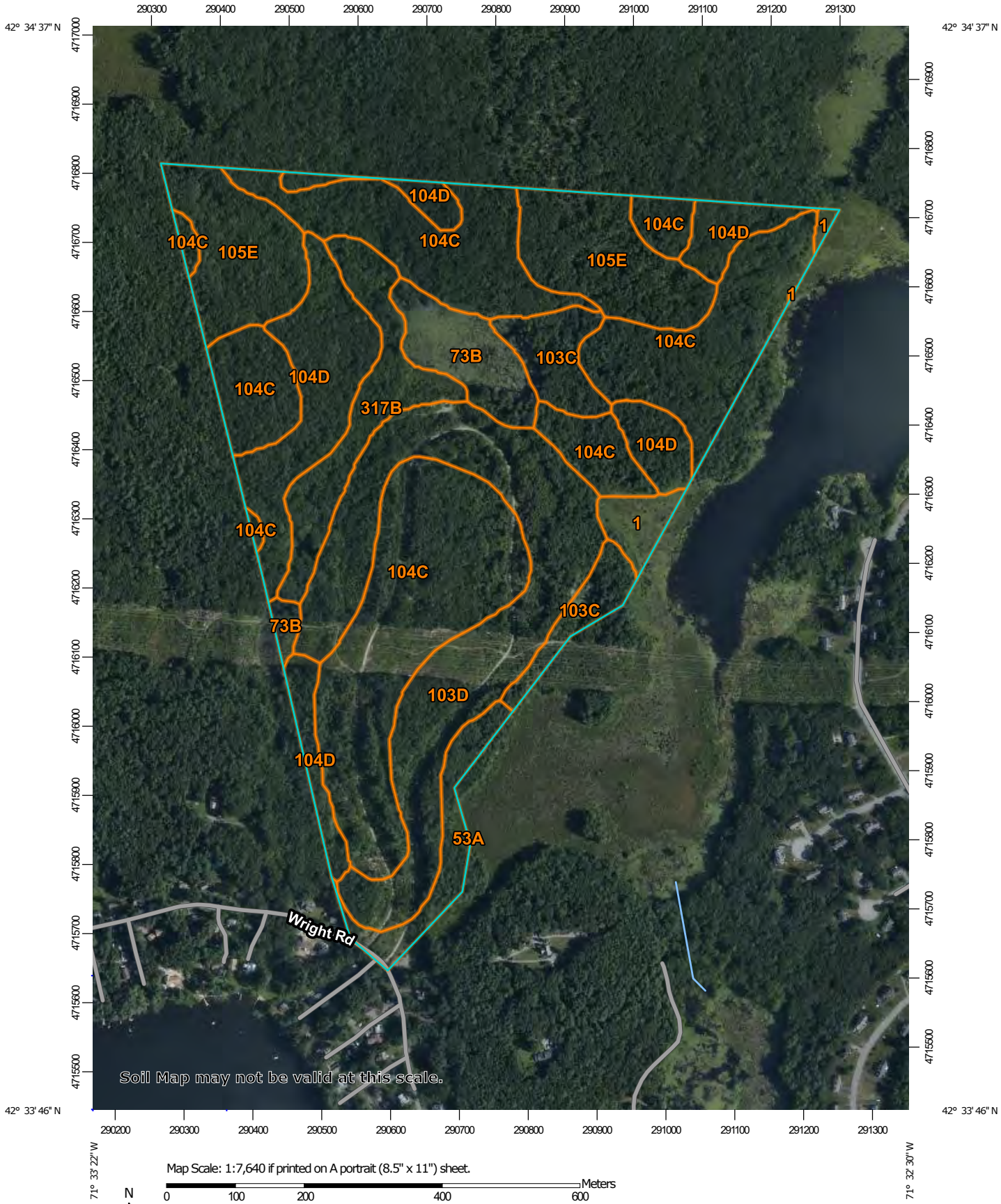
NO.	DATE:	DESCRIPTION:	BY:

PRE-DEVELOPED WATERSHED MAP
AYER, MASSACHUSETTS
STRATTON HILL

DESIGN BY:	DRAWN BY:	CHECKED BY:	SHEET NO.
FMM	RPV	FMM	DRN
DATE: 3/31/2021	JOB NUMBER: 6083	DRAWING NO. 6083-DRN	

Appendix C – NRCS Soil Map with soil series descriptions

Soil Map—Middlesex County, Massachusetts
(Stratton Hill Soil Map)



