STATE OF MAINE
BOARD OF ENVIRONMENTAL PROTECTION

IN THE MATTER OF

NORDIC AQUAFARMS, INC Belfast and Northport Waldo County, Maine A-1146-71-A-N L-28319-26-A-N L-28319-TG-B-N L-28319-4E-C-N L-28319-L6-D-N L-28319-TW-E-N W-009200-6F-A-N	))))))))))	APPLICATION FOR AIR EMISSION, SITE LOCATION OF DEVELOPMENT, NATURAL RESOURCES PROTECTION ACT, and MAINE POLLUTANT DISCHARGE ELIMINATION SYSTEM/WASTE DISCHARGE LICENSES

PRE-FILED DIRECT TESTIMONY OF ADELE FIORILLO

1. I am Adele Fiorillo, a Professional Wetland Scientist and Senior Project Manager with Normandeau Associates, Inc. I have over 30 years of experience in delineating, evaluating and characterizing freshwater and coastal wetlands (See Addendum A). I also have significant experience in developing and implementing wetland impact compensation programs that include creation, restoration and enhancement of these ecosystems.

2. My role on the Nordic Aquafarms, Inc. project is to provide information to the project team related to freshwater wetlands and streams and coastal wetlands. Additionally, I oversee personnel with specific expertise who undertook a variety of tasks for the project including wetland delineations, vernal pool surveys, stream, wildlife and fisheries assessments and, benthic studies.

3. Between July 2018 and October 2019 I was asked to complete a number of studies and to develop an impact compensation plan on behalf of Nordic Aquafarms, Inc. Nordic Exhibit 8 is the Natural Resources Report of May 8, 2019, in which we provide the methods and results of the wetland and stream determinations, vernal pool surveys, wildlife, fisheries and benthic assessments. Fisheries are addressed in the Natural Resources Report but are summarized by Tyler Parent, a Normandeau fisheries biologist, under separate pre-filed direct testimony.

Wetlands, Streams and Vernal Pools

4. Freshwater wetland boundaries and streams were delineated according to the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), which utilizes the three parameter approach (i.e., evaluating the site for the presence of hydric soils, hydrophytic vegetation and wetland hydrology) for identifying wetlands and determining their jurisdictional limits. Coastal wetlands were identified based on salt tolerant vegetation and tidal observations. NRPA jurisdictional streams were identified based on the criteria outlined in 38

M.R.S.A § 480-B as well as Chapter 310 and the vernal pool survey was completed using Maine Department of Inland Fisheries and Wildlife (MDIFW) guidelines.

5. Wetlands and streams were surveyed at the time of delineation using a Trimble® Global Positioning System (GPS) unit capable of sub-meter accuracy and post-processed against known base stations. These GPS points were translated into a detailed map depicting jurisdictional boundaries using Normandeau's geographic information system (GIS) software. Since the completion of the Natural Resources Report, further wetland delineations and stream status updates were completed. Seventeen freshwater wetlands, two coastal wetlands and six NRPA jurisdictional streams were identified as shown on the Revised Wetland and Stream Survey of November 4, 2019 (Nordic Exhibit 9). Drainages, which are not NRPA jurisdictional, are also shown on Nordic Exhibit 9 for planning and design purposes.

6. A Stream Assessment Report of July 29, 2019 (Nordic Exhibit 10) was undertaken to better evaluate NRPA stream habitat and condition. Wetland scientists from Normandeau conducted the stream assessment utilizing "Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)". The QHEI was developed as an index of macro-habitat quality using physical parameters important to aquatic life. The scoring process assigns numbers to each physical parameter (metric) that, when summed, provide an index that can range in the negative to positive with a maximum score assigned to each metric. The higher the cumulative score the better the habitat quality. Maximum score is 100. A cumulative score of >70 is considered excellent while scores of <30 are considered very poor. The metrics are:

- Substrate
- In stream cover
- Channel morphology
- Riparian Zone
- Pool Quality
- Riffle Quality
- Gradient

7. Eight sampling reaches within six intermittent streams were evaluated utilizing the QHEI method. Overall, each of the streams scored low, between 18 and 42 out of 100 available points. This is largely because each stream was intermittent and mostly made up of silt. Each stream also lacked flowing water that could aid in the identification of pools, glides, riffles and runs with the exception of S8, S9a and S9c (see Nordic Exhibit 10); however, riffles and runs were identified based on substrate formations and not active flowing water. Water quality wasn't conducive to providing fish habitat, particularly in regard to dissolved oxygen with the exception of S8, S9a and 9b. The streams exhibited low invertebrate diversity, largely due to minimal water, and low quality silty substrate, with the exception of S8 and S9c which had higher quality gravel and cobble for substrate. Overall, the streams do not have characteristics conducive to providing fish habitat due to either intermittent flows or no potential connection to known downstream fish habitat, low dissolved oxygen, and poor substrate quality. All of the streams assessed at the Nordic Aquafarms property have low QHEI scores. Therefore, it is unlikely that these streams provide adequate habitat to support viable fish populations and generally represent overall low quality stream habitat.

Wildlife

8. The project site is includes a variety of habitat types assessed during site visits. These include uplands (forested and open fields), freshwater and coastal wetlands, and open water habitats. Forested habitat is either hardwood (+19 acres) or pine (+15 acres) dominated. Stand age and condition, and remnant barb wire fence on site suggests that these areas were previously cleared for farm fields or pasture. Portions of the forested stands appear to have been recently selectively harvested. In the hardwood stand, the cover is dominated by red oak with lesser amounts of red maple, bigtooth aspen, and eastern white pine, as well as small components of six other species (paper birch, sugar maple, eastern hemlock, red spruce, yellow birch, balsam fir). The pine stands are dominated by eastern white pine with lesser amounts of paper birch, balsam fir, red maple, and bigtooth aspen, and a small component of American beech and northern white cedar. The variety of hard and softwood species provides multiple sources of food for wildlife, including acorns, other seeds, and browse, as well as shelter. Some smaller snags are present and a few larger trees have hollows, but due to the age of the stand as secondary growth, these features are not abundant. The open field habitat on-site appears to be regularly mowed for hay, which reduces its value for wildlife habitat. However, regularly mowed hayfields do provide habitat for snakes and frogs in summer, and for certain small mammal and bird species year round. The species of bird most likely to use hayfields varies with the season and the height of the vegetation as discussed more fully below in paragraphs 10-13. The project site supports some wetland habitats, including intermittent streams. Due to the soils present on-site, these wetland and stream habitats have a minimal hydroperiod, limiting their value to wetland-dependent wildlife species that require more constant levels of inundation. However, the intermittent streams on-site do provided some suitable habitat for wetland-associated wildlife species adapted to a limited hydroperiod, including certain stream-breeding salamanders and aquatic invertebrates. Specifics related to species groups are provided in the Natural Resources Report and reiterated here.

9. Reptiles and Amphibians – Seasonal conditions during the site visit were not suitable for observing reptiles or amphibians. However, the species potentially present can be estimated based on known distributions and the type of habitat available within the project site. Turtles are not expected to use the site due to the lack of wetland habitats, and turtles that may use the adjacent reservoir are unlikely to use the site as nesting habitat due to its generally wooded, shaded conditions and soil type (see Nordic Exhibit 8). Likewise, shaded forest habitats are less preferred by the snake species with a known range that coincides with the project site, except for the common garter snake, which is expected to be present throughout the site. Milk, ringneck and northern red-bellied snakes may also be present, but would most likely be restricted to forest edges and the field habitats. Because there are no open water freshwater wetlands or vernal pools present on the parcel, the amphibian species likely to be present are the northern red-back salamander, a forest-dwelling species which does not require water to breed, and those species adapted to a limited hydroperiod and/or which may have suitable breeding habitat in adjacent areas and that are capable of traveling widely during the non-breeding season, including eastern newt, northern two-lined salamander, and American toad. Based on known distribution and habitat preferences of Maine's special status reptile and amphibian species, none of these species are expected to use habitats within the project site.

10. Birds - A project-specific avian survey was not conducted. However, bird records from the Little River Hiking Trail (LRT), located immediately south of the site have been submitted to e-Bird since 2016, and records from the Perkins Road fields (PRF), just to the north of the site, have been submitted to e-bird since 2013. The habitat surrounding the LRT is essentially the same as the forest habitat on-site, and the on-site field habitat is the same as across the road from the hayfields on Perkins Road. Therefore, the records from these two locations provide a good indication of the species likely to be present at the project site, and are listed in Nordic Exhibit 8. Species from the LRT that are strictly associated with water (the reservoir) are not included in this list. Also note that species that prefer larger fields (e.g., bobolink, savannah sparrow), or that are commonly associated with buildings/human activity (e.g., European starling, house sparrow) are less likely to be present on-site, as the field is smaller than the adjacent hayfield, and has no houses/buildings. Based on e-bird reports, the species expected to use the TWWH within the Project Area include all of the common sea duck and shorebird bird species that occur in this region of Maine. Shorebirds commonly use the Maine shoreline as stopover and feeding habitat during migration, especially during mid- and late summer, while sea ducks primarily use it as overwintering habitat, roughly from late October to April or early May.

11. Of the terrestrial species that likely use the on-site habitats, based on their habitat preferences and e-bird records, eight are listed as Special Concern (SC), and five designated as Species of Greatest Conservation Need (SGCN) in *Maine's Wildlife Action Plan*. None are listed as State or federally threatened or endangered. Eleven of these 13 special status species are long-distance migrants that spend the winters in Central or South America and their summers in northern latitudes. The wood warblers (American redstart, northern parula, black and white, chestnut-sided, black-throated green, and black-throated blue warblers) depend on upland forest habitats for feeding and breeding, as does the eastern wood-pewee, while the veery uses understory thickets associated with water courses and surrounding uplands, and bobolinks and barn swallows use open fields. The two short-distance migrants, the purple finch and white-throated sparrow, use a variety of edge and wooded habitats. All 13 species are likely to use the site during migration, and have at least some potential to nest on-site. Of the 19 water bird species with a high likelihood of using the TWWH associated with the intake and outfall pipes, based on e-bird records, three are listed as SC (greater scaup, lesser yellowlegs, semipalmated plover), and four additional species are designated as SGCNs (common eider, least sandpiper, long-tailed duck, semipalmated sandpiper). None are listed as State or federally threatened or endangered.

12. Tidal Waterfowl and Wading Bird Habitat – Designated TWWH will be temporarily impacted during the construction of the area to be trenched and the installation of the intake and outfall pipes. This impact area is located in larger intertidal area that extends roughly from the mouth of the Little River southwards for about ¾ of a mile to Browns Head, a Point on the Northport, ME shoreline, covering over 4 million square feet. The value of TWWH is associated with feeding habitat that it provides for waterfowl and wading bird species, generally intertidal mudflats, eelgrass and mussel beds where they can forage for aquatic invertebrates. The intertidal area that will be impacted by the project has a cobbly and firm substrate and does not support any mussels, eelgrass, or shellfish beds.

13. Inland Waterfowl / Wading Bird Habitat - Forest cover is generally present right up to the shoreline, which is also relatively steep, and there is no shoreline emergent vegetation to provide

cover. All these attributes make the shore low value habitat for inland waterfowl and wading birds. The reservoir itself does provide some opportunity for these species to loaf or feed, especially ducks, which e-bird records indicate are observed on the reservoir in moderate numbers during migration, especially in the spring. The project does not propose any changes to Reservoir One or the adjacent shoreline.

14. Mammals – Conditions during the site visit were ideal for tracking, and track and sign of eight mammals species were observed in the forested portion of the site, including white-tailed deer, red fox, coyote, fisher, grey squirrel, red squirrel, deer mouse, and porcupine. Based on the timing of the last snowfall, most tracks were less than 24 hours old. Deer, red squirrel, and porcupine sign was common, but not abundant, scattered throughout the parcel, and included scat as well as tracks, sign of feeding, and an actively-used porcupine den located under the overhang of S3. Tracks for the predator species were less abundant, but relatively wide ranging across the parcel. Deer may feed in the field portion of the site, especially in spring and mice, voles and shrews likely use this habitat year-round, and coyote and fox in turn hunt for these small mammals in the field on occasion, throughout the year.

15. All of Maine's eight bat species are listed, and based on known distribution and the habitat available, all have some potential to be present during the summer. The forest cover on-site provides ample summer roosting habitat for the foliage-roosting species (eastern red, hoary, and silver-haired bat, all listed as SC) as well as the northern long-eared bat (State Endangered SE, Federally Threatened FT), which roosts under loose bark and tree trunk crevices and hollows. Structures on-site and nearby provide potential summer roosting habitat for little brown bats (SE) and big brown bats (SC), and forest edges and the nearby reservoir provide suitable feeding areas for all these species as well as the eastern smallfooted bat (State Threatened ST). No other listed mammals are expected to be present. Tree removal in winter will avoid any impact to bat species.

16. Invertebrates – Based on known distribution and habitat preferences of Maine's special status invertebrate species, none of these species are expected to be present within the project site.

<u>Benthos</u>

17. Eight sediment samples from Belfast Bay were taken on November 29, 2018 using a 4-inch diameter Vibracore, to determine what benthic species are present in the subtidal areas of Belfast Bay (See Nordic Exhibit 8). Although some of the benthic sampling stations are no longer along the current proposed pipeline, based on the similarity among samples taken, it is very likely that the benthic habitat along the current pipeline is very similar to sampling locations up to 1,000 ft to the south and provides an adequate representation for this analysis.

18. The top 6 inches of each core were thoroughly washed in the field through a 500-micron mesh sieve and preserved in rose bengal stained, 10% buffered formalin. Samples were shipped for processing to the Normandeau Biological Laboratory in Bedford, NH, with appropriate chain of custody forms. In the laboratory, macroinvertebrates were washed through a 500-micron mesh sieve. All soft substrate macrofaunal organisms were identified to the lowest practical taxon (usually species) and enumerated, with the exception of groups which, by convention, are

identified to higher taxa (e.g., nemerteans, nematodes, and oligochaetes). Immature or damaged specimens missing the necessary diagnostic features for identification to the target taxonomic level were identified to the lowest practical taxon. Quality control checks were performed on 10% of all samples processed, with at least 90% of the organisms from each sample being removed.

19. The intertidal substrate is firm sand with an abundance of cobble and some boulders. A Coastal Wetland Characterization – Intertidal and Shallow Subtidal Check list was completed (See Nordic Exhibit 8). The deeper portions of the subtidal substrate along projected pipe path was determined based on sediment cores and underwater video and is characterized as mostly homogenous sandy/silty/muddy sediment with cobble mixed in.

20. Overall, abundance of benthic organisms was relatively low (See Nordic Exhibit 8). A total of 18 species or species groups were identified: two nemerteans (ribbon worms), 12 annelids (including 10 polychaetes, one oligochaete, and one archannelid, a primitive form of polychaete), one gastropod (snail), and three bivalves (clams). The mean number of individuals per sample ranged from 1.0 at to 12.8. Two species groups accounted for a majority of the abundance: bivalves (57%) and polychaetes (including archiannelida, 37%).

21. Impacts to the benthos in the Project Area during construction and operation of the Nordic Aquafarms salmon aquaculture facility will be both temporary and permanent. The temporary impacts, including increased turbidity during dredging, rock removal, and pipe burial; and underwater noise from dredging, hoe ramming, pile driving, and construction vessels will be short term and occur only during construction (from November 1 through April 1). The permanent impacts will include the loss of soft bottom habitat, converting to hard substrate with the two intake pipes,one discharge pipe and the anchoring system. The loss of this area is minimal considering the the amount of similar available habitat throughout Belfast Bay as well as the anchoring design which supports the pipe above the substrate. The addition of hard substrate in the form of the intake and discharge pipes will provide a positive component to an otherwise predominately soft substrate for colonization by marine organisms.

