Public Service of New Hampshire
Seacoast Reliability Project

Madbury, Durham, Newington & Portsmouth, NH

Natural Resource Existing Conditions Report

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Executive Summary

Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH") is proposing to construct a new 115 kilovolt ("kV") transmission line between the existing Madbury and Portsmouth substations. The Seacoast Reliability Project ("SRP") would be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. The 12.9-mile long project would begin at the existing PSNH Madbury Substation in Madbury, traversing Durham, crossing Little Bay via an underwater cable into Newington, and then continuing east before ending in Portsmouth. The terrestrial portions of the project lie almost entirely within an existing electric utility corridor, and the submarine portions of the project are proposed within a mapped cable corridor across Little Bay. Natural resources, including wetlands, streams, vernal pools, estuarine resources, soils and wildlife, were identified in the approximately 152-acre Project Area. This report summarizes the methodology used in the surveys, and describes the existing natural resources along the proposed SRP corridor.

Streams, Rivers and Ponds

The majority of the streams identified in the Project Area are perennial or intermittent (81%), which is consistent with the flat topography and low elevation of the site. Eighteen perennial streams were mapped; the most notable being the Oyster River which is a designated river under the New Hampshire Rivers Management and Protection Program ("RMPP")(RSA 483). As a designated river, the Oyster River is subject to the protections afforded by the New Hampshire Shoreland Water Quality Protection Act ("SWQPA"). The SRP corridor crosses through a small portion of the Lamprey River Watershed which is also designated; however it does not cross the Lamprey River, or any of the tributaries cited in the watershed designation description (North Branch, North, Little, Pawtuckaway, or Piscassic Rivers). The only other water resource protected under the SWQPA is Little Bay, which the Project will cross via underwater cable.

Wetlands

Wetlands were delineated in 2013, 2014 and 2015 with a total of 114 wetlands identified within the SRP corridor. Approximately 77 percent (by area) of the delineated wetlands were palustrine (freshwater) systems, while the remaining 23 percent were estuarine. Due to the routine vegetation maintenance activities associated with the existing electric lines, the majority of the terrestrial wetlands were a combination of palustrine emergent and scrub-shrub systems (49%) or palustrine emergent (17%) wetlands. The remaining palustrine wetlands were different combinations of emergent, scrub-shrub, forested and unconsolidated bottom. A fringing salt marsh borders the west shore and portions of the east shore of Little Bay. Other estuarine wetlands include rocky shore, mudflat and subtidal unconsolidated sands and mud associated with Little Bay. Many of the wetlands were parts of larger wetland systems that included the SRP corridor, and many were disturbed to some extent due to development and other ongoing activities. In the freshwater wetlands, the most common principal functions and values identified across the study area include groundwater recharge/discharge, wildlife habitat, production export, sediment retention, and floodflow alteration. Five of the wetlands are sections of three prime wetlands mapped in the Town of Newington.

Vernal Pools

Some of the water resource surveys were conducted outside of the vernal pool identification window, which typically occurs in April and May along the coastal plain of New Hampshire. During the initial wetland and stream delineation in the summer and fall of 2013, two potential vernal pools ("PVPs") were identified. A follow-up survey was conducted in the spring of 2014 to identify any other active vernal pools and verify the previously identified PVPs. Another vernal pool review was conducted in the spring of 2015 and resulted in one area that contained a primary vernal pool indicator (wood frogs) utilizing a permanently inundated pond within a larger wetland complex. The pond did not meet the definition of a vernal pool. Based on the 2014 and 2015 spring surveys, no vernal pools occur within the Project Area.

Little Bay Bathymetry and Substrate

The SRP crosses Little Bay north of Adams Point and Furber Strait into Newington north of Welsh Cove within an area denoted as Cable Area on the National Oceanic and Atmospheric Administration ("NOAA") navigation chart 13285. A broad tidal flat with depths ranging from about +1 to -1 feet Mean Lower Low Water ("MLLW") extends from the western shoreline approximately 1800 feet. At this point water depths increase gradually (over a distance of about 800 feet) to ~30 feet below MLLW. Water depth remains deep for about 400 feet, gradually decreasing to about 17 feet below MLLW and then more abruptly to 0 feet MLLW. The tidal flat on the eastern shoreline into northern Welsh Cove is about 500 feet wide.

Sediment surveys by PSNH and by others were consistent in showing that the substrate on the western tidal flat was predominantly silt-clay and in the channel and eastern channel slope was predominantly sand. Values for samples within Little Bay (by others) indicated that total organic carbon ranged from 0.55 to 2.35 percent, averaging 1.4 percent, a relatively low value. Sediment toxicity testing by others revealed no significant mortality among test benthic organisms. Based on these data, USEPA (2007) characterized sediment quality in Little Bay as good. Trowbridge (2009) noted that although sediment contaminant levels in tributaries to the Great Bay/Little Bay system often exceeded NOAA screening levels, the concentrations within the bays themselves did not. It is unlikely that this has changed since the last assessment. Sediment contamination was not considered as a factor affecting the estuary in Piscataqua Region Estuary Program's 2013 State of the Estuary report.

Little Bay Water Quality

NOAA's National Estuarine Eutrophication Assessment program has designated all of Little Bay as part of the Seawater Zone of the Great Bay Estuary system, with salinities exceeding 25 parts per thousand (ppt). In Great Bay, estimates of water temperature from April 2009 through September 2014, ranged from -2 to 29.1°C (28.4 to 84.4°F), with July having the highest monthly mean temperature (24°C; 75.2°F). Dissolved oxygen ("DO") levels ranged from 3.7 to 17.4 mg/l during April 2009 through September 2014, with the lowest monthly mean DO in July (7.5 mg/l).

Several studies have found that total suspended solids off Adams Point located south of the project area were statistically higher during the period from 2001-2008 than during 1974-1981. This increase was linked to decreases in eelgrass, whose root and rhizome system stabilizes sediments and helps sequester nutrients in the substrate. Total suspended solids concentrations vary widely both seasonally and tidally.

Eelgrass and Macroalgae

Eelgrass is the most widespread aquatic vegetation in the Great Bay Estuary, of which Little Bay is part. Eelgrass provides significant habitat functions and values both biologically and physically. It is important for cover, nursery and breeding grounds for invertebrates and fish, sediment stability, and nutrient and carbon retention. Eelgrass distribution in Little Bay has varied tremendously over decades. In the Project Area, it has varied from thick beds in the 1980s to sparse or absent in more recent years. Project specific surveys did not observe any attached eelgrass within the survey areas.

Most macroalgae require hard substrate for attachment so their presence is restricted in Little Bay to nearshore areas where bedrock outcrops, cobble, or boulders are present. Substrate in the Cable Area is predominantly unconsolidated fine granular sediment however limited areas of rock outcrops occur along both shorelines where the macroalgae was observed.

Shellfish

The Great Bay estuary system supports populations of several shellfish species of interest to harvesters, including oysters (*Crassostrea virginica* and *Ostrea edulis*), softshell clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), razor clams (*Ensis directus*), and sea scallops (*Placopecten magellanicus*). Recreational harvesting of oysters and softshell clams is allowed in specified areas in the estuary but the proposed SRP lies within a Cable Area mapped on NOAA chart 13285 and is permanently closed to harvest. Major natural oyster beds have not been documented in Little Bay in recent years; the closest beds to the Cable Area are at Adams Point (about 0.75 mile south of the Cable Area) and Nannie Island (off of Woodman Point; about 1.75 mile south of the Cable Area). Small populations of oysters are likely to be present on some rocky surfaces in Little Bay. New Hampshire Department of Environmental Services ("NHDES") is also encouraging oyster aquaculture in the estuary. Existing aquaculture operations include an aquaculture lease that falls partially within the Cable Area; NHDES may move this lease to the north to avoid the non-harvestable Cable Area. New Hampshire Department of Fish and Game ("NHFG") considers the western tidal flats of Little Bay to provide suitable habitat for softshell clams, razor clams, and the non-harvested *Macoma balthica*. Normandeau's field surveys on the western flats identified softshell clams at nine of fifteen stations and live razor clams were identified at two. Razor clam shells were noted in several locations. No live *Macoma* were observed although shells were present. These results confirm that these resources are present within the Cable Area.

Benthic Infauna

Benthic infauna are the macro- and micro-organisms that reside in the sediments of tidal and intertidal systems. In the Project Area, infaunal abundance was generally highest at the stations on the western tidal flat, most variable in the channel, and most consistent along the channel slope. The total number of unique taxa was most consistent on the tidal flat and most variable among the stations in the channel and along the channel slope.

Results of the project-specific survey compare well to data collected between 2000 and 2006 for the National Coastal Condition Assessment ("NCCA") program. Most taxa that were numerical dominants in the NCCA samples were also dominants in the Project Area. A study of infauna in the Great Bay estuary reported that species richness and dominant species (including *Streblospio*, *Heteromastus*, *Scoloplos*, *Pygospio*, *Aricidea*, and oligochaetes, many of the dominants in the Project Area) were similar over a twenty-year period (1972-1995) indicating that the benthic infaunal community in the estuary was been relatively stable in composition for those three decades. The National Estuary Program rated benthic conditions in Little Bay as good based on the fact that Shannon-Weiner diversity at all of the stations within the bay itself (excluding tributaries) exceeded 0.63, a condition that was also met in the project-specific data collected in 2014.

Epibenthos

Epibenthic organisms that live and feed on the substrate surface and are known to, or are likely to, occur in the Great Bay Estuary include American lobster (*Homarus americanus*), rock crabs (*Cancer irroratus*), green crabs (*Carcinus maenas*), mud crabs (Xanthidae) and horseshoe crabs (*Limulus polyphemus*) (Jones 2000). These species move around on and burrow into the substrate seeking food or refuge. Bioturbation caused by these activities can have a substantial effect on the infaunal biota and on eelgrass beds. Lobsters are present throughout the estuary and are fished both commercially and recreationally, although no landings or distribution data are available for the estuary. Lobsters move in and out of the estuary seasonally, with their greatest presence during late spring through fall.

Horseshoe crabs are ecologically important because their eggs, laid intertidally, provide a rich food source for migrating shorebirds in the spring. In addition, the crabs forage in muddy substrates for food and by doing so, bioengineer the substrate. Studies have not identified breeding habitat in the immediate vicinity of the Project. Juveniles are most apt to reside in the upper regions of Great Bay, with none being observed in Little Bay. Mudflats throughout the Great Bay Estuary are important feeding habitats for both adult and juvenile horseshoe crabs.

Rock crabs have been reported from the Great Bay system and may occur in deeper portions of the proposed cable crossing as this species prefers sandy substrate (Jeffries 1966). Rock crabs are fished commercially and recreationally to some degree. NHFG has found green crabs, an invasive species, to be the most abundant invertebrate species collected in New Hampshire's estuaries (NHFG 2014c). Green crabs have been shown to consume juvenile softshell clams, contributing to the failed recruitment to harvestable sizes and to uproot eelgrass plants, particularly in restoration areas. Abundances of rock and green crabs in Great Bay are not readily available; results of the NHFG surveys are reported as total Great Bay, Little Bay, Piscataqua River, Little Harbor and Hampton/Seabrook Estuary combined (NHFG 2014c). Jones (2000), however, noted that rock crabs are abundant in Great Bay and that green crabs are more common in Little Bay than in Great Bay.

Fish

A number of fish species are known to utilize the Great Bay Estuary during at least one life stage. The NHFG and National Marine Fisheries Service are tasked with management of ecologically and economically important fish species including, diadromous fish species, Essential Fish Habitat ("EFH") species, and rare, threatened, or endangered ("RTE") species. Diadromous fish species either spend their life in saltwater and spawn in freshwater (anadromous) or spend their life in freshwater and spawn in the ocean (catadromous), and are discussed below. EFH (SEC Appendix 38) and RTE (SEC Appendix 37, NHDES Wetlands Application Appendix C) fish species are also summarized, and described in more detail in separate reports.

Six species of diadromous fish utilize Great Bay Estuary for some portion of their life cycle: American eel, American shad, alewife, blueback herring, rainbow smelt, and sea lamprey. All species with the exception of American shad have been observed in the Mill Pond fish ladder on the Oyster River, and therefore have the potential to be within the corridor crossing the Oyster River. All species except blueback herring may transit through the Cable Area in Little Bay during migrations between the marine and freshwater environments.

Two federally listed fish species, short-nosed sturgeon (Endangered) and Atlantic sturgeon (Threatened), may use the Little Bay corridor as feeding habitat. Neither species is known to breed in New Hampshire, and short-nosed sturgeon is considered extirpated in New Hampshire, but adults from other populations in the Gulf of Maine could occasionally feed in Great Bay, including the Project Area. Three state-listed Special Concern fish species, American eel, swamp darter and banded sunfish, are known to occur upstream and downstream of several streams crossing the Project Area, including the Oyster River. These species are assumed to periodically use the Project Area.

The proposed Project Area in Little Bay was determined to provide EFH for at least one life stage of 10 species at some point during the year: Atlantic cod, Atlantic Halibut, Atlantic mackerel, bluefish, pollock, red hake, white hake, windowpane flounder, winter flounder, and yellowtail flounder.

Soils, Vegetation and Habitat Types

The Natural Resources Conservation Service ("NRCS") soil mapping indicates that soils within the Project Area are derived from till, or are of glaciomarine or outwash parent material. The soils observed during field surveys were primarily fine or very fine sandy loams or silt loams. Example series include the Hollis-Charlton very rocky fine sandy loams, Scantic silt loam, Buxton silt loam, Suffield silt loam, and Swanton fine sandy loam. In Little Bay, surveys showed that sediments on the western tidal flat were predominantly silt-clay and in the channel and eastern channel slope were predominantly sand.

The project corridor is located within the Coastal Plain ecological region of New Hampshire. The highest elevation is approximately 130 feet above sea level near the Madbury Substation. Based on the NHFG 2015 Wildlife Action Plan's ("WAP") cover type map and field observations, habitat cover types in the vicinity of the SRP consist mostly of Appalachian oak-pine forest, with smaller areas of wet meadow/shrub wetlands, grasslands, and temperate swamp. The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes. One rare plant species in Durham, and four exemplary natural communities all associated with Little Bay have been identified within the Project Area.

Wildlife

Transmission corridors in general are known to provide suitable habitat for a variety of wildlife species, including mammals, birds, reptiles, amphibians, and invertebrates. Species with small home range requirements may use a portion of a corridor as their primary habitats. Animals with larger home ranges may use a corridor as a part of their overall home range, or as a travel/dispersal route. Transmission corridors may also provide intrinsic habitat value as a relatively undeveloped habitat area in locations were the surrounding land use consists of commercial, institutional, and/or residential development.

The undeveloped areas and low density residential areas surrounding the SRP are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types. Although narrow (approximately 60 feet wide), the existing cleared corridor provides some relatively valuable habitat resources for grassland/shrubland species, and may also provide a dispersal corridor for species that depend on grassy and/or shrubby habitats.

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the New Hampshire WAP, primarily in Durham. Most of the remainder of the corridor is designated as Supporting Landscapes or has no designation at all.

In late fall, Great Bay typically hosts large numbers (>500) of migrating Canada geese and black ducks, as well as smaller numbers (<100) of other diving and dabbling ducks, shorebirds and seabirds. These birds use a variety of areas around the bay and are not likely resource constrained. Bald eagles and osprey also nest on lands bordering Great Bay. No known nests occur in the vicinity of the Project Area.

1.0 Introduction

Public Service Company of New Hampshire d/b/a Eversource Energy is proposing to construct a new 115 kV transmission line between their existing Madbury and Portsmouth substations to enhance the electric reliability in the seacoast region. The SRP would be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. Normandeau Associates ("Normandeau") was contracted by PSNH to delineate and evaluate natural resources including rivers, streams and ponds, wetlands, vernal pools, wildlife, fish, shellfish, benthic infauna, eelgrass, and water quality in Little Bay for the Project. This report summarizes the methodology used by Normandeau and describes the existing conditions along the proposed Seacoast Reliability Project corridor.

1.1 Project Description

The SRP is proposed to be approximately 12.9 miles long including a 0.9-mile crossing under Little Bay (Figure 1.1-1). The entire line will be constructed within existing electric corridors, with minor adjustments to right-of-way ("ROW") widths in several locations. The corridor ranges from 40-130 feet wide, but is predominantly 100 feet wide. For most of its length, a mowed clearing approximately 60 feet in width has been maintained by PSNH in support of the existing electric distribution line. The edges of the corridor are unmaintained and frequently support forest (approximately 20 feet on each side) which will need to be cleared for the SRP. The cable crossing proposed in Little Bay will directly affect a corridor approximately 90 feet wide within a charted Cable Area approximately 1,000 feet wide.

The majority of the SRP will be constructed aboveground on overhead structures between 65 and 115 feet in height. It will cross under Little Bay by being buried 3.5-8 feet in the substrate using jet plow and hand jet technology. For this crossing, the transmission line will be necessarily split into three cables to maintain the required transmissivity for the reliability project. East of Little Bay, the line will remain underground until it crosses Little Bay Road in Newington, after which it will emerge to cross overland until it terminates at Portsmouth substation. In most locations, the existing distribution line will be co-located on the new structures and the existing distribution structures will be removed. In several locations, the existing distribution line will be relocated outside of the SRP corridor and the new structures will carry the new transmission cables only. A short portion of an existing transmission line will need to be relocated to accommodate the new SRP alignment at Crossings at Fox Run Mall in Newington. Substation improvements in Madbury and Portsmouth will be confined to the existing substation footprints. No other substation modifications are proposed.

1.2 Site Description

The length and acreage of the SRP is in each of the four towns is shown in Table 1.2-1. The Project begins in Madbury at the existing PSNH Madbury Substation located off of Perkins Road. From the Madbury Substation, the corridor passes immediately into Durham and follows an existing PSNH distribution line that parallels a railway line

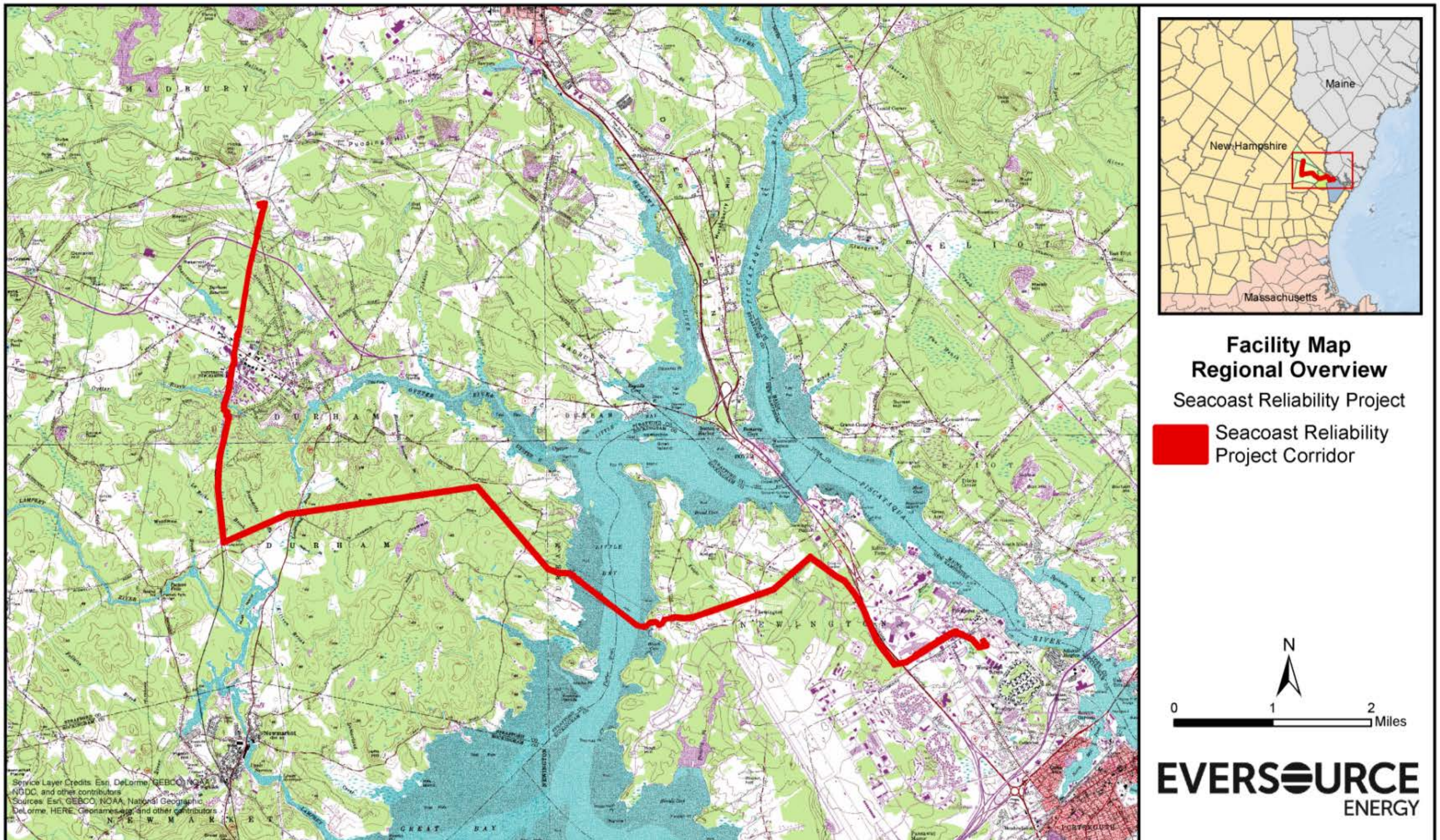

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Figure 1.1-1. Site Location Map.

Table 1.2-1. Extent of the Seacoast Reliability Project's corridor within the four towns.

Town	Length (Miles)	Area (acres)
Madbury	0.4	5
Durham	7.8	87
Newington	4.4	56
Portsmouth	0.3	4
Total	12.9	152

southward towards the campus of the University of New Hampshire ("UNH"). The corridor passes to the west of the main campus and continues south over Mill Road where it crosses through undeveloped lands as it approaches Bennett Road. From just north of Bennett Road, the corridor bends sharply to the east and traverses rolling hills and a mix of undeveloped and residential areas where it crosses NH Route 108 and Durham Point Road before approaching the western shore of Little Bay.

The transmission line will transition from an overhead line to an underwater cable and cross Little Bay within an existing charted Cable Area. Remnants of a former electric cable crossing are still present in the form of cable houses on both shores, and four old de-energized cables still present within the Cable Area. On the east side of Little Bay, the line will transition from an underwater cable to an underground line where it will pass through a residential area buried in Gundalow Landing (road). Where the corridor crosses Little Bay Road, the line will transition once again to an overhead line and continue to the east before bending south parallel to the Spaulding Turnpike. After approximately one mile, the corridor crosses over the Spaulding Turnpike and passes through densely developed commercial and industrial areas associated with Gosling Road and Woodbury Avenue. Near the Newington Substation the line turns south until it terminates at the existing PSNH Portsmouth Substation.

The Project corridor crosses through a diverse assemblage of land uses and habitat types. These include relatively rural and undeveloped areas in Madbury and Durham, densely developed areas associated with the UNH campus and commercial lands to the east of the Spaulding Turnpike in Newington and Portsmouth, and several lower and moderate density residential areas to the east and west of Little Bay. The topography is generally flat to rolling which is typical in the coastal areas of eastern New Hampshire.

1.3 Agency Pre-Application Meetings

Three pre-application meetings have been held with New Hampshire and federal natural resource regulatory agencies. The first was at the NHDES in Concord, New Hampshire, on January 6, 2015. Agencies represented included NHDES staff from the Wetlands Bureau, Coastal Program, Alteration of Terrain, and Public Information; NHFG; New Hampshire Department of Resource and Economic Development's Natural Heritage Bureau ("NHB"); U.S. Army Corps of Engineers ("USACE"); U.S. Environmental Protection Agency ("USEPA"); U.S. Fish and Wildlife Service ("USFWS") and National Marine Fisheries Service. The agencies were given a presentation of the proposed Project and preliminary natural resource studies and findings, which were then followed by a discussion of the various regulatory concerns. Key decisions that resulted from the meeting and feedback immediately following the meeting were as follows:

- an Alteration of Terrain permit would likely not be required because most of the project will not trigger the need for the permit, and the Little Bay crossing is entirely within wetlands thus will be reviewed by the Wetlands Bureau; however follow-up conversations indicated that an Alteration of Terrain permit would indeed be required to address potential disturbances;
- water quality impacts in Little Bay will be reviewed by NHDES;
- compensatory wetland mitigation via in-lieu-fee payment to the Aquatic Resource Mitigation (ARM) fund appears appropriate; and
- the Corps expects the Project to qualify for a General Permit review, given that almost all impacts are temporary and permanent terrestrial impacts are less than <1,000 square feet.

Data and study requests included justification for the jetplow installation versus horizontal directional drilling, rationale for the need to cross the Oyster River during construction which was resolved by utilizing a new access route that avoids the need for the crossing, the addition of sea lamprey to diadromous fish list, and a final eelgrass survey the growing season before the Little Bay cable installation.

A meeting of the marine agencies was held on March 3, 2015, at Normandeau's Portsmouth office. Agencies present included NHDES Watershed Bureau, USACE, National Marine Fisheries Service, and USEPA. The focus was to discuss the Little Bay crossing in particular, including the construction process, and impacts on potential resources and water quality.

Another joint pre-application meeting was held January 12, 2016 with state and federal agencies. Attendees included NHDES Wetlands Bureau, Alteration of Terrain, and Water Quality staff, NHFG; NHB; USACE; USEPA; USFWS and National Marine Fisheries Service ("NMFS"). The purpose of this meeting was to present the final permitting design, describe the project community outreach efforts, and request any outstanding agency concerns. Topics of discussion included a description of alternatives, installation methods in Little Bay, impact details to terrestrial and marine areas and sedges, resource survey findings such as eel grass, mitigation and permitting, monitoring including salt marsh areas, water quality, and re-deposition of sediments. The development of Little Bay water quality monitoring program, post-construction bathymetric surveys, and *Carex cristatella* monitoring were also discussed.

In addition to these multi-agency meetings, the SRP has met or spoken with various agencies individually or in small focus groups to provide updates on the Project; discuss specific rare species, historic, and mitigation measures; and present Great Bay impacts.

Summaries of all meetings are provided in SEC application.

