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CONSULTING



**OFFSETTING PLAN (MARINE LOSSES)
Black Point Quarry and Marine Terminal**

July 30, 2025

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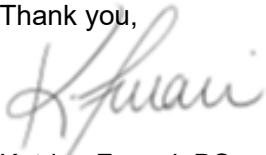
Black Point Aggregates Inc.

**Re: Offsetting Plan (Marine Losses)
Black Point Quarry and Marine Terminal**

Attached is the Offsetting Plan (Marine Losses) prepared for the Black Point Quarry and Marine Terminal.

We trust this to be satisfactory at this time. Once you have had an opportunity to review this correspondence, please contact us to address any questions you may have.

Thank you,



Katrina Ferrari, BSc.
Aquatic Specialist
Environmental Assessment & Approvals
kferrari@strum.com



Carrie Jardine, MSc.,
Senior Ecology Lead
Environmental Assessment & Approvals
cjardine@strum.com

EXECUTIVE SUMMARY

Black Point Aggregates Inc. (BPAI) proposes to develop the Black Point Quarry and Marine Terminal (the “Project”) located near Black Point in Guysborough County, Nova Scotia (NS). The Project will be operated by BPAI; “the Proponent”, a wholly owned subsidiary of Vulcan Materials Company (Vulcan). The Project consists of quarried rock being blasted, crushed, screened, washed, and stockpiled on-site. The product will be loaded into bulk carrier ships for transport to markets along the eastern and Gulf coast markets of the United States, with an anticipated average annual production rate exceeding 1.0 million tons (MT).

This Offsetting Plan (Marine Losses) is accompanying an application for a marine *Fisheries Act* Authorization (FAA) Application (prepared by Strum) in accordance with the information requirements outlined in Schedule 1 of the Authorizations Concerning Fish and Fish Habitat Protection Regulations. Offsetting and compensation requirements for the marine FAA [subsections 34.4(2)(b) and 35(2)(b) of the *Fisheries Act*] as a result of the Project are presented collectively in this Offsetting Plan (Marine Losses); (Canada, 1985)].

Strum is pursuing the option of enhancing habitat within the marine environment. Habitat enhancement will be done in the form of “rock reefs” which will increase habitat diversity for the local flora and fauna. These rock reefs are intended to provide cover for crevice dwelling creatures such as American lobster, American eel, and Atlantic wolffish. The offsetting measures described herein have been selected based on the advice and recommendations received from Fisheries and Oceans Canada (DFO).

BPAI is seeking authorization for a harmful alteration, disruption, or destruction (HADD) of 11,078 m² (1.1 ha) of fish habitat. Based on the range of proposed offset ratios applied to the different habitats that will be negatively affected by the project, 30,477 m² (3.0 ha) of fish habitat offsetting has been calculated to counterbalance the Project HADD of fish habitat. Following a detailed equivalency analysis and accounting for habitat type, time lag, and uncertainty, the total offsetting required is calculated at 11,997 m² (1.2 ha).

However, due to the size of the rock reefs, the layout of the proposed offsetting measures, and the edge effect that extends 15 m beyond all structures, the combined rock reef fisheries offsetting projects amounts to 13,068 m² (or 1.3 ha) of new habitat area. This area is considered sufficient to counterbalance the Project HADD (including proposed offsetting ratios).

Monitoring and contingency measures are proposed to ensure that the measures to offset are effective in meeting their stated objectives.

Based on the nature of the habitat losses and alterations as a result of the Project, the fisheries offsetting measures presented in this Offsetting Plan (Marine Losses) are expected to counterbalance Project impacts successfully.

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1.0 INTRODUCTION

1.1 Purpose

Black Point Aggregates Inc. (BPAI) proposes to develop the Black Point Quarry and Marine Terminal (the “Project”) located near Black Point in Guysborough County, Nova Scotia (NS). The Project will be operated by BPAI; “the Proponent”, a wholly owned subsidiary of Vulcan Materials Company (Vulcan). The Project consists of quarried rock being blasted, crushed, screened, washed, and stockpiled on-site. The product will be loaded into bulk carrier ships for transport to markets along the eastern and Gulf coast markets of the United States, with an anticipated average annual production rate exceeding 1.0 million tons (MT). The Project is anticipated to have capital costs in the order of US\$80-\$110 million and will be a significant employer in Guysborough County throughout the expected 70+ year lifespan of the quarry.