Key Findings

22. The freshwater wetlands to be impacted by the project are not unique, represent disturbed conditions from logging in the case of forested areas and agricultural activities in the case of the wet meadows. Additionally, the freshwater wetlands exhibit marginal wetland characteristics relative to soils and vegetation. The Project Area encompasses approximately 57 acres and the wetlands represent only 9.65% (5.5 acres) of the Project Area. Based on project needs (land area, proximity to ample fresh and salt water) it is not unreasonable to have the level of wetland impact proposed.

23. The streams to be impacted on the project site exhibit an intermittent flow regime resulting from upslope storm water runoff that creates enough flow to erode these highly erodible soils which develop narrow channels. By controlling the flow at the lower reaches and improvements provided in the compensation plan as proposed (see paragraph 34), Reservoir Number One will benefit from the reduced sediment load. Overall habitat quality is low for aquatic organisms,

flows are intermittent and therefore proposed impacts do not represent a significant loss in aquatic habitat. Although stream S9 is channelized at the lower reaches it is the only stream shown on USGS maps and there are areas within the upper reaches that have good quality riparian habitat. This stream was given due consideration during project development for avoidance and plays a significant role in the impact compensation plan (see Nordic Exhibits 11 and 12 as discussed below).

24. There are no vernal pools present on the project site.

25. The coastal wetlands on the project site include salt marsh, cobble beach, intertidal and subtidal environments of Belfast Bay. The salt marsh is a narrow fringe at the upper reaches of the tide. The cobble beach transitions quickly to a mix of sand, silt, mud and cobble in the intertidal and subtidal areas. Impacts are predominately temporary or, where permanent, are relatively small and therefore are not unreasonable.

26. Forested and meadow habitats are varied and therefore represent opportunity for wildlife species diversity. However, the habitats are not unique and therefore do not represent an unreasonable or significant loss of habitat for any given species and tree removal in winter will avoid any impact to bat species.

27. Designated TWWH will be temporarily impacted during the construction of the area to be trenched and the installation of the intake and outfall pipes. This is not unreasonable given the temporary nature of the impact and the fact that there is ample similar habitat nearby that highly mobile species such as birds can easily access. Additionally, because the work period will vary with tides, birds may acclimate to the presence of the equipment and use the area when active work is not being conducted.

28. Inland Waterfowl / Wading Bird Habitat is outside of the Project Area.

29. The abundance of benthic organisms was relatively low. The permanent impacts include the loss of soft bottom habitat, converting to hard substrate with the two intake pipes and one discharge pipe. The loss of this area is not unreasonable as it is minimal considering the pipe anchoring design which reduces impacts to the substrate and the amount of similar available habitat throughout Belfast Bay. The addition of hard substrate in the form of the intake and discharge pipes will provide a positive addition to the substrate for colonization.

<u>Impact Summary</u>

30. Freshwater wetland impacts total 196,030 square feet of which 3,960 square feet are temporary. Permanent impacts will be compensated via payment to the in-lieu-fee program and on-site improvements to 91,065 square feet of riparian area restoration along S9. Temporary impacts will be restored in place.

31. Impacts to intermittent streams total 1,988 linear feet of which 120 linear feet are temporary. The project will compensate for the permanent impacts via on-site improvements of 1,623.50

square feet to streams and drainages and improvements to aquatic passage. Temporary impacts will be restored in place.

32. Coastal wetland impacts total 638,580 square feet of which 631,877 square feet are temporary and will be restored in place. Permanent impacts will be compensated through payment to the in-lieu-fee program.

33. Impacts to Natural Resources have been tabulated and are provided in Nordic Exhibit 13 and shown on Wetland and Stream Impact Mapping of October, 2019 (Nordic Exhibit 12).

Compensation Plan

34. A Natural Resources Impact Compensation Plan of May 10, 2019 (Nordic Exhibit 11) was developed to compensate for unavoidable impacts and represents a combination of a payment to the in-lieu-fee program and permittee-responsible on-site compensation. All temporary impacts are to be restored in place and are not included in fee calculations. Design changes and additions to the overall project impact compensation package are reflected in an updated Impact Compensation Plan of November 4, 2019 (Nordic Exhibit 14).

- Permittee-responsible on-site compensation includes:

S9:
- Riparian buffer restoration (91,065 sq ft)

S3 Western Bank:
- Native plantings after bridge replacement (160 sq ft)
- Revegetation with native plantings (297 sq ft)

S3 Eastern side:
- Stone steps along steeply sloped trail (195 sq ft)
- Slope stabilization with native plantings (390 sq ft)

S5:
- 166.5 sq ft of stream bed protection with a new bridge

S6:
- 325 sq ft of stream bed protection with a new bridge
- Revegetation with native plantings on both sides of bank (100 sq ft)

D7:
- Stabilize slopes at plunge pool with native plantings (90 sq ft)

35. The permittee-responsible on-site compensation totals 92,688.50 sq ft which offsets the calculated in-lieu-fee payment at a 1:2 ratio.

- The Calculated payment into the in-lieu-fee program is $613,466.48

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Dated December 10, 2019

By. Adele Fiorillo

Adele Fiorillo, Professional Wetland Scientist
Normandeau Associates, Inc.

STATE OF New Hampshire
County of Rockingham, ss.

December 10, 2019

Personally appeared the above-named Adele Fiorillo and made oath as to the truth of the foregoing pre-filed testimony.

Before me,

Amber MacDonald

Notary Public / Attorney at law

AMBER D. MACDONALD
Notary Public-New Hampshire
My Commission Expires
March 21, 2023

SWS PCP
CERTIFICATION
ADELE F. FIORILLO
000832
PROFESSIONAL WETLAND SCIENTIST

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

ADELE F. FIORILLO, PWS, NHCWS
Principal Wetland Scientist

Ms. Fiorillo is a Principal Scientist with over 30 years of experience. She is responsible for a variety of professional services including: project team development and management; wetlands delineation; mitigation plan development/ implementation; environmental impact evaluations; wetlands analysis and permit applications for federal, state and local entities. Her project experience includes energy, transportation and real estate development projects as well as projects for communities and non-profit groups. She has prepared Environmental Assessments and Categorical Exclusion documents to comply with the National Environmental Policy Act (NEPA). Ms. Fiorillo oversees the Terrestrial Wetlands Group in Normandeau's Maine, New Hampshire and Vermont offices, collaborates with multi-disciplined project teams, establishes and oversees project staff and budgets, defines scoping guidelines and stays updated on changes in environmental regulations. Ms. Fiorillo teaches graduate courses in Wetlands Ecology and Marine and Coastal Processes. Technical expertise includes fresh water and coastal wetland ecosystems.

EDUCATION

M.A., Marine Biology, San Francisco State University

B.A., Biological Sciences, University of California, Berkeley

PROFESSIONAL EXPERIENCE

2010-Present	Normandeau Associates
2009-2010	GZA Geo Environmental
1998-2009	NHSC, Inc.
1994-1998	Wetlands Preservation, Inc.
1990-1994	Tiburon Center for Environmental Studies
1986-1989	Tenera, Corporation

PROFESSIONAL CERTIFICATIONS

- Professional Wetland Scientist, Society of Wetland Scientists #823
- NH Certified Wetland Scientist #064
- Certificate of Completion – Project Management Institute (2008)
- Maine DIFW Credentialed Vernal Pool Observer

PROFESSIONAL AFFILIATIONS

- Society of Wetland Scientists – Life Member
- New Hampshire Association of Natural Resource Scientists – Member
- Adjunct Professor University of Massachusetts, Lowell Department of Civil and Environmental Engineering
- Gulf of Maine EcoSystem Indicator Partnership – Climate Change Committee Member
- Hodgson's Brook Advisory Board Member

REPRESENTATIVE PROJECT EXPERIENCE

City of Saco, ME Wetland Consultant (2017- present). Oversaw over seventeen property assessments for the City of Saco, including wetland delineations, vernal pool surveys and reporting. Also completed a number of peer reviews of wetland delineations completed by others on behalf of the City. Senior Project Manager

Maine DOT Route 95 Exits 48-53 (2017-2018). Oversaw wetland and stream delineations, vernal pool survey and reporting for this 5 mile stretch of highway improvements. Senior Project Manager.

Gas Line Expansion, Liberty Utilities, Pelham, NH (2017). As a sub, Normandeau Associates completed wetland delineations, determined the ordinary high water mark for Shoreland jurisdiction related to Beaver Brook, completed a Shoreland tree inventory and rare species surveys (plants, turtles and snakes) for a 5-mile gas main and meter station. Normandeau worked with the project team to analyze alternative routes and identified permitting needs on the local, state and federal levels and obtained all required permits which included New Hampshire Shoreland Permits for the gas main and meter station and, working closely with the Town of Pelham, obtained permits for work in the wetlands conservation district and site plan review. Once permits were issued Normandeau provided construction monitoring and permit compliance services. Senior Project Manager.

Pennichuck Water Works, Merrimack/Litchfield, NH (2016-2019). This project involves a Merrimack River water main crossing proposed by Pennichuck Water Works. Normandeau delineated the areas under the jurisdiction of the New Hampshire Department of Environmental Services Wetlands Bureau, Shoreland Program and the Army Corps of Engineers, completed rare plant and mussel surveys, compiled state and federal permit applications to request authorization for unavoidable wetland and shoreland impacts. Senior Project Manager.

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Environmental Support for Structure Replacements for various 345-kV lines (3195, 307, A253) Eversource, southern NH (2017-Present). Normandeau performed wetland delineations, vernal pool surveys and complied state and local environmental permit applications for several structure replacement, maintenance, and capital improvement projects. Senior Project Manager.

Gorham, ME Schools 6F conversion (2017). The Gorham Schools Land and Water Conservation Fund (LWCF) conversion project required the development of an Environmental Assessment to evaluate the proposed action and alternatives for the relocation of four tennis courts from the Gorham High School site and four tennis courts from the White Rock School site. Ms. Fiorillo oversaw the preparation of a Project Description and Environmental Screening Form (PD ESF), and an Environmental Assessment (EA) for the proposed activity defined as the conversion of LWCF restrictions from two sites to a third site. The EA followed federal guidelines and included Chapter 1 – Purpose and Need, Chapter 2 - Description of Alternatives, Chapter 3 - Affected Environment, Chapter 4 - Environmental Impacts, Chapter 5 - Coordination and Consultation. Resources reviewed included geology, air quality, water quality, stream flow, wetlands, floodplains, land use and planning, transportation, wildlife habitat and other biological resources, recreation, aesthetics, historical resources, socioeconomics and an effects analysis. Senior Project Manager.

NHDOT, Northfield and Tilton, NH (2014-2017). As a sub, Normandeau performed environmental services related to rehabilitation of the two existing bridges carrying I-93 over the Winnipesaukee River between the Towns of Northfield and Tilton. Environmental efforts included wetland reviews, agency coordination preparing environmental documents and permit applications. Project Manager.

Gorham, ME Schools Mitigation Monitoring (2011-2015). Oversaw a 5 year monitoring program for a 25,377 square feet of bordering wetland buffer enhancements, including implementation of the grading and planting, data plot establishment. Monitoring included hydrology and soil conditions and vegetation survival and aerial coverage by species. Invasive species we noted and management options provided. The monitoring plan also included a reference site. Senior Project Manager.

NH Route 101A Construction, NHDOT, Milford to Nashua, NH (2011-2013). Normandeau conducted agency consultations and performed wetland delineations for the approximately 7-mile project as a sub. Project Manager.

Pole Replacement Wetland Permitting for E-194 Line, Eversource Energy, Portsmouth, NH (2016-2017). Under an Emergency authorization Eversource Energy replaced a damaged utility pole on the E-194 line. Ms. Fiorillo oversaw the delineation of wetlands and compiled and obtained an after the fact wetlands permit for the work that occurred in a City of Portsmouth Prime Wetland and in the vicinity of a nesting peregrine falcon. Senior Project Manager.

Residential Dock Expansion for Cook Dock, Residential Client, Dover, NH (2014–2016). Ms. Fiorillo provided expert testimony on appeal of this dock expansion project which was denied a permit. She established and defended the highest observable tideline to establish regulatory jurisdiction, oversaw the development of an assessment for Essential Fish Habitat and characterized the benthic environment. Senior Project Manager.

Peirce Island Wastewater Treatment Facility Upgrade, City of Portsmouth, NH (2013-2016). The City of Portsmouth is undergoing a facility upgrade to meet mandated Environmental Protection Agency effluent guidelines. Completed wetland delineations, shoreland tree inventory, rare species survey, developed a permitting needs assessment for the project concept, coordinated with the Wetland Bureau for investigations related to geotechnical borings and archaeology. Worked with the project team to apply for and obtain state and federal approvals for work in tidal and freshwater wetlands. Senior Project Manager.

Confidential Pipeline, Confidential Client, PA, NY, MA, CT, NH (2014-2016). Ms. Fiorillo was Normandeau's Project Manager for environmental data collection and permitting efforts associated with this pipeline project, which consisted of approximately 400 miles of new, adjacent and looping pipelines carrying natural gas from the Marcellus Shale fields to New England. Ms. Fiorillo provided a critical issues analysis of alternative routes and was responsible for overseeing wetland and vernal pool delineation and Section 404 permitting in New Hampshire. She also oversaw all endangered species studies for this multi-state project and worked closely with the owner's prime engineering consultant, other subconsultants, and Normandeau staff based in multiple offices throughout the East. Senior Project Manager.

Wentworth Scrap Metal, Ransom Consulting, Portsmouth, NH (2014). Normandeau worked with Ransom to obtain local permits from the City of Portsmouth to construct a contaminated soil cap/cover system as part of NH DES-approved remedial action plan for an active scrap metal yard. Normandeau completed wetlands delineation to establish buffer limits, wetland functions and values assessment and compiled a Conditional Use Permit Application which was presented to the Conservation Commission and Planning Board for approval. Senior Project Manager.

326 Line Thermal Uprate Project, Public Service of New Hampshire, NH and MA (2012-2013). Public Service of New Hampshire (now Eversource) was planning to upgrade the existing 326 line to carry higher voltage. Ms. Fiorillo coordinated field crews for wetland delineation and venal pool identification and obtained permits for work along the 18-mile long thermal uprate project in three communities in western New Hampshire and Massachusetts. Provided construction management and permit compliance in 2013. Senior Project Manager.

Violation Resolution, Torromeo Industries, Kingston, NH (2011-2014). Previous wetland fills and stream channel relocations associated with past practices within a sand and gravel quarry operation resulted in issuance of Environmental Protection Agency and New Hampshire Department of Environmental Services violations. Full compliance will include wetland restoration, stream channel relocation, new process and stormwater retention facilities, compensatory mitigation and supplemental environmental projects as mitigation. Ms. Fiorillo obtained stereo pair aerial photos and color infrared (CIR) aerial photos, test pit data and geo-referenced data overlays to complete an aerial photo analysis of historic wetland and stream violation impacts in conjunction with the violation resolution. Ms. Fiorillo also compiled Individual 404 Permit and 401 Water Quality Certification applications for the after the fact impacts. Task Manager.

Stormwater Ordinance Development, Piscataqua Region Estuaries Partnership, Strafford, NH (2012). Worked with the Town of Strafford, NH to develop a stormwater ordinance under a Piscataqua Region Estuaries Program community technical assistance grant. The goal of the project was to add stormwater management and erosion and sediment control regulations to existing subdivision and site plan regulations. Worked directly with the Town, presented Low Impact Development technologies to the Planning Board, attended informational meetings, wrote the ordinance and completed a review of the existing ordinance to coordinate all aspects of the new and existing ordinances. Project Manager.