2.0 Methods

This section describes the methods used to investigate terrestrial and estuarine natural resources within the limits of the SRP.

2.1 Terrestrial Resources

Normandeau used qualified and experienced staff scientists to provide wetland delineations, wildlife habitat surveys, botanical surveys and marine surveys. Normandeau New Hampshire Certified Wetland Scientists ("NHCWS") and other field scientists investigated the study area in 2013, 2014 and 2015. All delineated resource boundaries, including wetlands, streams, and vernal pools were located with a Trimble® Global Positioning System ("GPS") that is capable of sub-meter accuracy. A project-specific data dictionary was used with each GPS unit to supplement the data recorded on field data sheets. The dictionary aided in maintaining consistency for data collection between field teams. The GPS files were post-processed and incorporated into a geodatabase using ESRI ArcMap 10.2. Selected field delineations were subjected to field Quality Assurance/Quality Control reviews by senior Normandeau biologists and other wetland staff throughout the field data collection effort.

Other resources, such as water quality, fish, epibenthos, general vegetation cover types, wildlife, rare species, soil map units and conservation lands, were investigated via a combination of mapped resources from GRANIT and the municipalities, as well as field observations.

Latin names for plants used in this document are from *Flora Novae Anglia* (Haines 2012), which includes the most current plant taxonomy.

Streams, Rivers and Ponds

All jurisdictional streams and waterbodies within the study area were delineated and located with GPS. A project-specific data form was utilized to standardize the collection of stream characteristics. The centerlines of streams less than six feet wide were delineated with orange flagging and approximate channel width noted. The tops of bank for streams greater than six feet wide were individually flagged. Drainage swales and ditches in uplands were not considered jurisdictional streams when it was apparent that water flow only occurred during precipitation events and the ditch or swale was not functioning as a wetland, or did not provide a connection between wetlands. The data forms included basic information such as flow regime, apparent flow (at the time of delineation), width, depth and relationship to other streams and wetlands. The following guidance was used in determining the watercourse type, which is based on Federal definitions (Federal Register, March 12, 2007) and is generally consistent with New Hampshire regulations:

- *Ephemeral stream*: Flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from precipitation is the primary source of water for stream flow.
- *Intermittent stream*: Flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from precipitation is a supplemental source of water for stream flow.
- *Perennial stream*: Flowing water year round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary

source of water for stream flow. Runoff from precipitation is a supplemental source of water for stream flow.

The New Hampshire Shoreland Water Quality Protection Act (SWQPA; RSA 483-B) provides oversight of activities within designated buffers that range between 50 to 250 feet from an established reference line, either the ordinary high water mark for rivers or a defined surface elevation for lakes and ponds, or the highest observable tide line associated with waters subject to the ebb and flow of the tide (NHDES 2011a). Waterbodies include lakes and ponds greater than 10 acres in size, tidal waters, fourth order and greater streams and rivers and, "designated rivers" under the Rivers Management and Protection Act of 1988 (RSA 483).

The portions of the project corridor that are within 250 feet of the highest observable tide line for Little Bay are subject to the requirements of the SWQPA. The corridor also crosses the Oyster River, which is a Designated River and is therefore managed and protected for its outstanding natural and cultural resources in accordance with RSA 483, The Rivers Management & Protection Act. The portions of the corridor within 250 feet of the ordinary high water mark on the Oyster River will also be subject to the SWQPA. No other rivers or waterbodies within the project corridor qualify for review under the SWQPA.

Wetlands

The NHDES has jurisdiction of wetland resources under RSA 482-A and New Hampshire Code of Administrative Rules (Env-Wt.100-900). The USACE has jurisdiction over wetlands and waterways under Section 404 of the Clean Water Act. Field protocols were developed to ensure consistency during the delineation of wetlands and the documentation of wetland characteristics. Wetland boundaries were delineated by, or with oversight by, a NHCWS. Wetland delineations were completed in the field using the routine determination according to the criteria established by the USACE in the *1987 Corps of Engineers Wetlands Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (2012). The manual and regional supplement both utilize a three parameter approach to the field determination of wetland boundaries and requires the presence of hydric soils, hydrophytic vegetation and hydrology under normal circumstances.

Wetland boundaries were flagged with pink and black "Wetland Delineation" flagging and numbered with an identifier for the wetland and a flagging sequence. The wetland boundary flags were located with GPS and a project-specific data form was completed for each wetland. The data form included an evaluation of the functions and values of each wetland according to the USACE "Highway Methodology" (USACE 1995). Functions and values considered principal for the wetland, as well as those considered suitable were noted. Other field information gathered and recorded on the data forms included wetland associations with water bodies, streams, vernal pools and dominant cover type class based on the USFWS classification system (Cowardin, et al. 1979).

Under RSA 482-A:15 and the associated administrative rules (Env-Wt 700), individual municipalities may elect to designate wetlands as "prime-wetlands" if the municipality can demonstrate that high-quality wetlands are present. Newington and Portsmouth have designated Prime wetlands and Durham and Madbury have not. The Newington and Portsmouth prime wetland maps were reviewed and those that intersect with the SRP corridor are indicated on the project Environmental Maps.

Vernal Pools

The SRP corridor was surveyed for potential vernal pools during wetland delineations. Each potential vernal pool encountered was visually inspected for egg masses and/or larvae of amphibian vernal pool indicator species during the spring 2014 vernal pool species breeding season. A follow-up review of specific areas was also conducted in the spring of 2015. A dip net was also used to survey for amphibian larvae and invertebrates. Vernal pools were identified in accordance with the NHDES Wetland Rules (Env-Wt) 101.106 and Env-Wt 301.01, and procedures described in *Identification and Documentation of Vernal Pools in New Hampshire*, published by the New Hampshire Fish and Game Department (NHFG 2004).

A vernal pool is defined (Env-Wt 101.106(a-b)) as:

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

Primary and secondary vernal pool indicator species are described in Env-Wt 101.75 and Env-Wt 101.86, respectively. Under these rules, primary vernal pool indicators refer to:

> "*the presence or physical evidence of breeding by marbled salamander (Ambystoma opacum), wood frog (Rana sylvatica), spotted salamander (Ambystoma maculatum), Jefferson-blue spotted salamander complex (Ambystoma jeffersonianum/A. laterale complex), or fairy shrimp (Eubranchipus sp.)*". [Env-Wt 101.71]

Secondary vernal pool indicators are:

> "*physical evidence used by wildlife biologists or certified wetlands scientists who are familiar with vernal pool habitats as evidence of the presence of a vernal pool, if primary vernal pool indicators are absent and other vernal pool characteristics suggest vernal pool habitat. Secondary vernal pool indicators include, but are not limited to, caddisfly larvae and cases (Limnephilidae, Phyrganeidae, or Polycentropodidae), clam shrimp and their shells (Laevicaudata, Spinicaudata), fingernail clams and their shells (Sphaeriidae), aquatic beetle larvae (Dytiscidae, Gyrinidae, Haliplidae, and Hydrophilidae), dragonfly larvae and exuviae (Aeshnidae, Libellulidae), spire-shaped snails and their shells (Physidae, Lymnaeidae), flat-spire snails exuviae (Coenagrionidae, Lestidae), and true fly larvae and pupae (Culicidae, Chaoboridae, and Chironomidae).*" [Env-Wt 101.82]

2.2 Estuarine Resources

Normandeau investigated estuarine resources within the SRP corridor in 2013 and 2014. The investigations included a desktop review of historical and existing eelgrass (*Zostera marina),* macroalgae, shellfish areas, benthic infauna, fish, sediment characteristics and water quality. Field surveys were performed to confirm the current condition of eelgrass, shellfish and benthic infauna, and incidentally observed macroalgae and sediment characteristics.

Eelgrass

On October 14, 2013, Normandeau conducted a towed underwater video survey along transects within and south of the charted Cable Area where eelgrass had been reported in 2012. One transect extended across the bay to the western shoreline. No attached eelgrass was observed on any of the five transects. In addition, because water clarity was good, the field crew was able to observe that eelgrass was absent on the eastern side of the cable route. Other incidental observations by Normandeau biologists during shellfish surveys in September 2014 did not find eelgrass on the western tidal flats within the cable corridor. Surveys by the marine contractor in mid-July 2014 to inspect the condition of the existing cables also did not observe eelgrass in the corridor.

Shellfish

A conversation with Mr. Bruce Smith, NHFG on August 25, 2014, indicated that the department considers the Cable Area as suitable habitat for softshell clams (*Mya arenaria*), razor clams (*Ensis directus*), and the non-harvested *Macoma balthica*. In order to assess this resource, at the suggestion of Mr. Smith, Normandeau conducted an observational survey within the Cable Area on the western tidal flat on September 16, 2014. Scientists accessed the area by canoe and a molluscan expert observed the substrate through a view tube in water depths ranging from about 1 to 2 feet. Three transects equating to nearshore, mid-tidal flat, and off-shore tidal flat were pre-selected in the office to cross the 1000-foot charted Cable Area. On each transect, five stations were distributed equidistantly along transects that extended beyond the boundaries of the Cable Area identified on NOAA Chart 13285 such that three stations on each transect were within the Cable Area and two were beyond to serve as reference stations. Including reference stations beyond the potential impact area facilitates the evaluation of whether the shellfish within the Cable Area is unique or similar to nearby resources. In the field, each of the 15 sampling stations was located by GPS, and three circular fields of vision using an underwater viewtube (each approximately 1 foot in diameter (0.8 square feet) were examined. The number of distinct molluscan siphon holes, species of mollusk and associated macrofauna were recorded. The three species of interest have distinct siphons so it was possible to identify feeding individuals to species.

Benthic Infauna

A site-specific benthic survey was undertaken on September 9, 2014. Fifteen stations were sampled along three depths zones to represent the western shallow subtidal mud flat (approximately 0 to -1 foot MLLW), the channel (approximately -30 feet MLLW), and the eastern channel slope (approximately -20 feet MLLW). Stations were distributed equidistantly along transects that extended beyond the boundaries of the Cable Area identified on NOAA Chart 13285 such that three stations on each transect were within the Cable Area and two were beyond to serve as reference stations. Including reference stations beyond the potential impact area facilitates the evaluation of whether the benthos within the Cable Area is unique or similar to nearby resources and it also minimizes the concern that recovery could be masked by broadscale temporal changes in the benthos. Infaunal samples were collected using a 0.43 ft^2 (0.04 m^2) Ted Young grab, the same sampler used for the NCCA (USEPA 2007) program which evaluates long-term conditions in Great Bay as part of a national estuary assessment. Samples were processed in Normandeau's biological laboratory where all organisms were removed from the sediment and identified to the lowest practical taxonomic level, generally species, consistent with NCCA protocols.

3.0 Existing Conditions

3.1 Watersheds and Water Bodies

Watersheds

The entire project corridor is located in the Salmon Falls-Piscataqua River watershed (HUC8) of the larger Saco River basin (HUC6; Appendix A; Map 1) . Northernmost portions of the study area, in Madbury and Durham, are located in the Oyster River watershed (HUC10). The central portions of Durham and Newington are located in the Great Bay Drainage watershed. A small portion of the corridor in Durham is located in the Lamprey River (HUC10) watershed before the corridor bends east and crosses back into the Great Bay Drainage in Durham and Newington near Little Bay. The easternmost portions of the project corridor in Newington and Portsmouth are located in the Portmouth Harbor watershed.

Streams and Rivers

Streams were classified using the Cowardin classification system (Cowardin et al, 1979). A total of 32 streams were delineated within the project study area (Map 2; Appendix A). A summary table of the delineated streams is included in Appendix B.

The study area contained 18 perennial streams (Table 3.1-1). These include Beards Creek, College Brook, Oyster River and several unnamed tributaries to Oyster River, two reaches of LaRoche Brook, Beaudette Brook, and Longmarsh Brook (Map 2; Appendix A). Eight intermittent stream segments, including Hamel Brook and Reservoir Brook were also identified; with the remaining six stream segments classified as ephemeral.

In general, the streams identified within the project corridor were low gradient, slow flowing systems that are consistent with the flat topography of the coastal plain region of New Hampshire. Anthropogenic influences were observed near established development, including highways and larger-scale commercial developments; these influences included culverts, evidence of stormwater input, and ditching.

Table 3.1-1. Number and percent of stream segments by flow regime within the SRP study area.

Stream Flow Regime	#	%
Perennial	18	56%
Intermittent	8	25%
Ephemeral	6	19%
Total:	32	100%

The most significant drainage identified within the study area is the Oyster River. The Oyster River is a designated river, under the RMPP(RSA 483). According to the NHDES:

> *The Oyster River contains some of the highest quality natural habitat in New Hampshire. It is home to at least 12 rare, threatened or endangered wildlife species. One hundred-thirty-nine plant species have been identified along the river corridor, making it one of the most vegetation-diverse rivers in New Hampshire. Eighteen species of fish are known to live within the river, most notably the state endangered American brook lamprey and the state threatened bridle shiner. A large number of the fish are diadromous, capable of moving between fresh and salt waters. To facilitate this, a fish ladder has been installed at the Mill Pond Dam. The Oyster River is considered critical spawning ground for blueback herrings and sea lamprey, and is accessible via a fish ladder on the Mill Pond dam in Durham. However, blueback herring numbers have declined significantly in recent years, possibly due to decreased levels of dissolved oxygen.*(NHDES, 2011).

The Oyster River is also protected as a part of the New Hampshire Shoreland Water Quality Protection Act (SWQPA; RSA 483-B) because it is a designated river and also a fourth order or greater river. The SWQPA provides oversight of activities within designated buffers that range between 50 to 250 feet from the ordinary high water ("OHW") mark.

The project corridor crosses through a small portion of the Lamprey River watershed, including LaRoche Brook. Sections of the Lamprey River and five of its tributaries (the North Branch, North, Little, Pawtuckaway, and Piscassic Rivers) are also designated under the RMPP; however the Project does not cross any of these rivers or designated sections.

The project corridor also includes a recently implemented stream restoration project located in Newington along an abandoned railroad line north of Arboretum Drive. This area was constructed after the SRP's initial delineations in 2013, the area was re-delineated to reflect current conditions in the spring of 2015. It presently consists of a stone-armored channel, an outfall, and emergent seeding. Additional plantings may still be scheduled.

Ponds

No named freshwater ponds were identified within the study area. Several wetlands were noted to contain small areas of ponded water as indicated by the unconsolidated bottom ("UB") Cowardin classification, and others are prone to flooding as observed on aerial photography. Some of the ponds appear to be beaver influenced, associated with larger drainages and floodplains, or in a few cases associated with stormwater detention and treatment or are constructed landscaping features near residential areas. A small pond was mapped in Newington's Flynn Pit Town Forest, and is contained within a delineated wetland (NW4) immediately east of Little Bay Road.

Water Quality

Nearly the entire project corridor is located within one mile of an impaired freshwater waterbody, according to the NHDES OneStop GIS database and the 2010 Surface Water Impairments listing. The most common impairments are dissolved oxygen, total nitrogen, fecal coliform, *Escherichia coli*, enterococcus, and dissolved oxygen saturation. Other impairments include Chlorophyll-a, chloride, Benthic-Macroinvertebrate Bioassessments and aluminum. In

2012, the NHDES categorized all surface waters as Category 5 as a result of a statewide fish consumption advisory for mercury in freshwater fish (Edwardson 2012).

3.2 Wetlands

A total of 114 wetlands were delineated along the approximately 152-acre ROW (Map 2; Appendix A). A summary table of each wetland including cover type and functions and values is included in Appendix B.

The wetlands delineated within the SRP corridor were generally portions of larger wetlands that extended outside of the project corridor. These large, flat wetlands are common throughout the Coastal Plain region of New Hampshire. Land use and vegetation management within and around the project corridor governed wetland structure and species composition, and this is reflected in the cover type classifications documented in the field.

Wetland Cover Types

Table 3.2-1 lists the extent of the dominant vegetation cover types delineated within the study area. All but four of the wetlands fit the Palustrine system, symbolized by the letter "P" and defined as Freshwater Nontidal wetlands (Cowardin 1979). The wetlands associated with Little Bay are symbolized by the letter "E" and are characterized as Estuarine, Intertidal and Subtidal wetlands.

The majority of the freshwater wetlands delineated within the Project Area were mixed systems comprised of both emergent and scrub-shrub cover types (49%), followed by emergent (17%) and then various combinations of emergent, forested, scrub-shrub and unconsolidated bottom systems (Table 3.2-1). Forested wetland cover types were uncommon, due to the routine vegetation management within the existing electric line corridor, and were generally restricted to the wetland areas at the edges of the project corridor. Shallow ponded areas observed within the delineated wetlands were classified as UB. The UB areas were typically bordered by emergent or scrub-shrub cover types and included shallow ponds, beaver ponds, and other sparsely vegetated (generally less than 30 percent) areas with standing water of shallow but unknown depth. Many of the wetlands continued outside of the project corridor as either forested, scrub-shrub or emergent wetlands, however these areas were not reviewed in detail due to lack of permission to access.

The estuarine wetlands delineated within Little Bay include two different subsystems and multiple classes depending on the nature of the substrate material and vegetation. Beginning at the highest observable tide line ("HOTL") and continuing downslope to the lowest observable tide line ("LOTL") the wetlands are considered intertidal, and include emergent high-marsh and low-marsh areas dominated by saltmarsh grasses (*Spartina* sp.), rocky shore, and unconsolidated tidal flats. Below the LOTL the wetland is considered subtidal and is dominated by sands (unconsolidated bottom), and sparse macroalgae, depending on the nature of the substrate and any algal growth.

Photographs of common wetland cover types are included in Appendix C.

Table 3.2-1. Cover type of wetlands delineated within the study area of the SRP Project.

Wetland Cover Type	Area (acres)	%
Palustrine (Freshwater) Wetlands		
Emergent and Scrub-Shrub Wetlands	21.6	48.9%
Palustrine Emergent Wetlands	7.5	17.1%
Palustrine Emergent, Scrub-Shrub and Unconsolidated Bottom Wetlands	3.7	8.3%
Palustrine Scrub-Shrub Wetlands	3.5	8.0%
Palustrine Scrub-Shrub and Forested Wetlands	3.5	7.9%
Palustrine Emergent, Scrub-Shrub and Forested Wetlands	3.2	7.2%
Other combinations of Palustrine Classifications (Emergent, Scrub-Shrub, and Unconsolidated Bottom)	1.2	2.6%
Sub-total:	*44.1*	
Estuarine Wetlands		
Subtidal Estuarine Wetlands	6.0	46.2%
Intertidal Estuarine Wetlands (includes saltmarsh, rocky intertidal, and mudflats)	6.9	53.8%
Sub-total:	*12.9*	

Mixed Emergent and Shrub-Scrub Wetland (PEM1/PSS)

The majority of the wetlands identified within the project corridor contained both emergent and scrub-shrub components. These natural communities were often distributed according to the hydrologic regime; the wettest portion of the wetland was an emergent marsh often dominated by cattail (*Typha latifolia and T. angustifolia*), and the percentage of woody shrub and sapling species increased as the water regime trended drier. Wetland NW11 and DW18 are examples of these circumstances. A more detailed description of the emergent and scrub-shrub components are provided below.

Wetland DW41 is a large example of a wetland system that is primarily emergent and scrub-shrub, but that also contains small pockets with limited vegetation cover and ponded water (classified as Unconsolidated Bottom), especially near the railroad tracks.

Emergent (PEM1)

Emergent marsh and/or wet meadow wetlands were common throughout the project corridor. These wetlands were dominated by non-woody, herbaceous plant species and were primarily the result of on-going land use including utility maintenance mowing, clearing in wet areas associated with agriculture and residential areas. The hydrology in these emergent wetlands was mainly groundwater controlled and a reflection of a shallow water table and seasonal fluctuations of this water table. Other hydrological influences included floodflow where the wetlands were located adjacent to large water courses and groundwater seeps in the hillier portions of the project corridor. The species composition of the emergent marshes frequently included cattail, sedges such as fringed sedge (*Carex crinita*) and tussock sedge (*C. stricta*), ferns species such as sensitive and marsh ferns (*Onoclea sensibilis* and *Thelypteris palustris*), rushes such as soft rush (*Juncus effusus*), and goldenrods (*Solidago* sp.). Invasive species noted during the delineations included purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Examples of emergent wetlands include wetlands MW02, DW02, and DW67.

Wetland NW28, NW30 and NW32 are examples of wet meadow wetlands that are associated with actively mowed hayfields; consequently the species composition of these resources were dominated by grasses, such as reed canary grass, sedges, rushes and bulrushes (e.g. *Scirpus cyperinus*).

Shrub-Scrub Wetland (PSS1)

As with the emergent wetlands, the scrub-shrub resources were governed primarily by land use. Scrub-shrub wetlands were found away from mowed hayfields and residential areas, and included shrub species as well as small, regenerating tree species that are routinely mowed during utility line maintenance. The hydrology of these wetlands was primarily controlled by a shallow water table; however some areas were also influenced by floodflows, particularly near larger water courses in the floodplains. Common shrub species noted in these wetlands include speckled alder (*Alnus incana*), meadowsweet (*Spiraea alba*), steeplebush (*S. tomentosa*), glossy buckthorn (*Frangula alnus*), highbush blueberry (*Vaccinium corymbosum*) and assorted willows (*Salix* sp.). Commonly observed tree species include birches (*Betula* sp.), red maple (*Acer rubrum*), and swamp white oak (*Quercus bicolor*). Several invasive species were also documented throughout the project corridor and include glossy buckthorn, autumn olive (*Elaeagnus umbellate*), oriental bittersweet (*Celastrus orbiculatus*), and multiflora rose (*Rosa multiflora*). All of these latter species are listed on the New Hampshire Prohibited Invasive Plant Species List[1].

Approximately nineteen were classified as predominantly scrub-shrub wetlands, although many included some lesser areas where emergent/herbaceous vegetation was dominant. Examples include NW15, which is primarily an alder swamp, and NW26 which is a disturbed area located between a road and hayfield.

Unconsolidated Bottom (UB), Forested (FO) and Other Wetland Classifications

Several wetlands delineated within the project corridor included either unconsolidated bottom or forested classifications. The unconsolidated bottom wetlands were primarily small ponds and the forested wetland components were a result of tree species bordering the project corridor. Approximately 50% of wetland NW34 was flooded at the time of delineation due to a beaver dam along Pickering Brook outside of the corridor. Nearby, wetland NW13 was also flooded due to beaver activity, and included fringing areas of emergent vegetation including cattails and rooted aquatic species; this wetland also hosted waterfowl.

Wetlands with forested components include DW22, DW36, DW38, DW74 and NW04. In most cases, the percentage of the wetland that was forested within the project corridor was low at approximately 20 percent, but continued as forested outside of the corridor where vegetation management was not performed. Common tree species include red maple and white pine

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[1] http://agriculture.nh.gov/publications-forms/documents/prohibited-invasive-species.pdf

(*Pinus strobus*), with fewer instances of swamp white oak and Atlantic white cedar (*Chamaecyparis thyoides*).

Estuarine Wetland (E1 or E2)

The entire corridor in Little Bay is classified as an estuarine wetland, with both intertidal and subtidal subsystems depending on the location relative to the LOTL. On the western shore, beginning at the HOTL, the wetlands included a fringing marsh of shallow peat over a cobble and rock substrate. The saltmarsh vegetation was dominated by salt cordgrass (*Spartina alterniflora)*, with smaller patches of salt hay (*S. patens)*, and sea-blite (*Sueda linearis)* along the upper limit of the marsh. The substrate was a mix of peat over mud and bedrock outcrops as the wetland descended to the LOTL. Rocky shore (bedrock colonized by fucoid algae (*Fucus vesiculosus* and *Ascophyllum nodosum*) followed a ledge/rock outcrop below the salt marsh. The western shore had extensive tidal flats for approximately 2,000 feet dominated by a mud mix of silt, fine sand, clay and organics. The subtidal channel was predominantly sands with silts at depth. On the eastern shore, the intertidal zone was primarily unvegetated muck tidal flat. This shore included a patchy band of salt cordgrass near the high tideline.

Wetland Functions and Values

Representative wetland functions and values were assessed for each wetland using the U.S. Army Corps of Engineers Highway Methodology (USACE 1999). This methodology evaluates thirteen functions and values potentially provided by individual wetlands. The assessment relies on professional judgment that is documented according to characteristics provided within the methodology for each function. The methodology indicates whether a wetland provides a specific function, and if that function is considered Principal. Principal functions are those that provide "an important physical component of a wetland ecosystem (function only) and/or are considered of special value to society, from a local, regional and/or national perspective". The functions and values for all wetlands are provided in the summary table in Appendix B. While multiple functions were provided to some degree by most wetlands, the principal functions were the distinguishing features among the wetland types. The most common principal functions include: Groundwater Recharge/Discharge, Wildlife Habitat, Production Export, Sediment/Toxicant/Pathogen Retention, Floodflow Alteration and Nutrient Retention. Fewer than ten wetlands were noted as having Fish/Shellfish Habitat, Sediment/Shore Stabilization, Visual Quality/Aesthetics, Education, Recreation, Rare/Threatened/Endangered Species or Uniqueness/Heritage principal function or values. The following descriptions address the principle functions in general terms.

Groundwater Recharge/Discharge (GW)

This function combines recharge and discharge into a single function, based on the concept that many wetlands provide both recharge and discharge depending on seasonality and the relative position of ground and surface waters. On the coastal plain of New Hampshire, the majority of the wetlands were interacting with groundwater, with discharge more prevalent in the hillier areas of the corridor and recharge where sandier substrates were noted. In reality, most of the wetlands were likely functioning as both recharge and discharge sites depending on the spatial location within the wetland and also depending on the season and location of the water table.

Ninety-eight percent (98%) of the delineated wetlands were characterized having the GW function as a principal function or as suitable for either recharge or discharge and this was by far the most common wetland function.

Nutrient Removal & Sediment/Toxicant Retention (NUT & STR)

These two functions are combined because they are provided by similar wetland conditions – those that have the exposure to a pollutant and/or nutrient source, and have the structure and vegetation to treat it. Sixty-eight percent (68%) of the wetlands in the project corridor were listed as suitable or principal for the STR function and 50% were listed for the NUT function. These functions are mostly associated with the ability for the large wetlands identified along the project corridor to trap and attenuate nutrients, sediments, fertilizers, and toxicants from the many roadways and turnpikes, residential areas, and dense commercial and educational development.