Strum was retained by BPAI to prepare the Project Paragraphs 34.4(2)(b) & 35(2)(b) Authorization Offset Plan [herein referred to as the Offsetting Plan (Marine Losses)] to support the Project *Fisheries Act* Authorization (FAA) Application for both the marine and freshwater impacts. The purpose of the Offsetting Plan (Marine Losses) is to demonstrate that appropriate offsetting of residual Project effects to marine fish and fish habitat have been provided for the Project. This Offsetting Plan (Marine Losses) is intended for the marine FAA only, which addresses impacts to marine fish and fish habitat as a result of the Project. Associated impacts and offsetting for the pit, processing area, access road, and monitored discharges fall outside the scope of this report and have been submitted under separate cover (Freshwater FAA submitted on March 31, 2025).

This Offsetting Plan (Marine Losses) is intended to meet the information and documentation requirements set out under Schedule 1: Section 16 of the Authorizations Concerning Fish and Fish Habitat Protection Regulations.

1.2 Proponent Contact Information

Contact information is provided in Table 1.1.

Table 1.1: Proponent Contact Information

Name and Address of Owner	Authorized Contact Person
Black Point Aggregates Inc., a wholly owned subsidiary of Vulcan Materials Company 1200 Urban Center Drive Birmingham, Alabama 35242 USA Tel: (205) 298-3000	Chris Ridgway, PG Manager Geological Services – SGC, SWD & International 1200 Urban Center Drive Birmingham, Alabama 35242 USA Tel: 205.873.6328 ridgwayc@vmcmail.com

1.3 Project Team

The Offsetting Plan (Marine Losses) was prepared by Strum Consulting. The Project Team is provided in Table 1.2.

Table 1.2: Project Team

Personnel	Role	Company
Meghan Johnston	Senior Advisor	Strum Consulting
Shaun Allain	Project Manager	Strum Consulting
Carrie Jardine	Technical Lead	Strum Consulting
Katrina Ferrari	Technical Specialist	Strum Consulting
Boat Crew	Transportation and Sampling Facilitation	Connors Diving Services Limited
Boat crew	Post construction surveys	To be determined

1.4 Regulatory Considerations

BPAl submitted an Environmental Impact Statement (EIS) and an Environmental Assessment (EA) Registration Document (EARD) to the Canadian Environmental Assessment Agency (CEAA) and Nova Scotia Environment and Climate Change (NSECC), on March 4, 2015. The EIS and EARD were prepared as required under the *Canadian Environmental Assessment Act*, (2012) and *Environment Act*, S.N.S. 1994-95, c. 1 (respectively). The Project received subsequent Approval with Conditions from the Minister of Environment and Climate Change on April 26, 2016, and was subject to a number of conditions issued by CEAA and NSECC.

The Project will likely result in harmful alteration, disruption, or destruction (HADD) of fish habitat and the incidental death of fish as defined by the federal *Fisheries Act*. The Project requires both an Authorization under Paragraphs 34.4(2)(b) and 35(2)(b) of the *Fisheries Act*. The *Fisheries Act* prohibits the carrying out of any work, undertaking or activity that results in the death of fish (other than fishing) and/or HADD of fish habitat. If a project cannot avoid, or is likely to cause, death of fish and/or HADD, then a FAA is required (Canada, 1985).

This Offsetting Plan (Marine Losses) is accompanying an application for a marine FAA (prepared by Strum) in accordance with the information requirements outlined in Schedule 1 of the Authorizations Concerning Fish and Fish Habitat Protection Regulations. A separate FAA for the freshwater impacts and its associated offsetting plan were submitted on March 31, 2025.

The required components of the Offsetting Plan (Marine Losses) and relevant section references within this document are provided in Table 1.3.