Town-wide Wetland Modeling, Piscataqua Region Estuaries Partnership, Kittery, ME (2011). Oversaw the development of a Global Information System model under a Piscataqua Region Estuaries Program community technical assistance grant for the Town of Kittery, ME. Using ESRI ArcMap 10.0 and Spatial Analyst, the project team incorporated multiple spatial raster datasets, including conventional and LIDAR topography data, NWI wetland mapping, NRCS soil mapping, remotely sensed land use data, ground truthing and hydrography data. Each input was scored based on its relative ability to predict wetlands and vernal pools. The results of the model analysis and a natural breaks classification produced a town-wide map that indicated areas with high wetland probability. Project Manager.

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Ayers Island Dam Retrofit, Public Service of New Hampshire, Bristol and New Hampton, NH (2011). Normandeau Associates, Inc. was the environmental consultant for the Ayers Island Dam Earthquake Retrofit project. The project was mandated by the Federal Energy Regulatory Commission. The Ayers Island dam is the northernmost hydro station in the Merrimack River Basin and is located on the Pemigewasset River between Bristol and New Hampton, NH. The dam came into service in 1924 and is the highest dam on the river at 80 feet. A downstream fish passage sluice and trap were installed in 1988 to allow passage of native fish. In 2004, PSNH in conjunction with New Hampshire Audubon relocated an osprey nest that was located on an anchor to a cable car used to access the dam. The nest was relocated to a pole on the south eastern side of the dam and is active every year. As the project manager, Ms. Fiorillo identified natural resources on the project site, coordinated and attended state agency meetings to discuss permitting requirements and worked with PSNH and site contractors to develop a work plan that eliminated the need for permitting, with the exception of a dewatering permit from the Environmental Protection Agency under the National Pollution Discharge Elimination Systems (NPDES). Normandeau developed and oversaw the implementation of a limit of work plan, including specific sediment and erosion controls, to avoid inadvertent impacts to natural resources during construction and provided on-site training to the contractors for NPDES compliance. Project Manager.

Groundwater Withdrawal Permit Monitoring, Aquarion Water Company Wells 20 and 21, Hampton, NH (1998-2011). Aquarion Water Company provides drinking water to a number of southern New Hampshire communities through the use of groundwater wells. Ms. Fiorillo, under a previous employer, provided support for obtaining a Large Groundwater Withdraw permit, developed a long term wetland monitoring program within the zone of influence of the water supply wells and control sites. With Normandeau Ms. Fiorillo continued to coordinate and oversee the ongoing monitoring and reporting program. Monitoring included assessing vegetation plots, soil profiles and piezometer level readings. Project Manager.

Conservation Land Assessment, The Nature Conservancy, Swanzey, NH (2010). The Nature Conservancy grant application to the state of New Hampshire Aquatic Resources Mitigation Fund to secure funding to purchase the Ashoulet River property required an assessment of wetland functions and values and the restoration potential. Ms. Fiorillo oversaw the completion of these studies and a written report in support of the grant funding application. The application was successful and the grant was awarded. Project Manager.

Student Housing, Capstone Company, Durham, NH (2010-2011). Completed a natural resource review and provided permitting assistance on a 41-acre site proposed for development. The project scope included a review and delineation of wetlands, finalizing a soil survey and wetland functions and values assessment. Normandeau reviewed the wetland delineation completed by others and modified the boundary based on current methodologies. A site specific soil survey was also completed. The objective of the soil survey was to provide a soil map of the site showing limitations to development, including hydric soil boundaries where observed, depth to bedrock and seasonal water table. The survey also included an estimated seasonal water table (ESHWT) review for use by project engineers in developing the stormwater management plan. Site assessments, including a wetland functions and values assessment using the Army Corps of Engineers Highway Methodology (1999), were completed to address the Town of Durham Wetland Conservation Overlay District (WCO) and Shoreland Protection Overly (SPO) District requirements as they relate to the project proposal and to quantify the impacts on the basis of wetland, shoreland and upland buffer function. From this assessment a mitigation plan was developed to provide enhanced wetland, shoreland and upland buffer function to the extent that proposed impacts would be fully mitigated. Ms. Fiorillo attended town Conservation Commission and Agency meetings to present the project, compiled a wetland permit application which included requests for reviews of natural resource databases and review of the Division of Historic Resource files. A permit was successfully obtained from the New Hampshire Wetlands Bureau. Project Manager.

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Violation Resolution, 23 Regina Road, Portsmouth, NH (2013-Present). The property owner inadvertently cut trees in the wetland on the property, unaware that the City of Portsmouth had an ordinance requiring a conditional use permit to do this work. Ms. Fiorillo oversaw the completion of a wetland delineation to characterize potential wetland violation and developed a violation remediation plan, oversaw plan implementation and monitoring of the remediation plan. Project Manager.

Great Bay Eelgrass Study, Great Bay Municipal Coalition, Multiple Communities, NH (2013). The Great Bay Municipal Coalition communities of Dover, Rochester and Portsmouth contracted with Normandeau to evaluate eelgrass habitat in the Great Bay as part of the coalition's investigations resulting from the Environmental Protection Agency's mandate for nitrate reductions related to sewage treatment facility outfalls. Ms. Fiorillo oversaw all aspects of the project from eelgrass surveys to final report. Project Manager.

Portsmouth International Airport Obstruction Clearing, Pease Development Authority, Portsmouth, NH (2011–2014). The Portsmouth Airport is required to maintain a certain level of clear landing area for airplane take-off and landing safety. Ms. Fiorillo performed wetland delineations on and off the airport property and oversaw a rare plant survey to support planned obstruction clearing to meet Federal Aviation Administration safety requirements. Wetland permitting will be undertaken during a future phase of the project. Project Manager.

Wetland Services, 1900 Lafayette Road, Portsmouth, NH (2014). This Portsmouth property was targeted for development for a medical facility. Ms. Fiorillo completed a wetland delineation, compiled and obtained a wetlands permit for minor wetland fill on this site. Project Manager.

Pease Golf Course, Pease Development Authority, Portsmouth, NH (2011-Present). The Pease Golf Course was redesigning 18 of the 27 holes including fairways, greens, tees and irrigation ponds. Ms. Fiorillo oversaw the field team in the delineation of wetlands and hydric soils. She also directly coordinated local, state and federal wetland permit applications, attended agency and board meetings to represent the project and designed grading and planting specifications for stream and wet meadow restoration and wetland creation. Currently providing monitoring of, and reporting for, the wetland mitigation sites. Project Manager.

Route 4 Bridge Replacement, New Hampshire Department of Transportation, Durham New Hampshire (2013-2014). The New Hampshire Department of Transportation (NHDOT) is proposing the replacement of the bridge over Bunker Creek on US Route 4. The bridge, originally built in 1933, has deteriorated to an extent that necessitates complete replacement. US Route 4 is a major artery that connects Concord, NH and points west with the City of Portsmouth, NH to the east. The bridge is currently 12.8 feet above the mean low water line of the tidally influenced Bunker Creek. Bunker Creek discharges immediately south of the bridge into the north side of the Oyster River, which subsequently discharges into Little Bay. Ms. Fiorillo completed resource area delineations and oversaw rare, threatened and endangered, and invasive species surveys. Ms. Fiorillo attended Natural Resource Agency and Historic Resource Agency coordination meetings and coordinated the completion of a NEPA categorical exclusion. Project Manager.

Northern Pass HVDC New Hampshire Transmission Line Expansion Project, Public Service of New Hampshire, Multiple Locations, NH (2010-2015). This electric utility project is proposed to bring hydro-electric power from Canada into New Hampshire and the New England Power Grid. The project encompasses a nearly 200-mile electric transmission line consisting of an HVDC line extending from the US/Canada border to a converter terminal in Franklin, NH, and a 345 kV AC line from Franklin to Deerfield, NH. Ms. Fiorillo was responsible for the coordinated of all field surveys including the delineation of all wetlands and streams, surveys of vernal pools, botanical and wildlife habitats, and rare, threatened and endangered species. Ms. Fiorillo also supported cultural, visual and socio-economic resources studies and oversaw the reporting of data for Site Evaluation Committee submittals. Resource Evaluation Team Lead.

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Slayton Hill Roadway Reconstruction, City of Lebanon, Lebanon, NH (2013-2015). Slayton Hill Road crosses over the Mascoma River in Lebanon, NH. The City of Lebanon experienced historic weather events of the spring and summer of 2013, which caused widespread damage throughout the region. These storms caused significant damage to the road, culverts and drainage areas. A two-mile stretch of Slayton Hill Road was washed out during these rain events. Ms. Fiorillo coordinated a six person field crew for the delineation of wetland resources, wetland characterization and functional assessments for a roadway and bridge reconstruction over the Mascoma River. Ms. Fiorillo also provided site plan review and engineering support during the design phase of the project. Task Manager.

Eelgrass Study, Riverside & Pickering Marine Contractors, Newington, NH (2013). Riverside & Pickering Marine Contractors provide services for the construction of wharfs and piers, tug and barge services, and dredging. When developing a new facility for their operations in Newington, NH Normandeau provided support to the permitting effort by performing an eelgrass survey in the vicinity of the proposed pier. Ms. Fiorillo oversaw the Normandeau survey team completing the eelgrass survey which included underwater video and GPS location of eelgrass bed boundaries, developing a map and writing a report. Ms. Fiorillo also coordinated with the project team and attended regulatory meetings. Project Manager.

Environmental Assessment, Bureau of Ocean Energy Management, Massachusetts (2012-2014). Prepared the natural resource sections of an Environmental Assessment and a Biological Assessment (Section 7 Consultation) for commercial wind leasing and site assessment activities on the Atlantic Outer Continental Shelf (OCS). Lease areas considered in these analyses included the Massachusetts Wind Energy Area (WEA) and the Massachusetts/Rhode Island WEA, located in Federal waters south of Martha's Vineyard. Normandeau was responsible for analyses related to noise (acoustic environment), birds and bats, marine mammals, sea turtles, threatened and endangered species, wetlands, and commercial and recreational fisheries. Ms. Fiorillo authored the section related to tidal wetlands. Task Manager.

Golf Course Maintenance Permitting, Wentworth by the Sea Country Club, Rye, NH (2013-2019). The Wentworth by the Sea Country Club was planning to undertake a series course renovations to the course the creation of water features, installing or replacing drainage in fairways, raising the grades of some fairways, installing and/or repairing low stone retaining walls, re-grading and re-sodding tee boxes, extending some tee boxes and stone dust cart paths, installation of a 12' X 16' barbeque grill pad on pervious pavers, and renovating sand bunkers. Due to the course location along the tidal reaches Piscataqua River nearly all the proposed work was within the regulated 100-foot tidal buffer zone. Ms. Fiorillo worked with the golf course management team to develop a maintenance and improvement program, oversaw tidal and freshwater wetland delineations, coordinated the with Natural Heritage Bureau due to the documented presence of rare plant and avian species, met with the Rye Conservation Commission and state agencies and, compiled and obtained wetland and shoreland permits to allow for the implementation of these course improvements. Project Manager.

Taylor River Bridge, Route 95, New Hampshire Department of Transportation, Hampton and Hampton Falls, NH (2012). The New Hampshire Department of Transportation (NHDOT) proposed the replacement of the I-95 Bridge over the Taylor River in Hampton and Hampton Falls, New Hampshire. The Taylor River flows for approximately 12 miles through southeastern New Hampshire before joining with the Hampton River to empty into the Hampton Harbor estuary of the Atlantic Ocean. Taylor River Pond is an impoundment created by an earthen dam on the Taylor River, and is located immediately west of Interstate 95 (I-95). The dam is crossed by a bridge which carries I-95 over the outflows of Taylor River Pond. I-95 currently carries the eight lanes of I-95 over the Taylor River and is integrated into the earthen dam that forms the Taylor River Pond impoundment. The proposed project includes the replacement of the existing I-95 Taylor River Bridge to support approximately 90 feet of I-95 length, with a 72-foot clear span between abutments under the roadway. Ms. Fiorillo coordinated the field identification of freshwater and tidal wetlands, streams, vernal pools and an invasive

species inventory. Ms. Fiorillo also supported natural resource characterization, functional assessments and site plan development. Task Manager.

Route 153, New Hampshire Department of Transportation, Farmington, NH (2012). The NH Department of Transportation (NHDOT) proposes to replace the NH Route153 Bridge over the Cocheco River. The existing bridge carries NH Route 153 (Main Street) over the Cocheco River and into the downtown of Farmington, New Hampshire. NH Route 153 is a rural principal arterial system with medium traffic volumes. The bridge is structurally deficient and is adjacent to a 3,300-foot long flood control berm constructed by the US Army Corps of Engineers (ACOE) in the 1950s to protect a large residential neighborhood in downtown Farmington from flooding. Ms. Fiorillo completed resource area delineations and invasive species surveys for this project. Task Manager.

Koppers Site Remediation, Beazer East, Inc., Nashua, NH (2013-Present). The former Koppers Wood Treating facility on the Merrimack River proposes remediation of hazardous waste as required under a Consent Decree issued by the New Hampshire Department of Environmental Services. The Remedial Action Plan (RAP) utilizes several approaches to remediate soils and sediment that were historically impacted by wood treating practices at the facility. Within the Merrimack River, which is a Designated Prime Wetland, remediation activities require the excavation of impacted soils and sediments in the riverbed, associated wetlands, and jurisdictional bank. To compensate for the proposed impacts a mitigation plan was developed, which will include a comprehensive planting plan and a payment to the Aquatic Resource Mitigation Fund. Ms. Fiorillo worked with the remediation team to obtain permits from the City of Nashua and the state of New Hampshire to enable the onsite testing required to develop the RAP. Once the RAP was approved Ms. Fiorillo oversaw the compilation of wetlands and shoreland permits for required for the implementation of the RAP. Project Manager.

Interstate 93, New Hampshire Department of Transportation, Northfield and Tilton, NH (2012). The New Hampshire Department of Transportation (NHDOT) proposes to rehabilitate the two bridges carrying Interstate 93 (I-93) over the Winnipesaukee River, in the Towns of Northfield and Tilton, NH. The bridges were originally constructed in 1959 with four-span continuous curved steel girders each. This project is on the NHDOT's Priority List and was on the State's Red List. Ms. Fiorillo conducted wetland, stream and vernal pool resource delineations and inventory along Interstate 93 and completed a functional assessment on delineated wetland areas. Task Manager.

Broad Street Parkway, City of Nashua, Nashua, NH (2010). The City of Nashua, in concert with the NH Department of Transportation and Federal Highway Administration proposed the Broad Street project to alleviate downtown traffic congestion, revitalize the historic downtown millyard area, and create a new link between downtown and the State highway system. Ms. Fiorillo supported the project team with various natural resource investigations, and federal and state permits. Task Manager.

Amoskeag Dam Eel Ladder, Public Service of New Hampshire, Manchester, NH (2011). The Amoskeag Dam was built in 1836 has been generating electricity for Public Service of New Hampshire (now Eversource) since 1921. The existing fish ladder was built in 1989 in an effort to restore anadromous fish populations to the Merrimack River. In 2011 Normandeau was tasked with designing improvements for the passage of eels over the dam. Normandeau fish biologists designed and fabricated the eel ladder and Ms. Fiorillo oversaw the compilation of the wetland permit required for ladder installation. The permit was approved and the ladder was installed to successfully allow for the upstream migration of eels. Normandeau continues to monitor the eel passage using the ladder for Eversource. Task Manager.