71° 33' 22" W 71° 32' 30" W
42° 34' 37" N 42° 33' 46" N
290300 290400 290500 290600 290700 290800 290900 291000 291100 291200 291300
4717000 4716900 4716800 4716700 4716600 4716500 4716400 4716300 4716200 4716100 4716000 4715900 4715800 4715700 4715600 4715500

Map Scale: 1:7,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 9, 2019—Sep 28, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	2.4	1.6%
53A	Freetown muck, ponded, 0 to 1 percent slopes	0.0	0.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	6.2	4.2%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	4.2	2.9%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	6.6	4.5%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	27.0	18.5%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	55.3	37.8%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	18.9	13.0%
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes	17.5	12.0%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	8.3	5.6%
Totals for Area of Interest		**146.3**	**100.0%**

Middlesex County, Massachusetts

53A—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown, ponded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Ponded

Setting

Landform: Marshes, kettles, swamps, bogs, depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea, ponded

Percent of map unit: 5 percent
Landform: Kettles, depressions, depressions, marshes, swamps, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w695
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Whitman, extremely stony, and similar soils: 81 percent
Minor components: 19 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitman, Extremely Stony

Setting

Landform: Depressions, drainageways, hills, ground moraines, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY041MA - Very Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Ridgebury, extremely stony

Percent of map unit: 10 percent
Landform: Depressions, drumlins, drainageways, hills, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Outwash terraces, depressions, drainageways, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs, marshes, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Woodbridge, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98yc
Elevation: 0 to 1,490 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 50 percent
Hollis and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope, summit
Landform position (three-dimensional): Head slope, base slope, nose slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Narragansett

Percent of map unit: 2 percent
Landform: Ridges, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, ground moraines, depressions, drumlins, drainageways
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, ground moraines, depressions, drumlins, drainageways
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69p
Elevation: 0 to 1,270 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis, extremely stony, and similar soils: 35 percent
Charlton, extremely stony, and similar soils: 25 percent
Rock outcrop: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent
Landform: Recessionial moraines, hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex

Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

104D—Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 98yh
Elevation: 0 to 1,530 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 35 percent
Rock outcrop: 30 percent
Charlton and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Crest, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Granite and gneiss

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Description of Charlton

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

105E—Rock outcrop-Hollis complex, 3 to 35 percent slopes

Map Unit Setting

National map unit symbol: 98yj
Elevation: 0 to 2,100 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 50 percent
Hollis and similar soils: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Whitman

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 1 percent
Landform: Bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed

Percent of map unit: 1 percent

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Middlesex County, Massachusetts

317B—Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 992p
Elevation: 70 to 1,200 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Scituate and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scituate

Setting

Landform: Hillslopes, depressions
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable loamy eolian deposits over dense sandy lodgment till derived from granite and gneiss

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 20 inches: sandy loam
H3 - 20 to 27 inches: loamy fine sand
H4 - 27 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 18 to 33 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Ridgebury
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