Table 1.3: Schedule 1 of the Authorizations Concerning Fish and Fish Habitat Protection Regulations, Offsetting Plan Requirements

Schedule 1 Section 16 Offsetting Plan Requirements	Section Reference
(a) the geographic coordinates of the location where offsetting measures will be implemented	Section 5.1
(b) a small-scale site plan identifying the general location and boundaries of the location where the measures will be implemented	Section 5.1
(c) a detailed description of the measures and how those measures will meet their objectives	Section 5.2
(d) a detailed description of the monitoring measures that will be implemented to assess the effectiveness of the measures referred to in paragraph (c)	Section 6.3
(e) a detailed description of the contingency measures and associated monitoring measures that will be implemented if the measures referred to in paragraph (c) do not meet their objectives	Section 6.4
(f) a detailed description of any adverse effects on fish and fish habitat that could result from the implementation of the plan	Section 6.2
(g) a detailed description of the measures and standards that will be implemented to avoid or mitigate the adverse effects and how those measures will meet their objectives	Section 6.2
(h) the timeline for the implementation of the plan	Section 6.1
(i) an estimate of the cost of implementing each element of the plan	Section 6.7
(j) if the implementation of the plan requires access to lands, water sources, or water bodies that are not owned by the applicant, a description of the steps that are proposed to be taken to obtain the authorization required for the applicant, Fisheries and Oceans Canada (DFO), and anyone authorized to act on DFO's behalf to access the lands, water sources, or water bodies in question. This information is not required if the applicant is His Majesty in right of Canada, His Majesty in right of a province, or the government of a territory.	Section 6.6

Offsetting and compensation requirements for the marine FAA [subsections 34.4(2)(b) and 35(2)(b) of the *Fisheries Act*] as a result of the Project are presented collectively in this Offsetting Plan [Marine Losses; (Canada, 1985)].

1.5 Consultation and Engagement

The offsetting projects described herein have been selected based on offsetting advice and recommendations of DFO, as well as through continued engagement with stakeholders (e.g., local fisher groups, elected officials) and the Mi'kmaq of Nova Scotia. Consultation and engagement under the FAA process is ongoing.

1.5.1 Department Consultation

BPAI has consulted with DFO through the FAA process with respect to impacts to fish and fish habitat. A Conceptual Offsetting Plan (Marine Losses) was presented to DFO (February 2025) for review. BPAI has continued to consult with DFO since EIS approval (2016) to identify requirements for the FAA submission under the *Fisheries Act*. These discussions are outlined in the FAA Application supporting document.

These consultations, as well as comments received through the EIS approval process, have informed the prioritization of offsetting projects for inclusion in this Offsetting Plan (Marine Losses).

1.5.2 Mi'kmaq of Nova Scotia

Engagement with the Mi'kmaq of Nova Scotia has adapted as required over the 14-year Project period to ensure groups and communities who wish to be engaged with directly are first being identified by BPAI, and that active engagement activities are completed with each of these groups. Over the years, BPAI has engaged directly with the Assembly of Nova Scotia Mi'kmaq Chiefs (the Assembly) and the Kwilmu'kw Maw-klusuaqn (Mi'kmaq Rights Initiative or the KMK Negotiation Office- KMKNO), Paqtnkek First Nation, Sipekne'katik First Nation, Millbrook First Nation, Membertou First Nation, and other First Nation communities. BPAI is committed to engagement with all rightsholders and stakeholders who wish to receive information on the Project and participate in two-way dialogue and information exchange.

Specifically, BPAI has completed a Mi'kmaq Ecological Knowledge Study (MEKS) to support the EIS/EARD and archaeological studies and field surveys both during the EIS/EARD as well as to support recent permitting efforts. In 2016, BPAI signed a Memorandum of Understanding (MOU), and a draft Community Benefits Agreement (CBA) with the Assembly was developed in 2018. BPAI also completed a First Nations Fisheries Study, in collaboration with Indigenous fishers and interested communities and groups. BPAI also completed required follow-up studies including fish and fish habitat work in Reynolds Brook south of the project development area (PDA), and a follow up moose survey. The moose survey was completed with Kerry Prosper, an elder (and former Chief) of the Paqtnkek First Nation, and both final reports have been shared with all Mi'kmaq communities and the KMKNO.

