Boat Harbour Remediation Project

Response to IAAC Information Requirement Number 82

Technical and Economic Feasibility Assessment

Alternative Containment Cell Location Site

July 2022

Executive Summary

The IAAC Information Requirement

On October 8, 2021, IAAC provided NSLands with an information Requirement, identified as Information Requirement Number 82, seeking additional information on the EIS Sections 2.2.1.1 on Identification of Alternative Means and 2.2.1.2.1 on Waste Management Remedial Options Decision Document. IAAC advised that this information is required to ensure that the assessment of alternative means was sufficient to allow the evaluation and the selection of the preferred alternative for waste management and to increase the Agency's understanding of the potential effects of the Project, including potential impacts to Aboriginal and treaty rights.

The Specific Question/Information Requirement asked NSLands to provide an analysis of the technical and economic feasibility of the alternative containment cell location proposed by PLFN. The analysis should consider factors such as environmental impacts, cost, regulatory requirements, timing, risk, public concerns, and impacts to PLFN. Sufficient information should be provided to support any assumptions or conclusions made in the analysis. NSLands is also to provide PLFN the opportunity to comment on the analysis and clearly demonstrate how comments were addressed.

In the Context and Rationale for Information Requirement 82, IAAC advises that: "*PLFN has informed the Agency and NSLands that they do not support the use of the existing containment cell as the permanent storage facility for the remediated materials."* NSLands previously acknowledged and documented those concerns in the EIS and included mitigation measures and accommodation. As well, NSLands has taken steps to propose significant accommodation relative to potential impacts the ongoing existence of the approved containment cell may have on the PLFN community's ability to exercise aboriginal and treaty rights.

The existing containment cell was approved under NSECC's Industrial Waste Permit Approval #94-032. It is almost 2 kilometers from the PLFN community and is located on provincially owned lands that occupy a total area of approximately 10

hectares. It has been operating since 1996 in receiving and containing sludge from the Boat Harbour Effluent Treatment Facility's Aerated Stabilization Basin. The management of this cell is monitored by NSECC and continues to follow its Industrial Approval as issued by NSECC. For its ongoing use in containment of waste from the project, it will be enhanced, however, its footprint will not be expanded. The impacted area will remain at about 10 hectares.

The loss of use is a baseline condition and will not be exacerbated by the remediation project outcomes. As accommodation or compensation to mitigate continuing impacts or loss of use as a result of the proposed project, NSLands will take steps to transfer 173 hectares of provincially owned lands to PLFN. These lands include waterfront lands and estuary lands which are adjacent to the PLFN community and which directly enable community land owned access to the estuary and the remediated Boat Harbour.

Whether or not the proposed remediation project is approved, the containment cell will continue to exist in storage of Boat Harbour sludge. In the absence of an approval for the remediation, the containment cell will be managed under the jurisdiction of NSECC.

NSLands Response

In accordance with the Information Requirement Number 82 criteria, NSLands has carried out an evaluation of the preferred alternative, the existing approved containment cell, to a specific alternative site now proposed by PLFN. It should be noted the NSLands included in the EIS a review and analysis of remedial options, including off-site disposal of the hazardous waste, in accordance with guidelines provided by IAAC

The possibility of trucking the waste to an alternative hazardous waste site to be constructed on specific property owned by PLFN came to light only after NSLands filed the EIS and was therefore not considered during the original decision-making process for the project. However, it should be noted that the option of taking the waste to an alternative site other than the approved containment cell was generically assessed during the process of deciding on the preferred remedial options for the project. The assessment is summarized in the Table 2.3.1 of the EIS.

Evaluation of identified advantages and disadvantages associated with each option considered the negative and positive outcomes of the concepts in context of the professional judgement and experience of the evaluation team, with advice in specific areas from technical advisors with Nova Scotia Environment and Climate Change and 3rd party consulting professionals. The alternative evaluation also considered the context of the key overall Project goals, consistent with the alternative evaluation process used in the Remedial Option Decision Document (RODD):

- Founded on proven technologies
- Identified and assessed using a collaborative approach
- Evaluated in an open, transparent and traceable manner
- Protective of human health and the environment
- Constructible and includes mechanisms to manage project risks
- Meets established timelines and milestones
- Provides the best value to the Province

From a collaborative and consultative perspective, formal s. 35 Aboriginal and Treaty rights consultation on this Project was initiated in April 2018, as laid out in Section 5.2 of the EIS. This consultation was led by NSLands as the Crown agency responsible for implementing the Project. Consultation undertaken was carried out in accordance with the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference (August 31, 2010). NSLands provided formal correspondence to all Nova Scotia First Nations on April 18, 2018.

With respect to formal consultation with PLFN, a summary of the Remedial Option Decision Document was presented to PLFN at a formal consultation meeting on April 19, 2018. PLFN's position on the remedial options presented on April 19, 2018 was formally communicated to the Project Team by correspondence dated May 29, 2018. A response to this letter was provided by NSLands on August 23, 2018. The EIS includes documentation of this correspondence.

The concerns and impacts to Aboriginal and Treaty Rights that were articulated by PLFN in their response were incorporated into the analysis leading to the proposed solutions outlined in the Project Description subsequently submitted for environmental assessment purposes.

Technical Feasibility

In accordance with Project goals, both on-site and off-site options could be carried out in a manner being protective of human health and the environment. However, due to the significant volume of truck traffic required to move remediated materials (i.e., estimated 63,000 loads), there is an inherent level of risk and increased environmental impacts associated with the alternative site proposed by the PLFN option that require significant mitigative measures or regulatory hurdles that may be insurmountable.

From an environmental impact perspective, pursuant to a 2018 study (GHD 2018 – Greenhouse Gas Mitigation Assessment) the proposed project is expected to result in a net decrease in emissions of 315,020 tonnes of CO_{2e} over a 25 year time period.

For the PLFN proposed site scenario, an estimated 183,164 tonnes of CO_{2e} would be generated (see GHD memo, Annex 7). For comparison purposes, this quantity of CO_{2e} approximately equates to the annual energy consumption of 5,042 residential homes.

From a regulatory requirement assessment, both a federal and a provincial environmental assessment would be required. From an approval or permission to construct and operate requirement, NSLands has sought NSECC's technical assessment of the PLFN proposed site. It is attached as Annex 2. It points to a conclusion that there are specific regulatory requirements around siting a hazardous disposal facility at this site. Requirements associated with an industrial approval to construct and operate such a facility indicate that this site is not suitable.

Economic Feasibility

Another significant issue arises from a cost analysis. The province has set aside $310 million for the remediation of Boat Harbour. Using the cost measures developed, approximately $21 million is allocated to improvements to the existing containment cell.

The analysis of the cost associated with the PLFN Proposed Site includes cost of environmental assessment and baseline studies, approvals and permits, landfill

design and construction, transportation of the remediated materials to this site and landfill operations. The cost is estimated at $108 million (pursuant to GHD Class D cost estimate of 2021). A Class D estimate has an accuracy of -20% to +50% with the estimated range, therefore, being $86 million to $162 million.

The Province of Nova Scotia, in addition to committing to remediate Boat Harbour and setting aside $310 million (pursuant to March 31, 2021 Public Accounts of the Province of Nova Scotia) in recognizing the related liability, may also be facing a significant liability in the future due to litigation based upon Northern Pulp Nova Scotia's assertion of damages owed to them as a result of the enactment of the Boat Harbour Act. The Boat Harbour Act closed Boat Harbour to the reception and treatment of mill effluent as of January 30, 2020, and prohibited any action being brought against the Province or the Executive Council arising from the Act. Northern Pulp Nova Scotia submitted a demand for approximately $100 million in losses and estimates its overall losses at $450 million. While the outcome of litigation is unknown at this point, if a claim is permitted, the associated economic liability may be significant.

The costs associated with this alternative are incremental to the cost associated with the existing containment cell. The existing cell is required to enable sludge consolidation and dewatering whether or not the sludge was to be removed to another site. The cost analysis supports the use of the existing containment cell, as the incremental cost associated with the alternative are somewhere in the range of $86 million to $162 million. This estimate does not take into consideration the recent steep and continuing rise in inflation being experienced across the country.

In addition, this analysis does not consider any profit generated from any cost arrangement PLFN might be considering, therefore should be interpreted as a best-case cost scenario.

Conclusion on Technical and Economic Feasibility Analysis

Overall, from the context of technical and economic feasibility or cost analysis, the comparison of advantages and disadvantages supports selection of the on-site option with the existing approved containment cell over the alternative site proposed by PLFN. In fact, the technical assessment clearly concludes that the alternative site proposed by PLFN is not suitable or feasible for the intended

use, which therefore precludes its use. This reaffirms the results of NSLands' original assessment of an offsite disposal alternative.

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1.0 Introduction

On October 8, 2021, NSLands received Information Requirements from IAAC for the Environmental Impact Statement Review, identified as Round 1 – Part 4.

This round of Information Requirements included IAAC Information Requirement Number 82 and the specific references to the Environmental Impact Statement were to the EIS Sections 2.2.1.1 on Identification of Alternative Means and 2.2.1.2.1 on Waste Management Remedial Options Decision Document. The IAAC Information Requirement is attached as **Annex 1** to this response.

2.0 EIS Submission Context

In the Context and Rationale of the Information Requirement, IAAC has noted that: *"PLFN has informed the Agency and NSLands that they do not support the use of the existing containment cell as the permanent storage facility for the remediated materials."*

From a collaborative and consultative perspective, formal s. 35 Aboriginal and Treaty rights consultation on this Project was initiated in April 2018, as laid out in Section 5.2 of the EIS. This consultation was led by NSLands as the Crown agency responsible for implementing the Project. Consultation undertaken was carried out as per the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference, dated August 31, 2010.

With respect to formal consultation with PLFN, a summary of the Remedial Option Decision Document was presented to PLFN at a formal consultation meeting on April 19, 2018. PLFN's position on the remedial options presented on April 19, 2018 was formally communicated to the Project Team by correspondence dated May 29, 2018. A response to this letter was provided by NSLands on August 23, 2018. The EIS (Appendix J) includes documentation of this correspondence.

The concerns and impacts to Aboriginal and Treaty Rights that were articulated by PLFN in their response were incorporated into the analysis leading to the proposed solutions outlined in the Project Description subsequently submitted for environmental assessment purposes.

In that respect, NSLands has been aware of the lack of consensus from the PLFN community for several years and prior to the commencement of the federal environmental assessment by IAAC.

However, up until such time as the EIS was submitted and accepted by the Agency in December 2020, PLFN Leadership did not express strong or formal opposition to use of the containment cell during any meetings with NSLands. It was only in March of 2021 that PLFN leadership formally indicated to NSLands that they do not support the use of the containment cell as the permanent waste storage facility.

Nonetheless, NSLands' actions in potentially integrating the use of the existing containment cell as the permanent storage facility for the remediated materials have had considerable focus in the planning activities and in the processes of engagement and consultation on issues related to waste management and use of the existing containment cell. The submitted Environmental Impact Statement has addressed the manner with which NSLands has carried out engagement with a particular view on informing and educating the PLFN community on the functional environmental performance of the containment cell on site.

EIS Section 4 Public Participation and Concerns addresses this issue in detail. The related concern was raised at PLFN Open House #1 and #2, and the concern and NSLands response is identified in Table 4.4-1 and Table 4.4-2 of the EIS, respectively.

In EIS Section 4.4.2 Summary of Key Project-Related Issues Raised and their Consideration, the following is detailed:

> *In response to the public and PLFN concerns relating to the sludge disposal cell, including the effectiveness and the longevity of the containment cell to contain the waste placed in it, as the Project progresses, NSLANDS will continue to engage with stakeholders on the topic of the containment cell.*
>
> *At this stage, to address concerns raised about the longevity and effectiveness of the containment cell, NSLANDS has designed an improved base liner system that will reduce the potential for leachate to migrate through the liner to the groundwater and has modelled the effectiveness of the liner. In addition, NSLANDS will:*

• Ensure that the liner is installed and tested in accordance with best practices using quality control and assurance procedures

• Develop a groundwater and surface water monitoring program to monitor the effectiveness of the containment cell during and post-closure of the modified cell

• Implement a long-term post-closure monitoring and care program for the containment cell to ensure its integrity, and make available the groundwater and surface water monitoring program and the long-term post-closure monitoring reports through the Project's website

It is of note that the ongoing monitoring requirements under the NSECC issued Industrial Approval for operation of the existing containment cell as well as NSLands' Phase 2 Environmental Site Assessment have confirmed that the existing containment cell is functioning effectively in containment of sludge waste from Boat Harbour since it was constructed and commissioned by the Province of Nova Scotia with an Industrial Approval in 1996. Moreover, the proposed project plan involves temporary removal of the sludge waste in the containment cell and the complete refurbishment of the cell.

The EIS Section 2.2.1.1 Identification of Alternative Means detailed that **"**the process of identification of Alternative Means involved the establishment of design requirements, development of an evaluation and weighting matrix, option analysis, pilot scale testing and assessment of risks through the completion of a Human Health and Ecological Risk Assessment (HHERA)."

The EIS section 2.2.1.2.1 specifically addressed the alternative means assessment for Waste Management.

