21.0 SOLID WASTE

Project construction and operation will produce a variety of temporary and permanent waste streams. The variable volume of each waste stream will closely coincide with the construction schedule and slow operational increase to 50% capacity during Phase I development and slow increase to 100% capacity during Phase II development. In the interest of meeting Nordic's operational zero-waste objective, management options for the fish-related organic waste streams have been evaluated for beneficial reuse opportunities. Nordic has initiated efforts with the Maine Department of Marine Resources to have salmon cut-offs from the processing facility used as lobster bait. A copy of Nordic's letter to DMR is included in **Appendix 21-A**. While final contracts for Nordic's waste streams will be finally awarded during the construction phase, commitment letters covering the transport and off-take of all solid waste streams through construction and the first five years of operation have been provided in **Appendix 21-B**. These waste streams, estimated quantities and generation schedule, along with potential collectors and disposal facilities are discussed below and summarized in **Table 21-1** and **Table 21-2**.

21.1 Construction

Construction activities for the project will generate a standard assortment of solid waste consisting of construction and demolition debris, special waste, and land clearing debris. The land clearing debris will include timber, brush and stumps, as well as soil and ledge that cannot be reused on Site based on final grading design plans. Cleared vegetation will be harvested and removed as merchantable forest products, as it already has been on this property in recent years. Marketable timber/pulp will be sold by the clearing contractor or donated locally to an organization such as the Waldo County Woodshed which provides firewood to those in need. A timber inventory conducted by Comprehensive Land Technologies, Inc. in January 2019 for the approximately 30 acres of forest within the project area estimated the total volume of marketable standing timber to be 1,146 cords; this timber inventory report has been included in Appendix 21-B. Smaller woody debris and grubbing material will be chipped or mulched and used on-site for erosion control or as a soil amendment. Any excess wood waste, including stumps, generated during vegetation clearing that cannot be reused, marketed or donated will be hauled off-site to an appropriate management facility. Commitment letters have been provided by Comprehensive Land Technologies, Casella/Pine Tree Waste Services and Waste Management to manage these construction- related waste streams.

Construction activities pertaining to the renovation of the existing office building and former pump house are anticipated to generate small volumes of special waste including asbestos insulation, asbestos roofing, and localized polycyclic aromatic hydrocarbon (PAH) impacted soils, as documented in environmental due diligence investigations . Casella and Waste Management have provided Nordic with letters of commitment to manage these special wastes.