In 2023, BPAI met with Mi'kmaq Chiefs to support discussions relating to benefits and to provide them with an updated Project description based on on-going detailed engineering design and permitting. Relevant Mi'kmaq communities as described above and Mi'kmaq groups, including the Mi'kmaq Conservation Group (MCG), Confederacy of Mainland Mi'kmaq (CMM), and the Unama'ki Institute of Natural Resources (UINR) were invited to participate in

baseline field surveys including wetland delineation and functional assessment, wetland baseline monitoring, and fish and fish habitat surveys. BPAI has and will continue to reach out to Indigenous fishers to understand how this Project may impact their fishing practices.

Meetings have taken place (and will continue to take place) with the KMKNO, Sipekne'katik, and Paqtnekek in 2024 to support permitting efforts with discussion around Project description and Project impacts, proposed monitoring and mitigation measures supporting the provincial Industrial Approval (IA) application and supporting permits (wetland and watercourse alteration), the 2024 marine geotechnical program, and the federal FAA applications for both freshwater impacts associated with the Project and marine impacts associated with the marine terminal component of the Project. BPAI has offered to complete community meetings/open houses in each Mi'kmaq community to support the Project development and ongoing engagement efforts. To date, no specific concerns have been noted that would require adjustment of Project design.

BPAI has developed a Mi'kmaq Engagement Strategy and a Communications Plan to support the Project, in collaboration with the Mi'kmaq, and has also drafted a Follow Up Program to monitor project effects on Food, Social and Ceremonial Fishing. These plans have been drafted and shared with KMKNO, Paqtnekek, Sipekne'katik, Millbrook, and Membertou First Nations for feedback. All plans, as developed and finalized, will also be available on the BPAI website (<https://www.blackpointquarry.com/>). Some of these plans and follow-up studies have already been made available for review by all community members and interested Mi'kmaq people.

1.5.3 Public Engagement

Public engagement began during early project planning from 2010 to 2014 to support the EIS/EARD. Details associated with these early engagement efforts will not be repeated herein but can be found in the EIS/EARD document. In summary, engagement was completed with the Guysborough County Inshore Fishermen's Association, the Municipality of the District of Guysborough (MODG), and meetings took place with local business owners, individual landowners, community members, and fishers. Two open houses were completed, one in 2014 at the Chedabucto Fire Hall, and a second open house in 2015 in Queensport. Finally, a presentation was provided by BPAI at the Strait of Canso Superport Days in 2014.

A community liaison committee (CLC) was established in 2014 and has operated continuously since this time. The CLC meets biannually and is chaired by a local community member and has 6 -12 members. The CLC has been an effective group to gather Project information from BPAI and disseminate this information into the community. Equally important, the CLC has functioned well to collect questions and concerns from local community members and gather answers to these questions from BPAI for the community.

Since 2014 and continuing through 2024 and into 2025, BPAI is actively engaging with MODG, the Guysborough County Inshore Fishermen's Association, Nova Scotia Power, the Atlantic Pilot Authority, and the Strait of Canso Working Committee. Engagement with the Guysborough County Inshore Fishermen's Association has included preliminary marine

terminal designs, ship routes, freshwater and marine offsetting options, and ongoing fieldwork, including marine geotechnical and wind and wave data collection efforts.

2.0 OVERVIEW OF THE PROJECT

2.1 Purpose of the Project

The purpose of the Project is to develop a marine quarry operation to extract and sell construction aggregate. The Project will bring economic stimulus to the immediate area and will have regional and provincial benefits. The Project is anticipated to have capital costs in the order of US \$80-\$110 million and will be a significant employer in Guysborough County throughout the expected 70+ year lifespan of the quarry.