It outlined that five approaches were initially identified for Waste Management including:

A - Use of Existing Cell

This Approach consisted of the use of the approved existing containment cell to manage waste generated as part of remediation. The containment cell has received sludge originating from the Boat Harbour Effluent Treatment Facility

(BHETF) under IA 94-032 since 1996. The disposal cell operates under a separate approval from the BHETF.

B - Develop New Cell

This Approach consisted of the establishment of a new containment cell using the existing settling basins as the containment cell location. This proposed location was considered ideal as it is an already disturbed area on provincial land and is currently accessible using the BHETF site access road (Simpsons Road).

C - Use New and Existing Cell

This Approach combines aspects of the above two Approaches through use of the existing containment cell and development of a new containment cell within the existing settling basins. This Approach was developed to provide the flexibility to manage a potentially greater volume of waste that may be generated as a result of the remediation of BHETF.

D - Off-Site Disposal

This Approach consisted of hauling the waste materials to a licensed off-site facility.

E - Treatment through incineration, thermal destruction and separation

The fifth listed approach was not carried forward for assessment as the use of incineration as a method of waste management was not considered further based on potential impact to air emissions through incomplete destruction, public opposition to this technology on other sites within Nova Scotia, and that a facility of this nature has not been previously granted regulatory approvals within Nova Scotia. Following bench scale testing by a vendor and GHDs subsequent review of the results under a non-disclosure agreement, the use of thermal destruction and/or separation was not considered further as the technology was not proven, and the risk of performance could not be reasonably mitigated.

The Assessment of Alternative Means for Waste Management

As outlined in EIS section 2.2.1.2.1, Approach A and D were carried forward for further evaluation. Approach B and C were eliminated during the first filtering step and were removed from further development and evaluation as a Feasible

Concept. Development of a new on-site containment cell was common to both Approaches and was considered unlikely to be acceptable by stakeholders due to setback distances from adjacent properties and Boat Harbour; and due to visual appearance (i.e., mound height relative to surrounding grade in center of potentially usable land area).

2.1 PLFN Concern Over Use of the Containment Cell on the BHETF Site

As stated in the EIS (Section 5), over the period April 2017 to present, it became apparent that the most significant environmental concern of the PLFN community members is the waste management aspect, using the approved existing containment cell, adjacent to Boat Harbour.

The use of the containment cell on the BHETF site was the specific subject of a community meeting in PLFN in June 2018. Subsequently, PLFN Chief and Council leadership asked NSLands to hold four focus groups separately with Youth, Elders, Men, and Women to discuss this matter. The four focus group meetings were held separately in September and October 2018. In addition, a fifth focus meeting was held on October 30, 2018 to enable any PLFN community members who missed the focus group opportunities to be informed on the issue of waste management. These meetings were an opportunity for GHD and the NSLands Project team to present information on how containment cells are constructed, how they function, and how they are managed, maintained and monitored as well as to discuss the enhanced design and integrity of the containment cell adjacent to Boat Harbour.

Of additional note, many of the Boat Harbour Cleanup Committee meetings and general community meetings held monthly, were focused on the use of the containment cell on the BHETF site and served as opportunities to provide information on containment cells consistent with the foregoing description.

During these meetings, results of two independent consulting studies on PLFN's drinking water supply were also presented to assure PLFN residents that the groundwater supply for PLFN's drinking water is neither connected to Boat Harbour, nor to the approved containment cell located approximately 2 km away.

2.2 Impact of the Proposed Project on Aboriginal and Treaty Rights

The Context and Rationale for Information Requirement Number 82 states that:

> "*The EIS Guidelines also require the proponent to assess the effects of changes to the environment on Indigenous peoples, including potential impacts to Aboriginal and treaty rights, and to engage with PLFN, to obtain their views on potential adverse impacts of the project on potential or established Aboriginal or Treaty rights, in respect of the Crown's duty to consult, and where appropriate, accommodate them."* In addition, the Context and Rationale states that*: "PLFN has informed the Agency and the proponent that they do not support the use of the existing containment cell as the permanent storage facility for the remediated materials"*

The issue of the impact on aboriginal and treaty rights and accommodations proposed to mitigate those impacts, partly arising from the identified PLFN community concerns over the use of the containment cell on provincially owned lands, is laid out in detail in Section 6 of the submitted EIS.

Section 6.4.1 of the EIS states:

> *As the remediation of Boat Harbour has an objective to return the harbour and any impacted surrounding lands to their previous function as an estuary and wetlands prior to receiving effluent, impacts to the restoration of Aboriginal and Treaty rights during and post-remediation are considered generally positive (as described in Sections 6 to 6.3.3). This includes restoration of contaminated lands, land transfers to increase and restore PLFN ownership and traditional relationship with surrounding lands, and a Land Use Plan to help guide the ongoing reclamation and development of this land by PLFN. The two main components of the remediation that may negatively impact Aboriginal and Treaty rights for PLFN are the continued use of the containment cell and the remediation and/or removal of the wetlands.*

There is considerable address of treaty rights impacts and accommodations in Section 6.4.2 of the EIS, states as follows:

6.4.2.1 Perceived Limitations

Regarding Section 5.1(c) of CEAA 2012, "with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on (ii) physical and cultural heritage, (iii) the current use of lands and resources for traditional purposes," the following section describes limitations on land use in this context.

The existing containment cell is unique and separate from the BHETF, although both are located on the same provincially owned lands. Use of the existing containment cell to continue to store the waste historically disposed of in the cell and to permanently house the contaminated materials removed during remediation is seen by NSLANDS as the most economically viable and safe remedial option, arrived at during extensive research and comparative engineering analysis. The costs and safety risks associated with alternative siting and transport of these materials is deemed prohibitive. This would also delay completion of the remediation process significantly. Further discussion on the evaluation of alternative means is provided in Section 2 of this EIS.

The on-site containment cell and the permanent storage of contaminated materials in the containment cell are seen by some PLFN community members as an obstruction to the restoration of Aboriginal and Treaty rights of PLFN and an obstruction to the ecological and associated cultural and spiritual relationship with the lands and waters of A'se'k. The emotional and physical impacts of the effluent and the legacy of impact this has had on obstructing PLFN well-being, as well as related distrustful and negative relations with government that have been connected to this physical contamination, are seen to be an ongoing physical risk and impact to well-being if kept on-site. There is also concern over the longevity of the containment cell and its ability to safely and effectively contain dangerous materials. From an engineering perspective, 300 years has been cited, whereas the PLFN perspective would prefer permanent containment in perpetuity. There is mixed feedback regarding the notion that jobs associated with monitoring and maintenance of the containment cell have been presented as an economic benefit to PLFN, as they are either not

interested or are conflicted with their interest in employment or economic opportunities that involve the long-term monitoring of the containment cell.

6.4.2.2 Proposed Use

This section outlines the history of the existing containment cell and the continued limited role or impediment that it will have on surrounding land use.

A containment cell to receive the waste sludge from the BHETF was constructed on lands owned by the Province in the mid-1990s and has received waste sludge from Boat Harbour since 1996. Modifying the existing containment cell, with refurbishment and enhanced engineering controls and vertical expansion into a modern containment cell, is the proposed option for the long-term containment and management of the waste sludge from implementation of the BHRP.

The containment cell is situated on provincially owned lands. Its construction, maintenance and operation has been a provincial responsibility. Its operation has been under the jurisdiction of an Industrial Approval (IA) issued by the Nova Scotia Department of Environment. Ownership and all long-term maintenance and management costs and environmental liabilities associated with the improved and modified containment cell are expected to remain with the Province in perpetuity.

The Province started using the containment cell to receive and contain contaminated waste sludge from Boat Harbour immediately after completion of construction in 1995. Over the years the containment cell has received sludge from dredging the Aerated Stabilization Basin (ASB). There are approximately 180,000 cubic metres (m3) of material in the cell, of which approximately 70,000 m3 was deposited in 1996, and the 110,000 m3 representing the accumulated volumes deposited in the containment cell periodically since 1996. The existing containment cell is currently not capped. There is a security fence installed around its perimeter.

The existing containment cell is situated between IR 37 and IR 24G as shown on Figure 1.2-1. It does result in some limitation on land use in the areas around the existing containment cell and future modern containment cell. It

is anticipated that such limitations on land use will not be further impacted by the BHRP as the use of the containment cell is a long-term component of the Project with its planned maintenance and management during and post-remediation.

The planned volume expansion of the containment cell will be an expansion to its height, or a vertical expansion, and not an expansion to its footprint, or a horizontal expansion. As such, the long-term existence of the containment cell will not result in increased limitations of land use from a footprint or access perspective beyond the limitations which have existed since the mid-1990s. The existence of the containment cell represents a current or baseline access and use restriction to some of the land around Boat Harbour for PLFN to practice their Aboriginal and Treaty rights. Therefore, the permanent storage of sludge in the containment cell would continue to impact PLFN's asserted Aboriginal and Treaty rights in the area, which are significant and include assertion to Aboriginal title.

Section 6.5.1 of the EIS, Accommodations for Potential Effects on Aboriginal and Treaty Rights notes that:

The effects of providing more land to the community, along with funding investments in future site use will result in a positive effect on future use of lands and resources by the PLFN community for traditional purposes." And, "As such, with the outcome of the BHRP, the PLFN community will be accommodated in being able to exercise their Aboriginal and Treaty rights in and around A'se'k in a manner approaching their exercise of such rights prior to the industrialization of A'se'k.

6.5.2 of the EIS indicates:

PLFN has expressed concern through informal engagement, provincial formal consultation and consultation through the EIA process over the proposed use of the existing containment cell to receive and contain the waste from remediation of BHETF, as well as the long-term maintenance and management of the containment cell infrastructure. Accommodating past (containment cell) and current potential impacts of the containment cell on land use is currently being discussed between NSLANDS, Lands & Forestry, NS TIR, and PLFN. The accommodation contemplates land

ownership transfers of some of the lands surrounding Boat Harbour. The land transfers undertaken, committed and contemplated as outlined in Section 6.3.2 are intended to provide some accommodation for limitations in land use as a result of the continued and long-term existence of the containment cell.

The EIS clearly provides detail on the efforts NSLands has undertaken to accommodate impacts to aboriginal and treaty rights for land use limitations arising from the long-term existence of the containment cell. The containment cell, occupying a footprint of approximately 10 hectares, will remain on provincially owned lands; will be perpetually monitored and will always be the responsibility of the province in terms of its safety and environmental performance.

As accommodation for the land use limitations, the province has committed to transfer of a significant parcel of land currently used for the BHETF, once remediation is complete; and, contemplates transfers of other parcels of land around the estuary. Specifically, EIS Section 6.3.2.2 details the commitment to transfer a 128 hectare parcel of land currently used for BHETF operations to PLFN once remediation is complete; and, EIS Section 6.3.2.3 details that further transfers of 9 parcels of land around the estuary, comprising more than 45 hectares in total, are contemplated.

These land transfers committed and contemplated in the future are contingent upon the proposed remediation project being approved, through the federal environmental assessment process, and implemented.

As well, contingent upon the federal environmental assessment process, as laid out in EIS Section 6.3.3 Land Use Planning, NSLands was given executive direction in 2018 to undertake preliminary discussions with PLFN regarding land use planning for future post-Project Site use by the community.

NSLands supported and funded the development of a land use plan for PLFN. PLFN engaged Membertou Geomatic Solutions to develop a Boat Harbour Land Use Plan (the Plan), which was completed in 2018. The plan lays out the vision for the future of Boat Harbour after the remediation Project is completed. It outlines plans for commercial, institutional, recreational, agricultural and residential

development and provides a roadmap over a long-term planning and implementation horizon.

NSLands has discussed early implementation of some aspects of the Plan that are not a part of, do not impact, or are not dependent upon the federal environmental assessment process outcomes.

NSLands successfully secured a source of funding for implementation of aspects of the Plan and associated investment in future site use for activities such as light commercial development and recreational and potential tourism uses. The federal contribution under the Investing in Canada Infrastructure Program includes $15 million for this investment and is wholly contingent upon a federal environmental assessment approval.

3.0 Specific Question/Information Requirement and Assessment

3.1 The Assessment Requirement

IAAC Information Requirement Number 82 states the following:

> *Provide an analysis of the technical and economic feasibility of the alternative containment cell location proposed by PLFN. The analysis should consider factors such as environmental impacts, cost, regulatory requirements, timing, risk, public concerns, and impacts to PLFN. Sufficient information should be provided to support any assumptions or conclusions made in the analysis. Provide PLFN the opportunity to comment on the analysis and clearly demonstrate how comments were addressed.*

In the Context and Rationale for Information Requirement Number 82, the following information directly related to the assessment required, is stated:

> *PLFN has informed the Agency and the proponent that they do not support the use of the existing containment cell as the permanent storage facility for the remediated materials. PLFN owns a 29.14 hectare land parcel, located approximately seven kilometres west of New Glasgow. PLFN*

identified this parcel as a potential alternative location for the containment cell and provided this information to the proponent for review.

3.2 Properties Subject to Assessment under Information Requirement Number 82

While the Information Requirement does not provide specific property identifiers, NSLands was subsequently advised by IAAC that PLFN had identified to IAAC that the properties identified in the land registry as PID 00865469 and the adjacent PID 00865485 could both be considered for development.

