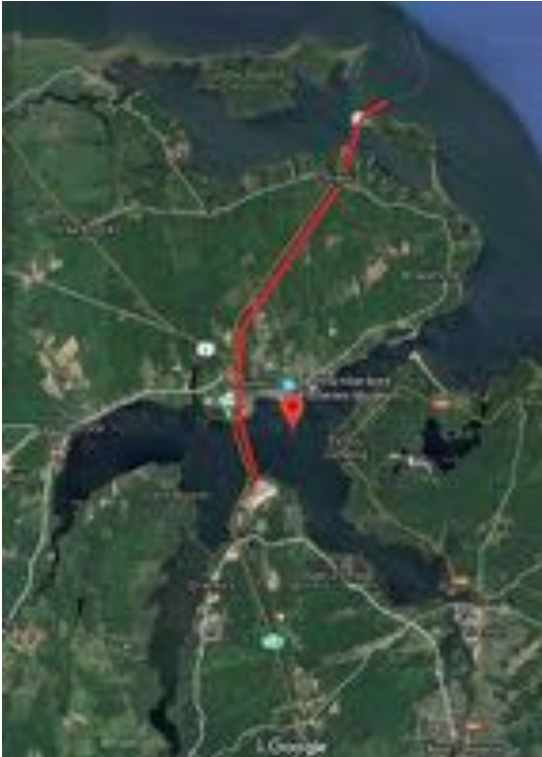


APPENDIX C-1

Northern Pulp's Effluent Disposal Plans - Issues and Answers

by Arthur A. MacKay
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BACKGROUND



Northern Pulp Nova Scotia Corporation (Northern Pulp) started operations in 1967 and is located in Pictou County, NS, on the shore of Pictou Harbour. The company states that it “*manufactures 280,000 tonnes of Kraft pulp annually, primarily for export*”. It claims to have 300 employees and to generate \$200 million annually into the Nova Scotia Economy.(1)

On February 7, 2019, Northern Pulp Nova Scotia Corporation (Northern Pulp) registered a project for environmental assessment. The purpose of the Project is to replace the existing effluent treatment facility (ETF) with a new one to treat wastewater received from the Northern Pulp pulp mill at Abercrombie Point, Pictou County.

Northern Pulp intends to use a biological activated sludge treatment process which combines moving bed biofilm reactor technology with conventional activated sludge. Once treated, effluent would be sent via an approximately 15.5 kilometers-long pipeline. The effluent pipeline would follow the Highway 106 for approximately 11.4 kilometers, then enter the marine environment near the Northumberland Ferries marine terminal, and continue for approximately 4.1 kilometers through Caribou Harbour to the Northumberland Strait where the treated effluent would be discharged via an engineered diffuser. (Modified from 3)

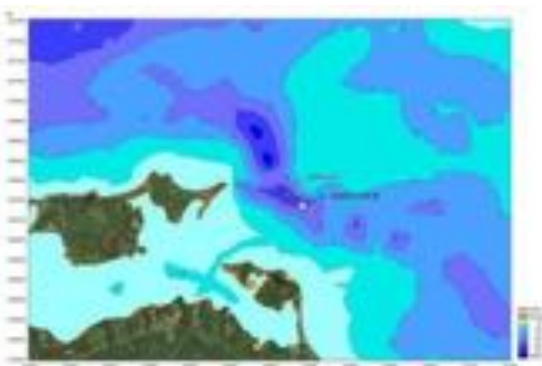


Figure 2.4 Bathymetry and Outfall Locations CH-A and CH-B in Caribou Harbour
Outfalls

There are also plans to eliminate the existing treatment facility at Boat Harbour.

Table E.5 Water Quality at the End of the Mixing Zone for a Three-port Diffuser

Parameter	Unit	Diffuser Daily Maximum Load	CCME Water Quality Objective	Assumed Conditions	End of Mixing Zone at 100 m from Diffuser	Distance (m) from Diffuser at which Condition is Reached
Dissolved Oxygen (DO)	mg/L	1.0	100	Trace amount	0.00	100
Total Nitrogen (TN)	mg/L	0.0	0.0	0.00	0.00	1.0
Total Phosphorus (TP)	mg/L	0.0	0.0	0.00	0.00	1.0
Color	PCU	100	100	10.0	10.0	1.0
Chemical Oxygen Demand (COD)	mg/L	0.0	0.0	0.0	0.0	100
Biochemical Oxygen Demand (BOD ₅)	mg/L	0.0	0.0	0.0	0.00	100
Total Suspended Solids (TSS)	mg/L	0.0	Negative ¹	0.0	0.0	>10
Dissolved Oxygen	mg/L	1.00	100	1.0	1.0	>10
pH	-	7.0 - 8.5	7.0 - 8.7	8.0	8.0	>10
Temperature (summer)	°C	20 ²	Negative ¹	17.5	17.7	>10
Temperature (winter)	°C	20	Negative ¹	0	10.1	>10
Salinity	PSU	0	Negative ¹	0	0	>10

1. CCME Water Quality Objective (CCME WQO) for the parameter.
 2. CCME WQO for DO is 100 mg/L.
 3. CCME WQO for pH is 7.0 to 8.5.
 4. CCME WQO for Temperature is 20°C.
 5. CCME WQO for Salinity is 0.