Wildlife Habitat Function (WH)

Wildlife habitat is a very broad term applicable to many wetland types, and for a variety of wildlife species. Fifty-eight percent (58%) of the wetlands delineated within the project corridor were observed or presumed to be suitable for the Wildlife Habitat function; with 31 listed as having Wildlife Habitat as a principal function. Common wildlife species observed within the wetlands included deer, beaver, water fowl, other bird species such as songbirds and species such as bittern; amphibians and reptiles along with invertebrates including dragonflies were also noted. The larger scrub-shrub wetlands provide breeding habitat for a number of passerine species: red-winged blackbird, swamp sparrow, yellowthroat and black and white warbler. The Little Bay wetlands provide habitat for multiple marine species.

Floodflow Alteration & Sediment/Shoreline Stabilization (FF & SSS)

Wetlands with dense vegetation that are in close proximity to larger brooks and rivers are typically valuable for detaining and storing surface water and reducing downstream flooding. Fifty-three percent (53%) of the wetlands delineated within the project corridor are suitable or principal for this function, most of which are associated with larger drainages. Examples include DW01 along Longmarsh Brook,DW58 which is associated with Roche Brook and DW74 located along College Brook. The Sediment/Shoreline Stabilization ("SSS") is related, and generally associated with wetlands that border larger streams, rivers and areas of open water. Twenty-seven percent (27%) of the wetlands were noted as either suitable or principal for this function.

Production Export (PE)

The ability for a wetland to produce food or useable products is considered when evaluating this function. Other functions are considered when rating this function: wildlife habitat and fish or shellfish habitat for the consideration of food; and sediment/shore stabilization for the consideration of export by stream. Thirty-eight percent (38%) of wetlands were suitable for production export within the study area, including 21 listed as principal. These were primarily attributed to dense patches for fruiting shrubs (primarily high-bush blueberry). The Little Bay wetland also contributes this function due to fish, shellfish and other benefits. Wetlands connected to streams are also important for production export.

Fish & Shellfish Production (FSH)

While not a common function, fish and shellfish production is an important function for several wetlands, including all of the estuarine wetlands and several rivers and streams known to support anadromous and/or rare species of fish. Several listed fish species are known to utilize the Oyster River, the Valentine Canal and the subtidal and intertidal portions of Little Bay. Diadromous fish (those that migrate between fresh and salt water in the course of their life cycles) also use these water bodies, and some rely on adjacent wetland vegetation for cover, food, spawning and nursery habitat. Additionally, the intertidal and subtidal area in Little Bay provide habitat for several commercially important shellfish species, including oysters, softshell clams and razorclams.

Wetland Values (REC, EDU, UH, VQ, & RTE)

In general, the majority of the identified wetlands within the study area were common for the region, slightly disturbed, not easily accessible, or the leased lands were generally posted against unauthorized access for hunting, hiking, and other forms of recreation. These factors contributed to the relatively low levels of function and values associated with visual quality and aesthetics, recreation, uniqueness and heritage and rare, threatened, and endangered species. Several wetlands within the corridor are located near the UNH campus; however, the extent of their use for educational purposes or research is low due to the ongoing routine maintenance, and access and safety considerations.

The exceptions are the Little Bay wetlands. Salt marsh and sparsely vegetated intertidal flats are considered Exemplary Natural Communities by the NHB.

Prime Wetlands

Newington and Portsmouth have designated specific wetlands as "prime" due in part to their large size, unspoiled character and ability to sustain populations of rare or threatened plant and animal species. Three of the Newington prime wetlands (designated as Prime Wetlands Q, K and F) intersect with the SRP study area in five different locations, and therefore correspond with five individually delineated wetlands (Map 2c). These locations include Wetland NW12 to the west of Nimble Hill Road (Prime Wetland Q, Knight's Brook); Wetlands NW34 and NW17 to the north of Fox Point Road (Prime Wetland K, Pickering Brook); and Wetlands NW1 and NW45 along the Spaulding Turnpike (Prime Wetland F)(West Environmental, 2005). Field surveys indicated that no sections of these wetlands within the project corridor contain rare species or communities.

3.3 Vernal Pools

Springtime surveys of all pools identified during resource mapping in the SRP corridor did not yield habitats that met the definition of a vernal pool (Env-Wt 101.106(a-b)) and also contained the requisite indicator species, and therefore no vernal pools are located within the project corridor. One pond in Newington associated with delineated wetland NW4 contained wood frogs in spring 2015, however observations in 2013, 2014 and 2015 suggest that the deeper portion of this pond is permanently flooded year-round. The permanent hydroperiod does not meet the definition of a vernal pool.

3.4 Estuarine Resources

3.4.1 Eelgrass

Eelgrass (*Zostera marina*) is the most widespread aquatic vegetation in the Great Bay Estuary. Eelgrass provides significant habitat values and functions both biologically and physically (Thayer et al. 1984; Jones 2000). In the Great Bay system, the plants create a three-dimensional structure on an otherwise flat substrate. This structure provides refuge, settlement surfaces, and feeding opportunities for numerous invertebrates and finfishes. Invertebrates, including lobsters, and finfishes, including winter flounder, have been documented as using eelgrass beds as breeding or nursery grounds. A vascular plant, eelgrass generally occurs subtidally in the Northeast. Eelgrass is a deciduous, perennial plant with an extensive root and rhizome system that remains year-round even when above-ground biomass has gone senescent and been shed. The underground structures help bind the sediments and retain nutrients and carbon. During the months when above-ground structures are abundant, these structures can attenuate current flow and wave action, enhancing sedimentation in the immediate vicinity. Plant growth is typically greatest from May through August (Nedeau 2004). Light penetration, or water clarity, is a critical factor in controlling the depth at which eelgrass can survive (Morrison et al. 2008) and can be affected by phytoplankton, suspended sediments, and colored dissolved organic matter. Based on the assumption that eelgrass needs 22% of surface incident light to survive (Koch 2001), Morrison et al. (2008) predicted that the survival depth of eelgrass in Little Bay would range from 1.068 to 1.679 meters (3.4 to 5.4 feet) below mean water level (“MWL”) and average 1.404 meters (4.5 feet) below MWL.

Eelgrass distribution in Little Bay has varied tremendously over decades. In 1980, eelgrass beds were found throughout Little Bay, covering the entire length of the shallow subtidal zones along both sides of the upper bay from Adams Point to Fox Point (Jones 2000). It was completely absent from Little Bay in 1991 (Jones 2000). PREP (2013) reported that it was essentially absent from Little Bay from 2007 through 2010. More recently, eelgrass was recorded in Welsh Cove and along the eastern shoreline from the point north of Welsh Cove nearly to Fox Point in 2011 and 2012 (Figure 3.4-1). Short (2013) noted that the bed along the eastern shore first appeared as seedlings that developed into patches of reproductive plants in 2010 and expanded into beds in 2011 through vegetative growth and seed production. When Barker (2014) mapped the distribution of eelgrass in the Great Bay system from aerial photography in August 2013 with field verification in September and October, he found, however, that eelgrass was absent from both Welsh Cove and the eastern side of Little Bay (Figure 3.4-1; 2014 survey results not available through GRANIT as of 12/09/15). Eelgrass was also absent from Welsh Cove and the eastern side of Little Bay in 2014 (P. Colarusso, USEPA, pers. com. 03/03/15).

Normandeau did not observe any attached eelgrass during the five video transect surveys conducted in early fall 2013 (Figure 3.4-2). In addition, because water clarity was good, the field crew was able to observe that eelgrass was absent to the shoreline in Welsh Cove in the vicinity of the proposed SRP corridor. Other incidental observations by Normandeau biologists during shellfish surveys in September 2014 did not find eelgrass on the western tidal flats within the cable corridor.

It is not expected that there will be an established eelgrass bed in the Project Area when cable installation takes place in 2017. As seen by the recent disappearance of the bed in Little Bay, eelgrass bed development from seed dispersal may not be successful. Various factors, such as burrowing invertebrates (e.g., lobsters or green crabs) or storm waves can uproot seedlings. Eelgrass beds can expand through vegetative growth of the rhizomes, but this is a slow process. Marbà and Duarte (1998) reported that horizontal growth of *Z. marina* rhizomes was about 26 cm/year (10 inches/year). The nearest established eelgrass bed is located within Great Bay proper more than 3,000 feet (914 meters) away from the Project Area.

3.4.2 Macroalgae

Mathieson and Penniman (1991, as cited in Jones 2000) reported 132 species of macroalgae occurring in Little Bay. Most macroalgae require hard substrate for attachment so their presence is restricted in Little Bay to nearshore areas where bedrock outcrops, cobble, or boulders are present. As detailed below, substrate in the Cable Area is predominantly unconsolidated fine granular sediment however small areas of rock outcrops occur along both shorelines. Dominant macroalgae observed during field surveys were rockweeds, predominantly *Fucus vesiculosus* with lesser amounts of *Ascophyllum nodosum*. As Short (2013) has pointed out, distribution and biomass of nuisance algae including *Gracilaria* sp. (graceful red weed) and *Ulva* sp. (sea lettuce) have increased in the Great Bay system. *Ulva* was observed during field surveys of the cable corridor. These species are considered to be threats to eelgrass habitat because they cover the substrate, essentially smothering the eelgrass shoots (Short 2013). Based on maps presented in Nettleton et al. (2011) and PREP (2012), Great Bay itself is the area of greatest concern in terms of nuisance algae, although no widespread surveys are available. In addition to *Ulva* and *Gracilaria*, smaller algal species often settle on eelgrass fronds and this biofouling has been regarded as contributing to the decline of eelgrass in the Great Bay system.

3.4.3 Shellfish

The Great Bay estuary system supports populations of several shellfish species of interest to harvesters, including oysters (*Crassostrea virginica* and *Ostrea edulis*), softshell clams, blue mussels (*Mytilus edulis*), razor clams, and sea scallops (*Placopecten magellanicus*) (Jones 2000). Blue mussels are generally limited by salinity to the lower estuary (Dover Point to Portsmouth Harbor) and sea scallops occur in the lower Piscataqua and Portsmouth Harbor. Historical distribution of major oyster and softshell clam beds is shown in Figure 3.4-3. Capone, et al. (2008) reported finding, however, high densities of oysters (up to $150/m^3$) associated with the fucoid alga *Ascophyllum nodosum* in the rocky intertidal at both Nannie Island and Woodman Point in the Great Bay estuary. Presumably, other rocky intertidal areas in the estuary support oysters as well. It is likely that small beds of oysters occur subtidally as well. Recreational harvesting of both of these species is allowed in specified areas in the estuary (Figure 3.4-4). The area designated as Cable Area on NOAA Chart 13285 and estimated in Figure 3.4-4 is permanently closed to harvest.

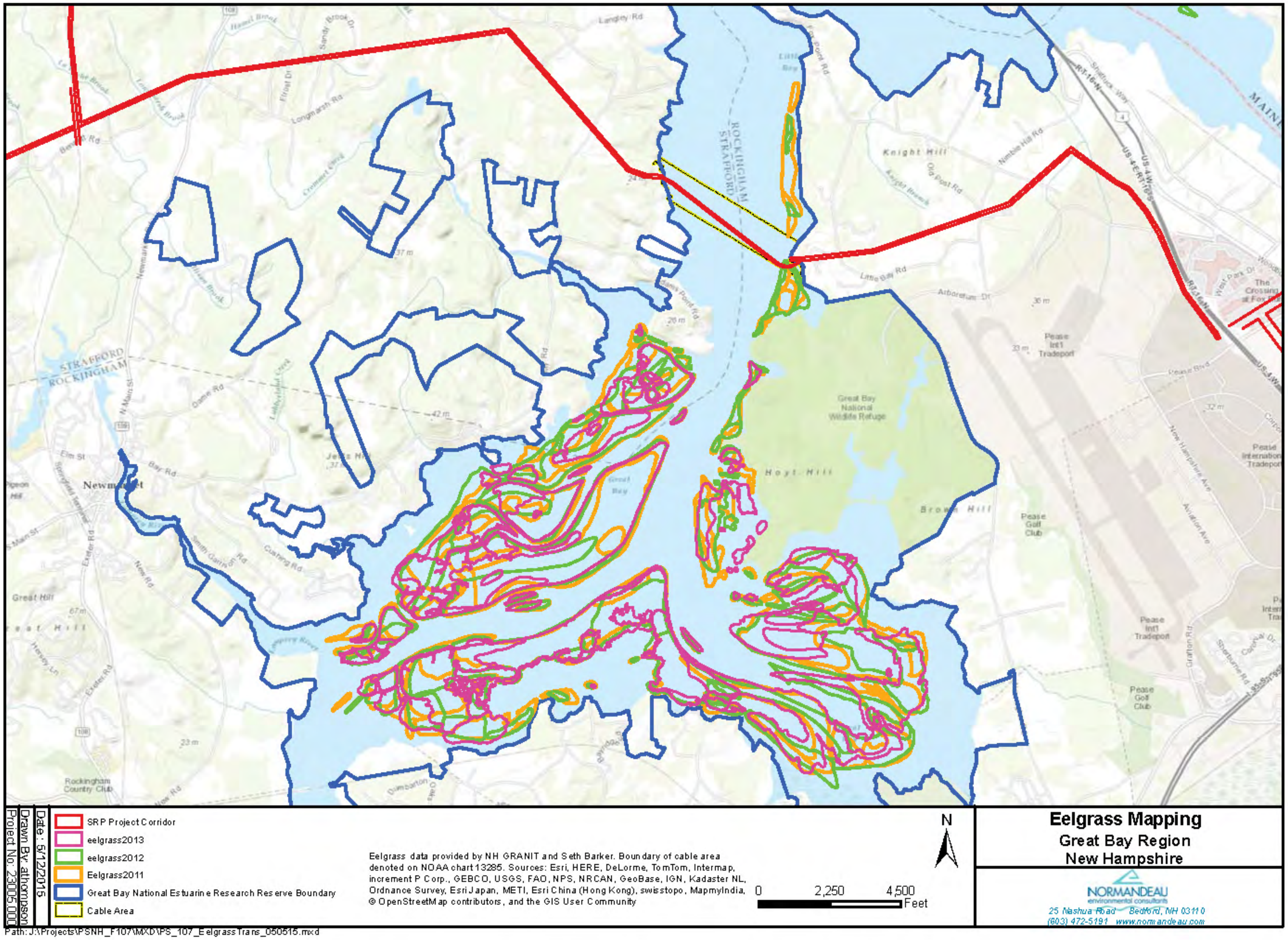

Figure 3.4-1. Historical Eelgrass Distribution.

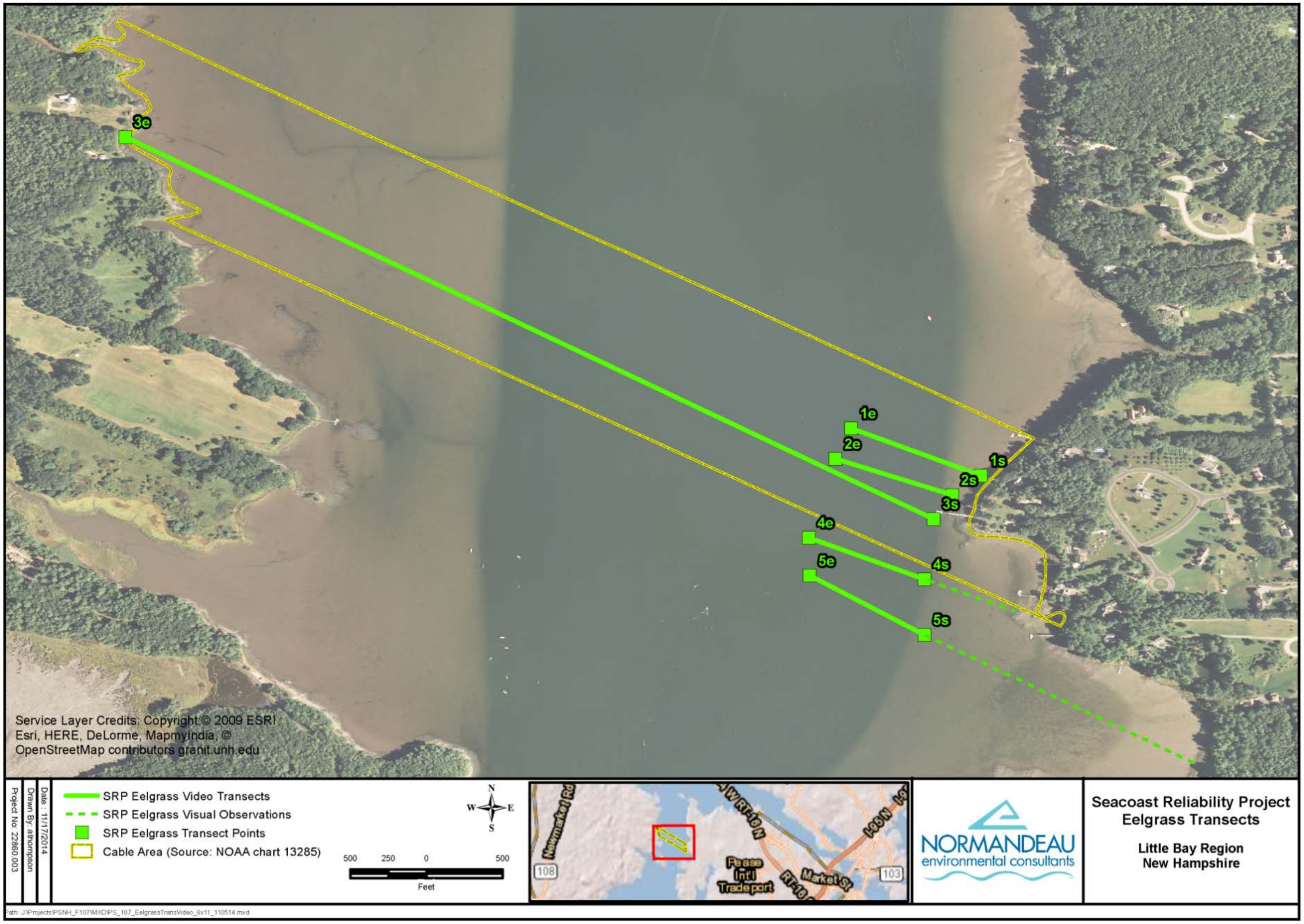

Figure 3.4-2. Normandeau Eelgrass Video Transects.

The status of oyster beds in the estuary has been of great concern to the Piscataqua Regional Estuary Project ("PREP") and other Great Bay environmental groups because this species is considered an indicator of environmental health. Oysters are long-lived, filter feeding organisms and therefore reflect cumulative exposure to environmental conditions. Major natural oyster beds have not been documented in Little Bay; the closest major beds to the Cable Area are at Adams Point (about 0.75 mile south of the Cable Area) and Nannie Island (off of Woodman Point; about 1.75 mile south of the Cable Area). Grizzle and Ward (2013) surveyed the known oyster beds in 2012 to estimate size and relative density. They determined that the bed at Adams Point in Furber Strait covered an area of 13.9 acres and classified it as a reef because more than 20 percent of the area contained shell cover and live oysters. The bed off Nannie Island was about 32.4 acres in 2012 and was also classified as a reef. The standing stock of oysters in the Great Bay estuary has been monitored since 1993 when there were more than 25 million oysters in the bays. PREP (2013) reported that in 2011, the standing stock was less than 10 percent of that total. Oyster populations at both Adams Point and Nannie Island experienced substantial declines. PREP (2013) attributed at least part of the decline observed starting in the mid-1990s to the oyster diseases MSX and Dermo and suggested that the large increase in Dermo in the last decade could be related to warming water temperatures. Konisky et al. (2014) indicated that siltation, resulting from increases in impervious surfaces within the watershed that have changed runoff patterns, may also be a factor in oyster decline (Great Bay Siltation Commission 2010).

There has been an active effort to restore oyster beds in Great and Little Bays and their tributaries with restoration sites located at the mouths of the Squamscott, Lamprey, and Oyster Rivers, in upper Great Bay, in the Bellamy River, and in the Piscataqua River (Konisky et al. 2014) (Figure 3.4-3). Restoration efforts include placement of clamshells on the substrate to serve as settlement sites to allow for natural settlement and rearing of oyster larvae for settlement in holding tanks prior to placement in the restoration sites. In 2014, oyster spat were reared at eight locations in upper Little Bay, including adjacent to the northern boundary of the charted Cable Area along the western shoreline; spat were retrieved from these sites in late September (McKeton et al. 2014). Monitoring has demonstrated that natural settlement at the restored oyster reefs is occurring and laboratory-reared spat are surviving in the field.

NHDES is also encouraging oyster aquaculture in the estuary. Grizzle and Ward (2012) evaluated the potential for shellfish aquaculture in the Great Bay system based on occurrence of red tide toxicity, water depth, harvest closures, eelgrass distribution, and mooring fields and concluded that conditions were most suitable in Little Bay (Figure 3.4-5), although there is no expectation that the entire suitable area would be utilized for aquaculture. Existing and recently proposed aquaculture operations as of December 2015 are shown on Figure 3.4-6. However, applications for new or expanded facilities are made frequently (C. Nash, NHDES Shellfish Coordinator; pers. comm. 07/17/15). The aquaculture lease that falls partially within the Cable Area may move to the north although bathymetric conditions could limit this.

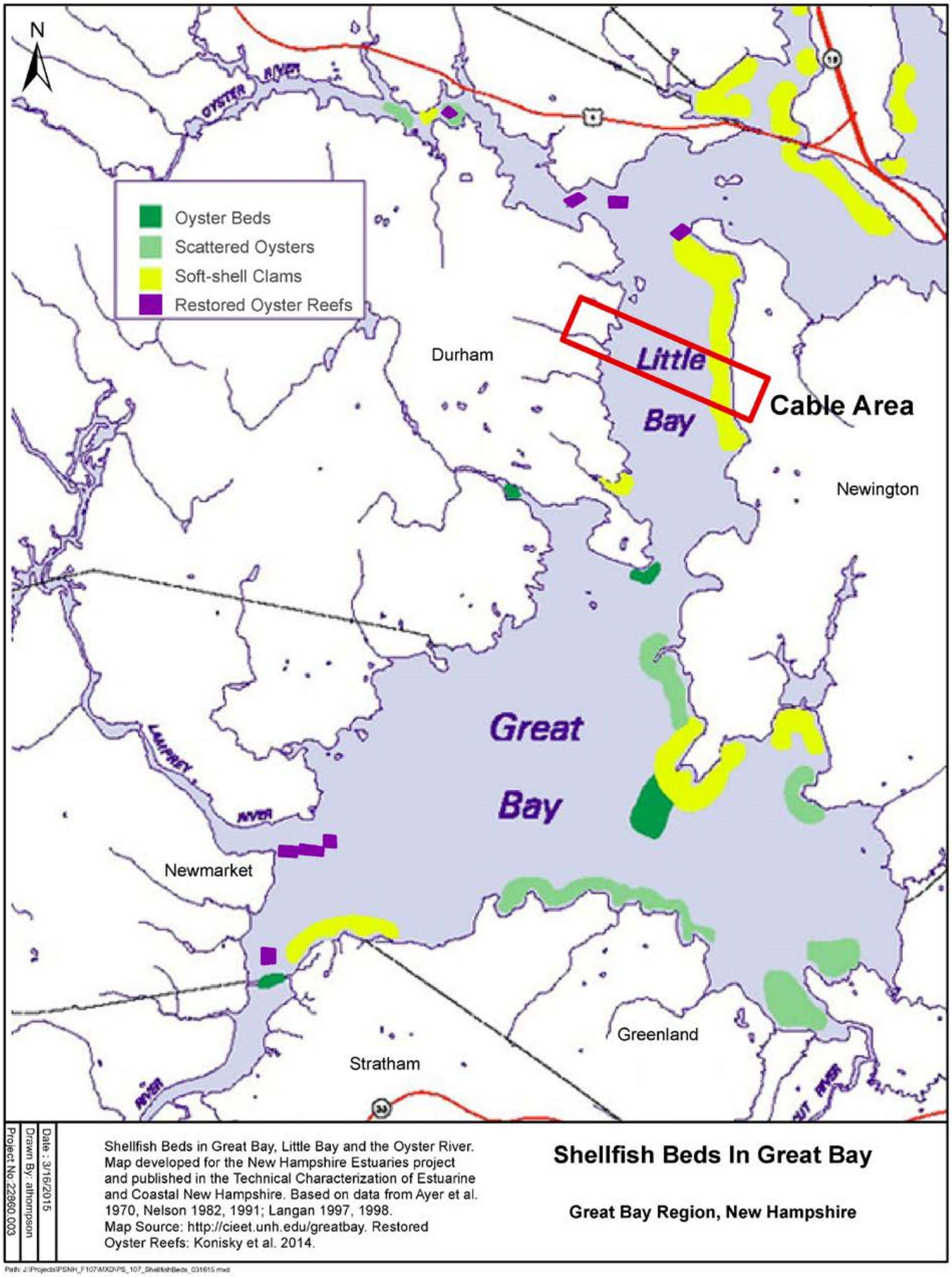

Figure 3.4-3. Historical Distribution of Shellfish.