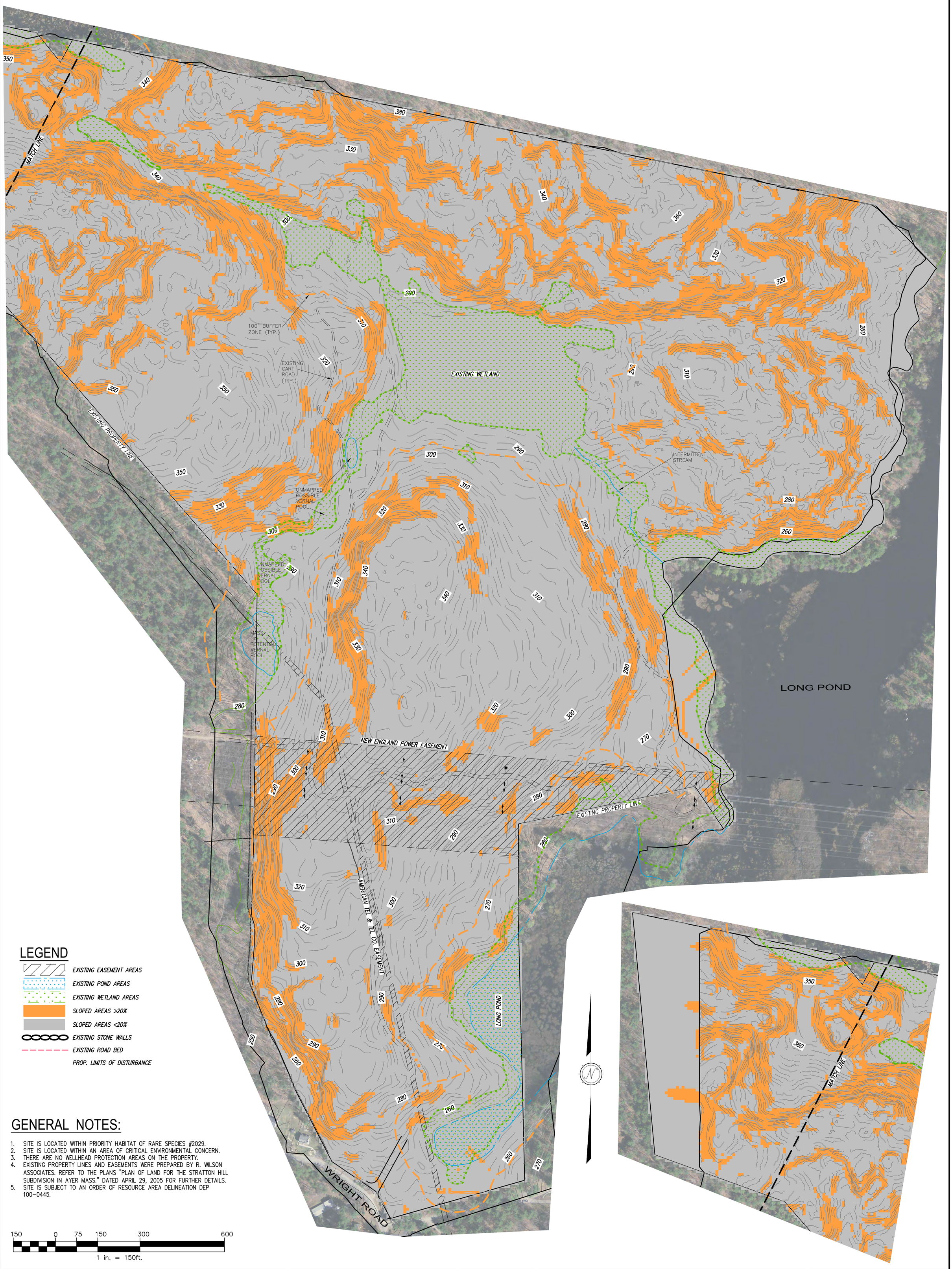
Woodbridge
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, toeslope
Landform position (three-dimensional): Head slope, base slope, nose slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

Appendix D – Topographic Exhibit Plan



LEGEND

- EXISTING EASEMENT AREAS
- EXISTING POND AREAS
- EXISTING WETLAND AREAS
- SLOPED AREAS >20%
- SLOPED AREAS <20%
- EXISTING STONE WALLS
- EXISTING ROAD BED
- PROP. LIMITS OF DISTURBANCE

GENERAL NOTES:

1. SITE IS LOCATED WITHIN PRIORITY HABITAT OF RARE SPECIES #2029.
2. SITE IS LOCATED WITHIN AN AREA OF CRITICAL ENVIRONMENTAL CONCERN.
3. THERE ARE NO WELLHEAD PROTECTION AREAS ON THE PROPERTY.
4. EXISTING PROPERTY LINES AND EASEMENTS WERE PREPARED BY R. WILSON ASSOCIATES. REFER TO THE PLANS "PLAN OF LAND FOR THE STRATTON HILL SUBDIVISION IN AYER MASS." DATED APRIL 29, 2005 FOR FURTHER DETAILS.
5. SITE IS SUBJECT TO AN ORDER OF RESOURCE AREA DELINEATION DEP 100-0445.

150 0 75 150 300 600

1 in. = 150ft.

PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS

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GROTON, MA

TOPOGRAPHIC EXHIBIT PLAN
STRATTON HILL
AYER, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY
1.	6/15/21	REVISIONS PER COMMENTS RECEIVED BY TOWN PLANNER	RPV
2.	7/21/21	LIMITS OF WETLANDS PER ORAD	SBD
3.	8/18/21	OMIT PROPOSED ROAD AND LOTS	SBD