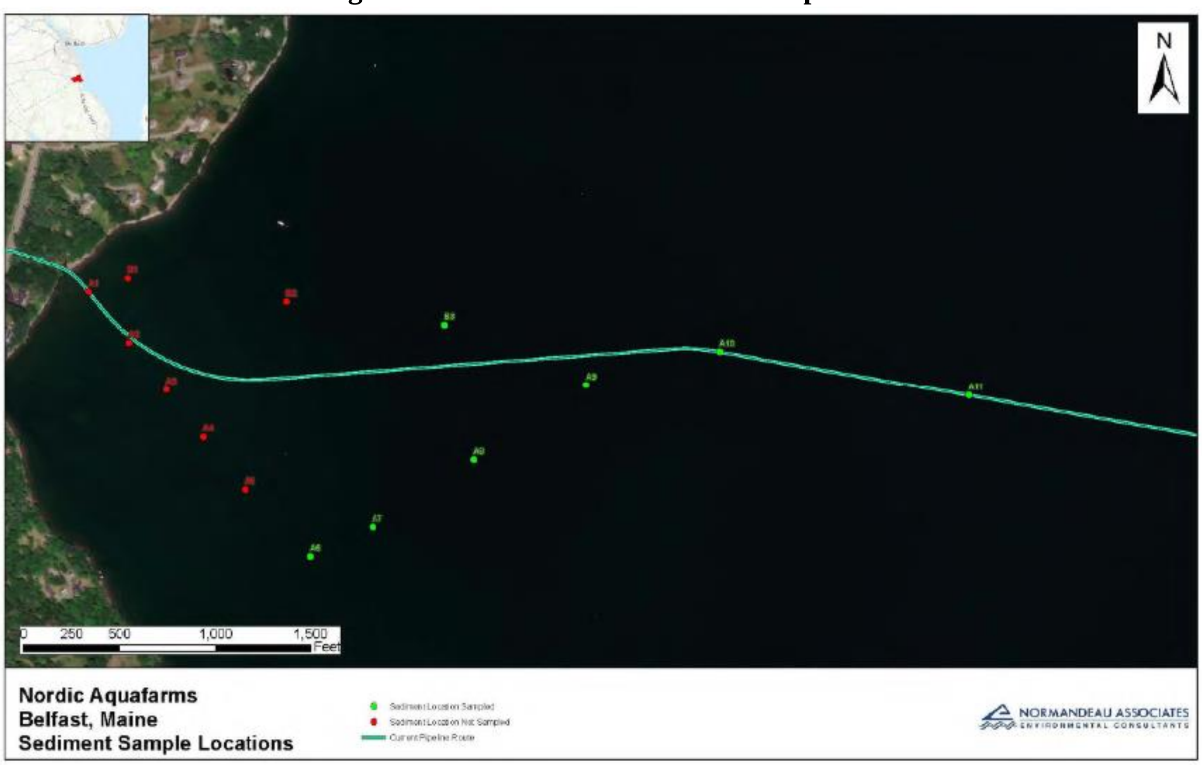
Additionally, construction of the ocean pipelines is anticipated to generate a net surplus of sediment removed from Belfast Bay during pipeline burial. Casella and Waste Management have provided letters of commitment to manage this sediment; analytical testing for waste characterization will be provided to the final waste management contractor to ensure appropriate disposal within the Maine Solid Waste Management Rules. Initial sampling and analytical testing of marine sediment along the pipeline route indicate the marine sediment will not have to be classified as hazardous material. Further discussion of marine sediment composition and presentation of analytical results is below.

21.1.1 Marine Sediment Composition

Materials disturbed during construction include marine sediments which will be excavated and removed from the site during construction activities. Marine sediments are to be disposed of on land at a solid waste facility; therefore, Maine regulations require waste characterization in advance of disposal. Further, if there is existing sediment contamination at the site it should be documented prior to construction activities so that proper procedures can be followed before any sediment disturbance. Therefore, to evaluate excess marine sediments remaining from construction following pipeline burial and to assess whether sediment contamination is present at the project site at concentrations that warrant further waste characterization testing, sediment samples were collected, and laboratory analyzed as part of this SLODA application effort.

Vibracore sediment samples were collected in Belfast Bay on November 29, 2018 and submitted to Alpha Analytical Labs in Westboro, MA for laboratory analysis of multiple parameters. Multiple samples were collected for grain size analysis, while two samples, B3 and A6/A7 composite (See **Figure 21-1**), were submitted for chemical and physical characteristics analysis. Sediment core samples were collected using standard vibracoring techniques and cores were sampled from the sediment surface through the unconsolidated layers to the depth of vibracore tool refusal (typically a compacted layer or bedrock). Note that vibracore sampling relies on the tool weight and mechanical vibration to penetrate marine sediments and does not employ impact forces (as with other sampling techniques) that would allow potentially deeper penetration into the sediment layers. Sample B3 was a depth composite sample collected at station B3 to a sediment penetration depth of 6 ft. 5 in. Sample A6/A7 composite was a two-sample composite from stations A6 and A7. Station A6 was sampled to a sediment penetration depth of 1 ft. 0in. while station A7 was sampled to a sediment penetration depth of 3 ft. 9 in.

Figure 21-1 Location of Sediment Samples



Samples B3 and A6/A7 composite were tested for:

1. Volatile Organics by method 8260
2. Semivolatile Organics by method 8270
3. Polychlorinated Biphenyls
4. Pesticides
5. Chlorinated Herbicides
6. Total Metals (RCRA 8: As, Ba, Cd, Cr, Pb, Hg, Se, Ag)
7. Ignitability
8. Total solids
9. pH
10. Reactive cyanide
11. Reactive sulfide
12. Paint filter liquid