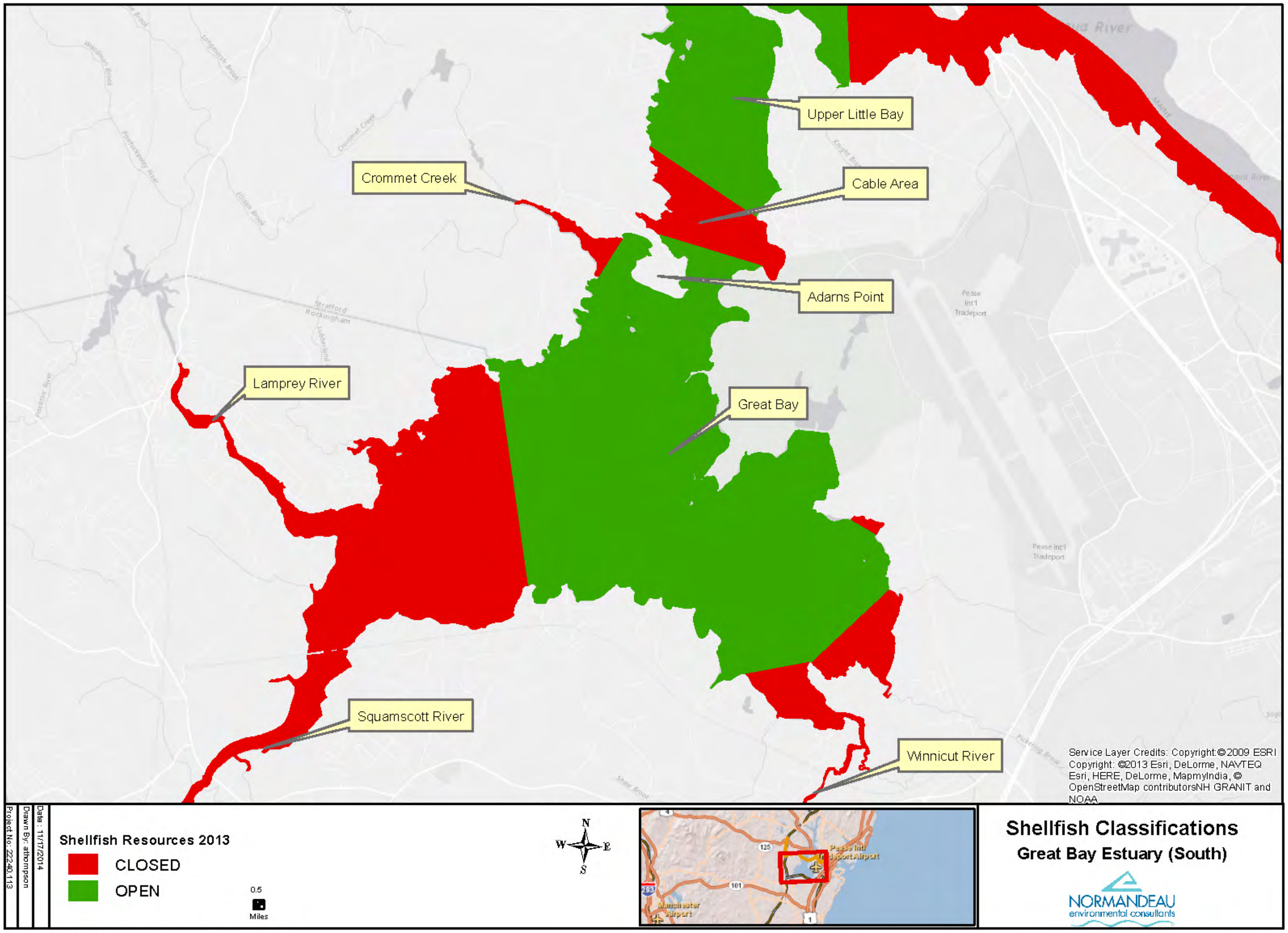

Figure 3.4-4. NHDES Classification of Great Bay Estuary Waters for Shellfish Harvesting.

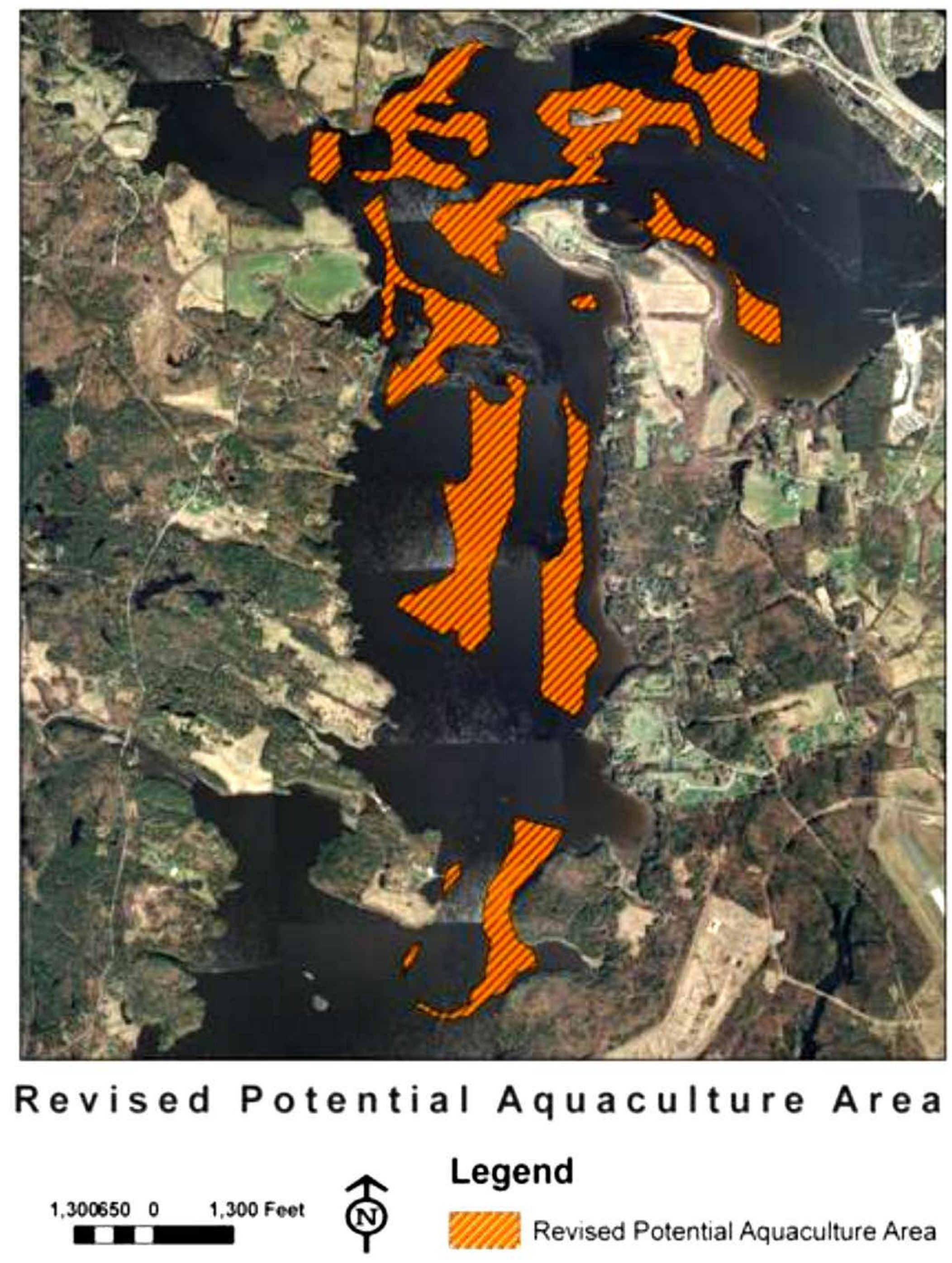

Figure 3.4-5. Areas Suitable for Aquaculture Identified by Grizzle and Ward (2012).

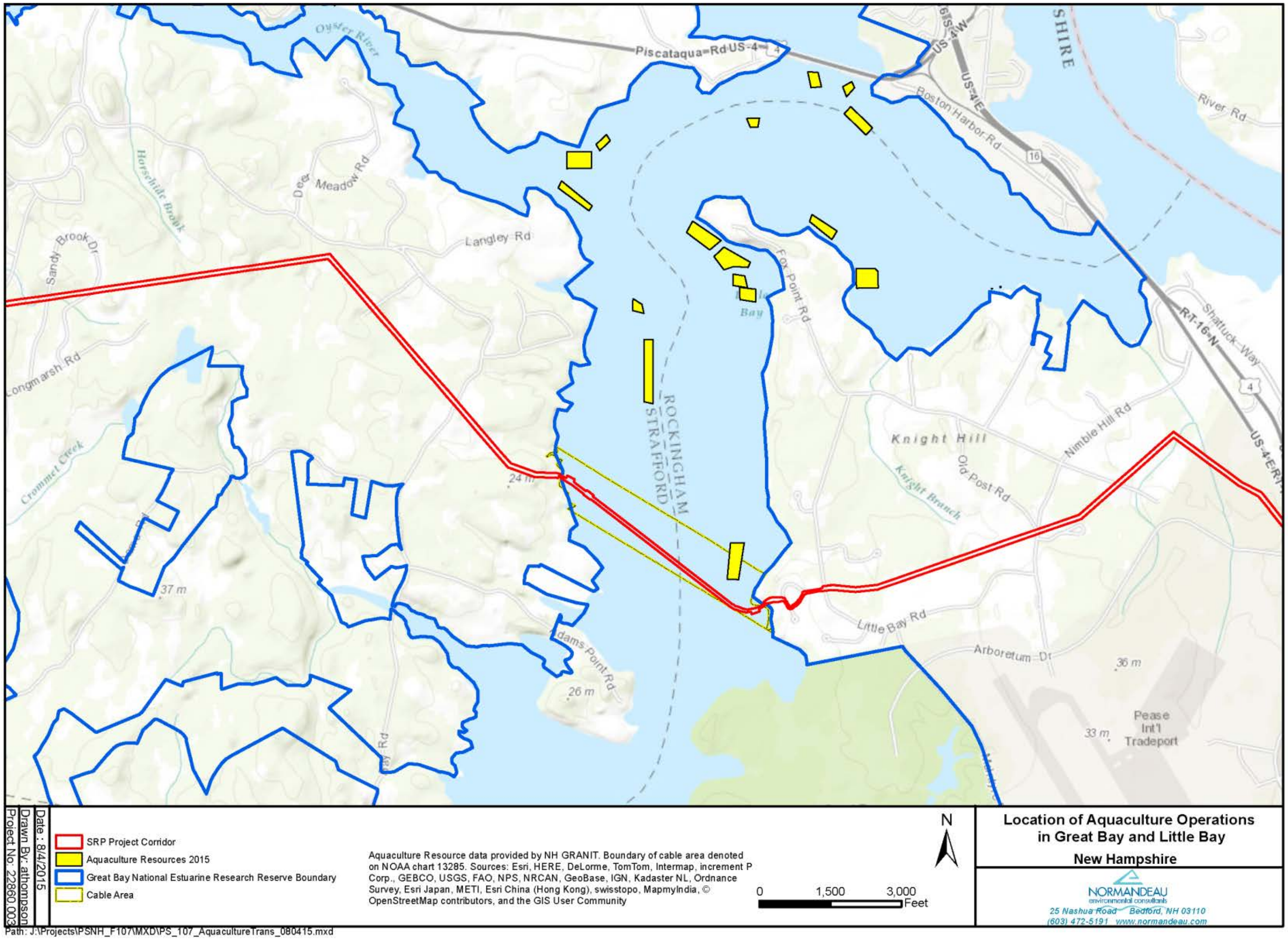

Figure 3.4-6. Location of Aquaculture Leases as provided by NHDES in 2015.

Historically, softshell clams were widespread in Great Bay and Little Bay (Figure 3.4-3). In New England, softshell clams are most abundant in the intertidal and shallow subtidal zone. Past records do not show softshell clam beds on the western side of Little Bay, although, it is possible that the historic records partially reflect accessibility. The substrate on the western tidal flat is very soft mud, unsuitable for access on foot. A conversation with Mr. Bruce Smith, NHFG, indicated that the department considers this area to provide suitable habitat for softshell clams, razor clams, and the non-harvested *Macoma balthica*.

Results of Normandeau's field surveys on the western flats are presented in Table 3.4-1 and Figure 3.4-7. Softshell clams (*Mya*) were observed at nine stations and live razor clams (*Ensis*) were identified at two. Razor clam shells were noted in several locations. No live *Macoma* were observed although shells were present. In addition to the bivalves observed, mud snails (*Ilyanassa trivitattus*) were numerous in many locations and were likely grazing on the benthic diatoms that were present. Hermit crabs were also common. Most sites had numerous invertebrate holes, most likely polychaetes (see Section 3.4.4 on benthic infauna). While this survey was not designed to quantify the bivalve population on the tidal flat, it clearly shows that these resources are present within the Cable Area.

3.4.4 Benthic Infauna

Benthic resources along the cable route will be affected by the installation process. In order to evaluate the ability of the infaunal resources to recover from this impact and to evaluate whether this impact would have consequences to other resources, such as species that rely on the benthos for feeding, it is important to characterize the benthos. USEPA's NCCA program includes sampling of benthic infauna in the Great Bay system (http://water.epa.gov/type/oceb/assessmonitor/ncca.cfm), but data available for Little Bay are limited (Figure 3.4-8) particularly in the immediate vicinity of the Project.

Benthic infaunal community structure is closely linked to substrate conditions and water depth. The Normandeau field crew characterized the sediment at the fifteen benthic infauna stations (Figure 3.4-9). Substrate texture differed among the three depth zones in the Project Area. All stations on the tidal flat consisted of a fine soft silt surface layer with some clay at the bottom of the grab. In the channel, sediments at the northern stations were fine sand with silt and shell hash and the three southern stations consisted of fine and medium sand. Along the channel slope, sediments were fine sand mixed with silt and shells or shell hash; the two northern stations also included some small gravel.

Infaunal abundance was generally highest at the stations on the western tidal flat, most variable in the channel, and most consistent along the channel slope (Table 3.4-2). The total number of unique taxa was most consistent on the tidal flat and most variable among the stations in the channel and along the channel slope (Table 3.4-2).

Table 3.4-1. Results of visual inspection of western tidal flat for shellfish and other benthic resources conducted on September 16, 2014 from mid-ebb to start of flood tide.

Station	Water Depth	Tide Stage	*Mya*	*Ensis*	Polychaetes	Mud snails	Hermit crabs	Substrate	Comments[b]	Between transects
1	24″	Ebb	1		holes	9	1	Diatom cover Soft silt (anoxic just below surface)		Areas with dense numbers of mud snails (*Ilyanassa*)
S2	n/a		2		holes		1	Diatom cover Soft silt (anoxic just below surface)	*Mya* shell Green crab depression	
S3	20″		4		holes		2	Diatom cover	Crab hole	
S4	18″		4		holes	2	3	Soft silt (anoxic just below surface)		
S5	16″		1		holes			Diatom cover	Crab burrow	
S6	24″		1		holes			Soft silt (anoxic just below surface)	*Macoma* shells	
S7	20″				holes			Diatom cover	Drift algae *Macoma* shells	Razor clam shells between stations
S8	20″					Too numerous to count	Present	Soft silt (anoxic just below surface)		
S9	20″	Low slack	2		holes	Present	2	Diatom cover	*Macoma* shells *Ascophyllum scarpoides*	
S10	20″			(1-shell)	holes	Too numerous to count		Soft silt (anoxic just below surface)	*Ulva*	
S11	18″				holes			Diatom cover	Unidentified bivalve holes (2) 3 small "grapes" (egg cases?) *Ulva*	
S12	18″			(2-shell)	holes	Present		Soft silt (anoxic just below surface)	Drift algae Razor clam shells	
S13	18″	Flood		4	holes		Present	Diatom cover		
S14	18″		1	3	holes		Present	Soft silt (anoxic just below surface)	Razor clam shells *Macoma* shells Drift algae (cover ~25%) *Ulva*	
S15	21″		2		holes		Present	Diatom cover	Drift algae Green crab burrow	
S16[c]	24″				holes			Soft silt (anoxic just below surface)	Snail trail Drift algae "grape"	Several horseshoe crabs

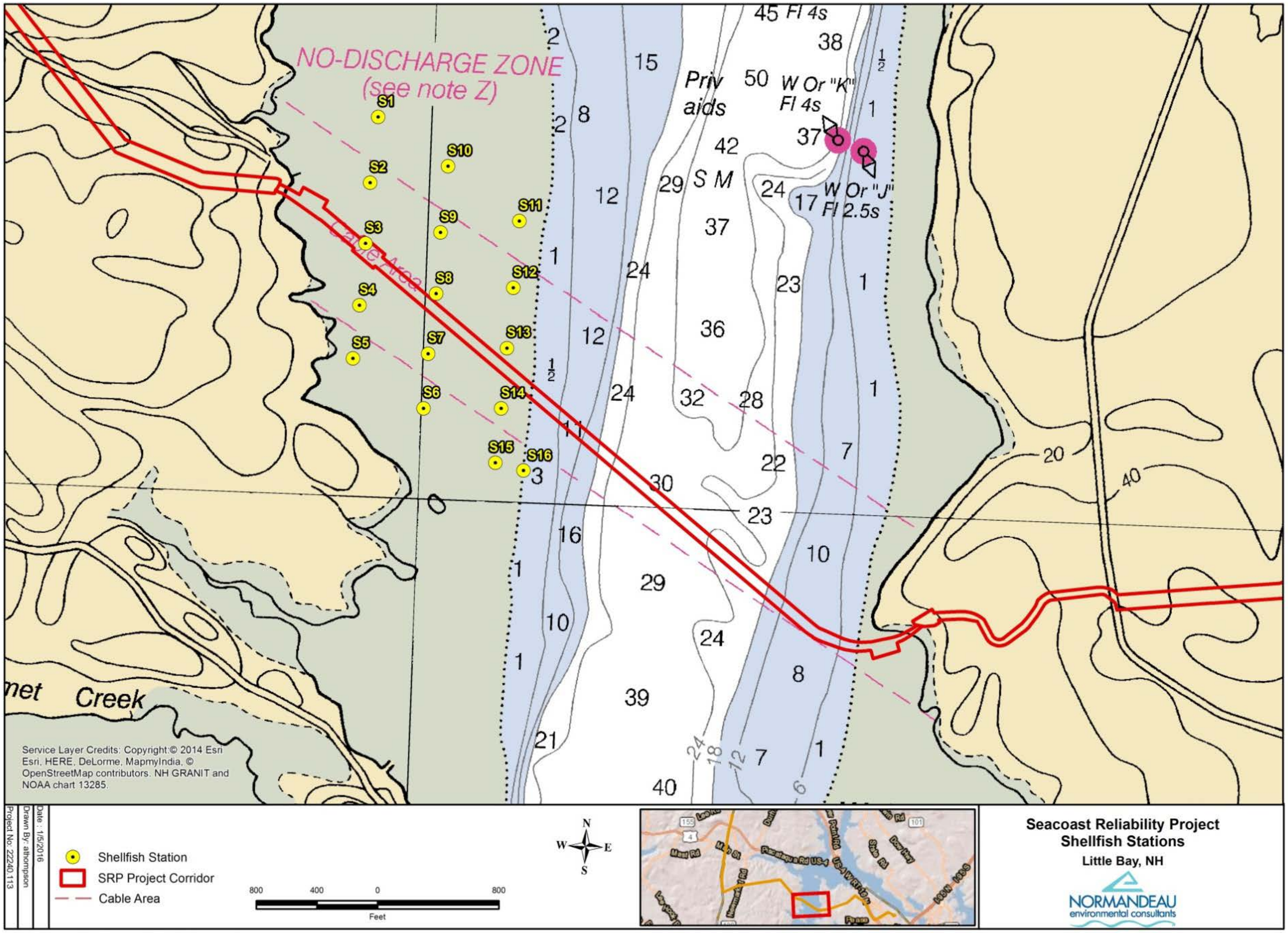

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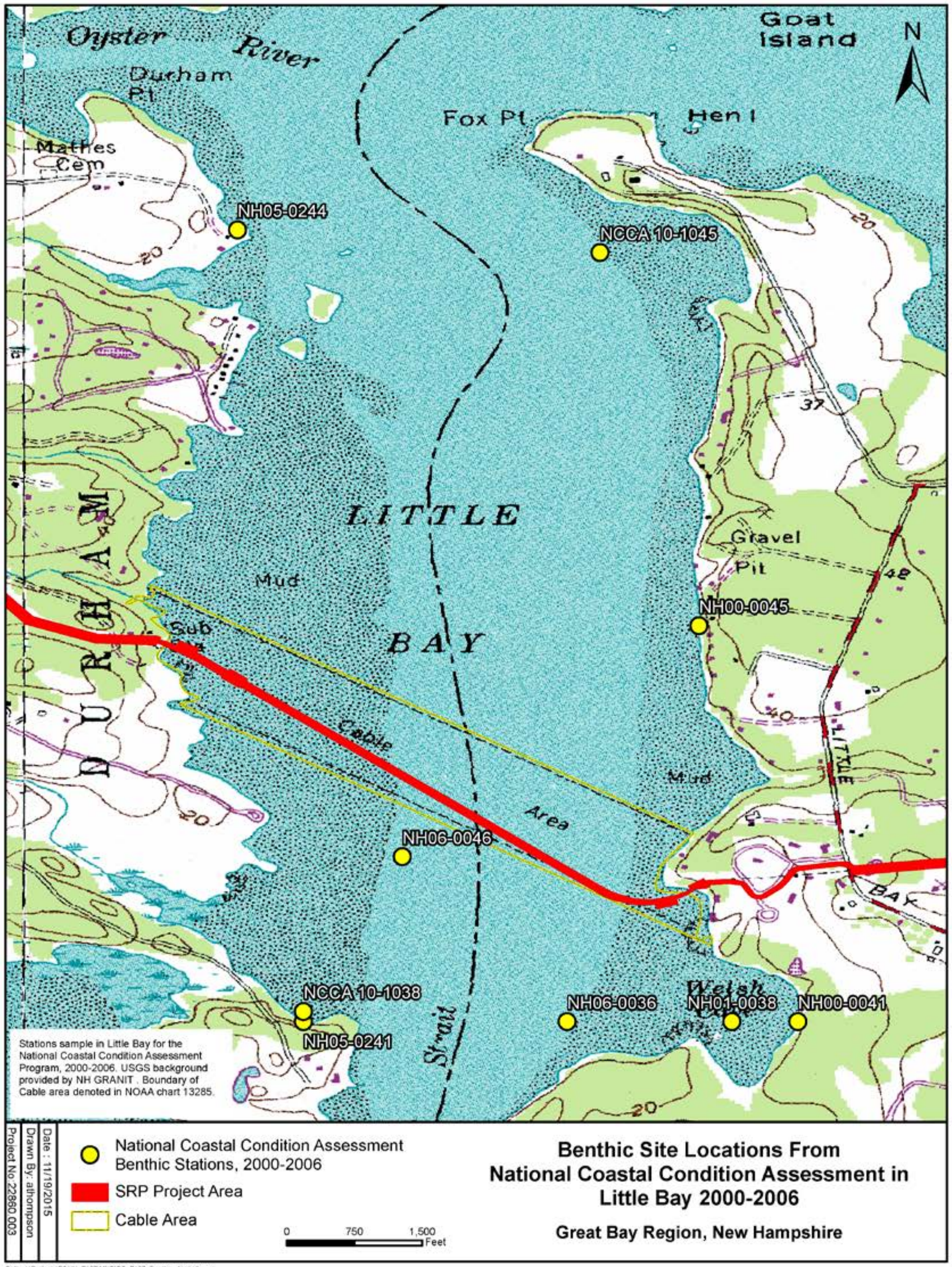
Figure 3.4-7. Normandeau Shellfish Survey Stations.



Source: http://www.epa.gov/emap/nca/html/data/index.html

Figure 3.4-8. National Coastal Condition Assessment Sampling Locations, 2000-2006.

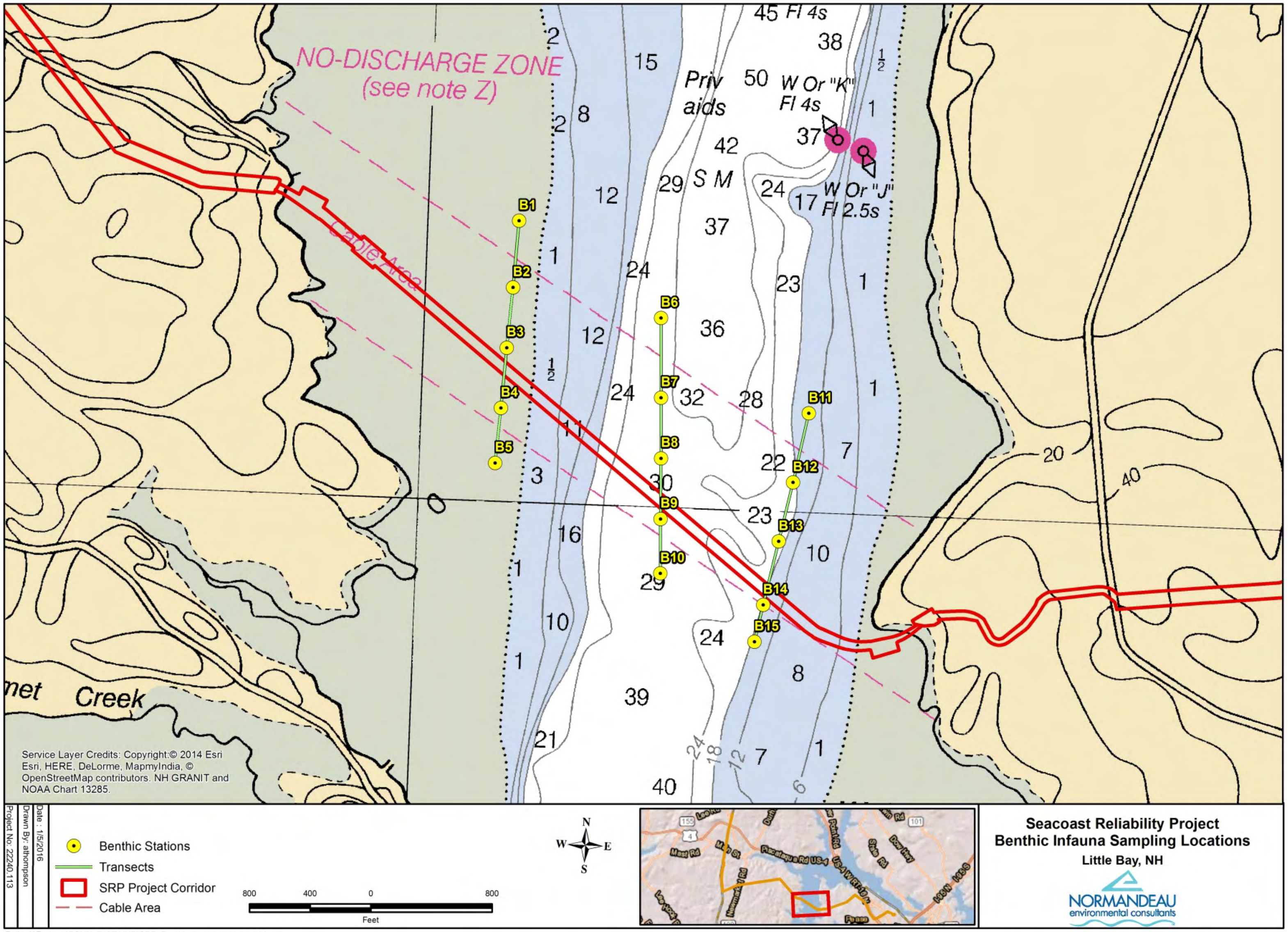


Figure 3.4-9. Normandeau Benthic Infauna Sampling Locations.