PID 00865469 is identified as a 29.14-hectare site and is owned by Aileen Francis, Alden J. Francis and Debbie Dykstra in Trust for the Pictou Landing First Nation. The adjacent PID 00865485 is identified as a 30.35-hectare site with the same ownership as the previous PID.

3.3 The Assessment of Proposed Land Parcels

The assessment requirement is as follows:

> *Provide an analysis of the technical and economic feasibility of the alternative containment cell location proposed by PLFN. The analysis should consider factors such as environmental impacts, cost, regulatory requirements, timing, risk, public concerns, and impacts to PLFN.*

This assessment applies to the land parcels identified as PID 00865469 and the adjacent PID 00865485.

3.4 Technical Feasibility

In assessing technical feasibility, NSLands received advice from Nova Scotia Environment and Climate Change and from the professional services consulting firm, GHD. NSLands also sought advice from others in carrying out the assessment. The factors considered in the assessment are environmental impacts, cost, regulatory requirements, timing, risk, public concerns, and impacts to PLFN. These factors are the same factors used in the EIS Section 2.2.1.2 - Summary of Approaches and Alternative Means Considered and more specifically in EIS Section 2.2.1.2.1 - Waste Management, with the exception that the Information Requirement Number 82 adds the factor of Impacts to PLFN. The assessment compares the use of the Existing Containment Cell on the BHETF site to the PLFN Site Proposed as identified by PID 00865469 and the adjacent PID 00865485.

The technical feasibility review, under each of the assessed criteria is included in the following sub-sections.

3.4.1 Environmental Impacts

The use of the existing containment cell precludes significant environmental impacts associated with the PLFN Site Proposed off site cell. These include increase in noise, dust (during summer months), wear and tear (e.g., deterioration) on surrounding roads, and impact on traffic volume. The site of the existing containment cell has previously been disturbed and is currently a brownfield site with no domestic water wells in the immediate area. As noted, the PLFN well field is approximately 1500m away and studies have proven that the presence of the existing cell has not and will not affect the drinking water for the community.

The impact of greenhouse gas emissions from transportation of approximately 63,000 truckloads of remediated material to an offsite location, an approximate 20 km round trip, would be significant. This is incremental to the significant number of trucks that would be required to bring material to the site to construct the facility. From an environmental impact perspective, pursuant to a 2018 study (GHD 2018 – Greenhouse Gas Mitigation Assessment) the proposed project is expected to result in a net decrease in emissions of 315,020 tonnes of CO_{2e} over a 25 year time period.

For the PLFN proposed site scenario, an estimated 183,164 tonnes of CO_{2e} would be generated Annex 7, GHD Memo). For comparison purposes, this quantity of CO_{2e} approximately equates to the annual energy consumption of 5,042 residential homes.

An off-site disposal location at the PLFN proposed site would involve the loss of natural habitat with the conversion of a natural green field site to a brown field (industrial) site. If the site was be deemed suitable for a hazardous waste site, it would involve the destruction of large wetland complexes which covers a large portion of the properties. Site specific wetland surveys were not conducted as part of the assessment of the PLFN proposed alternative site. There is potential that the wetland complex supports species of special concern.

Given the presence of such a large wetland complex on the site, the site has groundwater located at surface which renders the site unacceptable, including the fact water from the site feeds Middle River which is the drinking water supply for Michelin Tire.

From an environmental impacts' perspective, the use of the existing cell for waste management is the preferred alternative.

3.4.2 Cost

The costs associated with this alternative are incremental to the cost associated with the existing containment cell. The existing cell is required to enable sludge consolidation and dewatering whether or not the sludge was to be removed to another site. The cost analysis supports the use of the existing containment cell, as the incremental cost associated with the alternative are somewhere in the range of $86 million to $162 million.

This analysis does not consider any profit generated from any cost arrangement PLFN might be considering nor the recent steep and continuing rise in inflation being experienced across the country and therefore should be interpreted as a best-case cost scenario.

From a cost perspective, **the use of the existing cell for waste management is the preferred alternative.**

3.4.3 Regulatory Requirement

The use of the existing cell is approved for containment of Boat Harbour waste; is under assessment by IAAC pursuant to the CEAA (2012); and, is significantly advanced in this process. The Industrial Approval issued for the existing containment cell can be amended to meet project requirements.

The regulatory process for a new off-site containment cell would involve significant public consultation through the following assessments and approvals, which are in general:

- Municipal planning strategy to get a planning amendment
- Environmental Assessment, Nova Scotia Environment and Climate Change and Impact Assessment Agency of Canada's IAA (2019) processes
- Industrial Approval

- Watercourse Alteration Approval

There is a risk that the selected site of a new off-site cell is not approved in each of these processes, and the process must begin again.

NSECC's assessment, attached as Annex 2, points to a conclusion that there are specific regulatory requirements around siting a hazardous disposal facility at this site. These requirements include setback distances from adjacent property dwellings, potable water wells and watercourses. Requirements associated with an industrial approval to construct and operate such a facility indicate that the PLFN proposed site is not suitable.

In addition, a Watercourse Alteration Approval would be required to site the containment cell. This approval process requires NSLands to consider viable alternative locations. Since there is an existing containment cell that could accept the waste for long term storage, this would be an impediment to obtaining a Watercourse Alteration Approval.

From a regulatory requirement lens, the existing containment cell is the preferred option.

3.4.4 Timing

Subject to a forthcoming EA decision, the use of the existing cell enables the remediation to proceed as planned with additional schedule efficiency associated with reduced handling and transport of waste. The handling and transport of waste would all be internal to the BHETF and the Boat Harbour environment and would not be impacted by any issues associated with moving the material out of the site.

For the PLFN Proposed site, the estimate of timing to get an approval and construct a new off-site facility on a suitable site is in the range of five and a half (5.5) to six and a half (6.5) years. Refer to Annex 3, GHD Memorandum.

Project timeliness would be subject to the additional schedule requirement and logistics associated with transport, including restrictions due to spring road load restrictions (mid-March to mid-May) on secondary roads, which will limit off-Site transport.

In any event, it is necessary to remediate Boat Harbour and environs using dredging or land-based equipment and material management infrastructure, including pumps and piping, to move the remediated materials from their *in situ* situation to the existing, refurbished containment cell. The remediated materials would be consolidated and dewatered in the containment cell.

Given this knowledge, the transportation of the remediated materials off site to any location would only be possible with the prior implementation of the preferred alternative in use of the existing containment cell for consolidation and dewatering of the remediated material.

From a timing perspective, the existing containment cell is the preferred option.

3.4.5 Risk

With the preferred alternative of the existing containment cell, all remediation and the handling, transport and management of remediated materials will remain within the Boat Harbour Effluent Treatment Facility and the broader site which is now, and will remain, the responsibility of the province to operate and maintain. There will be no need to transport hazardous materials off site, on public highways, in a less controlled environment. A long-term maintenance, monitoring and management plan will be implemented. Risk management and mitigative measures will be rigorously established and effectively carried out in accordance with the Industrial Approval as issued by NSECC.

The PLFN Proposed Site presents:

- A higher level of risk to public health and safety due to the significant increase in truck traffic required with an estimated 63,000 truckloads of remediated material being transported (the preferred option eliminates all public transportation risks)
- A significant risk associated with the observation by NSECC that the PLFN site proposed is not suitable for such a facility and that an approval to construct and operate may not be obtained.
- A risk that the water supply for Michelin Tire could be contaminated, as well as potable wells adjacent to the site

From a risk analysis perspective, the preferred alternative is the use of the existing containment cell. The PLFN proposed site is not suitable and would never have been considered under any circumstances.

3.4.6 Public Concerns

PLFN Chief and Council currently oppose any contamination left at or near Boat Harbour. The degree of opposition has been elevated in 2021, from a position of relative support communicated to NSLands prior to early 2021. In 2019 and 2020, there were several supportive public comments on the project plans with no noted opposition to the use of the existing containment cell.

There had been active discussion on the matter of building capacity in the community to have a PLFN entity developed to monitor, maintain and manage the existing containment cell. Long term cost estimate for this activity is approximately $17 million. Such an approach could lead PLFN to better trust the diligence around monitoring as well as to possibly develop a center of expertise in environmental technology for other First Nations to draw upon.

Nova Scotia will retain ownership of the parcel of land where the approved cell is situated and will accept environmental and financial responsibility for all liability associated with the containment cell in perpetuity.

The existing containment cell is:

- approximately 1,700 meters from the PLFN residential community
- approximately 1,500 meters from the closest residences on Simpsons Road and Highway 348
- not currently impacting, and will not impact, the community water supply, as determined by two hydrogeological studies conducted by separate 3rd party engineering firms.

Significant accommodation/compensation for the loss of use of the approximate 10 hectares associated with the existing containment cell has been proposed with the transfer of approximately 173 hectares of provincially owned lands around Boat Harbour and the estuary to PLFN.

With respect to the PLFN Site Proposed in Mount William, Pictou County it is in a residential area, approximately 10 km from Boat Harbour. The nearest dwelling is less than 150 metres from the property line. The area in question is serviced by groundwater, therefore the nearest residential water well is less than 150 metres of the property line and the SPCA is located within 20 metres of the property line and the well servicing this property is within 30 meters.

The properties proposed as an alternative to the preferred option contain large wetland complexes with associated watercourses that flow to the Middle River water system, which is the drinking water supply for Michelin Tire.

An off-site disposal location at the PLFN proposed site would involve the loss of natural habitat with the conversion of a natural green field site to a brown field (industrial) site. Should the site be deemed suitable for a hazardous waste site, it would involve the destruction of large wetland complexes which covers a large portion of the properties. Site specific wetland surveys were not conducted as part of the assessment of the PLFN proposed alternative site. There is potential that the wetland complex could support species of special concern.

The PLFN properties are currently zoned as Resource Forest so re-zoning would be required.

While NSLands has not reached out to the public for engagement and to gauge public concern from those who may be impacted by the construction and operation of a hazardous waste facility, it is reasonable to conclude that public concern would oppose the construction and operation of such a facility.

With both the preferred alternative and the PLFN Site Proposed there are expected to be ongoing public concern issues, so the public concern analysis would signal that they bear equal merit.

3.4.7 Impact to PLFN

The use of the existing containment cell is met with opposition from PLFN. Although NSLands has undertaken efforts to educate and inform the community on the functional integrity of containment cell construction and operation; and, that design and regulatory examination of containment cell engineering integrity

through the IAAC process, inclusive of independent 3rd party external technical review has been carried out, it is accepted that there will be continued opposition. Of note:

- NSLands has also undertaken to transfer approximately 173 hectares of land in and around Boat Harbour as an accommodation for the long term storage of waste at the existing containment cell and the land use limitations associated with the existing containment cell's approximate 10 hectare site.
- NSLands has secured $15 million in funding for an investment in future site use and/or legacy associated with the project, contingent upon federal environmental assessment approval.
- These measures were undertaken and/or proposed to provide some assurance and/or positive impacts to PLFN as a means of mitigating perceived negative impacts associated with the existing containment cell.

The use of the PLFN Site Proposed is expected to have some associated financial compensation flow to the community, although there have been no substantive discussions on this matter. In the foregoing analysis on cost, no significant cost is included for such compensation. As there are significantly increased Risks and Environmental Impacts associated with the PLFN Site Proposed, these risks and impacts would also affect the PLFN community in their possible interaction with the activities driven by this alternative, including the environmental impacts.

If such an alternative was an outcome, then the future accommodation in the transfer of approximately 173 hectares of provincially owned lands to PLFN would be revisited. This could lead to possible loss of opportunity for land additions for community housing or community assets. In addition, since NSECC has deemed the site not suitable for a hazardous waste disposal site, regulatory approvals would be rejected, and the project would be halted. This would result in no remediation and the provincial strategy could revert to a managed contaminated site, which is essentially the status quo. The status quo would not meet any of PLFN's objectives of clean up and return to tidal and no positive benefits would accrue to PLFN and the environment surrounding the community.

As NSECC has expressed several technical reservations about the suitability of this site for a facility, there may be better future uses for these lands.

4.0 Conclusion

The use of the existing containment cell is:

- Founded on proven technologies
- Identified and assessed using a collaborative approach
- Evaluated in an open, transparent and traceable manner
- Protective of human health and the environment
- Constructible and includes mechanisms to manage project risks
- Meets established timelines and milestones

The use of the existing containment cell is protective of human health and the environment; meets established timelines and milestones; and, is founded on proven technologies. As well, from a cost perspective, it provides the best value to the province in meeting the other key overall Project goals and, accordingly, continues to be the preferred alternative.

Further, if an alternative site was technically feasible it may not provide best value to the province as the costs presented for this proposed alternative site are a best-case scenario at an incremental project cost of $86 million to $162 million for a site approximately 20 km from Boat Harbour.

From the context of technical and economic feasibility analysis, the comparison of advantages and disadvantages supports selection of the on-site option with the existing approved containment cell over the alternative site proposed by PLFN. This reaffirms the results of NSLands' original assessment of an offsite disposal alternative.