Wetland Services, Haverhill Country Club, Haverhill, MA (2010). The Haverhill Country Club was investigating the potential for course expansion. The club property includes portions of Snows Brook, tributaries

and impoundments. These waterbodies fall under the jurisdiction of the Massachusetts Rivers Protection Act. Ms. Fiorillo completed wetland, and riverfront resource delineation. The wetland boundaries were documented with data forms and located using GIS/GPS support for preliminary plan development. Ms. Fiorillo provided the client with a report of findings and a summary of permitting requirements based on the preliminary plan. Project Manager.

34.5 KV Distribution Line Feasibility Study, Public Service of New Hampshire, Dover, NH (2010). Public Service of New Hampshire requested a feasibility study for the existing distribution line to aid in decision making for utility upgrades. Ms. Fiorillo coordinated field crews for wetland delineation and venal pool identification along a 3 mile long section of the line targeted for an upgrade. These data were provided to an engineering firm that developed the feasibility assessment. Project Manager.

Pedestrian and Bicycle Path, Pease Development Authority, Portsmouth, NH (2009). The Pease Development Authority, with a grant from the NH Department of Transportation, planned a pedestrian and bicycle path that initiated at the intersection of Portsmouth Avenue and Greenland Road (Route 33) in Greenland to the end of Grafton Road on the Pease International Tradeport. With a previous employer Ms. Fiorillo provided wetland delineations, regulatory guidance, agency coordination, development of, and agency approval for, a wetland impact mitigation plan. Project Manager.

Environmental Assessments, East Boston and Brockton Neighborhood Health Centers, MA and Metowee Valley and Rutland Health Centers, VT (2009). The East Boston, Brockton, Metowee Valley and Rutland Health Centers undertook a variety of projects using federal funding from the American Recovery and Reinvestment Act of 2009. With a previous employer Ms. Fiorillo completed National Environmental Protection Act EA for these four projects. The projects included the renovation of an historic building at 20 Maverick Square in East Boston, converting it to a 49,000 square foot ambulatory care facility and a capital improvement project to provide a 68,900 square foot expansion to an existing facility in Brockton. The Vermont Health Centers used the funding to expand on much needed office space for personnel materials management. Project Manager.

Permitting and Mitigation Services, BJ's Wholesale Warehouse, Haverhill, MA (2005). This development project for a new BJ's Warehouse project required state permits and a Massachusetts Environmental Protection Act (MEPA) review. With a previous employer Ms. Fiorillo worked with the project team to obtain permits for wetland impacts and developed a MEPA reviewed Environmental Impact Statement. Ms. Fiorillo met with the Haverhill Conservation Commission during the review of the project and designed, oversaw implementation of and monitored the wetlands mitigation area which included 1,357 square feet of wetland creation and 131 linear feet of stream restoration for which compliance was issued. Project Manager.

REPRESENTATIVE PRESENTATIONS

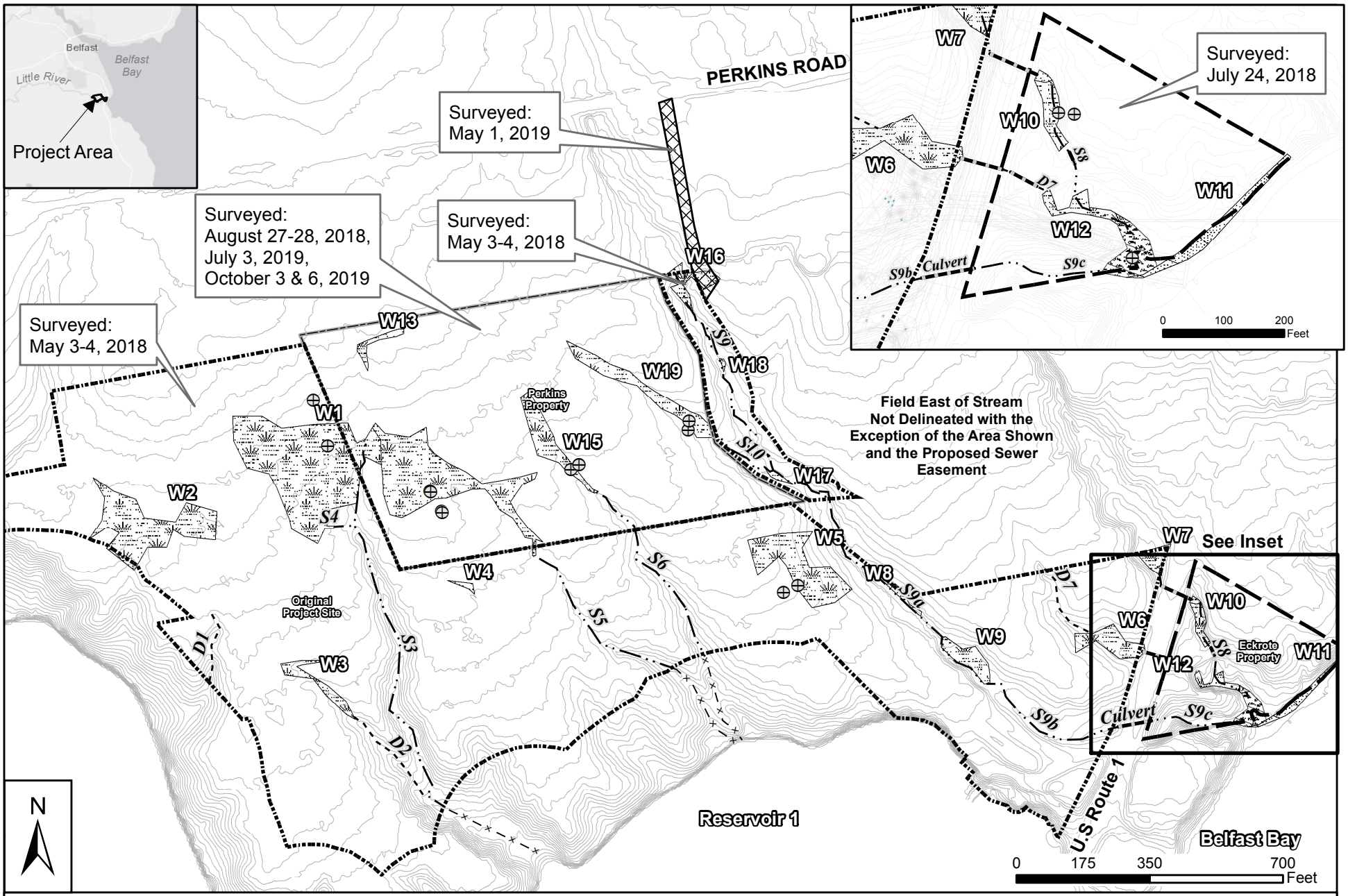
Delineating the Highest Observable Tideline in New Hampshire, New Hampshire Association of Natural Resource Scientists, Portsmouth, NH, 2008

Pond Clinic, Rockingham County Conservation District, Stratham, NH, 2001

Delineating Historic Salt Marsh, Society of Soil Scientists of Northern New England, Portsmouth, NH, 2000

Performing Eel Grass *(Zostera marina*) Surveys, Massachusetts Association of Conservation Commissions Annual Meeting, Worchester, MA, 1999

Effects of Crab Burrowing on Growth of Spartina in San Francisco Bay, SWS Annual Meeting, Cambridge, MA, 1995



Belfast Aquaculture Project
Revised Wetland and Stream Survey
Date: November 4, 2019

Wetland Survey Date
- May 3-4, 2018
- July 24. 2018
- August 27-28, 2018 , July 3, 2019 and October 3 and 6, 2019
- May 1, 2019

- Existing Culvert
- Drainage
- Intermittent Stream
- Stream Not Field Delineated

- Palustrine Wetlands
- Salt Marsh
- Cobble Beach
- 2 Foot Contours
- Army Corps Data Plot

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Environmental Consultants

Stream Assessment Report
Nordic Aquafarms Aquaculture Facility
285 Northport Avenue
Belfast, Maine

Prepared For
Ransom Consulting Engineers and Scientists
400 Commercial Street
Suite 404
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July 29, 2019

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1.0 Introduction

Ransom Consulting, Inc. (Ransom) contracted Normandeau Associates, Inc. (Normandeau) to conduct stream assessments at the site of the proposed Nordic Aquafarms Aquaculture facility in Belfast, Maine. This assessment was conducted on streams that fall under jurisdiction of the Natural Resource Protection Act (NRPA) and is in response to comments provided by the Maine Department of Environmental protection in a letter dated July 3, 2019.

2.0 Methods

Wetland Scientists from Normandeau conducted the stream assessment on July 19, 2019 utilizing "Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)". The QHEI was developed as an index of macro- habitat quality using physical parameters important to aquatic life. The scoring process assigns numbers to each physical parameter (metric) that, when summed, provide an index that can range in the negative to positive with a maximum score assigned to each metric. The metrics are:

- Substrate
- In stream cover
- Channel morphology
- Riparian Zone
- Pool Quality
- Riffle Quality
- Gradient

Each metric is then summed for a cumulative score for the given stream. The higher the cumulative score the better the habitat quality. Maximum score is 100. A cumulative score of $\geq$70 is considered excellent while scores of <30 are considered very poor.

QHEI data sheets were completed and are included in this report as Appendix A. The results of the QHEI surveys are summarized in **Table 1**. In addition to conducting QHEI's, water quality (temperature, dissolved oxygen and pH) was also assessed on five of the six streams (one of the six streams was dry at the time of the survey) utilizing a Yellow Springs Instrument (YSI) which was calibrated in the field. Results of the water quality monitoring are presented in **Table 2**. Invertebrate surveys were conducted at each stream utilizing a D net for kick-net sampling when possible, dip-netting when there was no flow in the stream, and visual observation when there wasn't enough standing water to submerge the net. The streams were also evaluated for their potential to provide fish habitat based on specific stream characteristics observed in the field and the results the water quality assessment.

For the purposes of this survey, S9 was divided into three sampling reaches (S9a, S9b, and S9c) due to noticeably different stream characteristics and surrounding habitat (**Figure 1**).

3.0 Results

The following summarizes the results of the QHEI survey, water quality analyses, invertebrate survey, and fish habitat assessment.

3.1 QHEI

The QHEI evaluates streams based on six parameters: 1) substrate, 2) instream cover, 3) channel morphology, 4) bank erosion and riparian zone, 5) pool/glide and riffle/run quality, and 6: gradient/drainage area. A score of up to 20 can be given to parameters 1-3 & 5, and a score of up to 10 can be given to parameters 4 & 6. The maximum cumulative QHEI score that can be given to a stream is 100.

Table 1 provides the QHEI scoring results for the eight sampling reaches within each of the six NRPA regulated streams within the project area:

Table 1. QHEI Scoring Summary

Stream ID	Substrate Max. 20	Instream Cover Max. 20	Channel Morphology Max. 20	Bank Erosion & Riparian Zone Max. 10	Pool/Glide & Riffle/Run Quality Max. 20	Gradient & Drainage Area Max.10	Total Max. 100	Rating
S3	7	6	10	9	-2	6	**36**	**Poor**
S5	6	6	10	9	-2	6	**35**	**Poor**
S6	6	10	10	4	-2	6	**38**	**Poor**
S8	7.5	6	12	6	1	6	**38.5**	**Poor**
S9a	7	10	10	7	-1	6	**39**	**Poor**
S9b	-1	4	4	4	-1	6	**17**	**Very Poor**
S9c	8.5	5	13	6.5	3	6	**42**	**Poor**
S10	6	9	9	4	-2	6	**32**	**Poor**

Table 2. Water Quality Results

	Temperature (Degrees Celsius)	pH	Dissolved Oxygen (Mg/L)
S3	16	6.3	3.02
S5	15.8	6	1.20
S6	16.1	6.2	0.81
S8	16.5	6.5	7.78
S9a	17.88	6.7	7.35
S9b	19.6	6.6	6.28
S9c	17.2	6.5	3.82
S10	Dry	Dry	Dry

Substrate

The substrate parameter is scored based on the following criteria: type, origin, and quality (amount of silt and embeddedness). Of the 20 possible points, S9c scored the highest at 8.5, whereas S9b scored the lowest with -1. S8 scored 7.5, S3 and S9a scored 7's and S5 and S6 scored 6. All eight sampling reaches generally scored low in this category due to the amount of silt and embeddedness identified within each stream.

Instream Cover

The instream cover parameter is scored based on the amount and quality of natural, overhanging or instream shelter available to fish and wildlife. While as these streams are intermittent and unlikely to provide suitable habitat to fish, this parameter was still evaluated. Of the 20 possible points, S9a and S6 scored the highest with 10 due to the presence of overhanging vegetation, and S10 scored 9 having similar characteristics. S3, S5, and S8 all scored 6 and S9b scored the lowest with 4 as this stream occurs within maintained lawn and overhanging vegetation is sparse. Logs and/or woody debris were observed within S3, S5, S6, and S8, and boulders were also observed within S8.

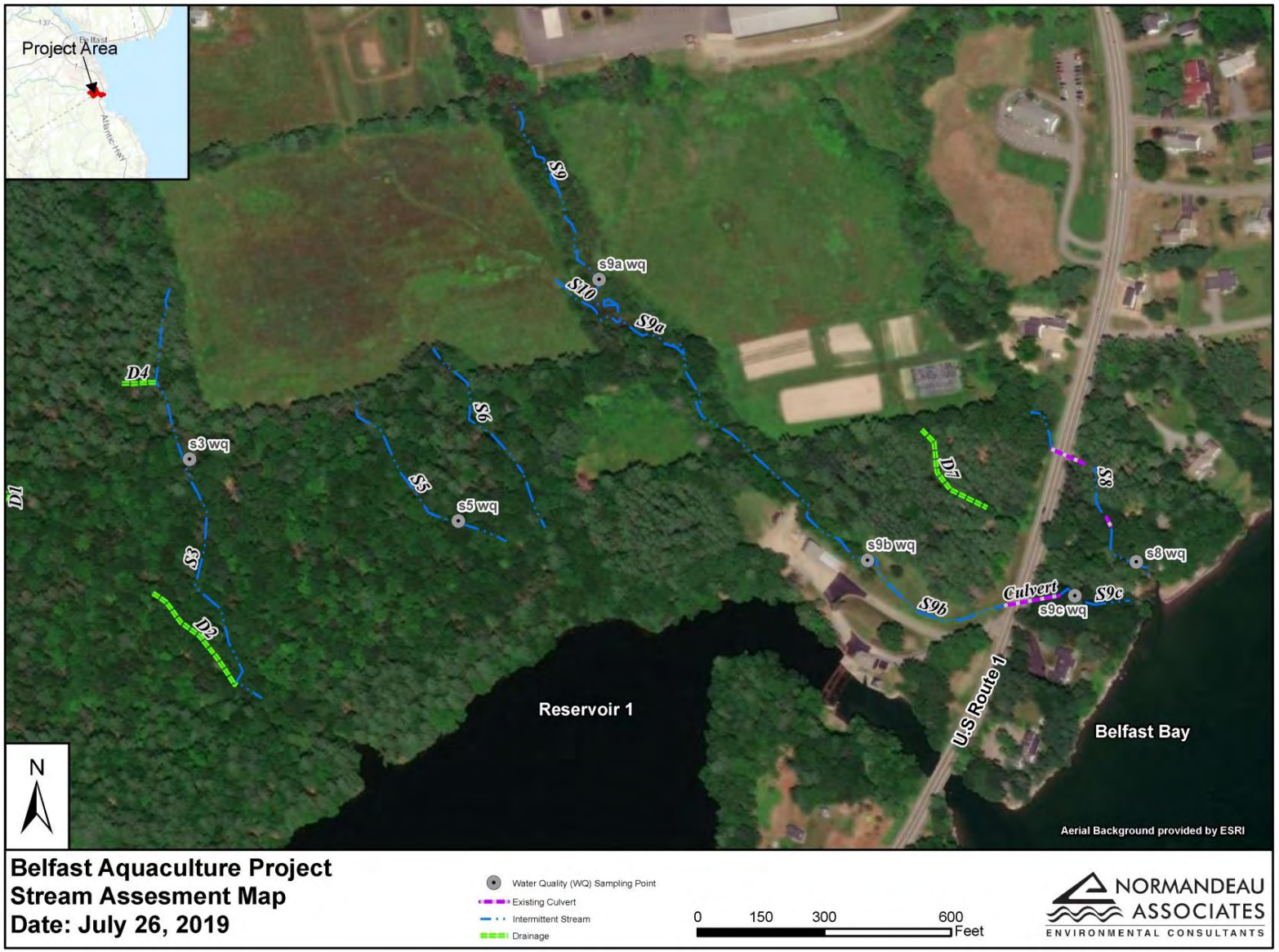

Figure 1. Belfast Aquaculture Project Stream Assessment Map.