Table 3.4-2. Total abundance (no./0.04 m^2 grab), species richness (no./0.04 m^2 grab), diversity (H'), and evenness (J') of benthic infauna at stations along the cable route in Little Bay, August 2014.

Parameter	Range (mean) values		
	Tidal flat	Channel	Channel slope
Abundance (no./grab)	1,961 – 3,883 (2,733)	548 – 2,521 (1,470)	1,039 – 1,397 (1,204)
No. of unique taxa (no./grab)	26 - 31 (28.2)	22 - 35 (25.8)	22 - 33 (27.8)
Shannon-Weiner Diversity (H')	1.43 - 1.79 (1.564)	1.59 - 2.12 (1.812)	1.66 - 1.63 (1.796)
Pielou's Evenness (J')	0.44 – 0.56 (0.476)	0.47 – 0.69 (0.574)	050 – 0.60 (0.556)

Table 3.4-3. Mean abundance (no./0.04 m^2 grab) and rank of dominant taxa ($\geq$ 1% of mean total abundance within area) along the cable route in Little Bay.

Taxon	Mean Abundance (Rank)		
	Tidal Flat	Channel	Channel Slope
Nematoda	246.4 (3)	78.8 (5)	74.2 (5)
Hypereteone heteropoda	68.4 (6)	*	*
Scoletoma tenuis	1457 (1)	*	
Aricidea (Acmira) catherinae	*	375.4 (2)	226.4 (3)
Polydora cornuta	83.4 (4)		*
Spio filicornis		*	11.6 (9)
Pygospio elegans	*	14 (9)	*
Streblospio benedicti	541.4 (2)	56 (7)	24.6 (7)
Scolelepis (Parascolelepis) texana	58.6 (8)	159 (3)	389.8 (1)
Cirratulidae	*	76.8 (6)	61.4 (6)
Tharyx acutus	60.8 (7)	417.8 (1)	249 (2)
Capitella capitata	*	40.2 (8)	11.8 (8)
Oligochaeta	*	106.4 (4)	105 (4)
Haminoea solitaria	80.8 (5)		

*present in area, but not among the dominant taxa

Within each of the three depth zones, eight or nine taxa individually made up more that 1% of the total abundance (Table 3.4-3). Combined, these taxa made up more than 90% of the total abundance in each zone. Although four taxa were among the dominants in each depth zone (nematodes, and three polychaetes: *Streblospio benedicti*, *Scolelepis texana*, and *Tharyx acutus*), the composition of the dominants was clearly different on the tidal flat than in the channel or the slope. These differences in species compositions likely reflected a combination of depth zone and substrate texture differences. Muddy sediments tend to support different benthic infaunal species than do sandier sediments. Two species, the lumbrinerid polychaete *Scoletoma tenuis* and the spionid polychaete *Streblospio benedicti*, accounted for more than 70% of the mean total abundance on the tidal flat. *Scoletoma i*s an actively burrowing species that reworks the sediment and is indicative of a moderately stable community. *Streblospio*, on the other hand, is often considered an opportunistic species that is capable of rapid population of disturbed sediments. Most of the other dominant polychaetes (*Polydora*, *Scolelepis*, and *Tharyx*) are also surface deposit feeders (Fauchald and Jumars 1979). Nematodes move about in the sediment and feed primarily on microorganisms and sediment particles. The gastropod snail *Haminoea solitaria* is among the dominants only on the tidal flat. This species lives and feeds on the sediment surface, consuming sediment particles and benthic diatoms (Chester 1993). The dominance by surface oriented infauna suggests that the sediments are frequently disturbed, perhaps by wave action during storms or icing in the cold months, although the species richness indicates good quality habitat.

Dominant taxa were virtually identical in the channel and on the channel slope although rank order differed. As on the tidal flat, polychaetes were the most important taxa numerically. The same three species (*Aricidea* (*Acmira*) *catherinae*, *Scolelepis* (*Parascolelepis*) *texana*, and *Tharyx acutus*) together contributed 65-70% of the total abundance at these depths indicating that sediment texture had a larger role in structuring the benthic community than depth. Each of these three species are considered to be surface deposit feeders but exhibit different levels of mobility, with *Aricidea* the most mobile and *Tharyx* sessile (Fauchald and Jumars 1979). A variety of behaviors provides some resiliency, but the predominance by surface-oriented species suggests some instability in the habitat, such as mobile sediments (to which *Scolelepis* is adapted; Fauchald and Jumars 1979).

Although polychaetes dominate both in terms of abundance and in terms of species richness, both arthropods and mollusks were well represented in each depth zone (Table 3.4-4).

Table 3.4-4. Number of unique species (no. across all samples) and mean total abundance (no./0.04 m^2 grab) of arthropods, mollusks, and polychaetes along the cable route in Little Bay

Taxonomic Group	Tidal Flat	Channel	Channel Slope
Arthropoda No. species	8	10	12
Mean abundance	41.2	82	21.2
Mollusca No. species	10	3	6
Mean abundance	97	11.6	5.6
Polychaeta No. species	15	23	21
Mean abundance	2307	1187.8	995.2

Species richness of arthropods was highest on the channel slope but abundances of these species were lowest in this area. Species richness and abundance of mollusks were highest on the tidal flat. Polychaete species richness was highest in the channel and lowest on the tidal flat but abundance was nearly double on the tidal flat compared to other areas. Results of the project-specific survey compare well to data collected between 2000 and 2006 for the NCCA program. Of the seven stations sampled during that time frame, total abundances (no./0.04 m^2 grab) ranged from 40 to 785 individuals and species richness (no. per grab) ranged from 5 to 22 unique taxa. Most taxa that were numerical dominants in the NCCA samples were also dominants in the Project Area. Jones (2000) reported that species richness and dominant species (including *Streblospio*, *Heteromastus*, *Scoloplos*, *Pygospio*, *Aricidea*, and oligochaetes, many of the dominants in the project area) in the Great Bay Estuary were similar over a twenty-year period (1972-1995) indicating that the benthic infaunal community in the estuary has been relatively stable in composition in the last three decades.

Recent alignment changes in the Little Bay crossing result in a short segment passing through the northern portion of Welsh Cove where no samples were collected during the benthic survey. However, several stations sampled during previous NCCA surveys were located in Welsh Cove (Figure 3.4-8). Total abundances and number of taxa of benthic infauna were lower in Welsh Cove than on the western tidal flat, but dominant taxa were similar which reinforces the concept that the estuary has supported a relatively stable macrofauna community for an extended period.

The National Estuary Program rated benthic conditions in Little Bay as good based on the fact that Shannon-Weiner diversity at all of the stations within the bay itself (excluding tributaries) exceeded 0.63 (USEPA 2007). The site-specific sampling confirmed this condition in the Project Area in 2014 (Table 3.4-2). Hale and Heltshe (2008), considered Shannon-Weiner diversity and predominance of capitellid polychaetes as two of the important factors indicating benthic habitat quality in the nearshore Gulf of Maine. The relatively low abundance of capitellids in the Project Area is an indication of good sediment quality (absence of organic pollution). Compared to Hale and Heltshe index values for diversity, the habitat value is most stressed on the western tidal flat and most consistently diverse on the channel slope.

Epibenthos

Epibenthic organisms that live and feed on the substrate surface known to, or are likely to, occur in the Great Bay Estuary include American lobster (*Homarus americanus*), rock crabs (*Cancer irroratus*), green crabs (*Carcinus maenas*), mud crabs (Xanthidae) and horseshoe crabs (*Limulus polyphemus*) (Jones 2000). These species move around on and burrow into the substrate seeking food or refuge. Bioturbation caused by these activities can have a substantial effect on the infaunal biota and on eelgrass beds. Lobsters are present throughout the bays and are fished both commercially and recreationally, although no landings or distribution data are available specifically for the estuary. Banner and Hayes (1996) reviewed environmental conditions (preferred substrate availability, salinity, temperature, and depth) in the estuary and concluded that the deeper portions of Little Bay provided good habitat for adult lobsters, but not juveniles. Watson et al. (1999) found that males were more common than females in the bay and that berried females tended to move into coastal waters to release larvae. Lobsters are generally active nocturnally, residing in burrows or crevices when they are not feeding. Although omnivorous, they feed primarily on large invertebrates (Jones 2000). Lobsters move in and out of the estuary seasonally in response to variations in salinity and temperature, with their greatest presence during late spring through fall (Watson et al. 1999; Jones 2000).

Rock crabs have been reported from the Great Bay system and may occur in deeper portions of the proposed cable crossing as this species prefers sandy substrate (Jeffries 1966). Rock crabs are fished commercially and recreationally to some degree. NHFG has found green crabs, an invasive species, to be the most abundant invertebrate species collected in New Hampshire's estuaries (NHFG 2014c). Green crabs have been shown to consume juvenile softshell clams, contributing to the failed recruitment to harvestable sizes and to uproot eelgrass plants, particularly in restoration areas. Abundances of rock and green crabs in Great Bay is not readily available; results of the NHFG surveys are reported as total catch from Great Bay, Little Bay, Piscataqua River, Little Harbor and Hampton/Seabrook Estuary combined (NHFG 2014c). Jones (2000) reported that green crabs were more abundant in the Piscataqua River and Little Bay than in Great Bay, however, and that both rock crabs and mud crabs are abundant in Great Bay.

Horseshoe crabs are ecologically important because their eggs, laid intertidally, provide a rich food source for migrating shorebirds. In addition, the crabs forage in muddy substrates for food and by doing so, bioengineer the substrate. Lee (2010) reported that mudflats in the Great Bay Estuary are important feeding habitats for both adult and juvenile horseshoe crabs. Horseshoe crabs are most noticeable in the estuary in the late spring and early summer when they undergo their spawning movements onto intertidal beaches (Mills 2010). According to Atlantic States Fisheries Management Commission ("ASFMC" 1998), preferred spawning habitat is sandy beaches in protected bays and coves, although spawning has been observed on substrates such as mud or peat. The tidal flats within the Project location could, therefore, provide spawning habitat. After investigating 15 locations in the estuary, ASFMC (undated) identified five (Wagon Hill Farm, Adams Point, Chapman's landing, Sandy Point, and Emery Point) as potential horseshoe crab spawning and nursery habitat. Over five years (2001-2006), researchers observed nesting and eggs in all but 2001 at these locations. CPUE was highest at beaches farther up Great Bay than at Adams Point. According to Cheng (2014) juveniles are most apt to reside in the upper regions of Great Bay, with none being observed in Little Bay.

3.4.5 Bathymetry and Substrate

The SRP crosses Little Bay north of Adams Point and Furber Strait, a span of approximately 5,470 feet. A broad tidal flat with depths ranging from about +1 to -1 foot MLLW extends from the western shoreline approximately 1800 feet. Moving eastward, water depths increase gradually (over a distance of about 800 feet) to ~30 feet below MLLW. Water depth remains deep for about 400 feet, gradually decreasing to about 17 feet below MLLW and then more abruptly to 0 feet MLLW. The tidal flat on the eastern shoreline is about 100 feet wide. Bathymetric conditions in Little Bay are shown in Figure 3.4-10.

Information on sediment texture in the Project vicinity is available from three sources – a vibracore survey conducted along the proposed cable alignment in April 2014 with the purpose of obtaining sediments for testing their thermal conductance properties (Figure 3.4-11), a survey conducted by Professor Thomas Lippmann (University of New Hampshire, personal communication, 2014) on a transect south of the cable route (Figure 3.4-12), and a diver survey along the route to determine the locations of existing cables. As the cable will be routed only through the northernmost portion of Welsh Cove, samples collected in the cove during the vibracore and Lippmann surveys are not relevant to this characterization. Sediment characteristics observed during the vibracore survey are shown in Table 3.4-5 and from Dr. Lippmann's survey are shown in Table 3.4-6. These two surveys were consistent in showing that sediments on the western tidal flat were predominantly silt-clay and in the channel and eastern channel slope were predominantly sand. Sediments were generally consistent within depth zones: the western tidal flat was predominantly silt with some clay and detritus; the channel (water depth about 30 feet below MLLW) was predominantly fine to medium sand with shell hash; the eastern channel slope (water depth about -20 feet below MLLW) was predominantly fine sand with silt and some shells. Neither survey collected samples in the northernmost section of Welsh Cove, however vibracore station LB-

11 and Lippmann stations 1-4 are likely to be fairly representative of conditions across the eastern tidal flat along the crossing. These results indicate that sediments farthest offshore are sandier and sediments closer to shore are siltier. During the in-water survey investigating old cables, Caldwell divers described the substrate at water depths of 10.6 to 32 feet as compact gravel, covered with 0-24 inches of fine sands and soft mud (Caldwell 2014). For depths <10 feet within the cable corridor, the substrate assumed to be fine sand and soft mud.

USEPA's NCCA has conducted surficial sediment quality sampling in Little Bay. The most recent publically available data were collected in 2000-2010. Stations sampled in Little Bay for this program are shown on Figure 3.4-8.

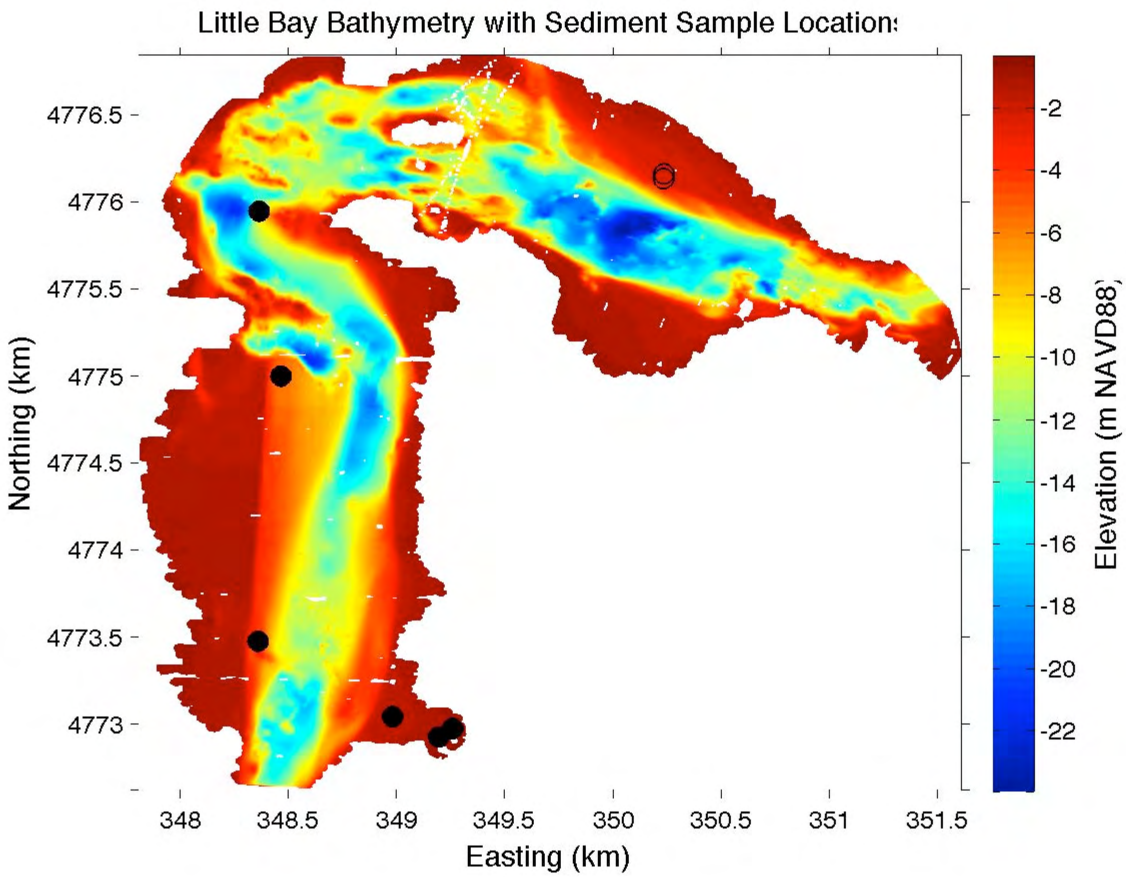
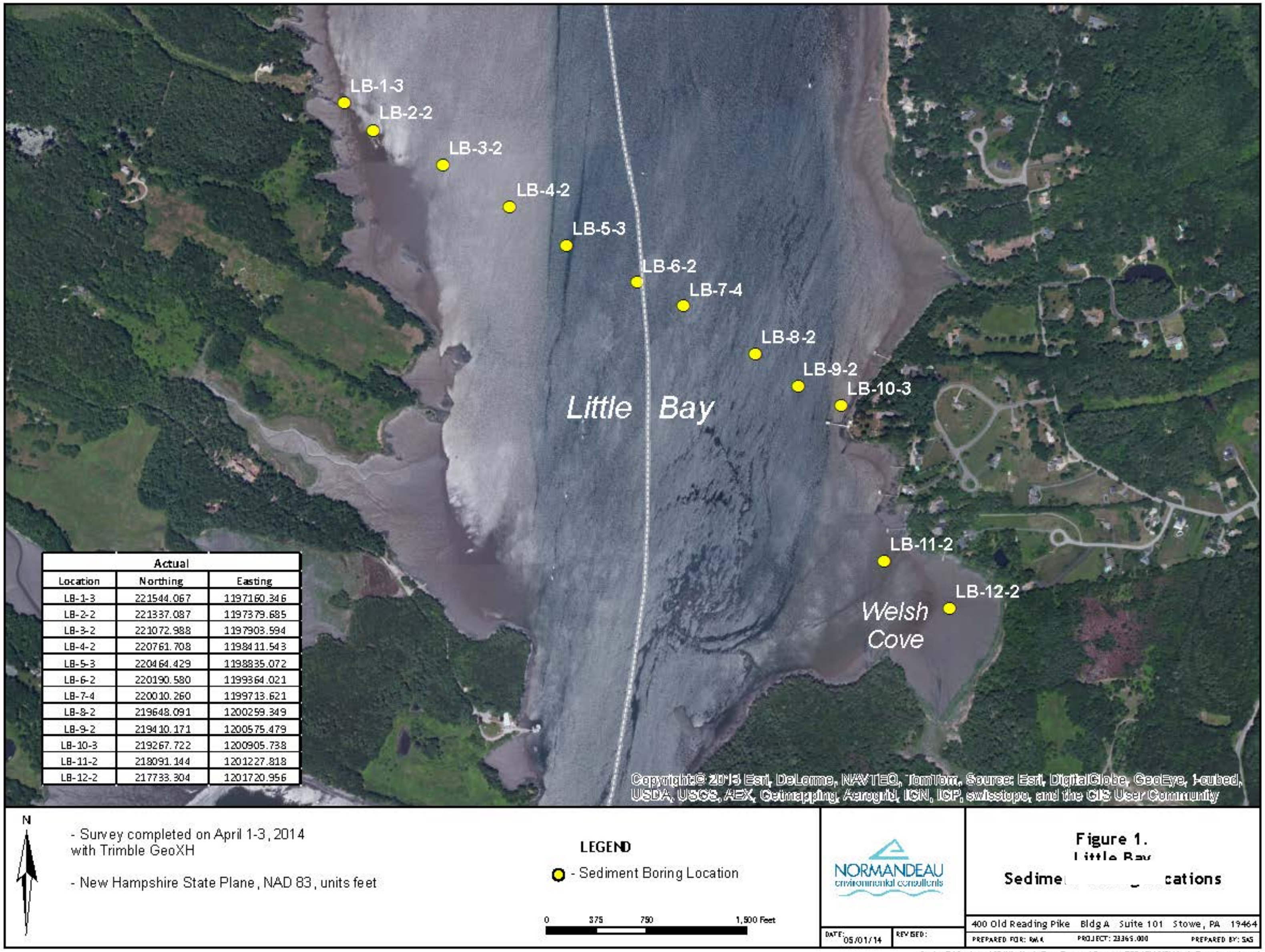


Figure 3.4-10. Bathymetric Map of Little Bay (Lippman 2013).

Values for total organic carbon ("TOC") at these stations ranged from 0.55 to 2.35 percent, averaging 1.4 percent, a relatively low value. Chemistry data are shown in Table 3.4-7. Sediment toxicity testing in 2000-2006 revealed no significant mortality among test benthic organisms. Based on the 2000-2006 data, USEPA (2007) characterized sediment quality in Little Bay as good. Trowbridge (2009) noted that although sediment contaminant levels in tributaries to the Great Bay/Little Bay system often exceeded NOAA screening levels, the concentrations within the bays themselves did not, which is consistent with low TOC values. It is unlikely that this has changed since the last assessment. Sediment contamination was not even considered as a factor affecting the estuary in the 2013 State of the Estuary report (PREP 2012, 2013). Data from 2010 (Table 3.4-7) suggest that sediment contaminant levels have shown little change since the previous assessment.

Table 3.4-5. Qualitative description of sediments along cable route from vibracore collections, April 2014.

Zone	Station	Penetration Depth	Sediment Description
Tidal Flat (west)	LB-1-A	94″	Cohesive Clay with silt
	LB-2-B	104″	
	LB-3-B	104″	
	LB-4-A	120″	Cohesive Clay with silt and trace of fine sands
	LB-5-B	86″	
Channel	LB-6-A	44″	Cohesive Fine to medium sand with small amount of clay and silt
	LB-7-B	63″	0-19″: Cohesive Fine to medium sand with small amount of clay and silt
			19-63″: cohesive Clay with silt
	LB-8-B	29″	0-15″: cohesive Fine to medium sand with small amount of clay and silt
			15-22″: cohesive Fine sand and clay, shell fragments present
			22-29″: cohesive Clay
Slope	LB-9-A	97″	0-22″: cohesive Fine to medium sand with small amount of clay and silt
			22-97″: cohesive Clay with silt, minor shell fragments throughout
Tidal Flat (east)	LB-10-D	44″	Cohesive Fine to medium sand with small amounts of clay
Welsh Cove	LB-11-B	103″	Cohesive Clay and fine sand with silt
	LB-12-B	46″	0-18″: cohesive Clay and fine sand with silt
			Cohesive Fine to medium sand with little clay and silt; minor amount of wood debris and shell fragments



Actual		
Location	Northing	Easting
LB-1-3	221544.067	1197160.346
LB-2-2	221337.087	1197379.685
LB-3-2	221072.988	1197903.594
LB-4-2	220761.708	1198411.543
LB-5-3	220464.429	1198835.072
LB-6-2	220190.580	1199364.021
LB-7-4	220010.260	1199713.621
LB-8-2	219648.091	1200259.349
LB-9-2	219410.171	1200575.479
LB-10-3	219267.722	1200905.738
LB-11-2	218091.144	1201227.818
LB-12-2	217733.304	1201720.956

Figure 3.4-11. Normandeau Vibracore Sediment Boring Locations.

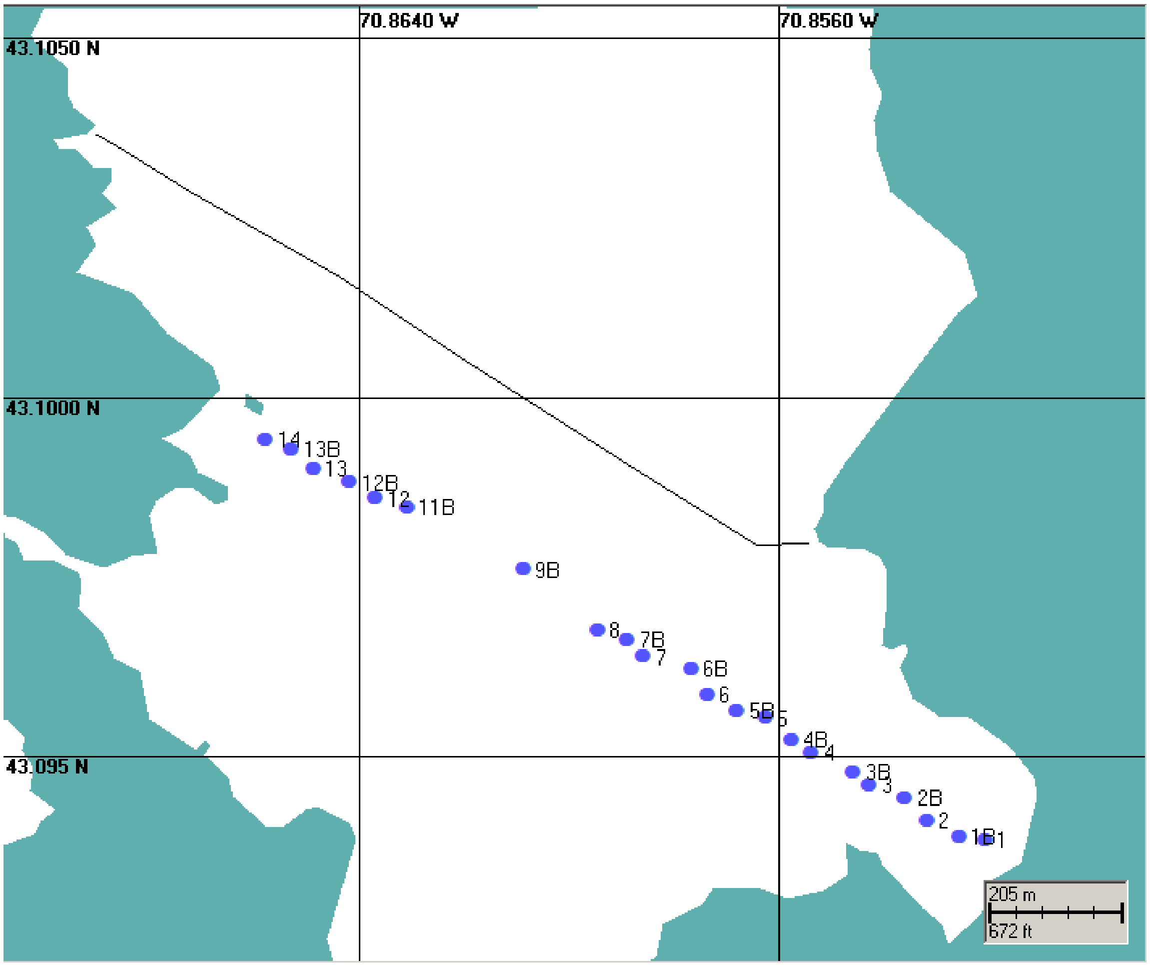


Figure 3.4-12. UNH Sediment Samples (Lippman, unpublished data, 2014).