Further from the site, there are increased and incremental environmental impacts and costs. The Stablex Facility in Blainville, Quebec is the closest approved facility to accept this material. The incremental environmental impacts associated with this scenario would be an estimated generation of 183,164 tonnes of $CO_{2e,}$ approximately equivalent to the annual energy consumption of 42,896 homes. The incremental cost associated with this scenario would be $763 million based on a Class C estimate (Annex 6) to truck the waste to this facility. A Class C estimate has an accuracy of -20% to +50% with the estimated range, therefore, being $610 million to $991 million to haul and dispose of the material at the

Stablex Facility in Blainville, Quebec. Recent inflation and construction cost uncertainty would appear to be driving the cost of this scenario towards the upper range noted above.

Annex 1
IAAC Information Requirement

Information Requirement Number

IAAC-82

External Reviewer ID

PLFN IAAC

Reference to EIS Guidelines

Part 2, Section 2.2 Part 2, Section 5.0

Reference to EIS

EIS, Section 2.2.1.1 Identification of Alternative Means

EIS, Section 2.2.1.2.1 Waste Management Remedial Option Decision Document (GHD 2018), Section 4

Context and Rationale

The EIS Guidelines require NS Lands to identify and consider the effects of alternative means of carrying out the project, and to provide an analysis of alternative means of meeting the project purposes or objectives that considers environmental effects as per the Canadian Environmental Assessment Act, 2012 (CEAA 2012). The Agency's Operational Policy Statement on Addressing "Purpose of" and "Alternative Means" under CEAA 2012 states that the approach and level of effort applied to addressing alternative means is established on a project-by-project basis taking into consideration the level of concern expressed by Indigenous groups or the public. The EIS Guidelines also require NSLands to assess the effects of changes to the environment on Indigenous peoples, including potential impacts to Aboriginal and treaty rights, and to engage with PLFN, to obtain their views on potential adverse impacts of the project on potential or established Aboriginal or Treaty rights, in respect of the Crown's duty to consult, and where appropriate, accommodate them.

PLFN has informed the Agency and NSLands that they do not support the use of the existing containment cell as the permanent storage facility for the remediated materials. PLFN owns a 29.14 hectare land parcel, located approximately seven kilometres west of New Glasgow. PLFN identified this parcel as a potential alternative location for the containment cell and provided this information to NSLands for review.

This information is required to ensure that the assessment of alternative means was sufficient to allow the evaluation and the selection of the preferred alternative for waste management and increase the Agency's understanding of the potential effects of the Project, including potential impacts to Aboriginal and treaty rights.

Specific Question/Information Requirement

Provide an analysis of the technical and economic feasibility of the alternative containment cell location proposed by PLFN. The analysis should consider factors such as environmental impacts, cost, regulatory requirements, timing, risk, public concerns, and impacts to PLFN. Sufficient information should be provided to support any assumptions or conclusions made in the analysis. Provide PLFN the opportunity to comment on the analysis and clearly demonstrate how comments were addressed.

Annex 2
Nova Scotia Environment and Climate Change
Memorandum dated March 2022

NOVA SCOTIA
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Inspection, Compliance and Enforcement Division

MEMORANDUM

TO: **Ken Swain, Project Lead, Boat Harbour Remediation Project, NS Lands**

FROM: **Kathleen Johnson, P.Eng., Manager Special Projects**

DATE: **March 29, 2022**

SUBJECT: **Boat Harbour Remediation Project IAAC Information Request 82**

Further to your request for NSECC to review with respect to the technical and regulatory feasibility an alternative containment cell location, located at PID 00865469 and PID 00865485, the Department offers the following for consideration:

Hazardous wastes are regulated under the Environment Act in Nova Scotia. The Dangerous Goods Management Regulations classify a hazardous waste as a waste dangerous good. Division IV of the Activities Designation Regulations outline the requirement for an approval to construct, operate and reclaim a waste dangerous goods disposal facility. The Environmental Assessment Regulations outline the designation of a waste dangerous goods disposal facility as a Class 1 Undertaking, requiring an Environmental Assessment Approval. NSECC will not issue a Waste Dangerous Goods Disposal Facility Approval until the Site has successfully undergone an Environmental Assessment.

In this particular case, there is a large wetland complex located on the 2 subject properties which alteration of, for any purpose, would trigger an Environmental Assessment.

With respect to the siting of a waste dangerous goods disposal facility, NSECC does not currently have guidelines specific to hazardous wastes. When guidelines do not exist within the Province, NSECC will look to what other jurisdictions have in-place. Typically, we would use a hierarchy approach- Federal, other Provinces, North America, then Europe- the weighting and use of another jurisdiction's guidance depends on when the guidance was written. NSECC does have Municipal Solid Waste Landfill Guidelines which would be used as minimum guidance.

In this case, NSECC reviewed Federal hazardous waste disposal requirements as well as guidelines and regulations from Ontario and British Columbia.

Location

The proposed alternative location is located at PID 00865469 and PID 00865485 off the Granton Abercrombie Road, Granton, Pictou County. The area is not zoned by the local Municipality and contains a mix of businesses (SPCA and Central Nova Director Services) and residential homes. Michelin tire is located approximately 2.38 km from the site.

Description

The properties in question lie on the eastern boundary of the Granton Abercrombie Road, just north of the Mount William Road. These properties are approximately 59 hectares in size and contain a Provincially mapped wetland complex, supporting more than 20 hectares of

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freshwater wetland which feeds the Middle River through a series of interconnected watercourses.

Assessment Criteria Considered

National Guidelines for Hazardous Waste Landfills

"A key factor to the success of the design for an engineered hazardous waste landfill facility is the site selection process. The selection of a natural setting that can effectively control contaminant migration for many years can be a significant component of the engineered hazardous waste landfill facility".~ National Guidelines

Site Selection

- An engineered hazardous waste landfill facility should be isolated from all surface water features, so that the contaminant travel time is based primarily on groundwater migration.
- There should be a sufficiently long travel time for contaminants from an engineered hazardous waste landfill facility to the nearest boundary of any National, Provincial or Municipal Park, wildlife area, ecological reserve or habitat of special significance, to prevent contamination.
- There should be a sufficiently long travel time for contaminants from an engineered hazardous waste landfill facility to any unstable land form or any groundwater resource to prevent contamination including but not limited to vulnerable source water areas including, but not limited to, critical surface water and groundwater recharge areas, surface water intakes, highly vulnerable aquifers, wellhead protection, areas or zones, and groundwater and surface water sources identified for future water supply.
- The site should not be near designated populated or public areas. The separation between an engineered hazardous waste landfill facility and populated areas should consider atmospheric, surface and groundwater times of travel.

The National Guidelines leave the determination of specific separation distances to the individual Provincial jurisdictions.

NSECC Municipal Solid Waste Landfill Guidelines

The Municipal Solid Waste Landfill Guidelines outline the minimum separation distances required for siting a Municipal landfill:

- The seasonal high elevation of ground water must be maintained at a minimum of 1000 mm below the lowest point of the leak detection and bottom liner.
- The distance between the active disposal area and the nearest residential, institutional, commercial or industrial building is recommended to be a minimum of 1000m.
- The distance between the active disposal area and the nearest property boundary should be a minimum of 100m.
- The distance between the active disposal area and the nearest bank top or high

water mark of any surface watercourse or water body, including salt water, or to any off-site well should be a minimum of 100m.

BC Environmental Act Hazardous Waste Regulations

The Environmental Management Act (EMA) prohibits the introduction of waste into the environment in a way that will cause pollution, except in accordance with a regulation, permit, approval or code of practice issued under the Act. The Hazardous Waste Regulation (HWR) addresses the proper handling and disposal of hazardous wastes, under the EMA.

Siting Requirements

- A person must not locate a secure landfill within a wetland area or an area immediately adjacent to a wetland so that natural drainage from the secure landfill would flow directly into a wetland area.
- A person must not locate a secure landfill on a site which has a predicted maximum peak seismic acceleration, in percent of gravity, greater than 8% with a probability of 10% exceedance in 50 years as determined from the National Building Code of Canada.
- A person must not locate a secure landfill where the landfill (including the underlying dual liners) cannot be constructed
  - (a) entirely above the seasonally high water table, and
  - (b) with a minimum separation depth of 3 m of unsaturated soil material with a permeability less than 1×10^{-6} cm/s above a seasonally high water table including the zone of capillary rise.
- A person must not locate a secure landfill in a recharge area for an unconfined aquifer with one or more high capacity wells (> 100 L/minute) or a significant number of lower capacity wells used for fish hatcheries, domestic, irrigation, industrial, municipal or livestock watering supply.
- A person must not locate a secure landfill where it (including the underlying dual liners) would be underlain by less than 5 m of fine grained unconsolidated material with a permeability of less than 1×10^{-6} cm/s over fractured or permeable bedrock formations (e.g. sandstone, limestone, dolomite).
- A person must not locate a secure landfill within 300 m of any nonintermittent watercourse or any other permanent waterbody.
- A person must not locate a secure landfill within
  - (a) a designated community water supply watershed, Category I, as defined in Guidelines for Watershed Management of Crown Lands used as Community Water Supplies,
- A person must not locate a secure landfill within an area where
  - (a) on average, when calculated on a monthly basis, Pt is greater than Et + Ws, and
  - (b) on average, when calculated on an annual basis, Pt is greater than Et.

- In subsection (8), the formula used must be based on the following:

Pt = precipitation falling on the surface of the closed secure landfill;

Et = maximum possible loss of water from the surface of the closed secure landfill to the atmosphere by evaporation and by transpiration;

Ws = available soil water storage in any month in the final cover of the closed secure landfill (maximum value is total available water storage capacity of the final cover).

- A person must not locate a secure landfill unless the person owns and provides an approved secure buffer zone surrounding the active area of the secure landfill.

Site Suitability

Separation to watercourses and wetlands:

- The NS Municipal Guidelines require a minimum of 100 metres from any watercourse or wetland:
  - The proposed site contains a Provincially mapped wetland complex of which more than 13 hectares is located on the subject properties.
  - The site also contains several watercourses which flow from the various wetland areas in the complex. These watercourses make up an additional 20 hectares of the subject property.

Conclusion: Implementation of a 100m separation from the high water mark of all of the watercourse and wetland areas would leave no remaining area available for disposal.

- The BC Hazardous Waste Regulations require that no secure landfill be located within a wetland area or an area immediately adjacent to a wetland so that natural drainage from the secure landfill would flow directly into a wetland area and that secure landfills must maintain a 300 m separation distance from any non-intermittent watercourse or other permanent water body:
  - As noted above, the site contains wetland area greater than 13 hectares in size.
  - There are many watercourses which can be identified from aerial photography and satellite imagery.

Conclusion: As above, there would be no area available for disposal should a 300 metre separation be employed.

Recognizing that an ecological, hydrological and hydrogeological assessment has not been completed for the site(s), other resources have been used in making the observations above including the Provincial Landscape Viewer, the Provincial Wetlands Database as well as topographical maps, photos and satellite imagery. The presence of large, Provincially mapped, wetland complexes and watercourses on the site(s) make the location unsuitable for any kind of landfill (Municipal or Hazardous) for siting a hazardous waste disposal facility.

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Separation to Groundwater

- The NS Municipal Guidelines require the seasonal high elevation of ground water be maintained at least 1000 mm below the lowest point of the leak detection and bottom liner:
    - Fifty-six percent of the site is either watercourse or wetland.
    - The wetlands are classified as swamps in the Provincial database which means they are fed by overland flow, precipitation and surficial groundwater.

Conclusion: The proposed location would not meet the minimum 1000 mm separation to groundwater requirement.

- The BC Hazardous Waste Regulations require a minimum of 3 metres separation between the bottom of the disposal cell and the seasonally high water table:
    - Fifty-six percent of the site is either watercourse or wetland.
    - The wetlands are classified as swamps in the Provincial database which means they are fed by overland flow, precipitation and surficial groundwater.

Conclusion: The proposed location would not meet the minimum 3 metre separation to groundwater requirements.

Separation to Residential, Institutional, Commercial or Industrial Buildings

- The NS Municipal Guidelines require the distance between the active disposal area and the nearest residential, institutional, commercial or industrial building is recommended to be a minimum of 1000m:
    - There are 16 residential buildings and 3 commercial buildings within 1000 metres of the property boundaries of the subject location.
    - 1 of the commercial buildings shares a common property boundary with the proposed location.
    - 1 of the commercial buildings is located directly across the Granton Abercrombie Road from the subject property.
    - 1000 metres from 3 of the residential buildings and 2 of the commercial buildings would exclude the entirety of the 2 proposed properties.

Conclusion: The proposed properties would not meet the minimum separation distance from residential or commercial buildings for a Municipal Solid Waste landfill.

Separation to a Designated Watershed used as a Community Water Supply

- The BC Hazardous Waste Regulations require a secure landfill not be located within a designated community water supply watershed:
    - The Middle River supplies drinking water to Michelin for staff use.
    - The proposed location is located 550 metres of the Middle River.
    - The wetland and watercourse complex located on the proposed site(s) flow directly into the Middle River.

Conclusion: The proposed site(s) are located within the watershed of the Middle River which supplies domestic water to Michelin which serves approximately 1100 employees.

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The proposed location does not meet any of the requirements of the NS Municipal Solid Waste Landfill Guidelines, which would be minimum requirement, nor does it meet the BC Hazardous Waste Regulation requirements assessed in this document. In reviewing the combination of all siting requirements, as well as the entirety of the site(s), NSECC has determined the proposed location to be unsuitable for the construction of a hazardous waste disposal facility.