All phases of the Project will provide economic benefit to the people and governments of Guysborough County and Nova Scotia through royalties and taxes paid, dollars invested into goods and services, and indirect dollars that will go into local businesses and services from employees and contractors working on the Project and at the quarry. A Community Liaison Committee (CLC) was established for the Project. The CLC will encourage two-way communication with the community and facilitate input and engagement on Project activities.

2.2 Project Location

The Project is located in the MODG in Nova Scotia, Canada. The approximate center of the PDA is at the coordinates: 45°21'13.25" N, 61°08'56.15" W (Drawing 1, Appendix A). The PDA is approximately 32 km northeast of the rural community of Goldboro, located along the Eastern shore and 20.5 km west of the Town of Canso. Throughout this report, the PDA refers to the current EARD PDA.

The Proponent's property encompasses 354.5 hectares (ha) of both crown land and private property. Active quarrying and plant operations are proposed to be confined to 237 ha. The PDA consists of properties assembled through a land exchange with the province and through expropriation of private lands. Additionally, the Project includes a submerged Crown Land Lease for the marine terminal, which has not yet been granted. Properties include PIDs:

- 35092063, 35044056, 35093210, 35093202 (from 2010 survey)
- 35212505, 35212521, 35214014, 35044056, 35212497, 35212521 (from Strum survey of water lot WL-1)
- 35044056, 35214014, 35093210, 35214022 (from registered and recorded interest documents)

The spatial boundary for the 'Project Area' for this Offsetting Report (Marine Losses) is the direct footprint for the marine terminal. The direct footprint of the access road and both Phase I and Phase II boundaries of the quarry are covered by the Offsetting Report (Freshwater Losses) submitted as part of the Freshwater FAA on March 31, 2025.

2.3 Proposed Work, Undertakings and Activities

The Proponent's property encompasses 354.5 ha. Active quarrying and plant operations are proposed to be confined to 237 ha.

Quarried rock will be blasted, crushed, screened, washed, and stockpiled on-site. The product will be loaded into bulk carrier ships for transport to markets along the eastern and Gulf coast markets of the United States. The anticipated average annual production rate will exceed 1.0 MT with a peak production rate of 7.5 MT per year, should market conditions warrant this production rate.

2.4 Description of Fish and Fish Habitat

2.4.1 Habitat Classification

Habitats viewed within both the marine study area (MSA) and offsetting sites were relatively consistent. These habitats were broken down and classified into three categories based on dominant substrate types: fines dominant, dominant gravel and sand, cobbles and boulders, and bedrock (Drawing 2, Appendix A). Overall, gravel and sand were the most dominant habitat type observed within the MSA; however, bedrock was more prevalent close to shore. Sand and silt were not as commonly observed as this habitat was mostly found on the outer fringes of the MSA.

2.4.2 Fish Community

Numerous aquatic fauna species were observed during the 2024 video reviews. Not all of the species observed could be identified to species due to video quality. A full breakdown of results from surveys can be found in Appendix D of the Supplemental Information – *Fisheries Act* Authorization Application report (Strum, 2025). The species observed includes the following:

- Alewife
- American lobster
- Common star fish
- Cunner (*Tautoglabrus adspersus*)
- Summer flounder (*Paralichthys dentatus*)
- Mackerel (*Scomber scombrus*)
- Pollock (*Pollachius pollachius*)
- Rock crab (*Cancer irroratus*)
- Ocean sunfish (*Mola mola*)
- Unidentified fish species
- Unidentified flatfish

While completing avian field surveys on August 23, 2024, staff members observed a group of approximately 20 dolphins (*Lagenorhynchus* sp.) surfacing approximately 400 m offshore, just east of Fogherty Cove. Grey seals (*Halichoerus grypus*) were also regularly observed from shore, including a group of approximately 25 observed on July 5, 2024, within 100 m of shore, east of Fogherty Cove.

Macrofauna observed during 2010 video surveys such as American lobster, cunner, and common starfish were all observed during 2024 surveys. The main species observed during 2010 surveys that was not observed during 2024 surveys was shorthorn sculpin (*Myoxocephalus Scorpius*); however, this species is likely still found in the MSA.