We reviewed the laboratory results in the context of disposing sediments excavated during construction at a solid waste facility. Crossroads Landfill, where construction waste would potentially be disposed of for this project, is licensed by the State of Maine to dispose of non-hazardous waste. 40 CFR 261.24 identifies toxicity characteristics (standards) in solid waste and is used to determine whether solid waste is characterized as hazardous or non-hazardous. Landfill waste is tested and compared to toxicity characteristics based on EPA Method 1311 "Toxicity Characteristic Leaching Procedure," or TCLP analysis, which is used for simulating the leaching potential from landfill waste. Method 1311 TCLP analysis specifies an extraction fluid equivalent to 20 times the total weight of a waste sample for evaluating the leaching potential of the sample. However, if a total sample concentration, as determined from a conventional analytical test (e.g. versus the TCLP test), is less than 20 times the toxicity characteristic concentration, then the waste can be considered non-hazardous and no further testing is required. We compared our laboratory results (analyzed with conventional methods for total concentration) for which there were detections above laboratory reporting limits to the 40 CFR 261.24 toxicity characteristics (multiplied by 20) to determine whether the samples met the criteria for non-hazardous waste. The summary of our detections and the 40 CFR 261.24 Guidelines are reported in **Table 21-3**. These results do not indicate exceedance of any of the toxicity characteristics in 40 CFR 261.24. Based on the laboratory results and using the "rule of 20" for evaluating waste samples, no further sediment testing (e.g. EPA Method 1311 TCLP testing) is warranted and marine sediments from the project site can be accepted as non-hazardous waste for disposal at a RCRA Subtitle D landfill. The full laboratory report is included with this application as **Appendix 21-C**.

Table 21-3 Vibracore sediment samples laboratory results summary. Analytes with one or more detections above laboratory reporting limits are presented. Toxicity characteristic and 20 x Toxicity Characteristic ("rule of 20") also presented.

Compound	Concentration	Sample B3	Sample A6/A7 Comp	40 CFR 261.24 Toxicity Characteristic	20 x (40 CFR 261.24 Toxicity Characteristic)
Acetone	mg/kg	0.040	0.017	NA	NA
Carbon Disulfide	mg/kg	0.036	ND (<0.013)	NA	NA
Fluoranthene	mg/kg	0.095	0.078	NA	NA
Pyrene	mg/kg	0.093	0.070	NA	NA
Arsenic	mg/kg	13.2	6.7	5	100
Barium	mg/kg	22.9	11.9	100	2000
Chromium	mg/kg	33.4	21.0	5	100
Lead	mg/kg	14.20	7.85	5	100
Mercury	mg/kg	0.267	ND (<0.103)	0.2	4

NA – not applicable
ND – non-detect, result was less than the laboratory reporting limit

Based on the history of mercury contamination in the Penobscot River and Penobscot Bay, additional research was conducted to evaluate the potential of the mercury impacts to affect sediment within the proposed project pipeline area. A chlor-alkali plant formerly operated in Orrington, ME which had a history of mercury contaminated releases to the Penobscot River that occurred primarily between 1967 and 1970 (see http://www.penobscotmercurystudy.com, accessed February 27, 2019 for the full mercury study repository) is located up-estuary of the project site in Belfast Bay.

We reviewed the Penobscot River mercury study for relevant information on sediment quality and mercury contamination in the Belfast Bay area (The Penobscot River Mercury Study Panel, 2013). A preliminary review of the comprehensive study did not indicate any data specific to Belfast Bay or the project area; however, Chapter 17 of the study provides a review of the background concentrations of mercury in central Maine estuaries, which encompasses Belfast Bay. The Penobscot River Mercury Study indicates that natural background concentrations of mercury in surface sediments varies from about 28 – 51 ng/g dry weight mercury as measured in the Narraguagas and St. George estuaries and the East Branch of the Penobscot River according to Bodaly, 2013[1]. NOAA considers levels below 51 ng/g dry weight mercury concentration in sediment to be the present background concentration or natural abundance (i.e. where the primary contamination source is atmospheric deposition) and the Penobscot River mercury study by Bodaly, 2013 concludes that modern regional background concentrations of total mercury in surface sediments in central Maine estuaries is approximately 55 ng/g (Bodaly, 2013).