Should you require any additional clarification, please do not hesitate to contact me at Kathleen.Johnson@novascotia.ca.

Regards,
Kathleen

Annex 3
GHD Memorandum
Cost and Timing

Memorandum

December 1, 2021

To	Angela Swaine, NSLI		
Copy to	Ken Swain, NSLI		
From	Christine Skirth/vl/086-Rev2	**Tel**	613-297-7687
Subject	High-Level Schedule and Cost Alternative Landfill Site Boat Harbour Remediation Planning and Design	**Project no.**	11148275-44

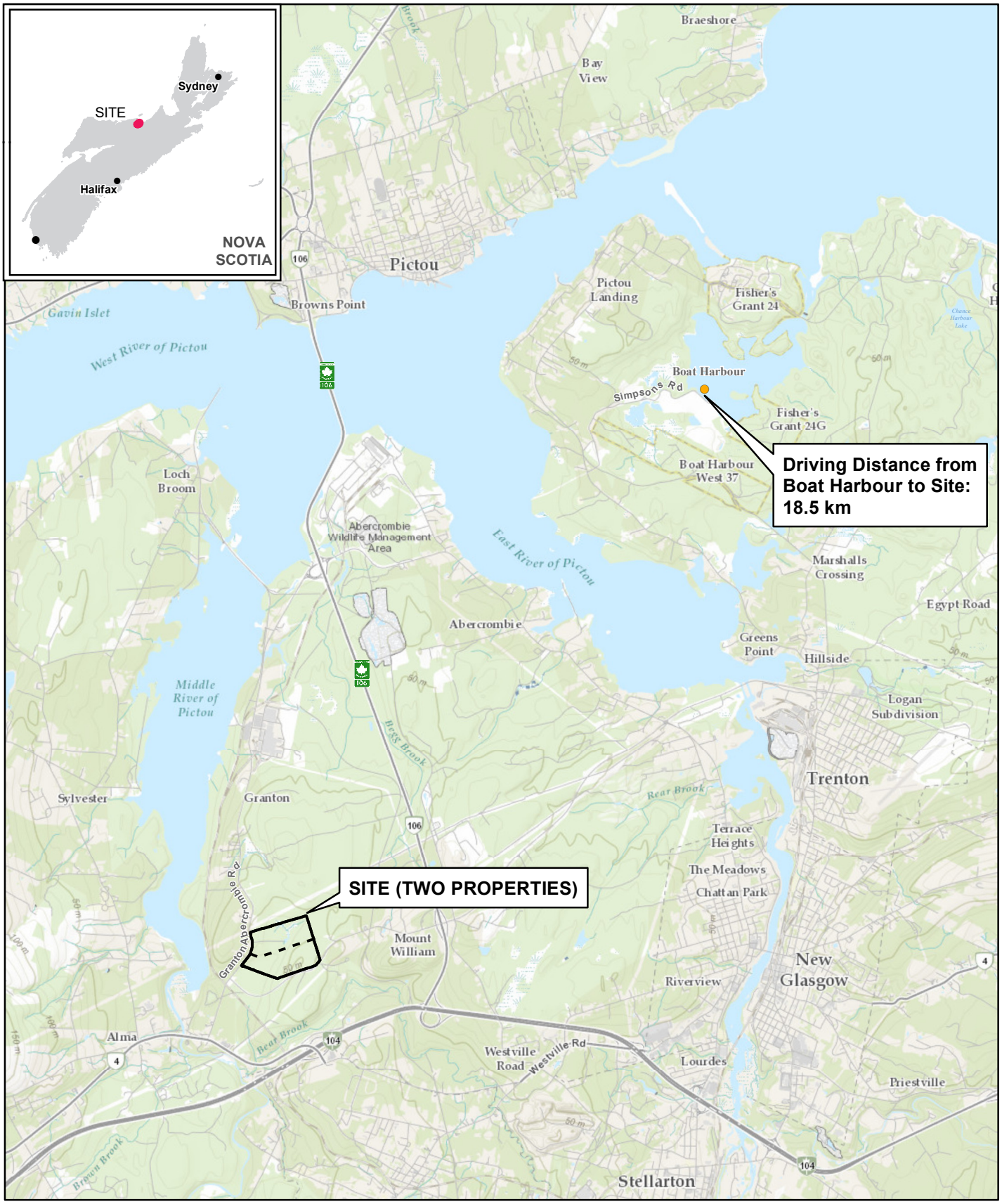
1. Introduction

This memorandum presents a high-level schedule and cost estimate for the development of a new hazardous waste landfill site as an alternative facility for the disposal of the waste anticipated to be generated from the Boat Harbour Remediation Project (BHRP). The anticipated capacity requirement for the disposal of waste and cover soil at the facility is approximately 1,265,000 cubic metres (m^3).

The two parcels of land (referred together as Site) identified by the Impact Assessment Agency of Canada (IAAC) and Pictou Landing First Nations (PLFN) as a potential site for the new landfill are located along Granton Abercrombie Road in Pictou County, Nova Scotia and are approximately 59.5 hectares (147 acres) in size. A Site location plan is provided as Figure 1. The property to the north is identified as PID00865469 and has an assessed value of $25,900. The property to the south is identified as PID00865485 and has an assessed value of $27,000. The properties are owned by Alden J Francis, Debbie Dykstra, and Aileen Francis, and are zoned as Resource Forest. Communication with the property owners has not been undertaken nor has any work to determine if the Site is suitable for siting a hazardous waste landfill.

The high-level schedule and cost memorandum is organized as follows:

– Section 2 | Preliminary Project Scope Statements and Assumptions
– Section 3 | Conceptual Schedule
– Section 4 | Class D Cost Estimate
– Section 4 | Limitations



Source: ESRI Topographic Basemap, Accessed 2021

0 500 1,000 1,500
Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

NOVA SCOTIA LANDS INC
BOAT HARBOUR, NS
ALTERNATIVE LANDFILLING SITE

11148275-44
Nov 4, 2021

SITE LOCATION PLAN

FIGURE 1

GIS File: Q:\GIS\PROJECTS\11148000s\11148275\Layouts\044\11148275-00(044)GIS-OT002.mxd

2. Preliminary Project Scope Statements and Assumptions

The following outlines the preliminary project scope statements and assumptions for the Project activities that have been considered as part of the high-level schedule and cost estimating for the property purchases, zoning, environmental assessment, approvals and permits, design, construction, operation, and post-closure care and maintenance of a hazardous waste landfill at the Site.

The conceptual schedule and costing assumes the Site is suitable for a hazardous waste landfill and also considers the Nova Scotia Environment (NSE) Municipal Solid Waste Landfill Guidelines (Guideline), Ontario Regulation 232/98 (O. Reg. 232) design guidelines for a double liner cell as appropriate practice for a hazardous waste landfill site, and the British Columbia Hazardous Waste Regulation (BC Regulation) for siting a secure landfill.

2.1 Property Purchase and Zoning

It is assumed that the properties will be owned by the Proponent prior to the submission of the Project Description under the Federal Impact Assessment Act, 2019 (IAA). The properties will also need to be re-zoned as they are currently zoned Resource Forest. Amendments to the Land Use Plan may also be required.

The basis for estimated costing and timeframe for Property Purchase and Zoning generally includes:

– Properties purchased at two times the assessed value.
– Plan of survey is required.
– Zoning Amendments required, without any consultation.
– Land Use Plan amendment is not required.

2.2 Environmental Assessment

It is assumed that a Federal Environmental Assessment (EA) will be required for the proposed undertaking subject to the Physical Activities Regulation under the IAA:

– ***56*** *The construction, operation, decommissioning and abandonment of a new facility that is not more than 500 m from a natural water body and is used exclusively for the treatment, incineration, disposal, or recycling of hazardous waste.*

The Project will also be subject to the Provincial EA requirements.

Scope statements and assumptions used in the basis of cost and schedule estimation for the activities required for the Environmental Assessment are provided below.

Baseline Studies | Collect environmental baseline studies as noted below. Data to be collected over an 18-month period to document seasonal conditions where needed to determine baseline conditions.

– Hydrogeological Investigation and Modelling
– Hydrologic Investigation and Modelling
– Natural Resource Studies
– Mi'kmaq Ecological Knowledge Study
– Archaeological Study
– Air, Noise, and Light Studies
– Traffic Study
– Human Health Risk Assessment (baseline)
– Socio-Economic
– Well-being Study

The basis for estimated costing and timeframe for Baseline Studies generally includes:

– 18-24 month window for collection of all baseline data.
– Well-being Study is limited in scope.

Federal Environmental Assessment (EA) (with Provincial EA) | Using baselines studies, a determination of Site suitability, and preliminary design, complete an Environmental Impact Statement (EIS) and support through approvals, including the following:

– Initial Project Description and a Detailed Project Description for IAAC and NSE determination.
– Review of Tailored Impact Statement Guidelines (TISG) and preparation of other Plans (i.e., Public Participation Plan, Indigenous Engagement Partnership Plan, Permitting Plan, and Impact Assessment Cooperation Plan).
– Completion of the EIS in accordance with the TISG.

The basis for estimated costing and timeframe for EA generally includes:

– 60 day review and acceptance period for Project Description with one month allocated for response to conformity.
– 365 day approval period with 4 months allocated to response to information requests.

Consultation/Engagement | Carry out consultation in accordance with the TISG for all stakeholders including Agencies, Public, and Indigenous Communities including planning, preparation for consultation engagement sessions, responding to comments, and reporting.

The basis for estimated costing and timeframe for Consultation/Engagement generally includes:

– Three engagement sessions for Agencies
– Three consultation events for the Public
– Four engagement sessions for Indigenous Communities
– Four engagement sessions with other stakeholders

2.3 Approvals and Permits

The Project will be subject to the Provincial Approvals as well as Municipal Permits. Scope statements and assumptions used in the basis of cost and schedule estimation for the activities required for Approvals and Permits are summarized below.

Provincial Approvals | Complete supporting documentation and application for approvals for Industrial Approval (IA), Water Approval (Withdrawal and Diversion, if required), DFO Fisheries Act Authorization (if required), Offsetting Plan (if required), and on-Site Septic. Support applications through approval process and review and comment on draft approvals.

The basis for estimated costing and timeframe for Approvals and Permits generally includes:

– One water approval (withdrawal and diversion) for construction and operation.
– Basis of Design Report, Design and Operations Plan, Surface Water Management Plan, and Environmental Protection Plan will be required to support IA Application.
– Post-EA approvals typical for landfills in Nova Scotia assuming the facility is not connected to a municipal water supply or sewer system and will have on-Site facilities requiring these services for staff.
– Typical application development periods and turnaround times for regulatory review of applications.

Municipal Permits | Complete supporting documentation and permit applications for road access and municipal signage and support permits through the application process.

The basis for estimated costing and timeframe for Municipal Permits generally includes:

– Typical turnaround times for municipal approvals such as Road Access Approval and Municipal Approvals for signage.
– Improvements and widening of Granton/Abercrombie Road are not required.

2.4 Hazardous Waste Landfill Design and Construction

Detailed design and preparation of tender document will be required to support the EA, Approval and Permit process, and to retain a contractor to construct the works. Scope statements and assumptions used in the basis of cost and schedule estimation for the activities required for a Hazardous Landfill Design and Construction are summarized below.

Landfill Design | Complete a detailed design for the hazardous waste landfill and supporting infrastructure. Complete tender documents and support the design through approvals and tender stages. Prepare issued for contraction documentation.

The basis for estimated costing and timeframe for a Hazardous Waste Landfill Design generally includes:

- Engineering assessments required to support the design include geotechnical and slope stability assessment, hydrogeological assessment, landfill gas assessment, leachate generation assessment, surface water assessment, contaminating life span assessment, and service life assessment.
- Use of a double composite liner system and low permeable final cover system will be required and will be comprised of the following layers:
  - Double Composite Liner System (from top to bottom):
    - Woven geotextile
    - 300 millimetres (mm) drainage aggregate with leachate collection piping (primary leachate management layer)
    - Non-woven geotextile
    - High Density Polyethylene (HDPE) liner
    - 750 mm compacted clay ($1x10^{-9}$ metres/second [m/s]) or geosynthetic clay liner
    - Woven geotextile
    - 300 mm drainage aggregate with leachate collection piping (secondary/leak detection layer)
    - Non-woven geotextile
    - HDPE liner
    - 750 mm compacted clay ($1x10^{-9}$ m/s)
    - 1,000 mm low permeability soils/subgrade material ($1x10^{-7}$ m/s)
  - Final Cover System (from top to bottom, also including landfill passive vents):
    - 150 mm vegetated topsoil
    - 600 mm of protective cover material
    - Drainage geo-composite
    - HDPE liner
    - 300 mm subgrade material
- It was assumed that the high groundwater elevation is approximately 2 metres below ground surface, waste mound height is approximately 18 m, and perimeter berm is 2 m above ground surface.
- Air space required for waste and daily cover soil is 1,265,000 m^3 based on approximately 1,150,000 m^3 waste and 10 percent for cover soil (115,000 m^3). The cover soil would likely be placed on a weekly basis.
- Hazardous waste landfill infrastructure includes Site access road, security fence and gate, weigh scale, serviced attendant building, surface water management pond and ditches, and long-term leachate management pumping station and controls to provide for post-closure hauling and disposal.