Table 3.4-6. Grain size distributions (in percent) for Lippmann sampling stations. (refer to Figure 3.4-12 for sampling locations)

Station	14	13B	13	12B	12	11B	9B	8	7B	7	6B	6	5	4	3	2	1
Clay	10.71	9.20	6.97	4.41	7.03	1.34	2.78	0.00	0.00	0.00	1.18	2.14	3.08	6.58	4.22	5.53	5.31
F Silt	20.68	18.31	15.14	8.53	12.87	2.91	4.76	0.00	0.00	0.00	1.99	3.93	5.71	12.76	8.67	11.62	11.13
C Silt	40.42	32.02	35.52	19.38	23.84	6.02	5.74	0.00	2.13	0.00	3.71	6.95	9.85	28.02	24.75	40.89	36.62
F Sand	26.65	37.69	40.28	60.37	50.84	84.57	49.43	16.67	48.34	69.43	87.46	83.05	68.06	51.23	57.03	40.45	43.78
C Sand	1.54	2.79	2.10	7.31	5.41	5.17	37.29	83.33	49.53	30.57	5.66	3.92	13.30	1.41	5.34	1.52	3.15

Source: Lippmann 2014, pers. comm.

Table 3.4-7. Chemistry of surficial sediments at Stations in Little Bay sampled as part of the National Coastal Condition Assessment, 2000-2006.

Analyte (units)	NH00-045 2000	NH00-045 2000	NH01-0038 2001	NH06-0036 2006	NH06-0046 2006	NH10-1038 2010	NH10-1045 2010
Silver (ug/g)	0.4	0.1	0.5	0.736	0.743	1.6	1.1
Aluminum (ug/g)	54800	38100	59300	56100	48200	34310	18400
Arsenic (ug/g)	9	2	8	7.55	4.46	10.8	4.8
Cadmium (ug/g)	0.31	0.12	0.2	0.325	0.211	1.5	0.8
Chromium (ug/g)	73	21	81	65.3	33.6	95	34.6
Copper (ug/g)	14	4	16	11.9	5.75	16.8	5.6
Iron (ug/g)	24400	9780	24100	20800	13800	23410	10610
Mercury (ug/g)	0.14	0.04	0.14	0.149	0.056	0.2	0.06
Manganese (ug/g)	426	436	401	399	521	400.3	439.8
Nickel (ug/g)	15	6	17	14.6	9.16	18.9	8.1
Lead (ug/g)	38.8	22.2	36.5	36.1	24.4	43.4	24
Antimony (ug/g)	0.3	0.1	0.3	0.292	0.188	0.4	0.2
Selenium (ug/g)	0.28	0.06	0.23	0.371	0.29	0	0
Tin (ug/g)	5.8	2	5.9	5.85	2.91	9.4	4.1
Zinc (ug/g)	79	28	80	63.8	35.6	82.5	32.9
High Molecular Wgt PAHs (ng/g)	829	191.1	685	659.7	265.6	385.6	1029.7
Low Molecular Wgt PAHs (ng/g)	124.7	27.16	64.04	58.9	23.4	128.2	270
Total PAHs (ng/g)	994.7	229.26	786.04	801.2	323.1	585.2	1479.4
Total PCBs (ng/g)	3.999	0.841	7.52	0	0	0	0
Aldrin (ng/g)	<0.4	<0.27	<0.37	<1	<1	0	0
Alpha-Chlordane (ng/g)	<0.37	<0.25	0.045	<1	<1	0	0
Total DDTs (ng/g)	1.474	0.256	1.99	0	0	0	0
Dieldrin (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Endosulfan I (ng/g)	<0.62	<0.42	<0.58	<1	<1	0	0
Endosulfan II (ng/g)	0.12	<0.42	<0.58	<1	<1	0	0
Endosulfan (ng/g)	0.092	<0.12	0.068	<1	<1	0	0
Endrin (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0

Source: http://www.epa.gov/emap/nca/html/data/index.html

(continued)

Table 3.4-7. (Continued)

Analyte (units)	NH00-045 2000	NH00-045 2000	NH01-0038 2001	NH06-0036 2006	NH06-0046 2006	NH10-1038 2010	NH10-1045 2010
Heptachlor (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Heptachlor Epoxide (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Hexachlorobenzene (ng/g)	<0.18	<0.12	0.027	<1	<1	0	0
Lindane (ng/g)	0.041	<0.18	<0.25	<1	<1	0	0
Mirex (ng/g)	<0.18	<0.12	0.16	<1	<1	0	0
2,4'-DDD (ng/g)	0.32	0.099	0.24	<1	<1	0	0
2,4'-DDE (ng/g)	<0.62	<0.42	<0.58	<1	<1	0	0
2,4'-DDT (ng/g)	<0.62	<0.42	0.16	<1	<1	0	0
4,4'-DDD (ng/g)	0.4	0.064	0.56	<1	<1	0	0
4,4'-DDE (ng/g)	0.66	0.093	0.87	<1	<1	0	0
4,4'-DDT (ng/g)	0.094	<0.58	0.16	<1	<1	0	0
Trans-Nonachlor (ng/g)	0.034	<0.18	0.054	<1	<1	0	0
Toxaphene (ng/g)			<23	<10	<10		

Source: http://www.epa.gov/emap/nca/html/data/index.html

3.4.6 Water Quality

NOAA's National Estuarine Eutrophication Assessment program has designated all of Little Bay as part of the Seawater Zone of the Great Bay Estuary system (Figure 3.4-13). Salinity in this zone exceeds 25 parts per thousand ("ppt"). Data from the National Estuarine Research Reserve System ("NERRS") Great Bay sampling station (station ID: GRBGBWQ) were used as estimates of water temperature and dissolved oxygen at the Little Bay cable crossing location (Figure 3.4-13). From April 2009 through September 2014, water temperature in Great Bay ranged from -2 to 29.1°C (28.4 to 84.4°F), with July having the highest monthly mean temperature (24°C; 75.2°F; NERRS 2014; Figure 3.4-14). DO levels in Great Bay ranged from 3.7 to 17.4 mg/l during April 2009 through September

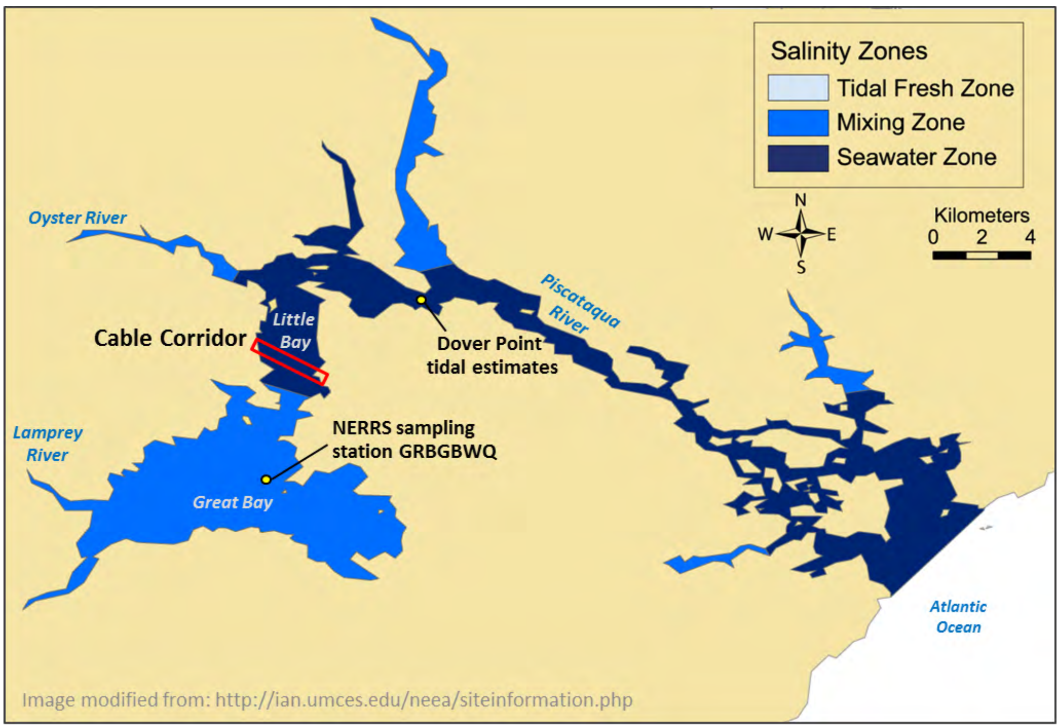


Figure 3.4-13. Salinity Zones of Great Bay (NERRS 2014).

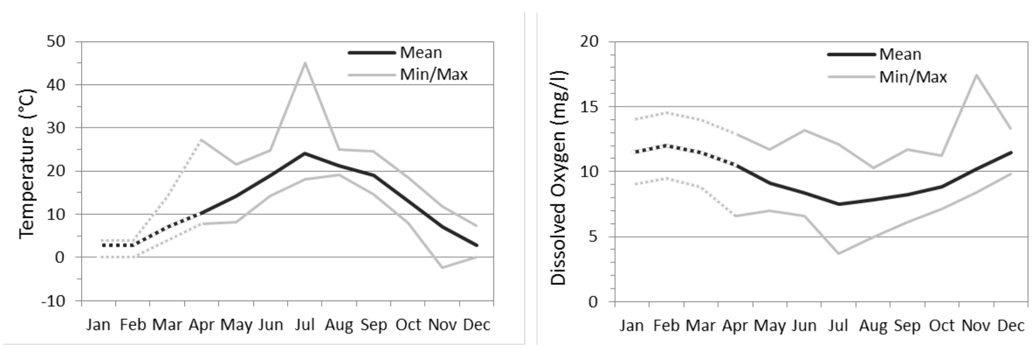
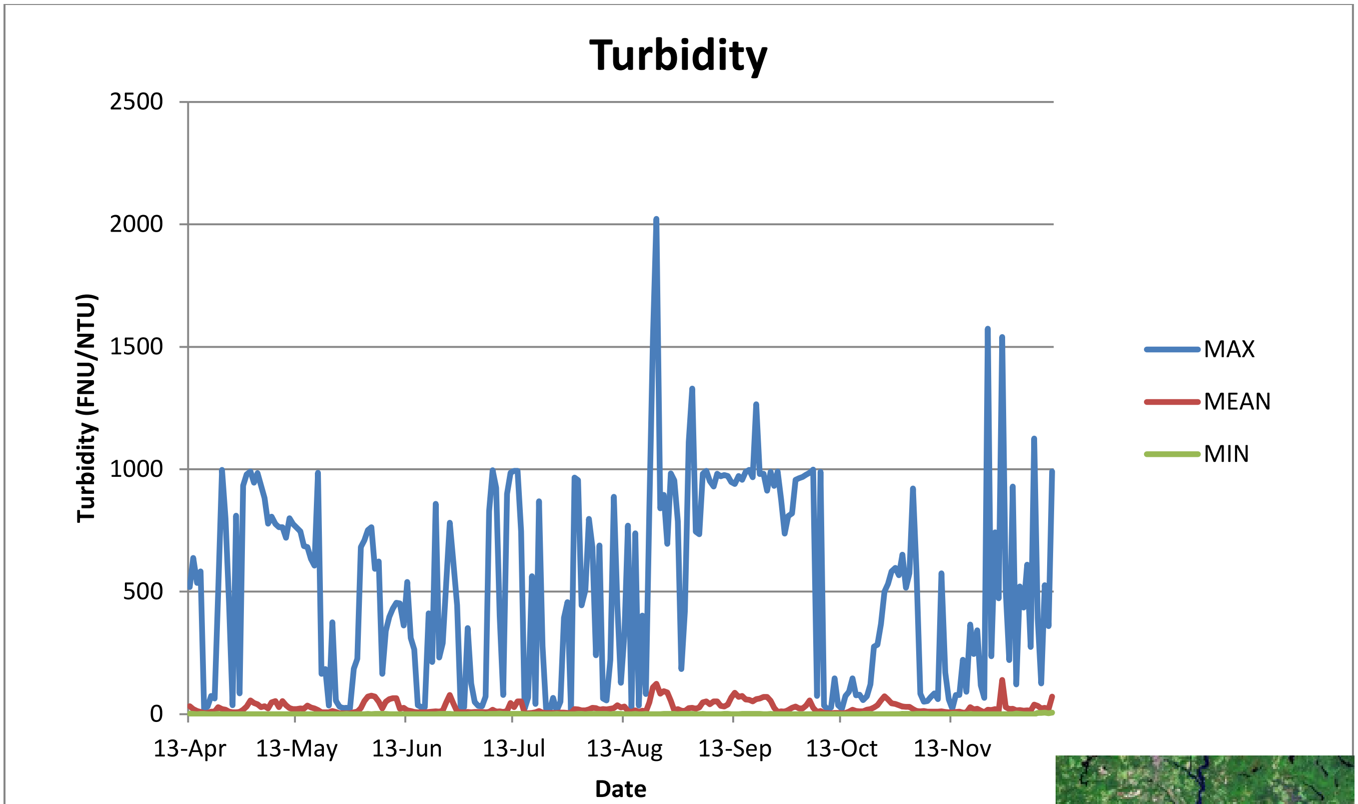
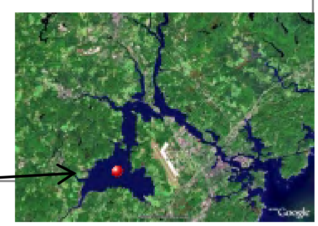


Figure 3.4-14. Monthly Temperature and Dissolved Oxygen in Great Bay (NERRS 2014).





(source: http://www.greatbaydata.org/gb_bu[illegible])

Figure 3.4-15. Range of Turbidity at Station GRBGBW (NERRS 2014).

2014, with the lowest monthly mean DO in July (7.5 mg/l; NERRS 2014; Figure 3.4-14). For the months not sampled (January - March), the report estimated that temperature and dissolved oxygen levels ranged between the December and April estimates.

Trowbridge (2009) compiled total suspended solids ("TSS") data collected off Adams Point and found that mean concentrations at low tide were statistically higher during the period from 2001-2008 than during 1974-1981 (Table 3.4-8). Consistent with that finding, PREP (2013) reported that TSS concentrations more than doubled (122% increase) at Adams Point between 1976 (mean of 1974-1976) and 2011 (mean of 2009-2011; averaging 16.3 mg/L). PREP linked this increase to decreases in eelgrass, an aquatic plant whose root and rhizome system stabilize sediments and help sequester nutrients in the substrate. It is likely that TSS concentrations can vary widely both seasonally and tidally. Monthly TSS measurements in surface waters off Adams Point indicated that from 2002 through 2011 maximum values in the fall ranged from 18 to 105 mg/L (GBNERR undated). Although not directly relatable, turbidity levels are often used as a surrogate for TSS because turbidity can be measured in the field whereas TSS requires a laboratory test. Figure 3.4-15 shows continuously collected turbidity measurements over four years (2009-2013) at Station GRBGBWQ located in central Great Bay. While mean turbidity values are typically low, the range of values clearly show a high level of variability with maximum values frequently exceeding mean values by 100-

fold. As GRBGBWQ is located along the main northeast/southwest axis of Great Bay, it is likely representative of conditions northeast of Furber Strait and the general vicinity of the Cable Area, at least in terms of fluctuations of turbidity. Jones (2000) noted that wave action on tidal flats, rain events, and ice scour are important factors in resuspension of fine grained sediments. Jones (2000) also cited studies that showed large variation in TSS over tidal cycles and over seasons.

Table 3.4-8. Total suspended solids (TSS) data collected off Adams Point (Trowbridge 2009).

Statistic	Total Suspended Solids (mg/L)		
	n	Mean	Standard Deviation
1974-1981	65	8.825	10.822
1993-2000	94	10.185	5.687
2001-2008	73	19.705	13.799
T-test	Significant (p<0.05}		
Kruskall-Walls test	Significant (p<0.05}		
Percent Change	123.28%		

T-test, Kruskall-Wallis test, and percent change calculated using 1974-1981 and 2001-2008 data.

3.4.7 Fish

A number of fish species are known to utilize the Great Bay Estuary during at least one life stage. The NHFG and NMFS are tasked with management of ecologically and economically important fish species. Management goals include the restoration of populations that have been depleted from historic levels, maintenance of recently recovered populations, and protection of populations that may be at risk due to habitat loss or overexploitation. Although not mutually exclusive of each other, groups of fish considered for management include: diadromous fish species, EFH species, and RTE species. Diadromous fish species either spend their life in saltwater and spawn in freshwater (anadromous) or spend their life in freshwater and spawn in the ocean (catadromous), and are discussed below. EFH (SEC Appendix 38) and RTE (SEC Appendix 37, NHDES Wetlands Application Appendix C) fish species are also summarized, and described in more detail in separate reports

Diadromous Fish

The proposed Project Area, which includes both freshwater and estuarine habitats, potentially contains habitat for multiple Species of Special Concern ("SC") as identified by the NHFG. SC species are also considered trust resources by NMFS. Species of Special Concern are classified as Category A or B. Species with Category A designation as are considered 'Near-threatened' presently, but may become 'Threatened' in the near future if conservation actions are not taken. Sub-category A1 describes species susceptible to further decline. Sub-category A2 identifies species that are considered recovered and were recently down-listed from the state Endangered and Threatened list. Category B Species of Special Concern are described as 'Responsibility Species', with a major portion of the total global population existing with New Hampshire.

The fish Species of Special Concern related to the proposed Project include diadromous (anadromous and catadromous) and freshwater species. Anadromous describes species that live as adults in the ocean and spawn in freshwater where the early life stages develop before migrating to the ocean. Catadromous fish live in freshwater, and migrate to the ocean to spawn. Freshwater species are strictly found in freshwater for all life stages.

American Eel *(Anguilla rostrata)*

American Eel is currently designated as a Species of Special Concern Category A1 (SC-A1) due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

The American Eel is a catadramous species found from Greenland to South America (Collette and Klein-MacPhee 2002). Spawning occurs in the winter and spring, and larval development occurs in the ocean. In the spring, juveniles ("elvers") migrate into estuaries as transparent "glass eels", where they develop into pigmented juveniles ("browns"). Elvers then continue upstream migration into freshwater to develop into adults and remain for up to 25 years as "yellow" eels before migrating back to sea to spawn as "silvers".

Ongoing surveys in the Oyster River (yellow eels) and Lamprey River (glass eels/elvers) indicate that the Great Bay Estuary and its tributaries should be considered currently viable American Eel habitat (NHFG 2013a, Enterline *et al*. 2012). From late-April through late-September 2012, a total of 4,092 glass eels and 121 browns were collected during a NHFG survey of the Lamprey River in Newmarket, New Hampshire (NHFG 2013a). Therefore, the proposed Project Area may contain both freshwater and marine habitat for American Eels. The corridor crosses the Oyster River (freshwater) in Durham, New Hampshire where American Eels were reported in 1985 and 1998 (NHB 2014). Additionally, American Eels were reported in 2003 in the Lamprey River (freshwater) in Durham, New Hampshire (NHB 2014). Although the SRP does not cross the Lamprey River, access to the Lamprey River from the Atlantic Ocean requires passage through the Little Bay cable corridor. The reported occurrence of American Eel in the Lamprey River indicates that Little Bay had provided temporary habitat for migrating glass eels and elvers during their transition into freshwater. Assuming survival to reproductive age within the Lamprey River, Little Bay would also provide temporary habitat for adults migrating back to the ocean for spawning.

In New England, juvenile American Eel migration into freshwater may occur from March through June (Greene *et al*. 2009). Glass eels progress into estuaries by drifting on flood tides and holding position near the bottom during ebb tides (McCleave and Wippelhauser 1987). Migrating elvers are mainly active at night, and may burrow into soft undisturbed bottom sediments or remain in deep waters during the day (Facey and Van den Avyle 1987). Spawning in the ocean occurs during the winter and the spring (McCleave and Kleckner 1985), indicating that Little Bay has the potential to be used by out-migrating adults in the fall and winter. Based on this, the habitat at the Little Bay project location may be considered American Eel habitat during the spring for juveniles and during fall and winter for adults. If present, juveniles would be most susceptible to jet plowing impacts during the day when they may be burrowed into soft substrate. The portion of the Oyster River within the SRP corridor may be considered year-round habitat for adult (yellow) American Eels.

American Shad *(Alosa sapidissima)*

American Shad is currently designated as SC-A1 due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

The geographic distribution of American Shad adults includes the coastal watersheds of New Hampshire. Although the historic spawning distribution within these New Hampshire coastal watersheds is not well documented, American Shad likely spawned in all rivers and tributaries throughout the Atlantic coast from Newfoundland to Florida prior to the construction of impassable dams (Colette and Klein-MacPhee 2002, NHFG 2005, Greene et al. 2009). Migrating adults may spend two to three days in estuarine waters before continuing to tidal or non-tidal freshwater rivers to spawn with an optimal water temperatures range of 57 to 77°F (Leggett 1976, Chittenden 1976, Greene et al. 2009). American Shad eggs and larvae remain at the spawning location or are transported downstream and may be found in areas with salinities < 15ppt and a minimum dissolved oxygen level of 5mg/l (Miller et al. 1982, Greene et al. 2009). For northern New England rivers, the spawning migration would occur from late-April through August, and juvenile out-migration to the ocean would occur during September and October. NHFG (2014a) determined that suitable spawning habitat for American Shad is accessible in both the Exeter and Lamprey Rivers. No American Shad passage through fish ladders was estimated for the Oyster, Lamprey, or Winnicut Rivers during April 15 through June 3, 2013 (NHFG 2014b). This suggests that the likelihood of American Shad using habitat within the proposed Little Bay cable corridor is low.

River Herrings *(Alewife (Alosa pseudoharengus) and Blueback Herring (Alosa aestivalis))*

Alewife (sea-run only) and Blueback Herring (together "River Herrings") are currently designated as SC-A1 due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

River Herrings are anadromous species with a current geographic range extending from North Carolina to Newfoundland. Spawning occurs in freshwater rivers, where the eggs, larvae, and early juveniles remain until the juveniles migrate downstream to estuaries and the ocean to develop into adults. Juvenile migration from freshwater nursery habitats to estuaries occurs from late summer to early fall for Alewife, and in the fall for Blueback Herring (NHFG 2005). Alewife spawning generally occurs in northern New England from early-April through mid-June, with Blueback Herring generally spawning 3 to 4 weeks later than Alewife in areas where the species overlap geographically (Greene *et al*. 2009).

Surveys by the NHFG in 2012 found 2,573 River Herring (55% Blueback Herring, 45% Alewife) in the Oyster River, and 86,862 (100% Alewife) in the Lamprey River (NHFG 2013b). From April 15 through June 3, 2013 the estimated total number of River Herring that passed through fish ladders was 79,408 for the Lamprey River, and 7,149 for the Oyster River (NHFG 2014). These recent spawning migrations occurred from mid-April through late-June in the Oyster River, and from mid-April through the end of May in the Lamprey River. This indicates that the portion of the Oyster River within the proposed project corridor may contain Alewife and Blueback Herring spawning habitat from April through June, and nursery (egg, larvae, juvenile) habitat from May through October. Note that no impacts to the Oyster River are expected because a new off-ROW access route will be utilized to access the area south of the river. Additionally, Alewife migration between the Atlantic Ocean and the Lamprey River would require passage through the Little Bay cable corridor in May and April for adults and in September and October for juveniles.

Rainbow Smelt *(Osmerus mordax, sea-run stock only)*

Rainbow Smelt is currently designated as SC-A1 because of restricted access to historical spawning areas due to undersized culverts and dams, and existing spawning habitat vulnerability to sedimentation and pollution (NHFG 2009).

Great Bay and its tributaries are important spawning and nursery habitats for coastal (anadromous) Rainbow Smelt populations. Following the breakup of winter ice in early spring, adult Rainbow Smelt migrate upstream from coastal areas into rivers to spawn at the head-of-tide. Smelt are transported downstream as larvae in the spring to brackish nursery areas, move into upper estuarine areas as juveniles by fall, and complete the migration to the ocean by the following spring (Collette and Klein-MacPhee 2002).

Adult Rainbow Smelt have been identified in recent NHFG surveys of the Oyster River (2008, 2010, 2011), and tributaries of Great Bay: the Lamprey (2008), Squamscott (2008-2011), and Winnicut Rivers (2008-2011; Enterline *et al*. 2012). The spawning run in the Squamscott and Oyster Rivers occurs from March through May. Rainbow Smelt egg deposition surveys were also conducted by NHFG from mid-March to mid-April, 1978 through 2007, in the Oyster, Lamprey, Squamscott and Winnicut Rivers (Enterline *et al*. 2012). These surveys indicate that the portion of the Oyster River within the proposed project corridor currently has the potential to provide spawning habitat for sea-run Rainbow Smelt adults, and nursery habitat for eggs and larvae. No impacts to the Oyster River are anticipated. Additionally, the area of the Little Bay cable crossing may provide nursery habitat for larvae and juveniles spawned in the tributaries of Great Bay, including the Lamprey, Winnicut, and Squamscott Rivers. Passage through the Little Bay cable corridor would also be required for adult Rainbow Smelt spawning in or for juveniles emigrating from any Great Bay tributaries.

Sea Lamprey *(Petromyzon marinus)*

Sea Lamprey is currently designated as a Species of Special Concern Category A1 (SC-A1) due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

Sea Lamprey are anadromous, and in the western Atlantic Ocean range from Greenland to the Gulf of Mexico (Collette and Klein-MacPhee 2002). In Gulf of Maine tributaries, adults migrate upstream from the ocean to spawn in freshwater rivers during May and June, and all adults die after spawning. Eggs and larvae remain in the natal stream until approximately October, when metamorphosis into juveniles is complete. Juvenile out-migration to the ocean begins following metamorphosis, and overwintering in estuaries may occur (Collette and Klein-MacPhee 2002).

From April 15 through June 3, 2013, an estimated 48 Sea Lamprey passed through the Oyster River fish ladder, and 114 passed through the Lamprey River fish ladder (NHFG 2014). These recent spawning migrations occurred in early-May in the Oyster River and from early-May through the early-June in the Lamprey River. This indicates that the portion of the Oyster River within the proposed project corridor may contain Sea Lamprey spawning habitat in May, and nursery (eggs and larvae) habitat from June through October. Additionally, Sea Lamprey spawning in the Lamprey River would require passage of migrating adults through the Little Bay cable corridor during May and June. The Little Bay cable corridor may also provide overwintering habitat for out-migrating juvenile Sea

Lamprey from both the Oyster and Lamprey Rivers. Note that no impacts to the Oyster or Lamprey Rivers are anticipated.