Channel Morphology

The channel morphology parameter is scored based on the quality of the stream channel in regards to sinuosity, development, channelization, and stability. It is important to note that "channelization" refers to anthropogenic channelization (ditching, etc.) and not natural channel development, which is discussed as a positive stream attribute in the Wetlands Delineation report Normandeau submitted for this project. Of the 20 possible points, S9c scored the highest with 13 due to low sinuosity (most streams scored 'none'), fair development, no channelization and moderate stability. S9b scored the lowest with no sinuosity, poor development, recent or no recovery from channelization, and low stability. S3, S5, S6 and S9a were all similar in channel characteristics and scored 10 and S8 scored a 12, as it had similar characteristics to S9c except for scoring "none" for sinuosity.

Bank Erosion and Riparian Zone

The bank erosion and riparian zone parameter is scored based on the quality of the surrounding buffer, floodplain, and presence or lack of bank erosion. Of the 10 possible points, S3 and S5 both scored the highest with 9. These two streams are similar in that they both had little or moderate bank erosion, moderate to wide riparian width, and scored high for floodplain quality with either forest or shrub/old field. S6 and S9b scored the lowest with 4. S9b scored low due to having no riparian width and the immediate floodplain being within a maintained lawn; S9b did however show no to little bank erosion due to thick vegetation (grass) along the banks and lack of noticeable flows able to cause erosion. S6 scored low due to heavy/severe erosion and a very narrow riparian width. The remaining streams fell between 7 and 6.5 due to visible erosion and low riparian/floodplain quality: S9a scored 7, S9c scored 6.5, and S8 scored 6.

Pool/Glide and Riffle-Run

The pool/glide and riffle-run parameter is scored based on the depth and width of these features, as well as velocity, substrate type and embeddedness. Of the 20 possible points, the streams scored a range of -2 to 3 (S9c being the highest scoring), largely because these streams are intermittent, mostly lacked flowing water and do not possess riffle and run characteristics.

Gradient

The gradient parameter is based on the elevation drop within the sampling area. The six streams all received the score of "moderate," as they are all intermittent with short sampling areas and are all within similar terrain. Drainage area was not calculated for these streams due to the fact that they are all intermittent with small drainage areas, and this calculation does not add or subtract from the QHEI score.

Summary

Of the 100 total possible QHEI points, the highest scoring sampling stretch was S9c with 42, largely because of the longer hydroperiod resulting in higher scores for substrate, instream cover, channel morphology, and pool/glide and riffle/run quality. S9b scored the lowest with 17, largely because of its channelization, riparian clearing, and other anthropogenic influences. S8 was the second highest scoring stream with 39 and had similarities to S9c in its relatively high scores in substrate quality and channel morphology. S3, S5, S6 and S9a all scored low, within the 30's, as they had relatively similar

characteristics including a shorter flowing hydroperiod, moderate substrate stability, and higher levels of silt and embeddedness.

Although our highest observed score of 42 is higher on the QHEI scale when compared to our lowest observed score of 17, both of these scores indicate low quality habitat. Rankin 1989[1] gives us some context for understanding the observed scores by comparing them to the Index of Biotic Integrity (IBI). Karr 1981[2] elaborates on the strength of IBI and why it is thought to be superior to purely rating aquatic habitat based solely on diversity of species. IBI is a complex rating system for fisheries and invertebrate communities which ensures that species diversity is weighted to reflect the relative environmental tolerances of the species present. This reduces the chances of an artificially inflated habitat quality rating produced by an abundance of only species which can tolerate poor conditions.

With this contextual information in mind, the QHEI scores can be put into perspective. Based on the documented relationship between QHEI and IBI which can be found in Rankin 1989, a QHEI score of 42 would equate to just over 30 on the IBI scale. Karr 1981 suggests that this would fall within the "Poor" rating which is assigned to any score between 28 and 35. A QHEI score of 17 would equate to an IBI score of just over 20, which would receive the worst designation IBI can give, "very poor".

4.0 Water Quality

A YSI was used to sample water quality (temperature, dissolved oxygen and pH) on five of the six streams, and 8 sampling stretches. S10 did not have standing water to sample at the time of the survey. **Table 2** summarizes the results of each sample.

The temperature ranges were typical of what to expect given the atmospheric temperature of approximately 75 degrees Fahrenheit and relative amount of shade, or lack thereof, over each sampling area. The pH was slightly acidic in all of the sampling reaches. Dissolved oxygen was low in most sampling reaches (4 mg/L is generally considered the minimum needed to support populations of fish) with the exception of S8, S9a, and S9b.

5.0 Invertebrate Survey

A D-net was used to survey for invertebrates by conducting kick-netting wherever there was flowing water. Kick-netting was only possible in S8, S9a and S9c as they had slight flows. Dip-netting was done at S9b because there was no flowing water; and invertebrates were recorded as visually observed in S3, S5, S6, and S10 because there were no pools deep enough to submerge the net.

Table 3 summarizes the results of the invertebrate survey. An 'X' indicates 'presence' and a '-' indicates absence.

[1] Rankin E. T. 1989. The Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods, and Application. State of Ohio Environmental Protection Agency. Ecological Assessment Section. Division of Water Quality. Planning and Assessment.

[2] Karr, James. (1981). Assessment of Biotic Integrity Using Fish Communities. Fisheries. 6. 21-27.

Table 3. Invertebrate Survey Results

Stream Sampling Stretch	Mosquito Larvae	Beetle Larvae	Amphipods	Oligochaetes	Snails
S3	X	-	-	-	-
S5	X	-	-	-	-
S6	X	X	-	-	-
S8	-	-	X	-	-
S10	-	-	-	-	-
S9a	-	-	-	-	X
S9b	-	-	-	-	-
S9c	-	-	-	X	X

The stream reaches sampled exhibited low invertebrate diversity, as just five species were observed. Mosquito and beetle larvae presence was observed in S3, S5, and S6, and the only water in these streams were isolated stagnant pools. A beetle larvae was also observed in S6. Amphipods were observed in S8 which is adjacent to Belfast Bay, and oligochaetes were observed in S9c, which is also adjacent to Belfast Bay. Snails were observed in S9a and S9c.

6.0 Fisheries

During the stream assessment, each sampling reach was evaluated for the potential to provide fish habitat. The potential to provide fish habitat was evaluated based on 1) presence and flow of water, 2) substrate quality, 3) dissolved oxygen, 4) and connectivity to known downstream fish habitat. Connectivity, or lack thereof, was determined based on downstream barriers such as hung culverts and natural barriers including topography and downed logs.

S3, S5, S6, S9a, S9b and S10 were determined to have no potential to provide fish habitat. S3, S5, S6, S8 and S10 have no potential connection with known downstream fish habitat. S10 had no standing water at the time of the survey, while stagnant, shallow, isolated pools were observed in S3, S5, and S6, which is not conducive to providing habitat for fish. Additionally, S3, S5 and S6 all showed dissolved oxygen numbers below 4mg/L (see **Table 2**), which is considered the general accepted minimum needed to support fish populations. S9b is a low gradient, silty, stagnant stretch of stream; upstream from a perched culvert under Route 1 to S9c, so it not considered to provide potential fish habitat. The substrate types in all sampling reaches besides S8 and S9c were predominantly silt based, which is not optimal for fish populations because it can damage gills and cover up eggs.

S8 and S9c are the only two sampling stretches that have an intermittent connection with Belfast Bay. However, both stretches had shallow, isolated pools and did not show an existing connection with Belfast Bay, so the potential for these streams to contain fish is very low.

7.0 Conclusion

Eight sampling reaches within six intermittent streams were evaluated utilizing the QHEI method. Overall the streams scored low out of 100 available points. This is largely because each stream was intermittent and mostly made up of silt, with the exception of S8 and S9c. Each stream also lacked

flowing water that could aid in the identification of pools, glides, riffles and runs with the exception of S8, S9a and S9c; however, riffles and runs were identified based on substrate formations and not active flowing water.

Water quality wasn't conducive to providing fish habitat, particularly in regards to dissolved oxygen with the exception of S8, S9a and 9b.

The streams exhibited low invertebrate diversity, largely due to minimal water, and low quality silty substrate, with the exception of S8 and S9c which had higher quality gravel and cobble for substrate.

Overall, the streams do not have characteristics conducive to providing fish habitat due to either intermittent flows or no potential connection to known downstream fish habitat, low dissolved oxygen, and poor substrate quality.

With all of the streams assessed at the Nordic Aquafarms property receiving QHEI scores between 18 and 42, and corresponding IBI ratings between poor and very poor, it is unlikely that these streams provide adequate habitat to support viable fish populations and generally represent overall low quality stream habitat. However, it is important to note that the project design and proposed impact compensation package focuses on the two highest scoring streams, S9 and S8. The Deeded Riparian Buffer protects all of S9 and the Riparian Restoration plan for S9 focuses on the lowest scoring reaches of S9. The protection and improvements to S9 and the culvert replacement for S8 will result in increasing the QHEI values for some metrics of these two streams.

Appendix B

Photo Log

	**Photo #: 1** S3 – dry portion covered with pine needles.
	**Photo #: 2** S3 – looking downstream near edge of the project area.
	**Photo #: 3** S3 – near upstream start of channelized flows.

	**Photo #: 4** S5 – looking downstream from middle section.

	**Photo #: 5** S5 – Looking upstream from middle section.

	**Photo #: 6** S5 – Looking upstream in upper portion.

Photo #: 7

S6 – Looking downstream from upstream portion.

Photo #: 8

S6 – Isolated small pool.

Photo #: 9

S8 – Looking downstream from Eckrote driveway.

	**Photo #: 10** S8 – Looking downstream from Route 1.

	**Photo #: 11** S8 – Looking upstream from the downstream portion.

	**Photo #: 12** S9a – Densely vegetated portion, facing downstream.

	**Photo #: 13** S9a – Densely vegetated portion looking upstream.

	**Photo #: 14** S9b – Cleared reach, facing downstream.

	**Photo #: 15** S9b – Cleared reach, facing upstream.

	**Photo #: 16** S9c – Lower reach near Belfast Bay, facing downstream.

	**Photo #: 17** S9c – Lower reach, facing upstream.

	**Photo #: 18** S10 – Looking downstream from field.

	**Photo #: 19** S10 – Facing upstream from the edge of the field.

	**Photo #: 20** S10 – Facing upstream from shrub portion.

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Natural Resources Impact Compensation Plan
Nordic Aquafarms Aquaculture Facility
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May 10, 2019

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1.0 Introduction

The proposed Nordic Aquafarms Aquaculture facility represents impacts to wetlands and streams that require compensation. Compensation is proposed, to the extent feasible, within the project site. This includes restore in place temporary impacts and, compensation for some permanent impacts. Where on-site compensation does not fully represent the impacts, additional compensation is proposed as participation in the in-lieu-fee program. This report outlines the complete compensation proposal to address impacts resulting from the construction of the Nordic Aquafarms Aquaculture facility. Appendix A includes Normandeau information and Bios of experienced personnel to illustrate sufficient scientific expertise to carry out the proposed on-site compensation work.

2.0 Impact Discussion

The natural resources under the jurisdiction of the Natural Resource Protection Act (NRPA) are shown on Figure 1. Impacts to these resources resulting from the project are shown on Figure 2. Impacts are discussed based on the type of resource, the specific functions and values of the resource and the amount and type of impact to each individual resource identified within the project footprint.

2.1 Wetlands

A total of 17 wetlands were identified on site (Figure 1). Of these, nine wetlands meet the criteria for freshwater wetlands of special significance (WOSS) under the Natural Resources Protection Act (NRPA): W7, W8, W9, W10, W11, W12, W16, W17, and W18. Eight wetlands do not meet such criteria. Each wetland was classified in accordance with Cowardin, *et.al.* [1] and assessed using the Army Corps of Engineers Highway Methodology[2]. A summary of the wetlands classification and functions and values are presented in Table 1.

[1] Cowardin, L.M., V. Carter, F.C. Golet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service: Washington, D.C.

[2] The Highway Methodology Workbook, Supplement, NAEEP-360-1-30a, September 1999

Table 1. Summary of Palustrine and Estuarine Wetlands Identified on Site

Wetland ID	Cowardin Class	Groundwater Recharge/Discharge	Floodflow Alteration	Fish/Shellfish Habitat	Sediment/Toxicant Retention	Nutrient Removal	Sediment/Shoreline Stabilization	Production Export	Wildlife Habitat	Recreation	Educate/Scientific Value	Uniqueness/Heritage	Visual Quality/Aesthetics	Endangered/Threatened Species Habitat	Wetland Description
W1	PFO	X	P	-	-	-	X	X	X	-	-	-	-	-	Coniferous overstory, highly invaded by buckthorn
W2	PFO	X	X	-	-	-	-	-	X	-	-	-	-	-	Deciduous dominated, drains off-site
W3	PFO	-	-	-	-	-	-	X	-	-	-	-	-	-	Small, marginal swale, drains into ephemeral gully off survey area
W4	PFO	X	-	-	-	-	-	-	-	-	-	-	-	-	Isolated pocket, area of standing water
W5	PSS	X	P	-	-	-	-	X	P	-	-	-	X	-	Old field, disturbed but high plant diversity, good shrub habitat for wildlife
W6	PFO	-	P	-	X	-	X	P	X	-	-	-	-	-	Stream S7 braids through this area, wetland is broad and saturated prior to roadway
*W7	PFO	-	X	-	X	X	X	P	X	-	-	-	-	-	Wetland area around stream S8
*W8	PFO	-	X	-	-	-	P	X	-	-	-	-	X	-	Floodplain wetland associated with stream S9
*W9	PFO	-	X	-	-	-	P	X	-	-	-	-	-	-	Small floodplain wetland
*W10	PSS	X	X	-	-	-	X	-	-	-	-	-	-	-	Narrow fringe on stream S8, surrounded by development
*W11	E2EM/ M2US	-	-	X	-	-	P	-	X	-	-	-	X	-	Saltmarsh and cobble beach at mouth of stream S8
*W12	PSS	X	X	-	-	-	X	-	-	-	-	-	-	-	Narrow fringe on stream S8, surrounded by development
W13	PEM	X	-	-	-	-	-	-	-	-	-	-	-	-	Small emergent wetland along edge of field
W15	PEM	X	-	-	-	-	-	-	-	-	-	-	-	-	Small wet meadow
*W16	PSS	X	X	-	-	-	X	-	-	-	-	-	-	-	Floodplain along stream S9
*W17	PSS	X	X	-	-	-	X	-	-	-	-	-	-	-	Narrow wetland fringe along stream S9
*W18	PSS	X	X	-	-	-	X	-	-	-	-	-	-	-	Narrow wetland fringe along stream S9