Hazardous Waste Landfill Construction | Provide full time oversight and construction contract administration to ensure the works are constructed in accordance with the design intent, permits, and approvals. Prepare a final construction report for the double composite liner system work and a separate report for the final cover system work and closure activities.

The basis for estimated costing and timeframe for Landfill Construction generally includes:

- No significant project delays caused by labour or material shortage.

2.5 Hazardous Waste Landfill Operation

Landfill operations will need to be undertaken in a manner that ensures optimization of waste placement, minimizes leachate generation, and in accordance with the condition of the IA and other permits and approvals. Scope statements and assumptions used in the basis of cost and schedule estimation for the activities required for Landfill Operation are summarized below.

Hazardous Waste Landfill Operation | Provide landfill management and operation services for the receipt and placement of waste, leachate management, surface water management, Site-related nuisance, monitoring and reporting, health and safety, environmental protection, and all other related landfill operations activities. Ensure that IA conditions are met.

The basis for estimated costing and timeframe for this Hazardous Waste Landfill Operation generally includes:

– Five full-time employees will be required for landfill operation (One manager, one attendant/weigh scale operator, two equipment operators, one labourer).
– Financial assurance is not required.
– Excavation and transportation of waste from the Boat Harbour Effluent Treatment Facility (BHETF) to the new Site is included.
– Cover soil will be applied to the waste on a weekly basis, deviating from a daily basis given the nature of the material (e.g., less potential for odours and wind-blown material as compared with municipal solid waste).
– Two new landfill compactors will be purchased to manage the daily tonnage and will be maintained in good working condition.
– Temporary on-Site leachate treatment (i.e., a single-train) is required for 4-years. Treated effluent meets quality for on-Site discharge to surface water.
– Monitoring and reporting (4 years), comprising bi-annual sampling/assessment for groundwater (assuming 15 locations) and leachate (assuming two locations).
– Mitigation of landfill gas migration is not required. Passive venting will be implemented within the landfill mound.
– Environmental Consultant knowledgeable of landfills is engaged to complete annual monitoring and reporting.

2.6 Hazardous Waste Landfill Post-closure Care and Maintenance

Post-closure care and maintenance will be required for a minimum of 25 years post closure. Care and maintenance are required to confirm that the Site performance follows the IA and other permits. Scope statements and assumptions used in the basis of cost and schedule estimation for the activities required for Landfill Post-closure Care and Maintenance are summarized below.

Landfill Post-closure Care and Maintenance | Provide post-closure care and maintenance at the landfill Site for 25 years post closure. This includes leachate management, surface water management, Site maintenance, monitoring and reporting, environmental protection, and health and safety. Ensure IA conditions are met.

The basis for estimated costing and timeframe for Post-closure Care and Maintenance generally includes:

– Financial assurance is not required.
– Leachate is managed through off-Site disposal at a licensed industrial wastewater treatment facility, up to 100 m^3/year.
– Post-closure annual monitoring and reporting (25 years, post-completion of final cover system), comprising bi-annual sampling/assessment for groundwater (assuming 10 locations) and leachate (assuming 2 locations).
– Post-closure maintenance (25 years, post-completion of final cover system), generally comprising vegetation and snow management, maintenance of surface water/long-term leachate management infrastructure, and monitoring well maintenance.

3. Conceptual Schedule

The conceptual schedule for the project is provided in Table 3.1 below. The estimated time form the start of the project until the first tonne of waste is received is estimated at 4.25 to 5.5 years. Landfilling and closure is anticipated to take between 5 to 6 years.

Table 3.1 Conceptual Schedule

Activity	Estimated Timeframe	
	By Activity	Total Duration
3.1 Property Purchase and Zoning	3 to 6 months (in parallel with 3.2 EA, but completed prior to submission of PD). Memorandum of understanding in place if not owned by Proponent prior to commencement of baseline studies.	4.25 to 5.5 years
3.2 Environmental Assessment	3.5 to 4 years	
3.3 Approval and Permits	6 to 12 months (post EA)	
3.4 Landfill Design and Construction	1 year (design) *(concurrent with EA)*	5 to 6 years
	1 year for construction of the first cell and support facilities 3.5 years for filling Progressive closure 0.5 years final cover construction capping in year following placement of waste in cell	
3.5 Landfill Operation	4 years	
3.6 Landfill Post-closure Care and Maintenance	25 years	25 years

4. Class D Cost Estimate

The Class D cost estimate for the alternative hazardous waste landfill site is presented herein. The Class D cost estimate was completed in accordance with the Treasury Board of the Canadian Federal Government cost classification system and is presented in 2020 Dollars (pre-pandemic dollars) without consideration of the time value of money and without HST. The cost estimate is considered to have an accuracy of minus 20 to plus 50 percent.

In recent months the cost of material has risen significantly due to global supply chain challenges resulting from the COVID-19 Pandemic. As an example, the retail price of HDPE pipe has risen by more 30 percent; wood products have risen more than 300 percent, and many suppliers are holding quotes for less than 30 days, some as low as 7 days. The impacts of global supply chain challenges have not been considered in this cost estimate as it is unknown where the prices will settle post-pandemic.

The total Class D cost estimate for Property Purchase and Zoning, EA, Approvals and Permit, Design and Construction, Operation, and Post-closure Care and Maintenance is estimated at $107,979,000. Based on

the accuracy of this estimate (-20 to +50 percent), the actual cost is expected to be between $86,383,200 and $161,986,500. A breakdown of the cost is provided on Table 1 attached.

5. Limitations

GHD has prepared the scope, schedule and cost estimate using information available to GHD and based on assumptions and judgments made by GHD. Additional scope and schedule may be required. Actual prices, costs and other variables may be different to those used to prepare the cost estimates and may change. Unless as otherwise specified in this letter, no detailed quotation has been obtained for actions identified in this letter. GHD does not represent, warrant, or guarantee that the alternative hazardous waste landfill site can or will be undertaken at a cost which is the same or less than the cost estimates.

Regards

<Original signed by>

Christine Skirth, C.E.T., PMP, a GHD Principal
Business Group Leader – Contamination Assessment and Remediation

Class D Cost Estimate
High-level PLanning and Costing
Alternative Hazardous Waste Landfill Site
Boat Harbour Remediation Planning and Design

Item	Description		Cost	
1	**Property Purchase and Zoning**			
1.1	Purchase of Site (Based on Land Value Assessment)		$	110,000
1.2	Zoning Amendment		$	70,000
		Subtotal	**$**	**180,000**
2	**Envirnmental Assessment**			
2.1	**Baseline Studies**			
2.1.1	Hydrogeological Investigation		$	200,000
2.1.2	Hydrogeological Modelling		$	280,000
2.1.3	Hydrology Investigation		$	120,000
2.1.4	Hydrology Modelling		$	105,000
2.1.5	Natural Resource Studies		$	320,000
2.1.6	Mi'kmaq Ecological Knowledge Study		$	75,000
2.1.7	Archeological Study		$	50,000
2.1.8	Air, Noise and Light Studies		$	90,000
2.1.9	Traffic Study (baseline)		$	10,000
2.1.10	Human Health Risk Assessment		$	240,000
2.1.11	Socio-Economic		$	30,000
2.1.12	Well-being		$	90,000
2.2	**Federal Environmental Assessment (with Provincial EA)**			
2.2.1	Federal Impact Assessment		$	600,000
2.2.2	EA (Provincial Fee)		$	15,000
2.3	**Consultation/Engagement**			
2.3.1	Engagement and Communications		$	294,000
		Subtotal	**$**	**2,519,000**
3	**Approvals and Permits**			
3.1	Water approval (withdrawal and diversion)		$	24,000
3.2	Industrial Approval		$	30,000
3.3	DFO Fisheries Act Authorization		$	40,000
3.4	Offsetting Plan		$	40,000
3.6	Septic		$	10,000
3.7	Post EA Management Plans		$	90,000
3.8	Other Municipal Permits		$	24,000
3.9	Permitting Fees		$	60,000
		Subtotal	**$**	**318,000**
4	**Landfill Design and Construction**			
4.1	Detailed Design with Survey, Hydrogeological Investigation, Surface Water, Creek Relocation, Leachate, Landfill Gas, Slope Stability, Filling Plan, and Environmental Management Plan		$	1,120,000
4.2	Admin/HSE Requirements and Temporary Facilities and Controls (5.75%)		$	3,093,000
4.3	Clearing, Grubbing, Excavation, Creek Relocation, and Perimeter Berm		$	7,484,000
4.4	Landfill Cell Liner System with Leachate Piping		$	32,303,000
4.5	Stormwater Management Pond and Ditches		$	1,446,000
4.6	Final Cover and Landfill Passive Vents		$	5,906,000
4.7	Site Infrastructure Including Fence and Gate, Weigh Scale, Serviced Attendant Building, Electrical and Access Road		$	1,311,000
4.8	Long Term Leachate Transfer Station Infrastructure		$	458,000
4.9	General Project Contingency Allowance (10%)		$	5,154,000
4.10	General Contractor Markup (5%)		$	2,577,000
4.11	Construction Contract Admin, Inspection, and Oversight (15%)		$	8,960,000
		Subtotal	**$**	**69,812,000**
5	**Landfill Operation**			
5.1	Excavation and Hauling of Boat Harbour Material to Alternative Landfilling Site		$	22,056,000
5.2	Landfilling of Boat Harbour Material with Weekly Cover and Operation and Maintenance, Including Landfill Compactors (2)		$	4,195,000
5.3	Temporary Leachate Treatment and Disposal (4 years)		$	3,170,000
5.4	Monitoring and Reporting (4 Years), Comprising Bi-Annual Sampling/Assessment for Groundwater (15 Locations) and Leachate (2 Locations)		$	400,000
		Subtotal	**$**	**29,821,000**
6	**Post-closure Care and Maintenance**			
6.1	Leachate Hauling and Disposal (25 years)		$	1,750,000
6.2	Post-Closure Annual Monitoring and Reporting (25 Years, Post-Completion of Final Cover System), Comprising Bi-Annual Sampling/Assessment for Groundwater (10 Locations) and Leachate (2 Locations)		$	2,500,000
6.3	Post-Closure Care (25 Years, Post-Completion of Final Cover System), Generally Comprising Vegetation and Snow Management, Maintenance of Surface Water/Long-Term Leachate Management Infrastructure, Monitoring Well Maintenance		$	1,079,000
		Subtotal	**$**	**5,329,000**
		Total	**$**	**107,979,000**
		Total Range (-20%)	**$**	**86,383,200**
		Total Range (+50%)	**$**	**161,968,500**

Annex 4
Detailed Technical Feasibility Analysis

Environmental Impacts

Existing Containment Cell	PLFN Site Proposed
The existing cell can accommodate the waste with an understanding that there will be an increased elevation of the cell. The Phase II Environmental Site Assessment has determined that the cell is functioning effectively in containing the approximate 116,000 m^3 of sludge already placed in the cell starting in 1995 with additional sludge placed there in seven subsequent years. The Design Engineer validated the engineering integrity of the existing drainage system and further has designed an improved liner and drainage system, which will be an initial step in the remediation project, i.e. to empty the containment cell and construct a new leachate draining system and install new liners. The PLFN Native Women's Association has commented that lichens grow in proximity to the cell, indicating localized air quality around the cell is not significantly impacted by the cell. The efficiency associated with reduced handling and transport of waste minimized environmental impacts (greenhouse gas emissions) associated with alternative transport. At completion of placement of sludge, an engineered cap will be installed as well as a leachate collection and pump out system. The site of the existing containment cell has previously been disturbed and is currently a brownfield site with no domestic water wells in the immediate area. As noted, the PLFN well field is approximately 1500m away and studies have proven that the presence of the existing cell has not and will not affect the drinking water for the community.	Assuming a truck capacity of 22.5 MT/truck 35 and based on the anticipated sludge volumes and density of 1.25 MT/m3, it is estimated that approximately 63,000 loads will be required to transport the treated sludge material off-Site all off which would be regulated by Transport Canada Transportation of Dangerous Goods Regulations. This number of trucks would be incremental to the significant number of trucks required to construct the site. The resulting increase in noise, dust (during summer months), wear and tear (e.g., deterioration) on surrounding roads, and impact on traffic volume. Offsite impact could be greater in an un-protected environment. Excess road traffic and operational impacts to local Pictou County and receiving community with respect to dust, noise and traffic. The impact of greenhouse gas emissions from transportation of approximately 63,000 truckloads of remediated material to an offsite location, an approximate 20 km round trip, would be significant. From an environmental impact perspective, pursuant to a 2018 study (GHD 2018 – Greenhouse Gas Mitigation Assessment) the proposed project is expected to result in a net decrease in emissions of 315,020 tonnes of CO_{2e} over a 25 year time period. For the PLFN proposed site scenario, an estimated 183,164 tonnes of CO_{2e} would be generated. For comparison purposes, this quantity of CO_{2e} approximately equates to the annual energy consumption of 5,042 residential homes. Loss of natural habitat with the conversion of a natural green field site to a brown field (industrial) site. Destruction of large wetland complexes which covers a large portion of the properties. As with any wetland, there is potential that the wetland complex could support species of special concern.