This figure shows the estimated water quality for some common parameters such as halides, nitrogen, phosphates, oxygen demand, dissolved oxygen, pH, temperature and salinity at the outfall and at varying distances away.

The purpose is to show that dilution occurs and as a result, all is well. However, except for Board Harbour data, I can find no definitive statement about the toxic chemicals that are of real concern in the Strait and in Caribou Harbour. This includes, among other things, cadmium, dioxins, furans, mercury, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, zinc, etc. (8)

How toxic are these chemicals? You can check each of these at:

<http://scorecard.goodguide.com/chemical-profiles/> which, for each chemical, provides information on Human Health Hazards, Hazard Rankings, Chemical Use Profile, Chemicals Rank in the United States, Regulatory Coverage, Basic Testing to Identify Chemical Hazards, Information Needed for Safety Assessment, and Links to associated information.

ASSESSMENT:

The “Replacement Effluent Treatment Facility Project” (11) is a massive document with 15 large sections and numerous appendices. “Section 8 - Environmental Effects Assessment” alone contains 356 pages that cover the following topics: Atmospheric Environment, Acoustic environment, Soils and Geology, Surface Water, Groundwater, Freshwater and Fish Habitat, Wetlands, Flora/Floral Priority Species, Terrestrial Wildlife/Priority Species, Migratory Birds and Priority Bird Species/Habitat, Harbour Physical Environment, Water Quality, and Sediment Quality, Marine Fish and Fish Habitat, Marine Mammals, Sea Turtles and Marine Birds, Socio-Economic Environment, Indigenous Peoples Use of Land and Resources, Marine Archaeological Resources, Terrestrial Heritage Resources, Effects of the Environment on the Project.

While the work itself is impressive and one would expect that it does impress in most circles, it has serious flaws which limit its short-term and long-term value in ensuring the ecosystem health of Caribou Harbour and Northumberland Strait. Unfortunately, it seems that few if any primary surveys have been done to determine the vital ecosystem components of the target areas apart from the engineering, construction surveys. As far as the biological components of the area goes, much of the material quoted is obtained from other studies of various purpose and extent, from opinions expressed and from limited surveys undertaken many years ago (plankton results from 1992 are used, for example).

In addition, only “Valued Environmental Components” and “Priority Species” are considered. Thus, only species that are deemed to be important such as commercial fish, are considered in the report. As a consequence, the foundational species of the ecosystem such as planktonic species, invertebrate and fish larvae, subtidal and intertidal invertebrates and plants, forage species, etc are not considered. Seasonality is an important issue and to truly understand ecosystem dynamics, at least 12 monthly surveys must be undertaken that include records for plankton, fish and invertebrate larvae, forage species, fish, bird, and mammals.

Also, baseline chemical analyses are required for water and bottom samples at predetermined sites which can be revisited for ongoing monitoring purposes in future years. The following figure is an example of how these sites should be selected to adequately cover the area under question. The white lines are transects used to survey marine organisms and bottom type. The red dots are sediment samples. For details on how sampling may be carried out see Chapter 2 at <https://issuu.com/artmackay/docs/healthofstcroixestuary>



In the absence of this information, the impact of the effluent from the proposed outfall pipe at Caribou Harbour or the proposed cleanup at Boat Harbour cannot be measured in the short term or long term. More particularly, the “out-of-sight-out-of-mind” pipeline will be unlikely to foster any response to future

deleterious impacts in Caribou Harbour and the Northumberland Strait ... or for that matter any improvements that might be made in Pictou Harbour.

While there seems to be an abundance of engineering studies, fishermen and other knowledgeable individuals have provided some descriptive information on the abundant life in Caribou Harbour and the Northumberland Strait, I have found no reference to professional biological surveys in Caribou Harbour, Pictou Harbour or the adjacent section of the Northumberland Strait.(12)

Many of the issues associated with the outfall proposed for Caribou Harbour are outlined in a letter to NS Advocate by John Collins (6) and others which can be summarized as follows:

1. The one ton of solids that will discharge daily with the millions of liters of effluent are still scientifically considered toxic waste.
2. The composition of toxic wastes is, at least in part, known.
3. Enormous amounts of water are required to dilute the effluent to permissible concentrations allowable in the receiving waters.
4. The average effluent temperature released in the summer will be 37 degrees C when the Straits ambient temperatures are already nearing 20 C and lobster larvae are present and may be impacted by this temperature difference. Other plankton and larvae will also be impacted by temperature and pressure changes.
5. Lobster larvae survival diminishes rapidly when the water temperature surpasses 20° C and is already a major concern without the addition of the millions of liters of hot effluent.
6. According to Northern Pulp, the effluent temperature and salinity will meet that of the ambient surrounding water within 100 meters of the discharge point. However, some calculations suggest the proposed system will impact 65,000 square meters of area (See John Collins 5).
7. The proposed discharge location is a narrow channel, just outside the mouth of Caribou Harbour and just alongside the ferry channel which is dredged regularly.