*= WOSS, Functional Assessment Qualitative Assessment Categories: P=Principal Function/Value; X=Suitable Function/Value.
Cowardin Class: PSS = Palustrine (freshwater) Scrub-Shrub; PFO = Palustrine Forested

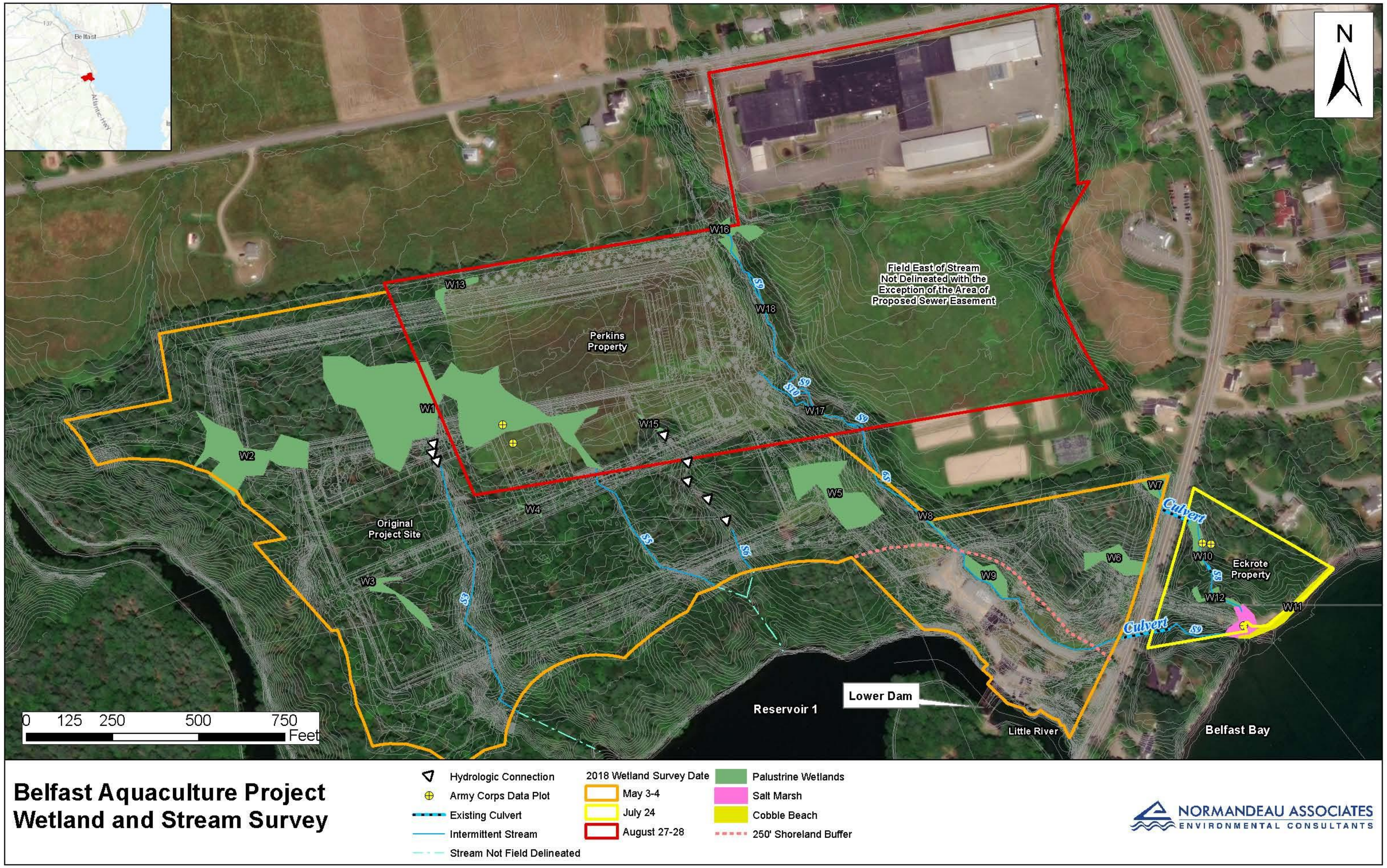

N
Field East of Stream Not Delineated with the Exception of the Area of Proposed Sewer Easement
Perkins Property
Original Project Site
Eckrote Property
Reservoir 1
Lower Dam
Little River
Belfast Bay
Culvert
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W15
W16
W17
W18
0 125 250 500 750 Feet
Belfast Aquaculture Project
Wetland and Stream Survey
Hydrologic Connection
Army Corps Data Plot
Existing Culvert
Intermittent Stream
Stream Not Field Delineated
2018 Wetland Survey Date
May 3-4
July 24
August 27-28
Palustrine Wetlands
Salt Marsh
Cobble Beach
250' Shoreland Buffer
NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Figure 1.

2.1.1 Forested Wetlands

Wetlands W1, W2, and W3 are forested wetlands dominated by a mixture of deciduous and coniferous species, including red maple (*Acer rubrum*), white pine (*Pinus strobus*), hemlock (*Tsuga canadensis*), and red spruce (*Picea rubens*). Species such as the pine, spruce, and hemlock are not typically regarded as wetland species, however it is acknowledged that these species are known to be found in wetlands in the northeastern region. This site is largely composed of fine textured soils that restrict the infiltration of water and create wetland environments. This is exemplified by the roots of the white pine, red spruce, and hemlock in wetlands W1 and W2, which are at or near the surface of the soil. This limited rooting depth in response to a high water table is known as a morphological adaptation of upland plants to wetland soil, and is sufficient to meet wetland vegetation criteria for the purpose of wetland delineations. Additionally, the understory in these wetlands consisted of wetland species such as cinnamon fern (*Osmundastrum cinnamomeum*) and sensitive fern (*Onoclea sensibilis*). A large amount of the non-native invasive shrub glossy false buckthorn (*Frangula alnus*) was present throughout W1, limiting the value of this wetland. Wetland W1 also extends into the adjacent hayfield on the Perkins Avenue parcel. This portion of the wetland is dominated by bluejoint (*Calamagrostis canadensis*) with numerous other common weedy field species present, including red clover (*Trifolium pretense*) and cow vetch (*Viccia cracca*).

Wetland W4 is an isolated depression in an oak dominated forest. There is evidence of standing water, and the understory is generally sparse and dominated by various sedges (*Carex* spp.) that were unidentifiable to species due to the early season survey. This wetland is marginal and possesses no discernible surface water outlet.

Wetlands W6, W7, W8, and W9 are all associated with watercourses. These wetlands receive additional flow during periods of seasonal high water, and likely during major storm events as well. W8 and W9 are along the same stream and are of similar character. The understory is dominated by herbs such as American trout-lily (*Erythronium americanum*) and cinnamon fern. The overstory of these wetlands often contains black ash (*Fraxinus nigra*), a frequent floodplain species, as well as green ash (*Fraxinus pennsylvanica*), black cherry (*Prunus serotina*), speckled alder (*Alnus incana* ssp. *rugosa*), and red maple. Wetland W7 is the most highly degraded by disturbance due to proximity to the road and a nearby residence, whereas W9 is generally undisturbed. Wetlands W7, W8, and W9 are considered WOSS under NRPA.

Wetlands W10 and W12 are palustrine forested wetlands separated by a driveway, but hydrologically connected by an intermittent stream. These wetlands are similar in character and lie on a narrow terrace at the bottom of a deeply incised ravine. Given their small size, these wetlands contain a relatively low diversity of plants, but are dominated by black elderberry (*Sambucus canadensis*), green ash (*Fraxinus pennsylvanica*), and speckled alder (*Alnus incana*) with an understory of sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*), and cinnamon fern (*Osmunda cinnamomea*). These wetlands are moderately disturbed on account of the adjacent road and driveway. Due to their proximity to the ocean and association with an intermittent stream, they are WOSS under NRPA.

2.1.1 Wet Meadows

Wetland W5 is a portion of an old field. The water table in this area is at or near the surface, likely due to repeated disturbance and compaction associated with maintaining the field. The wetland is

dominated by meadowsweet (*Spiraea alba* var. *latifolia*), with various herbs such as common wrinkle-leaved goldenrod (*Solidago rugosa* ssp. *rugosa*), sensitive fern, and common grass-leaved-goldenrod (*Euthamia graminifolia*) intermixed.

Wetlands W13 and W15 (W14 = W1) are small wet meadow (PEM1) depressions. These wetlands are relatively limited in function due to the short hydroperiod and low diversity of wetland plants.

2.1.2 Scrub Shrub Wetlands

Wetlands 16, 17, and 18 are narrow fringes to stream S9, collectively occupying less than one tenth of an acre. These wetlands are classified as palustrine scrub-shrub (PSS1) wetlands and are dominated by speckled alder (*Alnus incana*) in the shrub layer and spotted touch-me-not (*Impatiens capensis*) in the herb layer. These wetlands provide some flood storage and shoreline stabilization due to the proximity to the intermittent stream (S9). Their location along the stream results in their classification as WOSS under NRPA.

2.1.3 Estuarine/Marine Wetlands

Wetland W11 is a salt marsh and cobble beach. The salt marsh area is relatively small and limited to the mouth of a stream (S8). It is dominated primarily by black rush (*Juncus gerardi*) at higher elevations and smooth cordgrass (*Spartina alterniflora*) at lower elevations. The adjacent cobble beach is dominated by a firm sand and cobble substrate with little to no vegetation.

2.1.4 Permanent Wetland Impacts

The proposed project will result in direct alteration of 4.01 acres (174,713 sq. ft.) of wetland (Tables 2 & 3). Freshwater Wetlands W1, W2, W3, W4, W5, W6, W13, and W15 will be directly impacted by the proposed project. None of the directly impacted freshwater wetlands meet the criteria for a wetland of special significance with the exception of W16, which will be temporarily impacted to install a sewer force main.

Wetlands W1, W3, W4, W13, and W15 will be completely filled by the Project. As a result, these wetlands will no longer perform the assessed wetland functions and values. Wetland W2 will also have a significant (approximately 66%) reduction in area as a result of the project, but the impacted wetland will continue to perform the identified functions and values proportional to its reduced size. Wetland W5 will have a 75% reduction in area as a result of the project and will still be suitable for floodflow alteration and wildlife habitat but no longer will do so in a principal manner. This wetland will no longer be suitable for the visual quality value. Wetland W6 will experience an approximately 66% reduction in size as a result of the project. This wetland will no longer perform floodflow alteration and production export principally but will generally continue to function proportionally to the available area. Impacts to wetlands have been considered in the development of the mitigation package.

Table 2. Permanent Impacts to Wetland Resources

Wetland ID	Permanent Impacts (Sq.Ft.)	Impact Characterization
W1	115,674	Direct, Fill
W2	24,612	Direct, Fill
W3	5,057	Direct, Fill
W4	692	Direct, Fill
W5	18,672	Direct, Fill
W6	3,120	Direct, Fill
W13	556	Direct, Fill
W15	708	Direct, Fill
Totals	169,091	

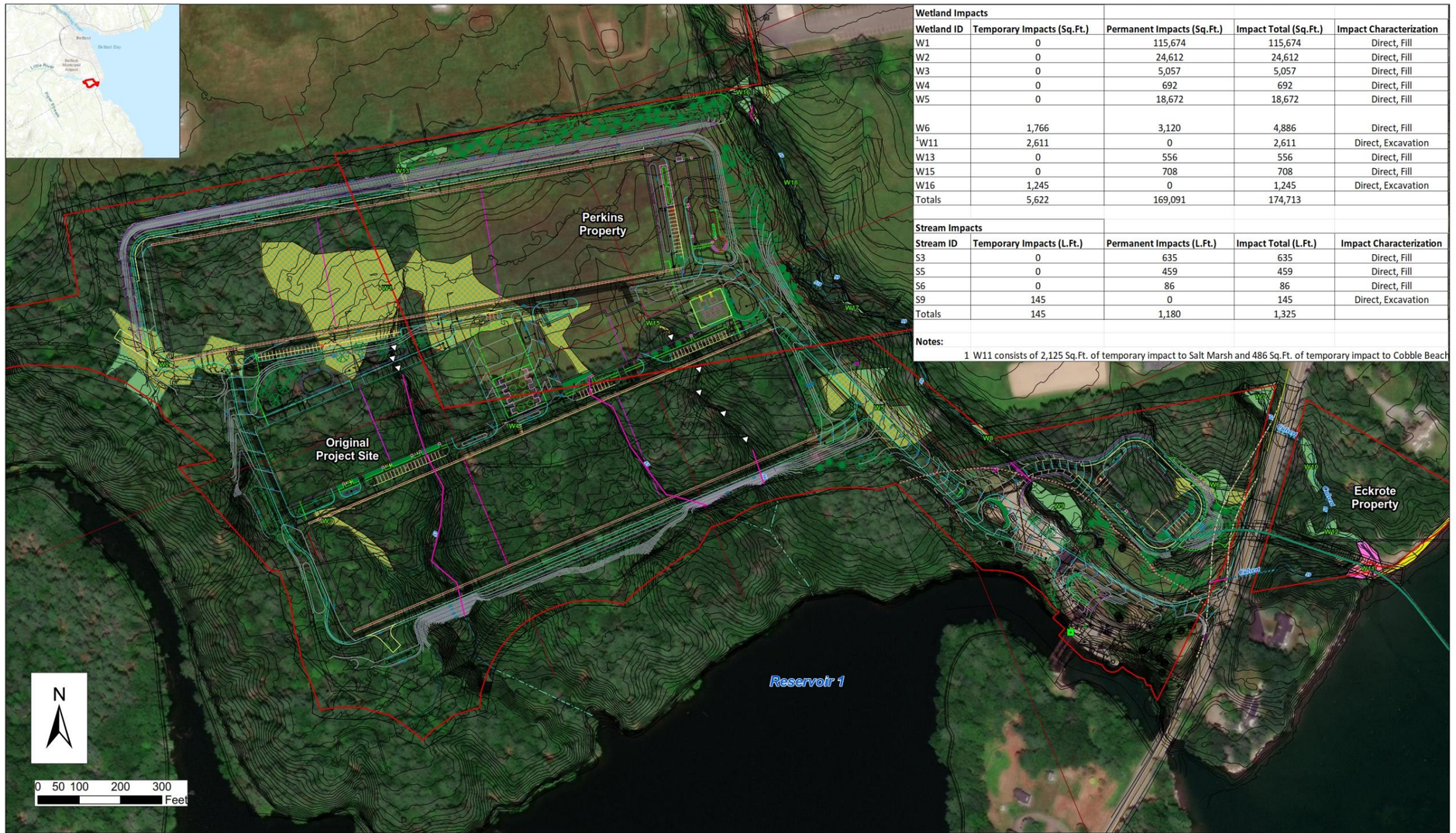
2.1.5 Temporary Wetland Impacts

There will also be direct, temporary impacts to wetland W6, W11 (a coastal wetland) and W16. The Route 1 By-Pass for the installation of the intake and discharge pipes will temporarily impact W6. The installation of the intake and discharge pipes will temporarily impact and W11. The sewer force main will temporarily impact W16 (Table 3). All temporary impacts are to be restored in place (Section 3.3).