3.5 Conserved and Public Lands

The SRP is located in New Hampshire's coastal watersheds, which have experienced rapid development over the past few decades and as a result, are the focus of ongoing conservation efforts. The 2006 report titled *The Land Conservation Plan for New Hampshire's Coastal Watersheds* identified areas that are important for conserving native plants, animals and natural communities and water quality in the coastal watersheds (Zankel, M., et al. 2006). These focus areas, which are available as GIS layers, and GIS data for existing conserved and public lands (as of April 2013) were reviewed along the project corridor. A more detailed report including conservation lands associated with the SRP is included in the *Review of Land Use and Local and Regional Planning, The Seacoast Reliability Project* report (See SEC, Appendix 43).

The SRP corridor crosses through portions of fifteen conserved parcels. Approximately 58 acres (36%) of the corridor are located within these conserved areas. The majority of the areas identified as "core" conservation focus areas in the vicinity of the project corridor are currently protected via conservation easements or other protection strategies. These lands near the corridor are concentrated in two clusters in Durham: the first located in and around the UNH campus including portions of the UNH College Woods, Foss Farm, Horticulture Farm, and NHFG La Roche Brook parcel; and the second to the east of Sandy Brook Drive and northwest of Longmarsh Road (Map 3; Appendix A). This second cluster is associated with the Durham Point Sedge Meadow Preserve and Crommet Creek. The Durham Point Sedge Meadow Preserve is a 20-acre site located north of the SRP corridor owned by The Nature Conservancy ("TNC"), and provides habitat for the globally-rare banded bog skimmer dragonfly (*Williamsonia lintneri*), which is listed as Endangered (S1) in New Hampshire. The conservation lands around Crommet Creek include parcels owned by TNC, plus state and municipally owned lands.

The project corridor crosses several other conserved and public parcels including six other fee ownership parcels, one parcel that has been set aside as open space, off Sandy Brook Drive, and three parcels protected by conservation easements. The corridor also crosses through a parcel owned by the Town of Durham, adjacent to the existing Durham Substation off Mill Road.

In Newington, the project corridor crosses a small town-owned conserved parcel (Flynn Pit) immediately to the east of Little Bay Road and the lower hay fields of the historic Frink Farm. No other conserved lands are crossed by the Project between the Frink Farm and the Portsmouth Substation. No conserved lands lie within or near the project corridor in Madbury or Portsmouth.

Little Bay is part of the Great Bay NERRS. The Great Bay estuary is New Hampshire's largest estuarine system that includes a diversity of land and water area, including upland forest, salt marsh, mudflats, tidal creeks, rocky intertidal, eelgrass beds, channel bottom/subtidal and upland field habitats (NERRS, 2014). The reserve encompasses 10,235 acres, including approximately 7,300 acres of open water and wetlands. The Great Bay's cultural heritage is equally diverse, ranging from paleo-Indian villages from 6,000 years ago to colonial transportation and industrial use (NERRS 2014).

3.6 Soils

The soils within the project corridor were mapped by the NRCS and these data were reviewed using GIS software. The NRCS soil surveys are made for planning purposes at a scale of 1:20,000. Due to mapping scale, inclusions of less than 3 acres may not be identified without detailed field surveys. The Project field delineations of wetlands, streams and vernal pools, completed by Normandeau provide more detail on hydric soil inclusions overlooked by the NRCS soil survey.

NRCS soil data and Normandeau's wetland delineations highlight the variation in soils within the project corridor. These differences are a result of variations in parent materials, landscape position, elevation, slope, aspect and vegetation. Deeper soils with larger areas of poorly drained (hydric) soils are found in depressions on the landscape while the low hills and higher elevations have shallower soils. The majority of the soils mapped within the corridor are derived from till, or are of glaciomarine or outwash parent material. The following is an overview of the soils within the project corridor by town. Soil maps are provided in the *Phase I-A Preliminary Archeological Survey* report and addenda (See SEC, Appendix 9).

Town of Madbury

Only a small portion of the Project is located within the Town of Madbury. Three soils are mapped within Madbury, and include Buxton silt loam, Scantic silt loam, and Paxton fine sandy loam. Buxton soils are moderately well drained, while Scantic soils are poorly drained, hydric soils and Paxton fine sandy loams are well drained and partially hydric.

Town of Durham

The soils mapped within the project corridor in Durham are primarily fine or very fine sandy loams or silt loams. Examples include the Hollis-Charlton very rocky fine sandy loams, Scantic silt loam, Buxton silt loam, Suffield silt loam, and Swanton fine sandy loam. The majorities of the soils in the corridor within Durham are well drained or poorly drained, which is consistent with the number and extent of wetlands delineated within the town.

Town of Newington

Similar to the soils mapped within Durham, the soils mapped within the project corridor in the Town of Newington are predominantly fine or very fine sandy loam or silt loams. Examples include Pennichuck Channery very fine sandy loam, Boxford silt loam, Scitico silt loam, and Hoosic gravelly fine sandy loam. Urban land and complexes that include urban land are also present in modest quantities. The majority of the soils in Newington are mapped as partially hydric or of unknown hydric nature.

City of Portsmouth

Only a very small portion of the Project is located within the City of Portsmouth. This area is predominantly mapped as a mix of the urban land-Canton complex and the Chatfield-Hollis-Canton complex. The latter is well drained and slopes range from three to 15 percent.

3.7 Vegetation Communities and Habitat Types

The SRP is located within the Coastal Plain ecological region of New Hampshire. The highest elevation along the project corridor is approximately 130 feet above sea level near the Madbury Substation. Based on the NHFG 2015 WAP cover type map and field observations, the undeveloped habitat cover types through which the Project passes consist mostly of Appalachian oak-pine forest, with smaller areas of wet meadow/shrub wetlands, grasslands, and temperate swamp (Map 4; Appendix A). The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes.

The Appalachian oak and pine forests are common throughout southern New Hampshire on dry to dry-mesic glacial till soils and on sand plain features. Good examples of mesic Appalachian oak – hickory forests are known near Little Bay and have a mix of canopy species including white, black, scarlet and red oaks, shagbark hickory, white ash, white pine, and other species common in more northern portions of New Hampshire such as birches, maples and beech (Sperduto and Kimball, 2011). Understory species include Canada mayflower, poison ivy, wild sarsaparilla, and other low herbs and forbs.

The residential and open areas are planted with common landscaping species and lawn grasses and escaped ornamental species are common in close proximity to residential areas. Escaped invasive species were noted in many of the identified wetlands throughout the project corridor.

In natural habitats, the vegetation communities within the existing electric corridor frequently differed substantially from adjacent communities due to the routine vegetation management typical of utility corridors. Under the existing electric lines, the vegetation was shrub and grasses as a result of periodic mowing in contrast with the adjacent forested communities. Common upland forest species found along the edge of the corridor included white pine (*Pinus strobus*), red and white oak (*Quercus rubra* and *Q. alba*), quaking aspen (*Populus tremuloides*) and gray birch (*Betula populifolia*). The size of trees varied from mature to early successional depending on the adjacent land use. Common shrub species within upland areas included glossy and common buckthorn (*Rhamnus frangula* and *R. cathartica*), multi-flora rose (*Rosa multiflora*), sumacs (*Rhus* spp.), barberries (*Berberis* spp.), honeysuckles (*Lonicera* spp.) and dogwoods (*Cornus* spp.). Many of these species are non-native invasives in New Hampshire. Clovers (*Trifolium* sp.), hayscented fern (*Dennstaedtia punctilobula*), sweet fern (*Comptonia peregrina*), goldenrods (*Solidago* spp.), common juniper (*Juniperus communis*), raspberries and blackberries (*Rubus* spp.), little bluestem (*Schizachyrium scoparium*), and plantain species (*Plantago* sp.) were frequently noted upland herbaceous plants in the maintained portion of the corridor.

Wetlands identified within the project corridor were generally dominated by both scrub-shrub and emergent (herbaceous) plant species (Section 3.2). Common woody species include red maple, glossy buckthorn, silky dogwood (*Cornus amomum*), speckled alder

(*Alnus incana*) and several meadowsweet (*Spiraea* sp.) species. Herbaceous species included sedges (*Carex* sp.), cattails (*Typha* sp.), several hydrophytic fern species including sensitive (*Onoclea sensibilis*), cinnamon and interrupted varieties (*Osmunda cinnamomea* and *O. claytoniana*), rushes (*Scirpus* sp.), and other species such as tearthumb (*Polygonum* sp.), asters (*Symphyotrichum* sp.), and purple loosestrife (*Lythrum salicaria*), which is an invasive species. Trees were observed within the wetland along the edges of the corridor, including red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), and cedar (*Thuja* sp.).

One State-listed plant species, *Carex cristatella,* and four Exemplary Natural Communities or Natural Community Systems were documented within the project corridor: *High salt marsh (shallow peat variant)*, *Salt marsh system*, *Sparsely vegetated intertidal system* and *Subtidal system.*. No federally listed rare plant species were observed within the SRP corridor. See the *Rare, Threatened, and Endangered Species and Exemplary Natural Community Report* for more information.

3.8 Wildlife Habitat and Wildlife

Transmission corridors in general are known to provide suitable habitat for a variety of wildlife species, including mammals, birds, reptiles, amphibians, and invertebrates. Species with small home range requirements may use a portion a corridor as their primary habitats. Animals with larger home ranges may use a corridor as a part of their overall home range, or as a travel/dispersal corridor. Transmission corridors may also provide intrinsic habitat value as a relatively undeveloped habitat area in locations were the surrounding land use consists of commercial, institutional, and/or residential development.

An evaluation of the wildlife habitat for the project corridor was conducted using aerial photography and other GIS data combined with site visits in specific locations. The lands surrounding the SRP have a low to moderate amount of development, including some protected conservation lands, substantial areas of low density residential development, and some areas of higher intensity development associated with Durham and Newington/Portsmouth. The undeveloped areas and low density residential areas are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types. Shrublands and grasslands are a required resource for many types of wildlife and are also relatively rare in New Hampshire’s predominantly forested landscape. Although narrow (approximately 60 feet wide), the existing cleared corridor provides some relatively valuable habitat resources for grassland/shrubland species, and may also provide a dispersal corridor for species that depend on grassy and/or shrubby habitats.

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the WAP (Map 5). The remainder of the corridor passes primarily though areas that are designated as Supporting Landscapes or that have no designation at all. The relative proportion of these habitat types in the corridor reflects their wider distribution in the surrounding landscape.

In late fall, Great Bay typically hosts large numbers (>500) of migrating Canada geese and black ducks, as well as smaller numbers (<100) of other diving and dabbling ducks, shorebirds and seabirds. These birds use a variety of areas around the bay and are not likely resource constrained.

Portions of the SRP corridor are in the vicinity of state-listed rare wildlife species, including New England cottontail, northern long-eared bat, northern black racer, Blandings turtle, spotted turtle, and ringed boghaunter, among others. While a number of these species may use the corridor for portions of their life cycle, the New England cottontail is dependent on early successional habitat such as shrub and grasslands and is declining throughout its range as these habitats mature or are developed. PSNH is actively working with NHFG to manage electric corridors to benefit New England cottontail. The SRP corridor passes through UNH's Foss Farm and NHFG's LaRoche Brook parcel, both of which are being actively managed for this species. The SRP corridor clearing will supplement that habitat and provide a connective route for the rabbit to disperse to other suitable habitats. See the *Rare, Threatened, and Endangered Species and Exemplary Natural Community Report* for more information.

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Appendices

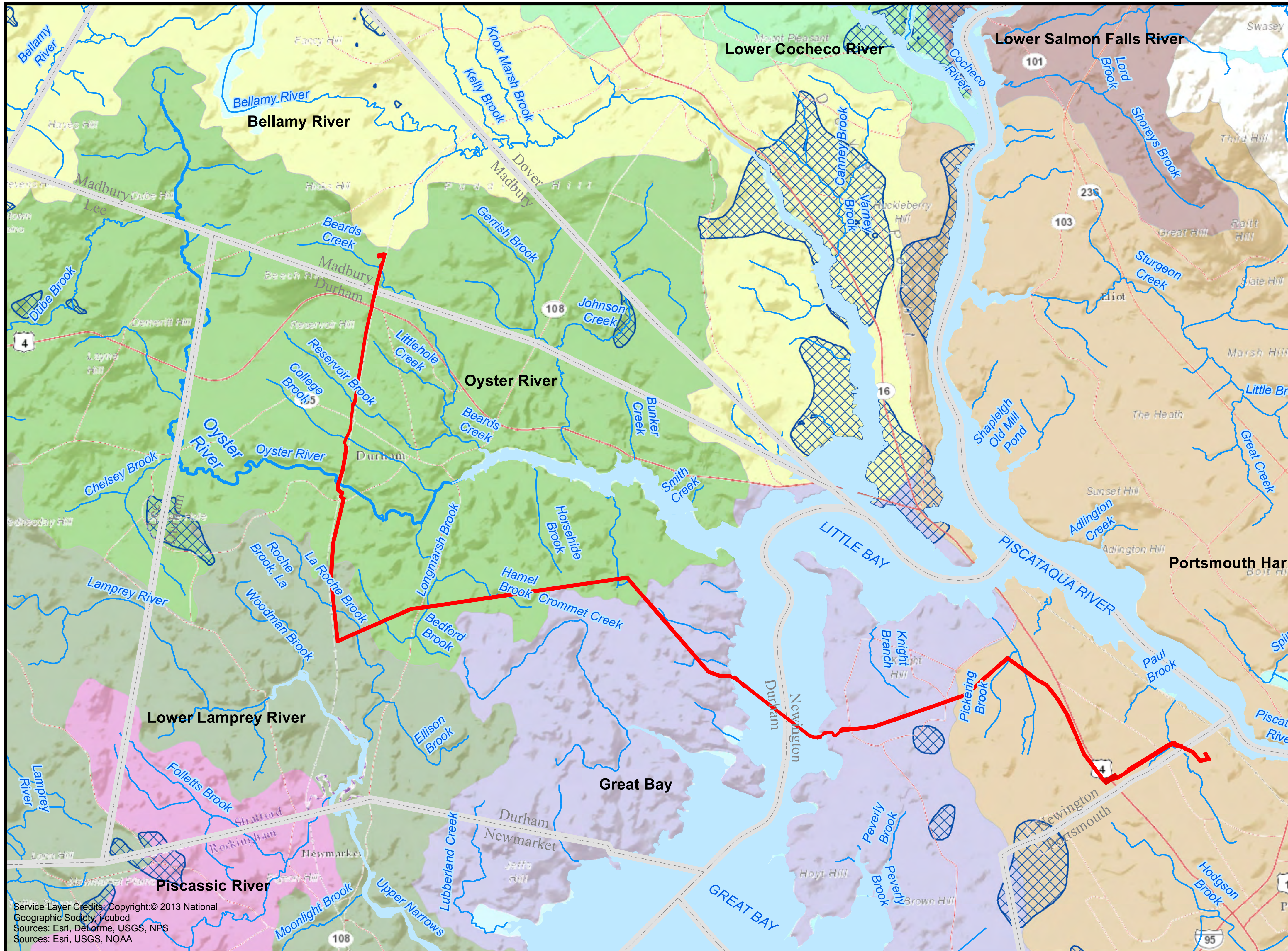
Appendix A. Maps

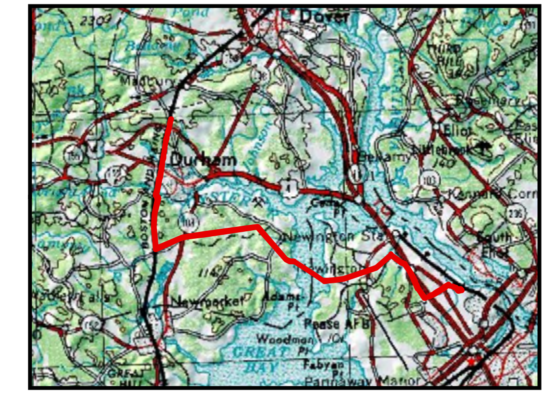
Map 1: Water Resources

Map 2: Wetland and Stream Map

Map 3: Conservation Land

Map 4: NH Wildlife Action Plan (WAP) Communities





Water Resources
Seacoast Reliability Project

Town Boundary
Seacoast Reliability Project Right of way
Great Bay
Streams and Rivers
Oyster River
Stratified Drift Aquifer (GA2)

HUC 12

Bellamy River
Great Bay
Lower Cocheco River
Lower Lamprey River
Lower Salmon Falls River
Oyster River
Piscassic River
Portsmouth Harbor

N

0 1 2 Miles

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Project No: 22240.113

Drawn By: wmccloy

Date: 12/22/2015

SRP Project Area/ROW

Town Boundary

Roads

Local

Not Maintained

Private

State

Wetlands

Not Prime

Prime

River Stream

Ephemeral Stream

Intermittent Stream

Perennial Stream

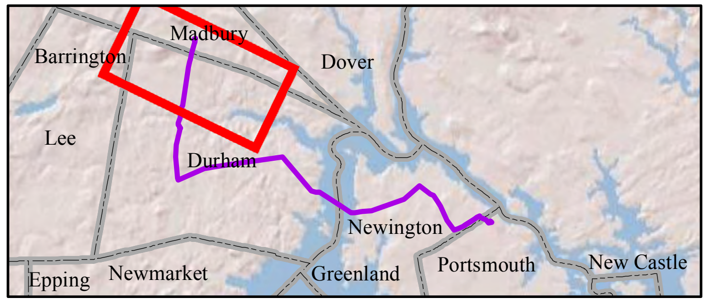
NHD Flowline

Streams and Rivers

Oyster River

N E S W

0 0.25 0.5 Miles



EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES
Environmental Consultants

Seacoast Reliability Project

Wetlands And Streams

Page 1 of 4

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Project No: 22240.113
Drawn By: wmccloy
Date : 12/22/2015

SRP Project Area/ROW
Town Boundary

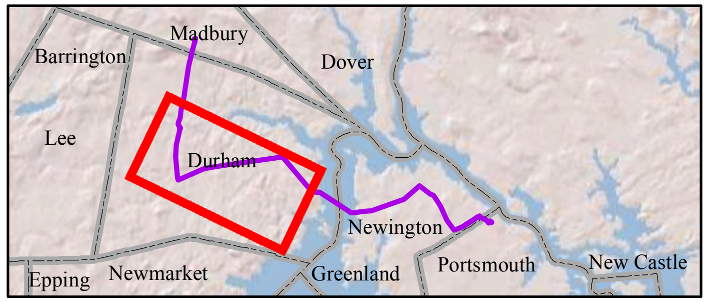
Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
- River Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

N E S W

0 0.25 0.5 Miles



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Seacoast Reliability Project

Wetlands And Streams

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SRP Project Area/ROW
Town Boundary

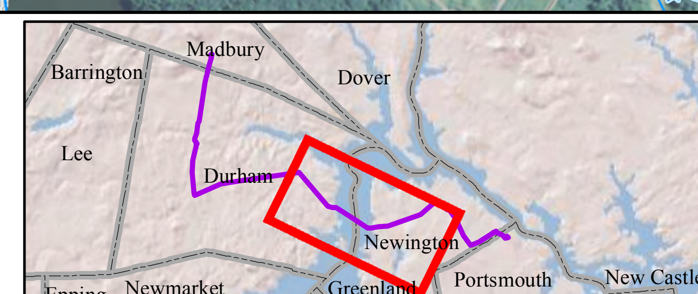
Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
- River Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

N E S W

0 0.25 0.5 Miles



EVERSOURCE ENERGY

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Seacoast Reliability Project

Wetlands And Streams

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Project No: 22240.113
Drawn By: wmccloy
Date : 12/22/2015

SRP Project Area/ROW
Town Boundary

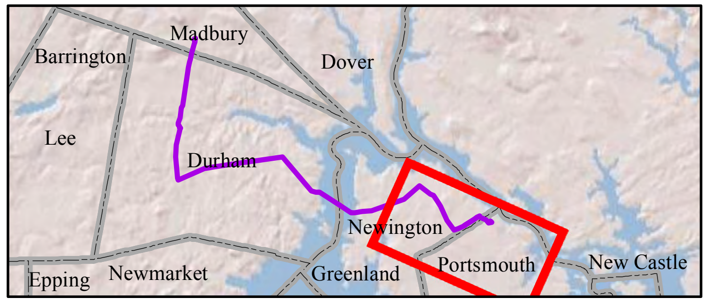
Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
- River Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

N E S W

0 0.25 0.5 Miles



EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES Environmental Consultants

Seacoast Reliability Project

Wetlands And Streams

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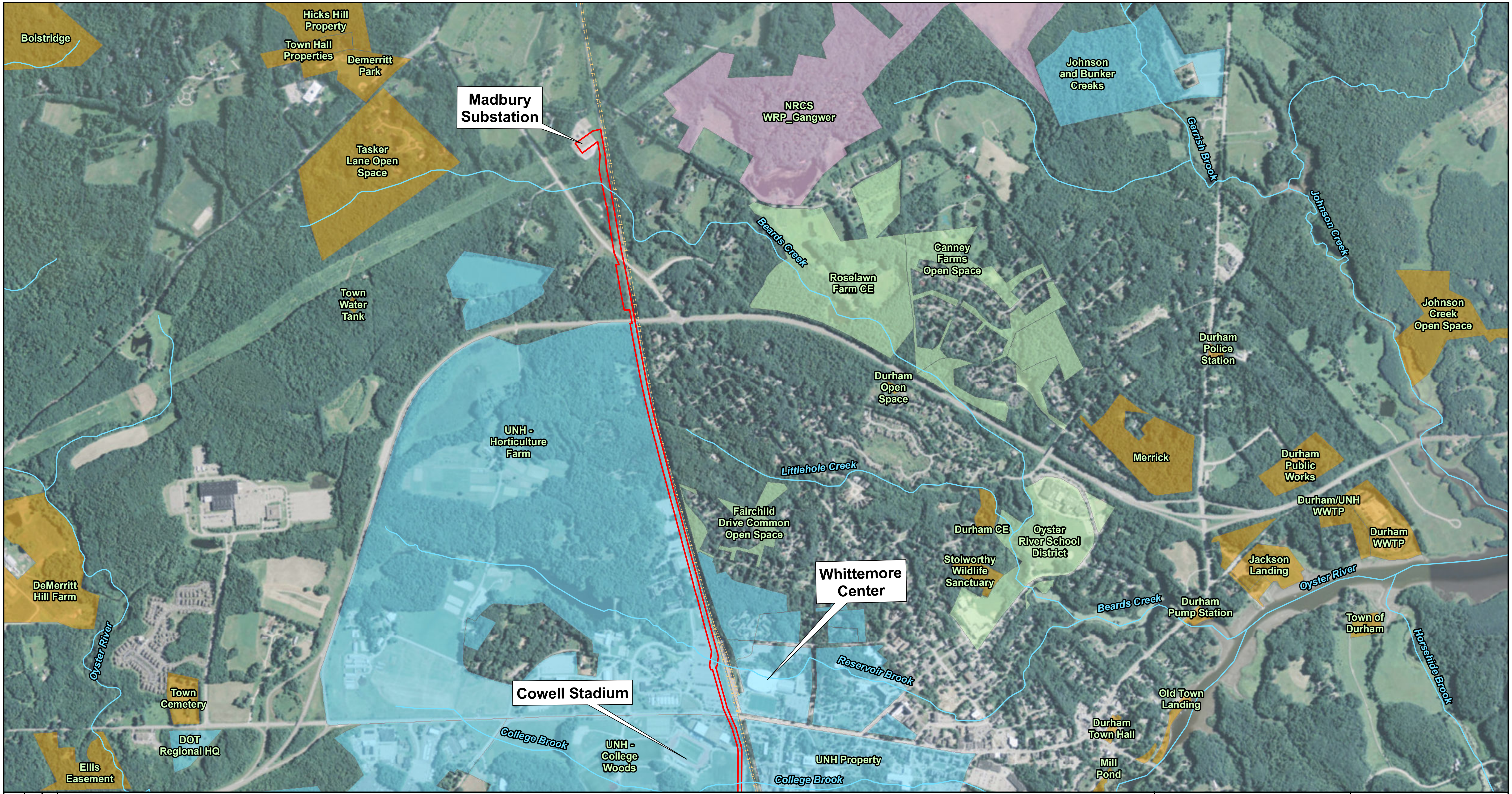

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Drawn By: wmccloy

Date: 12/22/2015

Conservation Lands

- Municial/County
- Federal
- State
- Private
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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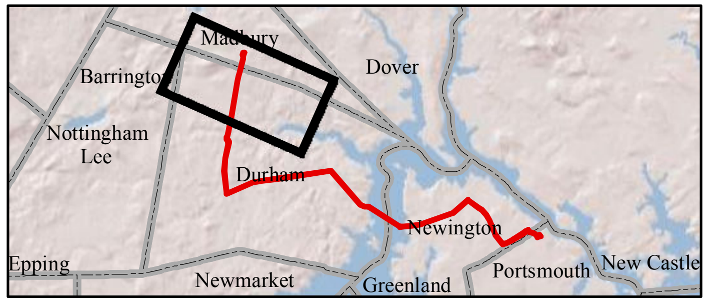
N E S W