	Groundwater located at surface (evidenced by the wetland complex) which would be very difficult to mitigate significantly increases the potential for groundwater contamination from the hazardous waste site. The large wetland complexes flow to the Middle River which could be impacted by any groundwater or surface water that could not be managed on site. Potential for contamination to spread to the Middle River which is the drinking water supply for Michelin Tire.

From an environmental impacts perspective, the use of the existing cell for waste management is the preferred alternative.

Cost

Existing Containment Cell	PLFN Site Proposed
The cost associated with the existing cell is approximately $21 million, (pursuant to GHD Class A cost estimate dated 2020) which includes vertical expansion of cell and general refurbishment and design to closure. The costs do not include post closure maintenance and monitoring. **Cost $21 million**	The cost associated with the PLFN Site Proposed is comprised of environmental assessment and baseline studies, approvals and permits, landfill design and construction, landfill operations are estimated at $108 million (pursuant to GHD Class D cost estimate dated 2021). A Class D estimate has an accuracy of -20% to +50% with the estimated range being $86 million to $162 million. The costs do not include post closure maintenance and monitoring. The costs are incremental to the cost associated with the existing containment cell as the existing cell is required to enable sludge consolidation and dewatering whether or not the sludge was removed to another site. The cost does not factor in any profit PLFN may be expecting to collect for use of the property (e.g., tipping fees or any other arrangement). **Cost $86 million to $162 million**

From a cost perspective, the use of the existing cell for waste management is the preferred alternative.

Regulatory Requirements

Existing Containment Cell	PLFN Site Proposed

The use of the existing cell is approved for containment of Boat Harbour waste. The Boat Harbour Remediation Project is under assessment by IAAC pursuant to the CEAA (2012) and is significantly advanced in this process. The Industrial Approval issued for the existing containment cell can be amended to meet project requirements.	The regulatory process for a new off-site containment cell would involve significant public consultation through the following assessments and approvals, which are in general: • Municipal planning strategy to get a planning amendment • Environmental Assessment, Nova Scotia and Impact Assessment Agency of Canada IAA (2019) process • Industrial Approval • Watercouse Alteration Approval There is a risk that the selected site of a new off-site cell is not approved in each of these processes, and the process must begin again. In particular, NSECC's assessment points to a conclusion that there are specific regulatory requirements around siting a hazardous disposal facility at this site. In particular, requirements associated with an industrial approval to construct and operate such a facility indicate that this site is not suitable and is likely to impact regulatory approvability. A Watercourse Alteration Approval would be required to site the containment cell. This approval process requires NSLands to consider viable alternative locations. Since there is an existing containment cell that could accept the water for long term storage, this could be an impediment to obtaining a Watercourse Alteration Approval.

From a regulatory requirement lens, the use of the existing containment cell is the preferred option.

Timing

Existing Containment Cell	PLFN Site Proposed
Subject to a forthcoming EA decision, the use of the existing cell enables the remediation to proceed as planned with additional schedule efficiency associated with reduced handling and transport of waste. The handling and transport of waste would all be internal to the BHETF and the Boat Harbour environment and would not be impacted by any issues associated with moving the material out of the site.	The estimate of timing to get an approval and construct a new off-site facility on a suitable site is in the range of five and a half (5.5) to six and a half (6.5) years. The likelihood of getting an approval for the PLFN proposed site is highly improbable given the determination by NSECC that the site is not suitable for a hazardous waste facility.

	Project timeliness would be subject to the additional schedule requirement and logistics associated with transport, including restrictions due to spring road load restrictions (mid-March to mid-May) on secondary roads, which will limit off-Site transport. In any event, it is necessary to remediate Boat Harbour and environs using dredging or land-based equipment and material management infrastructure, including pumps and piping, to move the remediated materials from their *in situ* situation to the existing, refurbished containment cell. The remediated materials would be consolidated and dewatered in the containment cell. Given this knowledge, the transportation of the remediated materials off site to any location would only be possible with the prior implementation of the preferred alternative in use of the existing containment cell for consolidation and dewatering of the remediated material.

From a timing perspective, the use of the existing containment cell is the preferred option.

Risk

Existing Containment Cell	PLFN Site Proposed
A long-term maintenance, monitoring and management plan will be developed and implemented. Risk management and mitigative measure will be rigorously established and effectively carried out. The relative ease of implementing a contingency measure during the post-remediation period was considered more difficult for an off-Site location than an on-Site location.	A higher level of risk to public health and safety due to the significant increase in truck traffic required with an estimated 63,000 truckloads of remediated material being transported (the preferred option eliminates all public transportation risks). Potential risks to public during waste transportation are generally considered to be easily mitigatable and may include stopping work during inclement weather, altering or restricting truck routes and travel times to avoid peak traffic areas and times. However due to the significant volume of traffic required to move the treated waste material, there is still an inherent level of risk including risk of upset of loads through perceived/actual leakage and/or accident. The level of risk associated with constructing a disposal cell cap and placement of waste in a cell under Existing Cell was considered to be less than the risk associated with Off-site Cell, which had a higher level of risk to worker and public

	health and safety due to the significant volume of transportation required. There is also a significant risk associated with the observation by NSECC that the PLFN site proposed is not suitable for such a facility and that an approval to construct and operate may not be obtained. A health risk that the water supply for Michelin Tire could be contaminated, as well as potable wells adjacent to the site.

From a risk analysis perspective, the preferred alternative is the use of the existing containment cell.

Public Concerns

Existing Containment Cell	PLFN Site Proposed
PLFN Chief and Council oppose any contamination left at or near Boat Harbour. There had been active discussion on the matter of building capacity in the community to have a PLFN entity developed to monitor, maintain and manage the containment cell. Long term cost estimate for this activity is approximately $17 million. Such an approach may lead PLFN to trust the diligence around monitoring as well as to possibly develop a center of expertise in environmental technology for other First Nations to draw upon. Nova Scotia will retain ownership of the parcel of land where the cell is situated and will accept environmental and financial responsibility for all liability associated with the containment cell for the long term. Hydrogeological studies conducted by two 3rd party engineering firms have concluded that there are no possible impacts between Boat Harbour and the PLFN community water well field. The existing containment cell is approximately 1,700 meters from the PLFN residential community and approximately 1,500 meters from the closest residences on Simpsons Road and Highway 348.	The site is in Mount William and is in a residential area approximately 10 km from Boat Harbour. The nearest dwelling is less than 150 metres from the property line. The area in question is serviced by groundwater, therefore the nearest residential water well is less than 150 metres of the property line. The SPCA is located within 20 metres of the property line and the well servicing this property would be within 30 meters. The properties contain large wetland complexes and associated watercourses which flow to the Middle River, the drinking water supply for Michelin Tire. Use of this site would involve the loss of natural habitat with the conversion of a natural green field site to a brown field (industrial) site and destruction of large wetland complexes which cover a large portion of the properties. Site specific wetland surveys were not conducted as part of the assessment of the PLFN proposed alternative site. There is potential that the wetland complex could support species of special concern. The PLFN properties are currently zoned resource Forest so re-zoning would be required. While NSLands has not reached out to the public for engagement and to gauge public concern from

Significant accommodation for the loss of use of the approximate 10 hectares associated with the existing containment cell has been proposed with the funding and/or transfer of approximately 200 hectares of provincially owned lands around Boat Harbour and the estuary.	those who may be impacted by the construction and operation of a hazardous waste facility, it is reasonable to conclude that public concern would oppose the construction and operation of such a facility.

With both the preferred alternative and the PLFN Site Proposed there are expected to be ongoing public concern issues, so the public concern analysis would signal that they bear equal merit.

Impacts to PLFN

Existing Containment Cell	PLFN Site Proposed
The use of the existing containment cell is met with opposition from PLFN. Although NSLands has undertaken effort to educate and inform the community on the functional integrity of containment cell construction and operation; and, that design and regulatory examination of containment cell engineering integrity through the IAAC process, inclusive of independent 3rd party external technical review has been caried out, it is accepted that there will be continued opposition. NSLands has also undertaken to fund and/or transfer approximately 200 hectares of land in and around Boat Harbour as an accommodation for the long term storage of waste at the existing containment cell and the land use limitations associated with the approximate 10 hectare site. NSLands also secured $15 million in funding for an investment in future site use and/or legacy associated with the project. These measures were undertaken and/or proposed as a means to provide some assurance and/or positive impacts to PLFN as a means of mitigating perceived negative impacts associated with the existing containment cell.	While it is expected that PLFN would seek to have some financial compensation flow to the community through whatever arrangement may be contemplated associated with the use of this land, there have been no substantive discussions on this matter. In the foregoing analysis on cost, no significant cost is included for such compensation. As there are significantly increased Risks and Environmental Impacts associated with the PLFN Site Proposed, these risks and impacts would also affect the PLFN community in their possible interaction with the activities driven by this alternative, including the environmental impacts. If such an alternative was an outcome, then the future accommodation in the transfer of approximately 173 hectares of provincially owned lands to PLFN would be revisited. This could lead to possible loss of opportunity for significant land additions for community housing or community assets. As NSECC has expressed a number of technical reservations about the suitability of this site for a facility, there may be better future uses for these lands.

Annex 5
Economic Feasibility Analysis

The economic feasibility issue arises from a cost analysis of the use of the existing containment cell versus the PLFN Site Proposed.

The province has set aside $310 million for the remediation of Boat Harbour. Using the cost measures developed, approximately $21 million is allocated to improvements to the existing containment cell.

The analysis of the cost associated with the PLFN Proposed Site includes cost of environmental assessment and baseline studies, approvals and permits, landfill design and construction and landfill operations. The cost is estimated at $108 million (pursuant to GHD Class D cost estimate dated 2021). A Class D estimate has an accuracy of -20% to +50% with the estimated range, therefore, being $86 million to $162 million.

In this economic feasibility, the costs associated with long term maintenance and monitoring have been excluded as they are deemed to be similar.

The costs associated with this alternative, of $86 million to $162 million, are incremental to the $21 million cost associated with the existing containment cell. The existing cell is required to enable sludge consolidation and dewatering whether or not the sludge was to be removed to another site. The cost analysis supports the use of the existing containment cell, as the incremental cost associated with the alternative are somewhere in the range of $86 million to $162 million.

The Province of Nova Scotia, in addition to committing to remediate Boat Harbour and setting aside $310 million in recognizing the related liability, may also be facing a significant liability in the future due to litigation based upon Northern Pulp Nova Scotia's assertion of damages owed to them as a result of the enactment of the Boat Harbour Act. The Boat Harbour Act closed Boat Harbour to the reception and treatment of mill effluent as of January 30, 2020, and prohibited any action being brought against the Province or the Executive Council arising from the Act. Northern Pulp Nova Scotia submitted a demand for approximately $100 million in losses and estimates its overall losses at $450 million. While the outcome of litigation is unknown at this point, if a claim is permitted, the associated economic liability may be significant.

The Province of Nova Scotia, subject to the outcomes of the IAAC environmental assessment process, is of the opinion that the use of the existing containment cell is the preferred alternative in the context of the key overall Project goals of the BHRD, being as follows:

- Meet established timelines and milestones
- Founded on proven technologies
- Provide the best value to the Province
- Identify and assess using a collaborative approach
- Evaluate in an open, transparent and traceable process
- Ensure constructability and mechanisms to manage project risk

The use of the existing containment cell is protective of human health and the environment; meets established timelines and milestones; and, is founded on proven technologies. As well, from a cost perspective, it provides the best value to the Province in meeting the other key overall Project goals and, accordingly, continues to be the preferred alternative.

Further, if another site was technically feasible it may not provide best value to the Province as the costs presented for this proposed alternative site are a best-case scenario at an incremental project cost of $86 million to $162 million for a site approximately 20 km from Boat Harbour.

With any option considered further from the site, the incremental cost increases. These increases would be the outcome up to a maximum estimated incremental cost of $763 million based on a Class C estimate (Annex 6) to truck the waste to the closest containment cell approved to take the waste. A Class C estimate has an accuracy of -20% to +50% with the estimated range, therefore, being $610 million to $991 million to haul and dispose of the material at the Stablex Facility in Blainville, Quebec.

Annex 6
GHD Memorandum
Class C Costing to Haul and Dispose of Material in Quebec

Memorandum

November 17, 2021

To	Angela Swaine, NSLI		
Copy to	Ken Swain, NSLI		
From	Christine Skirth/cs/95	**Tel**	613-297-7687
Subject	Class C Costing Off-Site Disposal of Consolidate Waste at 3rd Party Facility Boat Harbour Remediation Planning and Design	**Project no.**	11148275-44

1. Introduction

This memorandum presents a Class C costing for off-Site disposal of the consolidated hazardous waste anticipated to be generated as part of the Boat Harbour Remediation Project (BHRP). The Class C cost estimate was completed in accordance with the Treasury Board of the Canadian Federal Government cost classification system and is presented in 2021 Dollars without consideration of the time value of money. The cost estimate is considered to have an accuracy of minus 20 to plus 30 percent.

The nearest facility other than the existing containment cell that is currently licensed to receive the sludge/sediment waste from the BHRP is Stablex Canada Inc. Facility (Stablex Facility), located at 760 Industriel Boulevard, Blainville, Quebec.

The anticipated volume of waste to be generated from the BHRP is estimated to be approximately 1,150,000 cubic metres (m^3) including a 15 percent contingency.