It appears that no long term and adequate surveys have been done for Pictou Harbour. However, such surveys have been done for the St. Croix River and Estuary on the border between Maine and New Brunswick (See: <https://issuu.com/artmackay/docs/healthofstcroixestuary>), Saint John Harbour, and elsewhere and these surveys suggest that similar conditions can be found in Pictou Harbour and in the adjacent Strait area. Since effluent will be introduced continuously into the Strait at levels substantially elevated from those coming out of Boat Harbour into the Strait, the impacts can be expected to be substantially higher on a day-by-day basis. While Caribou Harbour will not be subjected to the same direct pollution, the incursion of seawater containing effluent from the outfall should be expected to create conditions similar to those that occur in Pictou Harbour, albeit over a longer period of time. Impacts that can be expected include but are not limited to:

1. Caribou Harbour - Tidal incursions of effluent can be expected from the outfall in the strait as well as from potential leaks and accidents. As a consequence effluent impacts will occur in Caribou Harbour estuary which has been identified as a small, shallow harbour "rich with fish of all sorts, including lobster, crab, mussels, clams, mackerel, etc."(5)
2. Toxic Chemicals can be expected to accumulate in the sediments of Caribou Harbour and the Northumberland Strait at, as yet, unknown locations.

3. As in the St. Croix, biological magnification of toxins will occur in the Harbour and in Northumberland Strait. A broad range of marine organisms including plankton, fish larvae, fish, birds, marine mammals and humans will be impacted directly or indirectly at lethal and sublethal levels. While these impacts will be observable in Caribou Harbour in a relatively short time, they will only be observable in the strait after more time has passed. This is partly why annual long term monitoring is required.
4. As in the St. Croix, toxic chemicals and physical alterations (pH, temperature, residual solids, etc.) will impose negative impacts on life forms, particularly at the planktonic level and will foster impacts on organisms up the food chain.
5. As in the St. Croix, over time anoxic "Dead Zones" should be anticipated.
6. As in the St. Croix, decline in marine invertebrates and fish as well as some birds and mammals can be anticipated. Those that remain are likely to harbour toxic chemicals.
7. As in the St. Croix, negative impacts on the local fisheries should be anticipated with consequence loss of income.
8. As in the St. Croix, some fisheries may be closed due to the presence of toxic chemicals in fish caught for human consumption.
9. As in the St. Croix, the impacts in the marine system are shared by multiple jurisdictions - Nova Scotia, Prince Edward Island, New Brunswick and the Federal government of Canada. All of these jurisdictions must be included in the crafting of studies and the decisions made to proceed with this proposal for an outfall off Caribou Harbour.
10. As in the St. Croix, the proposed outfall may impact several coastal parks and tourist destinations as well as human properties along all of the shores.

RECOMMENDATIONS:

The problems associated with the outfall proposed for Caribou Harbour are outlined and well defined by local knowledge. However, the knowledge base seems to be largely related to economically valuable and obvious species only and a literature search has not found any extensive science-based, ecosystem surveys and reports. Unless appropriate studies are undertaken, likely impacts are hard if not impossible to assess and cannot be tracked over the long term.

Effluent must be tested in the laboratory for lethal and sub-lethal impacts by an independent laboratory using appropriate local freshwater and marine species from all target areas including Caribou Harbour and the rivers flowing into it.

Frankly, in relation to the proposed pipeline, no work should begin until professional ecosystem surveys are undertaken at Caribou Harbour, Northumberland Strait at Caribou Harbour and Northumberland Strait at the Boat Harbour outfall (vital for comparison purposes). In the absence of these necessary surveys, the Minister must be made aware that there can be no confidence in the purported lack of impacts stated and implied in the Northern Pulp environmental submission. Additionally, the Minister will be remiss in supplying necessary data that will be required by subsequent Ministers to make essential decisions related to future environmental impacts in Caribou Harbour and Northumberland Strait.

Make no mistake, adequate surveys take time and requires highly qualified and experienced field staff. While running sufficient transects and collecting sufficient samples is time consuming, seasonal variations in abundance and distribution of marine organisms dictates designing a sampling regime that takes this into account. As a consequence, a full year at least should be designated for the work. Proposals must include an appropriate ongoing annual monitoring regime.

THE AUTHOR

As CEO and owner of research and consulting company Marine Research Associates Ltd, Art MacKay has had over 50 years of professional experience studying the marine environment of the east coast. In relation to this presentation he has several decades of field surveys and research relating to the pulp mill pollution in the St. Croix River and Estuary in New Brunswick. Other applicable experience includes studies on effluent and ecosystem impacts of the Point Lepreau Nuclear Generating Station, The Coleson Cove Generating Station, Saint John Harbour, coastal quarries in New Brunswick and Nova Scotia as well as mill impacts on the Humber River in Corner Brook Newfoundland. Additional information can be found at: <https://1drv.ms/b/s!AJHlkiSGh1knL5BB8Fyl05bnPdYJQ>

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