Table 3. Temporary Impacts to Wetland Resources

Wetland ID	[1]Temporary Impacts (Sq.Ft.)	Impact Characterization
W6	1,766	Direct, Fill
[1]W11	2,611	Direct, Excavation
W16	1,245	Direct, Excavation
Total	5,622	

1 W11 consists of 2,125 Sq.Ft. of temporary impact to Salt Marsh and 486 Sq.Ft. of temporary impact to Cobble Beach



Wetland Impacts				
Wetland ID	**Temporary Impacts (Sq.Ft.)**	**Permanent Impacts (Sq.Ft.)**	**Impact Total (Sq.Ft.)**	**Impact Characterization**
W1	0	115,674	115,674	Direct, Fill
W2	0	24,612	24,612	Direct, Fill
W3	0	5,057	5,057	Direct, Fill
W4	0	692	692	Direct, Fill
W5	0	18,672	18,672	Direct, Fill
W6	1,766	3,120	4,886	Direct, Fill
[1]W11	2,611	0	2,611	Direct, Excavation
W13	0	556	556	Direct, Fill
W15	0	708	708	Direct, Fill
W16	1,245	0	1,245	Direct, Excavation
Totals	5,622	169,091	174,713	

Stream Impacts				
Stream ID	**Temporary Impacts (L.Ft.)**	**Permanent Impacts (L.Ft.)**	**Impact Total (L.Ft.)**	**Impact Characterization**
S3	0	635	635	Direct, Fill
S5	0	459	459	Direct, Fill
S6	0	86	86	Direct, Fill
S9	145	0	145	Direct, Excavation
Totals	145	1,180	1,325	

Notes:
1 W11 consists of 2,125 Sq.Ft. of temporary impact to Salt Marsh and 486 Sq.Ft. of temporary impact to Cobble Beach

Figure 2.

2.2 Streams

There are six NRPA regulated streams on the project site. All of the streams are narrow intermittent drainages that result from groundwater discharge during periods of seasonal high water tables and stormwater runoff from adjacent slopes. The surrounding landscape is predominately forested with the exception of the lower reaches of S9 where the area has been channelized and is mowed and maintained lawn. Stream 9 is the only stream that is significant enough to be depicted on the United States Geological Survey quadrangle. Due to the geology of the site the substrate is predominately sand/silt/clay with some cobbles. Each stream was characterized for flow regime, substrate, channel characteristics and functions (Table 4).

Table 4. Summary of Functions for Streams Identified on Site

Feature ID	Flow Regime	Flow Observations	Dominant Bed Composition	Average Width (feet)	Average Depth (inches)	Functions
S3	Intermittent	Low	Sand, silt	4	2	Groundwater Recharge/Discharge, Floodflow Alteration, Wildlife Habitat
S5	Intermittent	Low	Silt, clay	4	2	Floodflow alteration
S6	Intermittent	Low	Silt, cobbles	3	2	Groundwater Recharge/Discharge, Floodflow Alteration, Wildlife Habitat
S8	Intermittent	Moderate	Silt, clay	5	4	Groundwater Recharge/Discharge, Floodflow Alteration, Wildlife Habitat
S9	Intermittent	Moderate	Silt, clay, cobbles	7	6	Groundwater Recharge/Discharge, Floodflow Alteration, Wildlife Habitat
S10	Intermittent	Dry	Silt, clay	2	1	Floodflow Alteration

2.2.1 Permanent Stream Impacts

There will be a total of 1,180 linear feet of permanent impacts to streams S3, S5 and S6 within the project area (Table 5). The culvert crossing at S9 located between wetlands W8 and W9 will be constructed using a natural open bottom culvert design that will span the banks and effectively eliminate impacts to the stream and will not impair flow during storm events. To avoid impact to S9 for the roadway crossing, a crossing location was chosen approximately midway between wetlands W8 and W9 at a point where the stream channel is relatively narrow (average width = 6.67'). To accommodate 1.2 times bank-full width an approximately 65 foot long culvert is proposed. The culvert will be open-bottom and allow the existing stream profile to remain unaffected while avoiding constriction of the upstream floodplain.

The upper reaches of streams S3, S5, and S6 will be filled as a result of this project. Impacts to these streams will typically result in the loss of Groundwater Recharge/Discharge, Floodflow Alteration, and Wildlife Habitats in these locations. A drainage system design to route clean foundation water to the streams and drainages to the south of the project site will prevent the remaining streams areas that flow off site areas from drying up. Additionally, flows into these areas will be controlled via a weir system to prevent erosion.

Table 5. Permanent Impacts to Stream Resources

Stream ID	Permanent Impacts (L.Ft.)	Impact Characterization
S3	635	Direct, Fill
S5	459	Direct, Fill
S6	86	Direct, Fill
Totals	1,180	

2.2.2 Temporary Stream Impacts

Stream 9 will be temporarily impacted by the by-pass constructed along Route 1 (Table 6), the installation of the sewer force main, and construction of the open bottom culvert crossing located between wetlands W8 and W9. The permanent S9 open bottom culvert crossing has been designed to not impact the stream. The by-pass is being proposed during the installation of the intake and discharge pipes to reduce traffic congestion and address safety concerns. Once the discharge pipes are installed the by-pass will be removed and the stream will be restored in place. Similarly, once the sewer force main is installed the area will be restored.

Table 6. Temporary Impacts to Stream Resources

Stream ID	Temporary Impacts (L.Ft.)	Impact Characterization
S9	145	Direct, Temporary Culvert, and Excavation
Totals	145	

3.0 Impact Compensation

On-site impact compensation for impacts to streams includes a proposal for riparian restoration and deeded riparian buffer protection. Restore in place activities will compensate for temporary impacts to some degree. The balance of the compensation is in the form of participation in the in-lieu-fee program.

3.1 Riparian Restoration and Deeded Riparian Buffer

This section of the Natural Resource Impact Compensation Plan provides a description of the existing conditions along S9 and the specifications for planting the riparian restoration areas as well as providing details for the Deeded Riparian Buffer as shown in Appendix B.

3.1.1 Riparian Restoration

Nordic Aquafarms is proposing to revegetate areas along S9 that are currently either open or mowed and maintained grass areas. The Riparian Restoration Area is 2.17 acres in size. There are a series of small wetlands of special significance that fringe S9. Soils are predominately a silt loam. Hydrology is provided by seasonally high water tables and surface run off. Where vegetated, the existing riparian area along S9 is thickly vegetated with a variety of trees, shrubs and herbaceous plant species that include red maple (*Acer rubrum*), quaking aspen (*Populus tremuloides*), multiflora rose (*Rosa multiflora*), speckled alder (*Alnus incana*), black ask (*Fraxinus nigra*), red oak (*Quercus rubra*), paper birch (*Betula papyrifera*), meadowsweet (*Spiraea latifolia*), white pine (*Pinus strobus*), rough-stemmed goldenrod (*Solidago rugosa*), sensitive fern (*Onoclea sensibilis*) and, spotted touch-me-not (*Impatiens capensis*).

3.1.2 Deeded Riparian Buffer

Nordic Aquafarms is proposing to establish a deed restricted buffer along the intermittent stream designated as S9 (Figure 1). This deed restricted area is shown in Appendix B and encompasses 4.73 acres. The deed restricted buffer varies in width but is a minimum of 75 feet wide and as much as 150 feet in width. Portions of the riparian area are currently mowed and maintained lawn. Therefore, as part of the impact compensation package, specific portions of the riparian buffer will be restored with native plantings as previously described in Section 3.1.1 and as detailed in Appendix B. To ensure protection into perpetuity language will be developed, reviewed and, once acceptable to the MDEP, registered with the land.

3.2 Aquatic Passage Improvement

The corrugated pipe culverts that currently carries Stream S8 under the driveway on the property located at 282 Northport Road will be removed and replaced with an improved structure for aquatic passage. Existing conditions photos and culvert details are provided in Appendix C. This structure will have natural bottom consisting of a minimum of 12 inches of streambed material laid on the existing substrate. This material has been chosen to match existing material and will allow for natural stream channel development, maintaining aquatic connectivity up and down stream by preventing down cutting at either end of the culvert. This channel is expected to provide adequate habitat for stream-associated insects, which in turn creates suitable habitat for stream dwelling salamanders. The dimensions of the culvert will provide passage opportunities for a variety of small to medium wildlife species, such as frogs, weasels, fox, and racoon. The disturbed area at the outfall of the culvert will be restored with native vegetation, including a conservation seed mix and, and a mix of native shrubs (see Appendix B). To ensure this area is protected into perpetuity language will be developed, reviewed and, once acceptable to the MDEP, registered with the land.

3.3 Restore in Place Impacts

Impacts resulting from temporary construction activities will be restored in place. Each area is discussed individually below. Stabilization measures, where needed, are outlined in Appendix B.

3.3.1 Intake and Discharge Pipes

The impacts to W11 (salt marsh and cobble beach) will be restored in place but also will be compensated for as required using a multiplier of 2 for the In-Lieu-Fee program calculation (see Section 4.2).

Cobble Beach

The cobble beach (486 sq.ft.) will be restored to its original condition after construction of the intake and outfall pipes. A trench will be dug in this zone, allowing the pipes to be buried in 5 feet +/- of cover. Due to the flat and stable surface, it is envisioned that an open-cut trench and side casting the material is the quickest and least impactful method to install the pipes in this zone. The excavated material will be side cast to the opposite side of the trench route from the staged pipes. After pipe placement, the trench will be backfilled with the side cast material, and the back-filled surface will be shaped to match to the original profile. Excess soil, rocks, and boulders not used to back fill the trench will be removed and disposed of off-site, leaving the cobble beach in the same profile appearance as originally found. Tidal action is expected to quickly blend the back-filled area in with the undisturbed cobble beach.

Salt Marsh

A small area of salt marsh vegetation (2,125 sq.ft.) will be disturbed during construction of the intake and outfall pipes. The salt marsh vegetation will be carefully separated from the subsoil with its root mat intact, in large pieces, and placed to the side in an area where it will not be trampled or otherwise covered with excavated material. The vegetated mat will be covered with burlap to prevent exposure and drying. If the root mat is exposed during freezing temperatures it should be also be mulched with straw. After the trench is backfilled, the salt marsh vegetation will be returned to its original location and tacked in place using wooden stakes at least 3 feet longer than the depth of the root zone. It is anticipated that the salt marsh will be restored to its original condition after 1 or 2 growing seasons.

3.2 Sewer Force Main

The installation of the sewer force main will temporarily impact W16. Similar to other restore in place activities, this area will be excavated and the material will be side cast for use in backfilling and restoring to original grade. Disturbed areas will be stabilized by hydroseeding with New England Wetland Mix.

3.3 Route 1 By-Pass

The installation of the intake and discharge pipes across Route 1 will require the installation of a temporary by-pass. This 2 lane bypass will divert all traffic flow to the west of the current roadway onto the Applicants property to provide the least amount of disruption to traffic and traffic patterns. Once the pipes are installed, Route 1 will be restored in kind and temporary impacts to S9 and W6 will be restored.

Stream 9 stream bed will be replicated to pre-construction conditions. The banks and surrounding disturbed area will be restored to original grade and stabilized by hydroseeding with New England Wildlife Conservation Mix.

4.0 Compensation Goals

The project as proposed will have temporary and permanent impacts to wetlands and streams. No vernal pools are present so no vernal pool impacts will occur. All permanent impacts to wetlands will be mitigated through participation in the in-lieu-fee program. Impacts to streams will be mitigated via riparian habitat restoration, culvert repairs to improve aquatic passage and deed restrictions on riparian buffers. The goal of the onsite mitigation components is to offset certain functions and values associated with impacted streams. These include floodflow alteration, groundwater recharge and discharge and wildlife habitat.

All temporary impacts will be restored in place. Permanent, direct impacts to protected natural resources have been minimized to the extent practicable (see Alternative Analysis in Attachment 2 of the NRPA application). Direct impacts associated with permanent fill of wetlands are anticipated to be compensated for with a contribution to the In-Lieu-fee program resulting in a significant financial commitment that will enable Nordic Aquafarms and the Maine Department of Environmental Protection (MDEP) to achieve the regulatory goals of no-net-loss of wetland functions and values which include the primary functions and values of flood flow alteration, sediment/shoreline stabilization, production export and wildlife habitat.

4.1 On-Site Compensation

A summary of on-site compensation and correlation to functions and values is presented in Table 7. Based on the calculations for compensation ratios, as set forth under Chapter 310, Section 5.C.(5) the stream impacts on the site have been compensated for up to 1,965 linear feet (S9) and 60 linear feet (aquatic passage) correlating to 1.677 acres, for the proposed 1,180 linear feet of stream to be permanently impacted. Although the coastal wetland (W11) and wetland of special significance impacts (W16) are restored in place the in-lieu-fee still applies at a multiplier of 2.

Table 7. On-Site Stream Compensation

Compensation Area	*Functions and Values Provided	Compensation Amount	Compensation Ratio	Total Compensated
Riparian Restoration	• Wildlife Habitat • **Visual Quality	2.17 acre	2:1	1.08 acre
Deeded Riparian Buffer	• Wildlife Habitat	4.73 acre	8:1	0.59 acre

Aquatic Passage Improvements	• Wildlife Habitat • Flood flow Alteration	0.014 acre	2:1	0.007 acre
Totals				1.677 acre

*Floodflow alteration as it relates to S9 will continue to be provided under proposed conditions.
** This is a value added

4.2 In-Lieu-Fee

To compensate for wetland impacts the project will pay into the in-lieu-fee program as calculated below using the following formula:

(Direct wetland impact/sq. ft. x (natural resource enhancement & restoration cost/sq. ft. + avg. assessed land valuation/sq. ft.)) x (resource multiplier)

The enhancement and restoration cost for Waldo County is $3.61 per sq.ft. and the average assessed land value is $0.09 per sq.ft. The resource multiplier for coastal wetlands and wetlands of special significance is 2. All other resources are set at a multiplier of 1.