0 600 1,200 Feet



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Conservation Mapping

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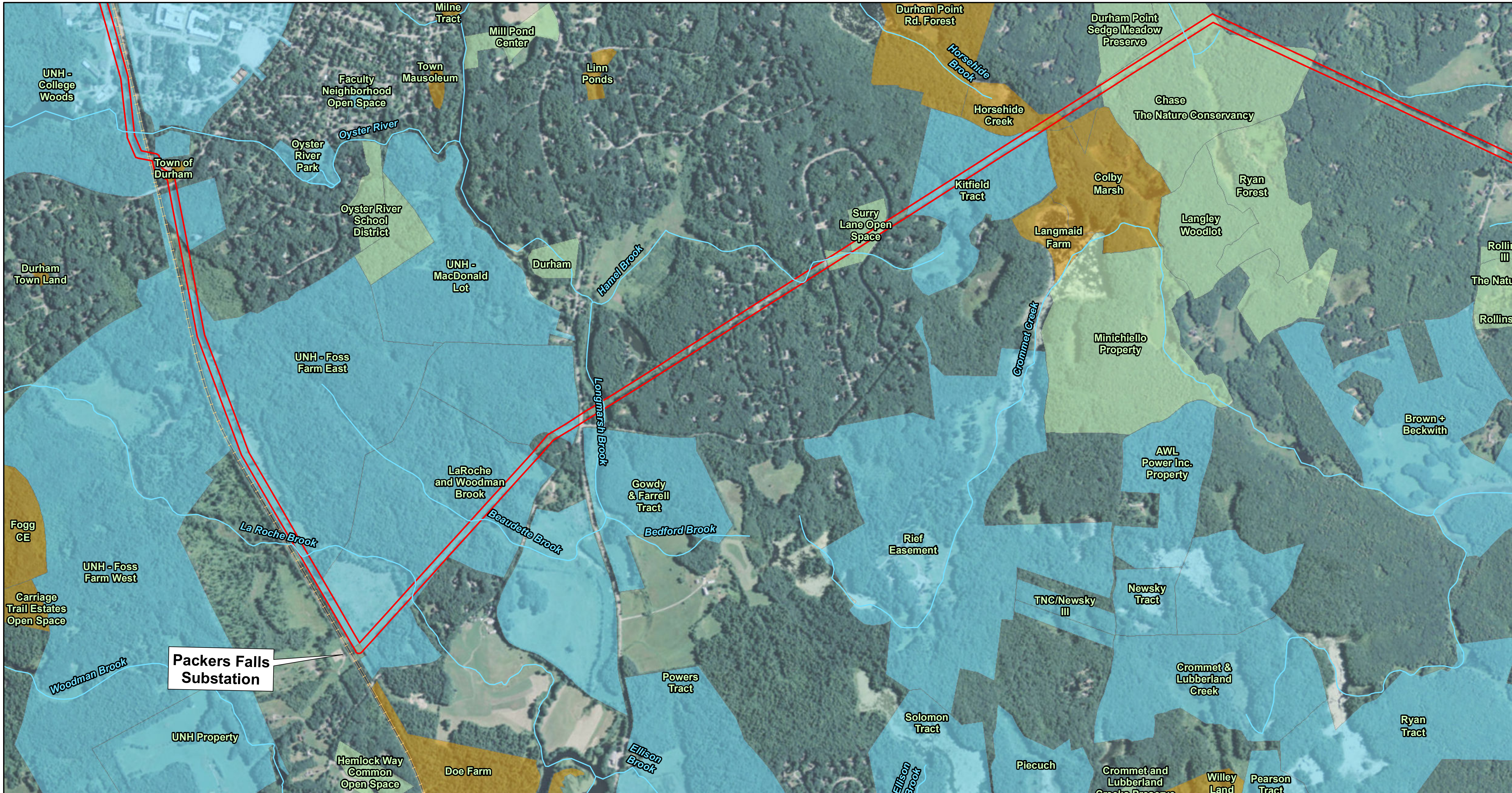

Project No: 22240.113

Drawn By: wmccloy

Date : 12/22/2015

Conservation Lands

- Municial/County
- State
- Private
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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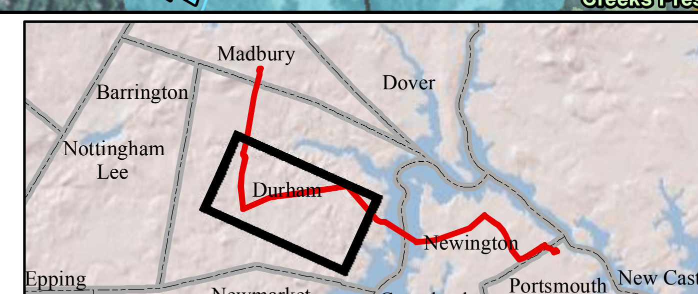

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Project No: 22240.113

Drawn By: wmccloy

Date : 12/22/2015

Conservation Lands

- Municial/County
- Federal
- State
- Other Public/Quasi-Public Entity
- Private
- Streams and Rivers

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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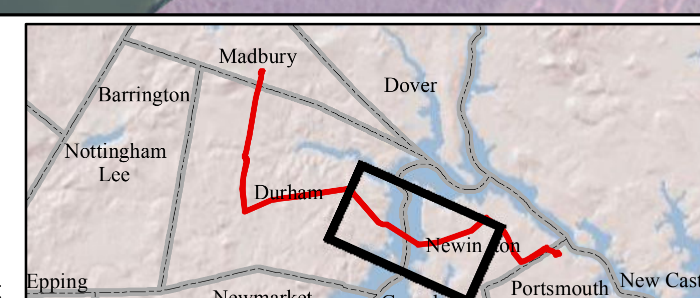

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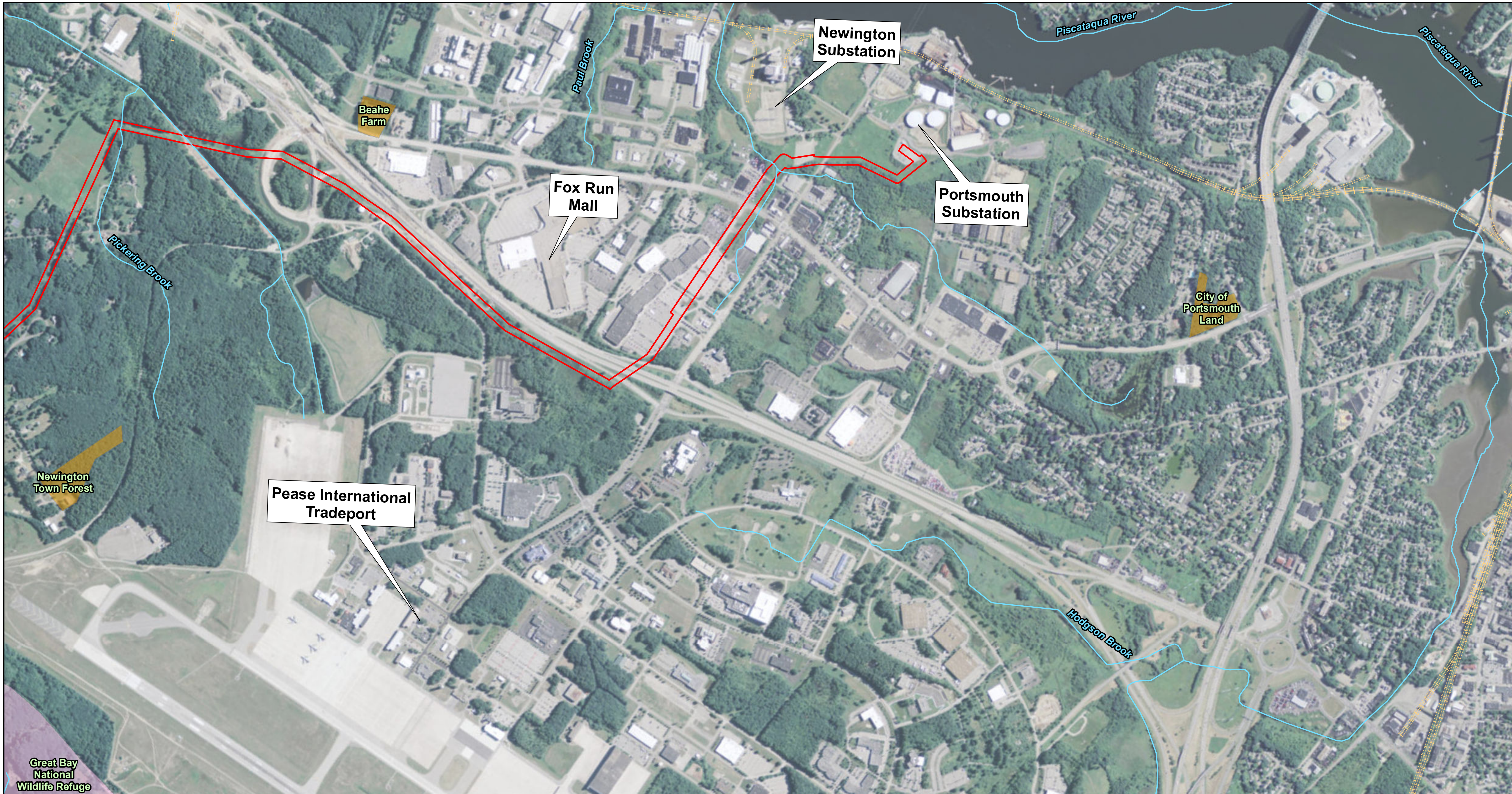

Project No: 22240.113
Drawn By: wmccloy
Date : 12/22/2015

Conservation Lands
- Municial/County
- Federal
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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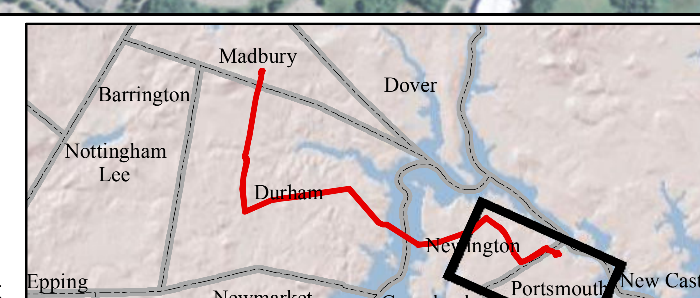

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Conservation Mapping

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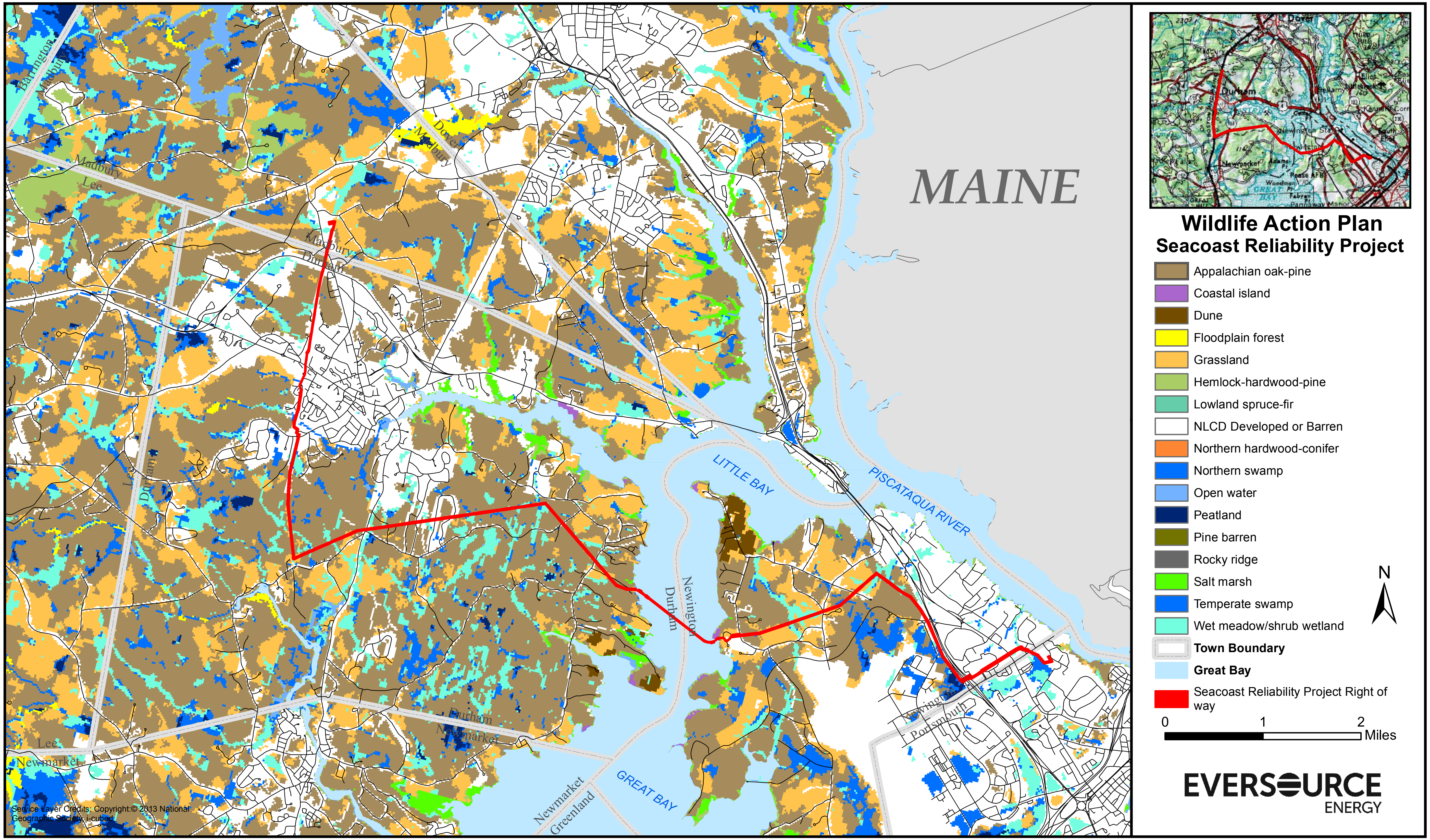

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Appendix B. Summary Tables

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DNW2 (Subtidal)	E1UB	259,459	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Salt Marsh)	E2EM	9,047	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Rocky Shore)	E2RS	15,636	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Intertidal Flats)	E2US	278,668	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DW1	PEM1/PSS1	18,663	Durham	S	S	S	S	S	S	S	S	-	S	-	S	-
DW2	PEM1E	51,456	Durham	P	-	-	-	-	S	-	P	-	-	-	S	-
DW4	PEM1J	6,829	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW5	PSS1	18,121	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW6	PEM1E/PSS1E	35,338	Durham	S	S	-	S	-	P	S	P	-	-	-	S	-
DW7	PSS1	4,726	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW9	PSS1/PEM1	5,839	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW10	PSS1E/PEM1J	17,144	Durham	S	-	-	-	-	P	-	S	-	-	-	-	-
DW11	PEM1/PSS1	7,353	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW12	PSS1E/PEM1E	11,821	Durham	S	-	-	S	-	-	-	P	-	-	-	S	-
DW13	PSS1/PEM1	48,977	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW14	PEM1J/PSS1E	21,504	Durham	P	S	-	S	-	S	-	P	S	-	-	P	-
DW16	PEM1E	763	Durham	S	S	-	-	-	-	-	S	-	-	-	-	-
DW17	PSS1/PEM1	11,886	Durham	S	P	-	P	P	S	P	P	-	-	-	-	-
DW18	PSS1E/PEM1E	54,161	Durham	P	S	-	-	-	S	-	P	-	S	-	S	-
DW20	PEM1J	3,144	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW21	PSS/PEM	24,887	Durham	S	-	-	S	S	S	-	S	-	-	-	-	-
DW22	PSS1E/PFO14E	40,728	Durham	P	S	-	-	-	S	-	P	-	-	-	-	S
DW24	PSS1E/PEM1E	35,043	Durham	S	-	-	-	-	P	-	P	-	P	S	S	-
DW25	PEM/PSS	10,231	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW26	PEM1J	245	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW27	PSS1E/PEM1F	2,294	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW28	PEM1J	839	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW29	PEM/PSS	9,272	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW30	PSS1E/PEM1J	14,577	Durham	S	S	-	S	-	P	S	P	-	S	-	-	-
DW31	PEM	46,279	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW33	PEM/PSS	39,676	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW36	PSS1/PFO1	10,787	Durham	P	P	-	-	-	-	-	-	-	-	-	-	-
DW37	PEM/PSS	3,294	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW38	PSS1/PFO1	32,062	Durham	P	S	-	-	-	S	-	-	-	-	-	-	-
DW40	PSS1/PEM1	6,354	Durham	P	-	-	-	-	P	-	S	-	-	-	P	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DW41	PEM/PSS/PUB	96,107	Durham	S	S	-	S	S	-	S	S	-	-	-	-	S
DW42	PSS1/PFO1	4,930	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW43	PSS/PFO	4,476	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW44	PEM1	7,145	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW45	PSS	7,812	Durham	S	-	-	-	-	-	-	S	-	-	-	-	-
DW47	PEM/PSS	23,061	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW48	PSS/PEM	14,505	Durham	P	P	-	-	-	S	P	S	-	-	-	-	-
DW49	PEM/PSS	3,533	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW50	PEM1	2,753	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW52	PSS1/PFO1/PEM1	18,865	Durham	P	-	-	-	-	S	-	-	-	-	-	-	-
DW54	PSS1	12,577	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW55	PSS	687	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW56	PEM1/PSS1	41,860	Durham	P	-	-	-	-	S	-	S	-	-	-	-	-
DW58	PSS1/PEM4	70,192	Durham	P	P	-	-	-	P	P	P	-	-	-	-	-
DW59	PEM/PUB	3,150	Durham	S	S	S	S	S	-	S	-	-	-	-	-	-
DW63	PSS/PEM	6,200	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW65	PEM	8,221	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW67	PEM	15,266	Durham	P	S	-	S	S	-	-	S	-	-	-	-	-
DW69	PEM	7,574	Durham	P	S	-	P	S	-	-	S	-	-	-	-	-
DW71	PEM	163	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW72	PSS1	2,527	Durham	-	-	-	S	S	-	-	-	-	-	-	-	-
DW73	PSS1/PEM1	1,098	Durham	S	S	S	S	S	-	S	-	-	S	-	-	-
DW74	PFO1/SS1	2,795	Durham	S	P	-	S	S	-	S	-	-	-	-	-	-
DW76	PSS1	12,237	Durham	S	-	-	-	-	-	-	-	-	-	-	S	-
DW77	PSS1	9,755	Durham	P	-	-	P	-	-	-	-	-	-	-	-	-
DW78	PSS1	139	Durham	P	-	-	P	P	-	-	-	-	-	-	-	-
DW79	PSS1	2,189	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW80	PSS1	5,966	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW91	PSS1	4,177	Durham	S	S	-	-	-	-	S	S	-	-	-	-	-
DW93	PSS1	4,637	Durham	P	-	-	-	-	P	-	-	-	-	-	-	-
DW94	PSS1	12,802	Durham	S	-	-	S	-	S	-	-	-	-	-	-	-
DW100	PEM1E	6,571	Durham	S	S	-	P	-	-	-	-	-	-	-	-	-
DW101	PEM1/SS1E	3,219	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW102	PSS1E	5,043	Durham	-	-	-	S	-	-	-	-	-	-	-	-	-
DW103	PSS1/EM1B	12,099	Durham	P	-	-	S	S	S	-	S	-	-	-	-	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DW104	PSS1/EM1E	874	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW105	PFO1E	1,227	Durham	S	-	-	S	S	S	-	S	-	S	-	-	-
MW1	PSS1	8,078	Madbury	P	-	-	-	-	P	-	-	-	-	-	-	-
MW2	PEM1/PSS1	74,736	Madbury	P	P	P	-	-	P	P	P	-	P	-	P	-
NW1*	PEM1/SS1	75,679	Newington	S	P	-	P	P	P	-	-	-	-	-	S	-
NW3	PEM1/SS1	80,336	Newington	S	P	-	S	S	-	S	-	-	-	-	-	-
NW4	PSS1E/PUB3/PFO14E	48,442	Newington	S	S	-	P	S	S	-	P	-	-	-	S	-
NW6	PSS1C	13,332	Newington	S	P	-	S	-	P	S	P	-	-	-	-	-
NW9	PEM1	44,940	Newington	P	-	-	S	-	-	-	-	-	-	-	S	-
NW10	PSS1E/PEM1E/PFO1B	31,671	Newington	P	-	-	-	-	-	-	P	S	-	-	-	-
NW11	PSS1/PEM1	38,909	Newington	P	P	-	P	P	P	-	S	-	-	-	S	-
NW12*	PSS1E/PEM1E	30,058	Newington	S	S	-	S	-	P	S	P	-	-	-	-	-
NW13	PEM1/PUB	16,815	Newington	S	S	-	S	S	S	S	P	-	-	-	S	-
NW16	PEM1F/PSS1E	47,505	Newington	P	S	-	S	-	S	-	P	-	S	-	S	-
NW17*	PSS1	12,715	Newington	P	-	-	S	S	S	-	-	-	-	-	-	-
NW18	PEM1J/PSS1J	7,003	Newington	S	-	-	P	-	-	-	S	-	-	-	-	-
NW19	PEM1	578	Newington	S	-	-	-	-	S	-	-	-	-	-	-	-
NW20	PEM1J	1,929	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW21	PEM1	6,666	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW22	PFO1E/PSS1E	10,953	Newington	P	-	-	-	-	-	-	S	-	-	-	-	-
NW24	PEM1F/PSS1E/PFO1E	18,186	Newington	S	-	-	S	-	P	-	P	-	-	-	-	-
NW26	PSS1E	15,500	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW28	PEM1J	39,285	Newington	P	-	-	S	-	-	-	-	-	-	-	-	-
NW30	PEM1J	13,978	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW32	PEM1J	11,001	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW34*	PSS1E/PUBb	23,065	Newington	P	S	S	S	-	S	S	P	-	-	-	-	-
NW35	PEM1/SS1/FO1B	8,824	Newington	P	S	-	P	P	-	-	P	-	-	-	-	-
NW37	PEM1/SS1E	33,462	Newington	P	P	S	P	P	P	P	P	-	-	-	-	-
NW39	PEM1/SS1E	2,472	Newington	P	P	-	P	P	P	P	P	-	-	-	-	-
NW41	PEM1E	4,114	Newington	P	P	-	P	P	P	S	S	-	-	-	-	-
NW42	PEM1/UB1E	7,736	Newington	P	P	-	P	P	S	S	P	-	-	-	-	-
NW43	PEM1B	9,495	Newington	P	S	-	P	P	-	S	S	-	-	-	-	-
NW44	PEM1E	4,194	Newington	P	S	-	P	P	S	S	P	-	-	-	-	-
NW45*	PEM1/SS1B	27,199	Newington	P	P	-	P	P	-	-	P	-	-	-	-	-
NW100	PEM1E	6,727	Newington	S	S	-	P	-	-	-	S	-	-	-	-	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
NW102	PEM/PFO/PSS	33,836	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW104	PEM	716	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
NW105	PEM	3,070	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW106	PEM/PSS	6,017	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
PW1	PEM/PSS	2,440	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-
PW2	PEM1/SS1/FO1B	51,333	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW3	PEM1B	2,132	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW4	PEM1E	535	Portsmouth	P	S	-	P	P	-	-	S	-	-	-	-	-
PW5	PEM1/SS1E	2,760	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-

^ GW= Groundwater Recharge/Discharge; FF= Floodflow Alteration; FSH= Fish/Shellfish Habitat; STR= Sediment/Toxicant Retention; NUT= Nutrient Removal; PE= Production Export; SSS= Sediment/Shoreline Stabilization; WH= Wildlife Habitat; REC= Recreation; EDU= Education/Scientific Value; UH= Uniqueness/Heritage; VQ= Visual Quality/Aesthetics; RTE= Endangered Species

* Prime Wetland

PSNH Seacoast Reliability Project (SRP)
Stream Summary Table

Stream ID	Town	Flow Regime	Cowardin Class	Average Width (ft)	Length (ft)	Area (SF)
DS3	Durham	Perennial	R2UB2	5	278	2,016
DS8	Durham	Ephemeral	n/a	1	238	238
DS15	Durham	Intermittent	R4SB4	2	103	154
DS15A	Durham	Intermittent	R4SB4	3	294	881
DS19	Durham	Intermittent	R4SB4	2	344	688
DS32	Durham	Intermittent	R4SB4	3	139	416
DS34	Durham	Ephemeral	n/a	2	48	72
DS35	Durham	Perennial	R2UB4	4	144	575
DS39	Durham	Perennial	R2UB2	3	120	361
DS46	Durham	Perennial	R2UB2/4	5	222	1,110
DS51	Durham	Perennial	R2UB2	2	49	98
DS53	Durham	Perennial	R2UB2	45	428	6,887
DS57	Durham	Perennial	R2UB2	6	226	1,877
DS60	Durham	Perennial	R2UB3	7	189	1,323
DS61	Durham	Perennial	R2UB3	2	236	473
DS61A	Durham	Perennial	R2UB3	2	13	27
DS61B	Durham	Perennial	R2UB3	2	56	112
DS74	Durham	Perennial	R2UB2	5	220	1,100
DS75	Durham	Perennial	R2UB1/2	6	215	1,288
DS92	Durham	Intermittent	R4SB4	3	56	140
DS100	Durham	Ephemeral	n/a	1	65	65
MS1	Madbury	Perennial	R3UB2	4	56	225
NS5	Newington	Ephemeral	n/a	1	391	391
NS8	Newington	Intermittent	R4SB4	5	153	763
NS14	Newington	Ephemeral	n/a	3	115	288
NS36	Newington	Ephemeral	n/a	1	62	62
NS38	Newington	Perennial	R3UB3/4	2	506	1,011
NS40	Newington	Perennial	R3UB2	3	94	283
NS50	Newington	Intermittent	R4SB2	10	35	346
NS51	Newington	Perennial	R3RB2	6	119	712
NS101	Newington	Intermittent	R4SB4	1	61	61
NH107	Newington	Perennial	R2UB2	3	149	447

Appendix C. Wetland Photographs

Wetland NW11: Emergent and Scrub-Shrub Wetland

Wetland DW18: Emergent and Scrub-Shrub Wetland

Wetland DW41: Emergent and Scrub-Shrub Wetland

Wetland MW2: Emergent Wetland

Wetland DW41: Emergent Wetland with Cattail, Sedges and Ferns

Wetland DW67: Emergent Wetland with Cattail and Grasses

Wetland NW28: Emergent Wet Meadow Wetland

Wetland NW30: Wet Meadow with Sedges and Other Hydrophytic Herbs

Wetland NW15: Scrub-Shrub Wetland

Wetland NW26: Wetland that is Primarily Scrub-Shrub

Wetland NW34: Flooded Wetland with Unconsolidated Bottom and Emergent Cover

Wetland DW22: Wetland with Area of Predominantly Forested Cover

Wetland NW4: Wetland with Forested Areas along Edge of ROW

Wetland DNW2: Estuarine Wetland along Little Bay

Wetland DNW4: Estuarine Wetland along Little Bay with Saltmarsh Fringe in foreground and Rocky Intertidal in background