2. Cost Assumptions

The assumptions carried in the costing are as follows:

– Sampling:
  - Toxicity characteristic leaching procedure (TCLP) analyses for a full suite of parameters (i.e., metals including mercury, nitrite, nitrate, and fluoride)
  - Soil analysis for dioxins and furans and flashpoint
  - One sample set per 10,000 m^3 (~ 115 samples)
– Loading:
  - No new access roads/points required
  - No additional permits or approvals required
  - Environmental monitoring limited to a routine air quality monitoring (i.e., PM_{10}, $PM_{2.5}$, and H_2S)

- Truck capacity: 18 m^3/truck (estimated at 22.5 MT/truck based on an average density of consolidated waste of 1.25 MT/m^3)

– Hauling:
  - Distance from the BHRP to the Stablex facility is approximately 1,250 kilometres (km) one-way
  - Hauling full loads to Stablex and empty on return trip
  - 70 truckloads per day/5 days per week/48 weeks per year/3.8 years
  - Management of the material by Stablex (refer to discussion below)

Preliminary discussions were held October 25 through November 3, 2021, with Stablex facility personnel to understand the potential tipping fee for management of the BHRP material at the facility and the potential limitations to tipping rates. A copy of available analytical results from the pilot scale testing and the Dioxin/Furan Toxicity Equivalency Quotient (TEQ) calculations forming the Project Description (both provided as part of the Environmental Impact Statement [EIS]) were provided to Stablex to assist in assessing the cost for management of the material, as part of their overall tipping fee. Facility personnel noted that the presence of mercury in the analytical results could substantially affect the tipping fee. The facility personnel requested additional data (i.e., TCLP) or for a sample to be submitted for their analysis to allow the narrowing of a wide tipping fee range. As the additional data were not available, only a wide tipping fee range was received from Stablex (i.e., $225/tonne up to $3,400/tonne). With regard to timeframe, Stablex provided only a wide timeframe of more than 1 year and less than 5 years for acceptance of the total quantity of waste.

Based on the excavation and hauling assumptions and noting the limited definition of pricing and timeframe available from Stablex to date, the Class C cost estimate considered the lower end price for tipping fee as the waste characteristics once dewatered and consolidated are estimated to be in the acceptable range for the lower pricing to apply overall. The lower end pricing is similar to pricing received for similar contaminated waste for disposal at a Clean Harbour Facility in Ontario.

– Exclusions:
  - PLFN participation and engagement
  - Independent monitor
  - Decommissioning and Restoration of the containment cell once waste is removed
  - NSLI project management

3. Cost Estimate

The total Class C cost estimate for sampling, loading, hauling and disposal of the consolidated waste at a 3rd Party facility is estimated to $762,603,000. Based on the accuracy of this estimate (-20 to + 30 percent), the actual cost is expected to be between $610,083,000 and $991,384,000. A breakdown of the cost is provided on the attached Table 1. All costs are in 2021 Dollars without the consideration of the time value of money.

Memorandum

4. Limitations

GHD has prepared the Class C cost using information available to GHD and based on assumptions and judgments made by GHD. Additional scope and schedule may be required. Actual prices, costs and other variables may be different to those used to prepare the costing and may change. Unless as otherwise specified in this letter, no detailed quotation has been obtained for actions identified in this letter. GHD does not represent, warrant, or guarantee that the disposal of the BHRP material at the Stablex facility can or will be undertaken at a cost which is the same or less than the indicative costing.

Regards

Christine Skirth, C.E.T., PMP, a GHD Principal
Business Group Leader – Contamination Assessment and Remediation

Class C Cost Estimate
Off-Site Disposal of Hazardous Waste at 3rd Party Facility
Boat Harbour Remediation Planning and Design

Item	Description		Cost
1	**Hauling, Loading, Disposal**		
1.1	Sample Collection and Analysis	$	95,000
1.2	Loading of Trucks	$	17,250,000
1.3	Enviromental Monitoring During Loading	$	1,006,000
1.4	Hauling	$	367,362,000
1.5	Disposal (for pre-treatment and disposal)	$	323,438,000
	Subtotal	**$**	**709,151,000**
2.1	Admin/HSE Requirements and Temproary Facilites and Controls (5.75%)	$	40,776,183
2.2	General Contractor Markup (5%)	$	2,038,809
2.3	Construction Contract Admin, Inspection, and Oversight (1.5%)	$	10,637,265
	Subtotal	**$**	**53,452,257**
	Total	**$**	**762,603,257**
	Total Range (-20%)	**$**	**610,082,605**
	Total Range (+30%)	**$**	**991,384,234**

Annex 7
GHD Memorandum
GHG Emissions Assessment

Memorandum

April 07, 2022

To	Angela Swaine		
Copy to	Ken Swaine		
From	Dana Lauder/Christine Skirth/Troy Small	**Tel**	+1 902 468 1248
Subject	Greenhouse Gas Emission Assessment	**Project no.**	12572494

Introduction

In June 2018, GHD Limited (GHD) completed a Greenhouse Gas (GHG) Mitigation Assessment (GHD 2018). The assessment included a calculation of GHG emissions under the baseline scenario - business as usual with no remediation of the Boat Harbour Effluent Treatment Facility (BHETF) and for the proposed remedial option.

The GHG emission sources considered in the baseline scenario included:

– Methane generation from pulp and paper sludge at the BHETF.
– Diesel-fired equipment.
– Purchased electricity to operate large pumps and aerators.

The GHG emission sources considered for the proposed remedial option included:

– Pipeline corridor abandonment of surface infrastructure.
– Site preparation including access road improvements and containment cell modification and vertical expansion.
– Active remediation of Boat Harbour stabilization basin, aeration stabilization basin, settling basins, estuary, and wetlands.
– Building demolition.
– Dam demolition.
– Bridge demolition and replacement.
– Waste management and capping of the containment cell.

Objective of Memorandum

The objective of this memorandum is to present the additional GHG emissions that the project would generate if, following remediation, the consolidated waste in the containment cell was relocated to an off-site location as

an alternative long term waste management solution. Two alternative waste management scenarios have been considered as detailed below.

Scenario 1 | Off-site disposal of consolidated waste at an existing 3rd party hazardous waste facility. Once the remediation is completed, the consolidated waste in the containment cell would be excavated and transported off-site for disposal at a licenced hazardous waste facility. For this scenario the following emission sources, not covered in the proposed remedial option, were considered:

– Excavation and loading of consolidated waste for off-site transport.
– Hauling of waste to a treatment/disposal facility located 1,250 kilometre (km) from the project site using standard highway licensed transport trailers with an approximately capacity of 18 cubic metres (m^3).

Scenario 2 | Off Site disposal at a new landfill site. A new landfill site would be constructed to receive the waste. Once the remediation is completed, the consolidated waste in the containment cell would be excavated and transported to the new landfill site for disposal. Following placement of the waste, the new landfill would be completed with final cover. For this scenario the following emission sources, not considered in the proposed remedial option, were considered:

– Construction of a new landfill cell including topsoil stripping, excavation of native soil, and importing and placement of structural fill and leachate collection drainage media.
– Excavation and loading of consolidated waste for off-site transport using standard highway licensed transport trailers with an approximately capacity of 18 m^3.
– Hauling of material to a new landfill facility located 20 km from the project site.
– Placement of waste in the new landfill.
– Construction of final cover including importing and placement of cover soils.

Estimated Additional Project Emissions

Scenario 1 | Off Site Disposal of Consolidated Waste at a 3rd Party Hazardous Waste Facility

A standard list of equipment with net horsepower ratings and brake specific fuel consumptions was used to estimate the total amount of diesel consumed for Scenario 1. It is estimated that excavators will be operating at full load for 8 hours per day and at 40 percent of net horsepower for 2 hours per day while idling. Based on this assumption, an average horsepower rating was calculated to estimate the total fuel consumption.

The consolidated waste will be trucked off-site to a licensed treatment/disposal facility, located 1,250 km from the site. For the scenario, a fuel economy of 39.5 Litre(L)/100 km was assumed to calculate total diesel consumption for transportation.
(https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607)

Equation 5.2 from the document "Standards for Quantification, Reporting and Verification of Greenhouse Gas Emissions" was used to estimate the total CO_{2e} emissions over the course of the remediation.

An estimated 183,164 tonnes of CO_{2e} are estimated to be generate under Scenario 1 as detailed in Table 1. For comparison purposes, this quantity of CO_{2e} approximately equates to the annual energy consumption of 42,896 residential homes (source:Greenhouse Gas Equivalencies Calculator | Natural Resources Canada [nrcan.gc.ca]).

Scenario 2 | Off Site Disposal at a New Landfill Site

A standard list of equipment with net horsepower ratings and brake specific fuel consumptions was used to estimate the total amount of diesel consumed for Scenario 2. For construction of the new landfill, waste placement, and capping it is estimated equipment will be operating at full load for 8 hours per day and at

40 percent of net horsepower for 2 hours per day while idling. Based on this assumption, an average horsepower rating was calculated to estimate the total fuel consumption.

The consolidated waste will be trucked off-site to the new landfill site, located 20 km from the site. For the scenario, a fuel economy of 39.5 L/100 km was assumed to calculate total diesel consumption for transportation. (https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607)

Equation 5.2 from the document "Standards for Quantification, Reporting and Verification of Greenhouse Gas Emissions" was used to estimate the total CO_{2e} emissions over the course of the remediation.

An estimated 21,530 tonnes of CO_{2e} are estimated to be generate under Scenario 2 as detailed in Table 1. For comparison purposes, this quantity of CO_{2e} approximately equates to the annual energy consumption of 5,042 residential homes (source: Greenhouse Gas Equivalencies Calculator | Natural Resources Canada [nrcan.gc.ca]).

Regards

Dana Lauder
Engineer

Christine Skirth, C.E.T., PMP
Business Group Leader

Encl

Table 1

GHG Emisssion Calculations
Boat Harbour
Pictou Landing, Nova Scotia

Description of Works	Duration in Working Days ** unless noted otherwise	No. of Equipment	Working Hours/Day **unless noted othertwise	Net hp **unless noted otherwise	Average 10-hour hp	BSFC (L/hp-hr)	Fuel Consumption (L)	CO2 (kg/year)	CH4 (kg/year)	N2O (kg/year)	CO2e (tonnes)
Scenario 1 Off Site Disposal at and Existing Hazardous Treatment Disposal Facility											
Excavation, Loading and Hauling of Consolidated Waste											
30 Ton Excavator with Operator (CAT 330)	915.0	3.0	10.0	270.0	237.6	0.4	2,506,224.18	6,674,074.98	333.33	1,002.49	6,981.15
	Distance (Round Trip)		Total Trips	Average Fuel Economy (L/100 km)							
Trucking Waste Off-Site	1250.0		128100.0	39.5			63,249,375.00	168,433,085.63	8,412.17	25,299.75	176,182.72
										Total	**183,163.87**
Scenario 2 Off Site Disposal at New Landfill Site											
Construction of New Cell											
30 Ton Excavator with Operator (CAT 330)	260.4	3.0	10.0	270.0	237.6	0.4	237,764.13	633,165.89	31.62	95.11	662.30
30 Ton Rock Truck with Operator	260.4	6.0	10.0	328.0	288.6	0.4	300,666.67	800,675.33	39.99	120.27	837.51
				Fuel Usage (gal/hour diesel)							
D7 Size Dozer with Operator	256.5	2.0	10.0	6.0			58,258.88	155,143.40	7.75	23.30	162.28
CAT 930G Loader	256.5	2.0	10.0	163.0	143.4	0.4	151,220.28	402,699.62	20.11	60.49	421.23
30 Ton Truck for material import	256.5	2.0	10.0	328.0	288.6	0.4	296,151.86	788,652.39	39.39	118.46	824.94
Mid size compactor	256.5	2.0	10.0	405.0	356.4	0.4	340,068.00	905,601.07	45.23	136.03	947.27
Excavation, Loading and Hauling of Consolidated Waste											
30 Ton Excavator with Operator (CAT 330)	915.0	3.0	10.0	270.0	237.6	0.4	2,506,224.18	6,674,074.98	333.33	1,002.49	6,981.15
Waste Placement											
Mid size compactor	915.0	2.0	10.0	405.0	356.4	0.4	1,304,424.00	3,473,681.11	173.49	521.77	3,633.51
Landfill Capping											
30 Ton Excavator with Operator (CAT 330)	260.4	3.0	10.0	270.0	237.6	0.0	-	-	-	-	-
30 Ton Rock Truck with Operator	260.4	6.0	10.0	328.0	288.6	0.4	300,666.67	800,675.33	39.99	120.27	837.51
				Fuel Usage (gal/hour diesel)							
D7 Size Dozer with Operator	256.5	2.0	10.0	6.0			58,258.88	155,143.40	7.75	23.30	162.28
CAT 930G Loader	256.5	2.0	10.0	163.0	143.4	0.4	151,220.28	402,699.62	20.11	60.49	421.23
	Distance (Round Trip)		Total Trips	Average Fuel Economy (L/100 km)							
Trucking Waste Off-Site	40.0		128100.0	39.5			2,023,980.00	5,389,858.74	269.19	809.59	5,637.85
										Total	**21,529.05**