Coastal Wetlands:

(2,611 x ($3.61 + 0.09)) x (2) = $19,321.40

Permanent Freshwater Wetlands:

(169,091 x ($3.61 + 0.09)) x (1) = $625,636.70,

Temporary Wetlands of Special Significance

(1,245 x ($3.61 + 0.09)) x (2) = $9,213.00

Total Compensation $654,171.10

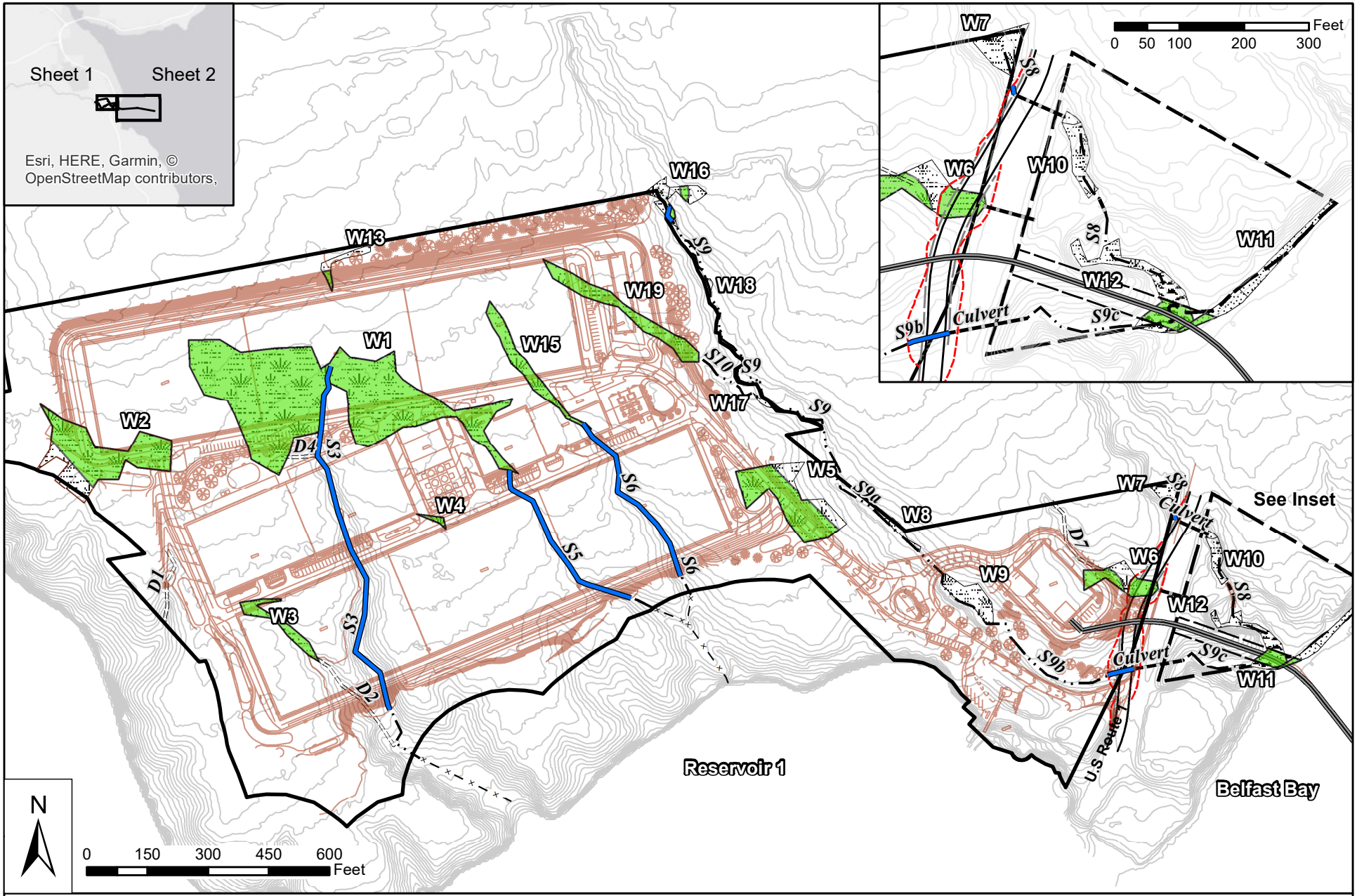
5.0 Schedule for Implementation

Given the phased nature of the development construction, both in-place restoration of impacted wetlands and riparian restoration along stream 9 will have to be scheduled so that no ensuing phases affect the restored areas. Attachment 7 of this application contains the full construction narrative and schedule for the project. The construction of the intake/discharge pipeline system will occur at the outset of Phase 1, with construction beginning with the Route 1 bypass and proceeding outward into Belfast Bay. It is expected that the total duration of this construction will be approximately 7 months, with construction beginning in September of 2019 (based on the assumed timeline of permit issuance) and continuing into March of 2020. Appendix 7-B of Attachment 7 contains a graphic representation of the proposed pipeline construction schedule; portions of wetland W6 impacted by the construction of the temporary bypass will be filled with suitable soils and stabilized following deconstruction of the bypass, however the area will not be fully restored until the end of the pipeline construction phase to ensure no further alteration of the area will occur. Likewise impacts to salt marsh W11 by the 40' construction easement and pipeline trenching will be immediately stabilized following installation of the pipe; however the need for conveyance of

equipment and materials along this portion as construction proceeds out into the Bay mandates that final restoration occurs only after the pipeline system is fully installed. The major impacts to stream 9 will consist of the addition of a culvert during construction of the access road to the water treatment plant area at the outset of Phase 1 construction, as well as a temporary diversion during installation of the force main sewer connection. A proposed construction schedule for the main facility site can be found in Attachment 7, Appendix 7-A. The sewer installation will occur during Phase 1E, as shown in Attachment 1.B, plan CE115. Following the trenching, sewer pipe installation, and backfill/stabilization of the impacted region, routing of stream 9 will be restored to its original state. Restoration and improvements to the riparian buffer along stream 9, as shown in Appendix 13-B, will also occur towards the conclusion of Phase 1E in the fall of 2021.

6.0 Compensation Monitoring Plan

All on-site compensation components will be monitored for proper implementation. Monitoring will include site preparation, stabilization, seeding and planting. During monitoring of site preparation the sediment and erosion control plans (Attachment 8 to the NRPA application) will be adhered to. All monitoring events will be documented and, in the event of minor field changes or remedial measures required to ensure restoration success, the monitor will alert the MDEP and an acceptable alternative will be developed and remedial measures proposed. Monitoring will also include reporting that addresses invasive species control measures and photo documentation for inclusion in monitoring reports. The riparian restoration areas and restore in place areas will be monitored for five years unless otherwise specified by a condition of approval issued by the MDEP. During the monitoring period transplant success will be quantified by establishing fixed plots. At the end of three years a functional assessment of the riparian restoration and restore in place areas will document the functions and values anticipated to be compensated for. The goal for restoration success will be achieved if 85% of the compensation area has successfully resulted in providing lost functions and values.



Belfast Aquaculture Project
Wetland and Stream Impact Mapping
August 16, 2019 Sheet 1 of 2

Palustrine Wetlands
Salt Marsh
Cobble Beach
Wetland Impact
Existing Culvert
Intermittent Stream
Drainage
Stream/Drainage Not Field Delineated
Stream Impact
Pipeline Route
Site Boundary
Proposed Development
Existing Contours (2 ft)
Eckrote Parcel
Limit of Work
40' Pipeline Easement
Temp US Bypass
Temporary Route 1 By-Pass
Culvert

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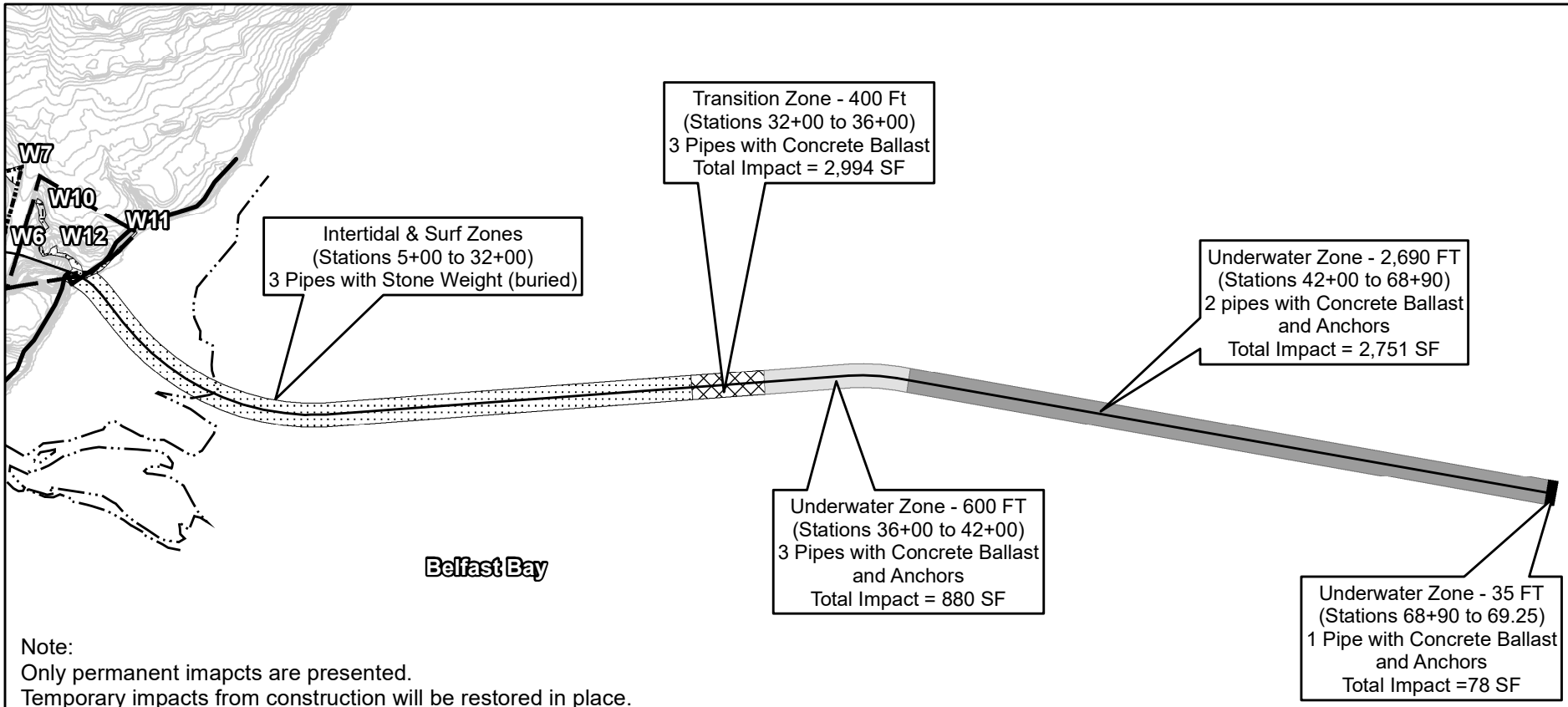
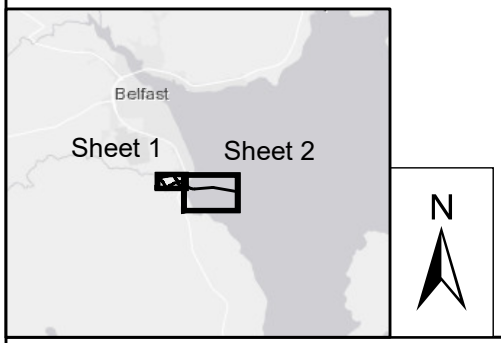


Note:
Only permanent imapcts are presented.
Temporary impacts from construction will be restored in place.



Belfast Aquaculture Project
Wetland and Stream Impact Mapping
August 16, 2019 Sheet 2 of 2

Mean High Water
Mean Low Water
Intertidal & Surf Zones
Transition Zone
Underwater Zone - 1 Pipe
Underwater Zone - 2 Pipes
Underwater Zone - 3 Pipes

0 175 350
Feet

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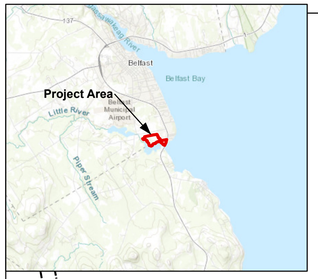
Impact Table Exhibit 3-6

Wetland Type	Total Temporary Impacts	Total Permanent Impacts	Impact Total	Impacts to WOSS
Freshwater Wetlands (sq ft)	**3,960**	**192,070**	**196,030**	**7,291**
Streams (l ft)	**120**	**1,868**	**1,988**	**0**
Coastal Wetlands (sq ft)	**631,877**	**6,703**	**638,580**	**81,081**
Impact Totals	**635,957**	**200,641**	**836,598**	**88,372**



Restore in Place Specifications

Sewer Force Main

1. All excavated material will be side cast within the construction easement
2. Install Force Main
3. Backfill to original grade using side cast material
4. Restore stream channel and wetlands to original elevations, slope and substrate
5. Hydroseed disturbed area using New England Wetland Mix or equivalent at manufacturers specifications

Rte 1 By-Pass

1. A temporary adequately sized culvert will be placed along the stream channel
2. Once the intake and discharge pipes are installed all temporary areas will be removed and restored to original grades
3. The weltand area will be restored to original grade and hyroseeded with New England wet mix or equivalent at manufacturers specifications
4. Restore stream channel to original elevations, slope and substrate

Herbaceous Species	Indicator Status	Planting Specification/Number of Stems: Restoration Area 1	Restoration Area 2	Restoration Area 3
Onoclea sensibilis /Sensitive Fern	FACW			60
Acorus americana /Sweetflag)	OBL			60
Aster novae-angliae /New England Aster)	FACW-			60
New England Conservation/Wildlife Mix	See Sheet 4			See Sheet 4
Shrub Species				
Cornus racemosa /Gray Dogwood	FAC		10	
Hamamelis virginiana /Witch Hazel	FAC-		10	
Alnus incana /Speckled Alder	FACW+		10	
Cornus alternifolia /Alternate-leaved dogwood	UPL	6	13	3
Tree Species				
Pinus strobus /White pine	FACU	6		6
Acer Rubrum /Red maple	FAC	6		9
Acer saccharum/Sugar maple	UPL	2		
Picea rubens /Red spruce	FACU	3		4
Fagus grandifolia /American beech	FACU	6		
Carpus caroliniana /American hornbeam	FAC	6		
Acer negundo /Boxelder	FAC+	6		
Populus tremuliodes /Quaking Aspen	FACU	6		
Tsuga Canadensis/Eastern Hemlock	FACU	2		3

Impact Compensation Plan Specifications		
Plant Type	Stock	Planting Specification
Trees	4'-6'	64 sq. ft. on center
Shrubs	3'-4'	16 sq.ft. on center
Herbaceous	2" plugs	2 sq.ft. on center
Ferns	1 gal. pot	2 sq.ft. on center

*Indicator Code	Indicator Status	Comment
OBL	Obligate Wetland	Almost always occur in wetlands (>99%)
FACW	Facultative Wetland	Usually occur in wetlands, but may occur in non-wetlands (67-99%)
FAC	Facultative	Occur in wetlands and non-wetlands (34-66%)
FACU	Facultative Upland	Usually occur in non-wetlands, but may occur in wetlands (1-33%)
UPL	Obligate Upland	Almost never occur in wetlands (<1%)

* For planting details see Sheet 4

W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12 W13 W15 W16 W17 W18 W19

S1 S2 S3 S4 S5 S6 S7 S8 S9

AREA 1 AREA 2 AREA 3 AREA 4

Restore in place areas for sewer force main

Restore in place areas for Route 1 By-Pass

Restore in place areas for Route 1 By-Pass

Restore in place areas for Intake and Discharge Pipe Installation

Restore in place areas for Intake and Discharge Pipe Installation

-Restore stream bed using existing stone to create riffles/pools, revegatate both sides of bank

-Install arched bridge
-Restore streambed
-Remove 40 concrete and aluminum pipe

Western Side: improve bridge and stabilize banks with plantings

Eastern Side: install steps along steep slope, stabilize stream banks revegatate along steps and stream bank

Replace hung culverts with arch.

Culvert

Replace the single driveway culvert with arch and stabilize/ revegatate above arch and plunge pool below arch

Intake and Discharge Pipes

1. All excavated material will be side cast within the construction easement
2. Excavated material will preserved for backfill keeping salt marsh root mat intact and cobble beah substrate separate from subsurface soils
3. Protect root mat from exposure, drying, freezing
4. Install intake and discharge pipes
5. Once the intake and discharge pipes are installed, carefully backfill using preserved side cast materials
6. Ensure the root mat and cobble beach backfill material are set a original grade
7. Stablize root mat with wooden stakes at least 3 feet longer in depth than the root zone

N

0 40 80 160 240 Feet

Belfast Aquaculture Project
Impact Compensation Plan
Date: November 4, 2019

Species

- Alternate-leaved Dogwood
- American Beech
- American Hornbeam
- Boxelder
- Eastern Hemlock
- Gray Dogwood
- New England Aster
- Quacking Aspen
- Red Maple
- Red Spruce
- Sensitive Fern
- Speckled Alder
- Sugar Maple
- Sweetflag
- White Pine
- Witch Hazel
- Conservation Wildlife Mix
- New England Wet Mix

- Sewer Easement
- Stream Impact

Regime

- Existing Culvert
- Drainage
- Intermittent Stream
- Stream Not Field Delineated

- Easement Centerline
- Permanent Easement 25' Wide
- Temporary Easement 40' Wide
- Project Area
- Other Belfast Parcels

- Palustrine Wetlands
- Salt Marsh
- Cobble Beach
- Riparian Restoration Area

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