[1] Bodaly, R.A. 2013. PENOBSCOT RIVER MERCURY STUDY Chapter 17 Background concentrations of mercury in central Maine estuaries. Submitted to Judge John Woodcock United States District Court (District of Maine). April 2013.

The Bodaly, 2013 Penobscot River mercury study determined that in the contamination zone of the Penobscot River, near the historic contamination source in Orrington, the mean sediment mercury concentration was about 800 ng/g, while upstream in the Old Town – Veazie reach (above the head of tide) the mercury concentration was about 78 - 145 ng/g in surface sediments. Several sampling sites are located in the lower estuary in the area between Sears Island and Isleboro Island and east of Belfast Bay including stations ES 7A, ES 8A, ES 8C, and ES 15A (Yeager, 2013[2]). These stations, which are the closest stations to the project site for which sediment mercury data were reasonably available, indicate mercury concentrations of 290 – 383 ng/g in surface sediments and sediment mercury concentrations of 111 - 145 ng/g as a column average (total column depth 90 cm). The Bodaly, 2013 Penobscot River mercury study and Yeager, 2013 study indicate that mercury concentration varies by depth in the affected marine sediments with the highest concentrations typically located at depths of 10-30 cm in the sediment column with lower values in surface sediments and lower values approaching background concentrations at depths below 40-60 cm.

The two sediment samples collected, and laboratory analyzed in support of this SLODA application were depth composite samples, as explained previously. These samples were found to have mercury at a concentration of 267 ng/g in the B3 sample and at a concentration that was less than the laboratory reporting limit of 103 ng/g in the A6/A7 composite sample.

Results indicate that low levels of certain compounds, including mercury, are present at the project site. However, the results also indicate that the presence of low-level contamination is not uniform at the project site and the majority of compounds tested were not detectable at typical laboratory reporting limits. Mercury levels in the tested samples were comparable to other sample sites in the lower Penobscot River estuary and well below the high values measured in the mercury contamination zone in the upper estuary. Samples collected for this study were depth composites which we believe to be a valid and representative sampling technique (i.e. versus testing discrete depths) to indicate the potential impacts from construction activities at the site. Construction and disturbance of marine sediments will expose and mix multiple depth layers concurrently which will tend to reduce the risk of exposing any single strata or other area of potentially concentrated contamination. In addition, construction methodologies will be used that minimize risk of sediment exposure and mobilization and construction impacts will be temporary.

21.2 Operation

Nordic has worked to establish markets for operational by-products including salmon processing solids such as heads, viscera, and mortalities and wastewater treatment filtrate high in organics and nutrients. While production of these by-products will likely lead to a range of recycling opportunities in the future, multiple businesses have provided letters of commitment and capacity to reflect their interest and ability to manage the volume and content of these organic by-product resources. Interested partners include Agri-Cycle Energy, Casella Organics, Channel Fish Co., Inc., Coast of Maine Organic Products, Inc., Compost Maine LLC, and Waste Management as presented in Table 2 and Appendix 21-A. With DMR approval for re-use of heads and racks for lobster bait, agreements will be pursued with the lobster industry to provide high quality bait resource.

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[2] Yeager, K.M. 2013. PENOBSCOT RIVER MERCURY STUDY Chapter 5 Total mercury sedimentary inventories and sedimentary fluxes in the lower Penobscot River and estuary, Maine. Submitted to Judge John Woodcock United States District Court (District of Maine). April 2013.

Organic solids are managed by dewatering into a filtrate with multiple beneficial reuses, including biogas. This filtrate comes from the wastewater treatment process where solid feces and feed particles in the water are filtered out. Solids are removed by drum filters in the production modules, and membrane bioreactors in the wastewater treatment plant. Filtrate from the production is dewatered indoors and stored in sealed tanks before being transported off-site for further recycling re-use by by-product partners. By-products from fish processing, including salmon heads, viscera, bones, carcasses and smaller cut-off pieces are frozen or refrigerated and shipped out for sale to a variety of customers for uses such as bait, pet food, nutritional supplements and fish meal.

In addition, commitment letters for the management of office waste (i.e. municipal solid waste), universal wastes, and recyclable products, have been provided by Casella/Pine Tree Waste Services and Waste Management.

APPENDIX 21-A

APPENDIX 21-B

APPENDIX 21-C