DATE: 03/31/21	JOB NO. 6083
DESIGN BY: RPV	DRAWING NO. 6083-PCAP
DRAWN BY: RPV	SHEET NO. 1 OF 1
CHECKED BY: SRD	

Appendix E – Land Cover and Soil Type Exhibit Plan

MATCH LINE

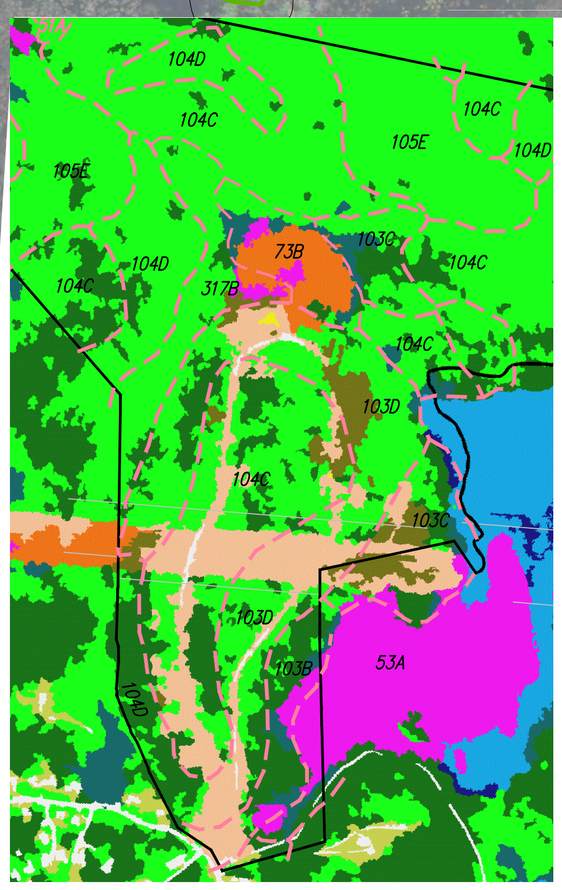
LONG POND

LONG POND

WRIGHT ROAD

150 0 75 150 300 600

1 in. = 150ft.



EXISTING LAND COVER & SOILS MAP
1"=500'

- Developed - High Intensity
- Developed - Medium Intensity
- Developed - Low Intensity
- Developed - Open Space
- Cultivated
- Pasture / Hay
- Grassland
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Scrub / Shrub
- Palustrine Forested Wetland
- Palustrine Scrub / Shrub Wetland
- Palustrine Emergent Wetland
- Estuarine Forested Wetland
- Estuarine Scrub / Shrub Wetland
- Estuarine Emergent Wetland
- Unconsolidated Shore
- Bare Land
- Water
- Palustrine Aquatic Bed

LAND COVER LEGEND

53A	Freetown muck, ponded, 0 to 1 percent slopes	
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes	
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	

SOIL TYPE LEGEND

GENERAL NOTES:

1. THIS PLAN HAS BEEN PREPARED TO DEPICT SOIL TYPES IDENTIFIED IN THE REGIONAL SOIL SURVEY ALONG WITH EXISTING LAND COVERAGE.
2. SITE IS LOCATED WITHIN PRIORITY HABITAT OF RARE SPECIES #2043.
3. SITE IS LOCATED WITHIN AN AREA OF CRITICAL ENVIRONMENTAL CONCERN.
4. THERE ARE NO WELLHEAD PROTECTION AREAS ON THE PROPERTY.
5. SOIL SERIES ARE SHOWN BASED ON USDA NATURAL RESOURCES CONSERVATION SERVICE MAPPING.

PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

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LAND COVER AND SOIL TYPE EXHIBIT PLAN

STRATTON HILL
AYER, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

DATE: AUGUST 4, 2021	JOB NO. 6083
DESIGN BY: SRD	DRAWING NO. 6083
DRAWN BY: SD	SHEET NO. 1 OF 1
CHECKED BY: SRD	

Appendix F – Wetland Resource Area Exhibit Plan

LEGEND

- EXISTING EASEMENT AREAS
- EXISTING POND AREAS
- EXISTING WETLAND AREAS

GENERAL NOTES:

1. SITE IS LOCATED WITHIN PRIORITY HABITAT OF RARE SPECIES #2029.
2. SITE IS LOCATED WITHIN AN AREA OF CRITICAL ENVIRONMENTAL CONCERN.
3. THERE ARE NO WELLHEAD PROTECTION AREAS ON THE PROPERTY.
4. EXISTING PROPERTY LINES AND EASEMENTS WERE PREPARED BY R. WILSON ASSOCIATES. REFER TO THE PLANS "PLAN OF LAND FOR THE STRATTON HILL SUBDIVISION IN AYER MASS." DATED APRIL 29, 2005 FOR FURTHER DETAILS.
5. SITE IS SUBJECT TO AN ORDER OF RESOURCE AREA DELINEATION DEP 100-0445.

150 0 75 150 300 600

1 in. = 150ft.

PREPARED BY:
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WETLAND RESOURCE AREA EXHIBIT PLAN
STRATTON HILL
AYER, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

DATE: 8/18/21	JOB NO. 6083
DESIGN BY: RPV	DRAWING NO. 6083-OS ANALYSIS
DRAWN BY: SD	SHEET NO. 1 OF 1
CHECKED BY: SRD	