3.0 SUMMARY OF IMPACT ASSESSMENT DESCRIBED IN THE FISHERIES ACT AUTHORIZATION APPLICATION

3.1 Summary of Project Interactions and Potential Effects

3.1.1 Habitat Losses

The Project will result in a permanent loss of aquatic habitat to support infrastructure development. These impacts are defined as the area of marine habitat that is directly overlaid by infrastructure (excluding suspended infrastructure such as the catwalk which have no impact to the marine environment).

The marine habitat in the MSA is known to provide habitat for the following finfish and macroinvertebrate species:

- Alewife
- American lobster
- Atlantic mackerel
- Common star fish
- Cunner
- Flounder
- Pollock
- Rock crab
- Ocean sunfish

The species listed above are known to occupy the MSA and are considered priority species. Other aquatic species at risk (SAR) or species of conservation interest (SOCI), with the potential to interact with the Project but have not been confirmed within the MSA, have also been designated as priority species:

- American eel
- Atlantic cod
- Atlantic Salmon (Southern Upland Population) & (Eastern Cape Breton population)
- Atlantic white-sided dolphin
- Atlantic wolffish
- Blue whale
- Brook trout (sea run)
- Fin whale
- Harbour porpoise

- Humpback whale
- Leatherback sea turtle
- North Atlantic Right Whale
- Northern wolffish
- Thorny Skate
- White shark
- Winter Skate

Although some marine habitat will be lost, it is a small portion of the coastline, and thus fish species could still complete their life history cycles in the adjacent habitat. It is assumed that that affected fish and marine mammal/reptile species will simply choose another location along the coastline for any necessary life history events.

Permanent losses of aquatic habitat are those Project interactions which are expected to result in a complete change in fish habitat quantity, measured in square metres (m²) of lost habitat (i.e., marine habitat that is overlaid by dolphins, pushed out fill, piles, etc.).

Additionally, to account for inefficiency while pushing out fill during the construction of the marine terminal, a 1.83 m (6-foot) buffer has been applied to the push out fill area. This area has been identified to experience a potential habitat disruption as outlined by DFO. This buffered area has the potential to experience a “change to fish habitat occurring for a limited period that reduces its capacity to support one or more life processes of fish” in the event that infill falls beyond the extent of the marine footprint (DFO, 2012). Marine habitat within this buffer has the potential to be impacted but over time the habitat should reclaim the boulders along the edge and develop capacity to support all life stages of fish present similar to habitat prior to construction.

In total, the development of the marine terminal is expected to result in the direct loss or disruption of 11,078 m² of marine habitat that has the potential to support one or more life stage of fish species. The impact areas for habitat destruction and disruption are 10,494 m² and 584 m², respectively.

3.1.2 Death of Fish

Placing fill within or below the highwater mark is expected to result in the death of fish that use the MSA, especially sessile invertebrates. The species most likely at risk of impact are as follows:

- American lobster
- Common star fish
- Cunner
- Flounder
- Rock crab

Mitigation measures can be completed to reduce this loss, such as timing work periods to occur at low tide and while species abundance tends to be lower. The implementation of mitigation measures should result in a low number of species being killed by compression.

In addition, marine vessels associated with the Project during the construction and operation phases have the potential to collide with marine mammals and sea turtles, causing injury or death in worst case scenarios. For example, vessel strikes are a major contributor to human-induced mortality in fin whales, particularly in regions with high shipping traffic (COSEWIC, 2019). The North Atlantic right whale is also vulnerable to vessel strikes (Blondin et al., 2025). Blondin et al., 2025 found that North Atlantic right whales were most likely to be impacted by vessels > 106 m in length. Reducing speeds does mitigate the risks; however, residual risks still remain even at lower speeds (Blondin et al., 2025). The risk of collisions can be reduced by following mitigation measures and monitoring for marine mammals and sea turtles.

3.1.3 Underwater Noise

Marine mammals are vulnerable to underwater noise because they rely heavily on sound for navigation, communication, hunting, avoiding predators, and avoiding obstacles such as vessels. The identified potential impacts of noise associated with blasting and pile driving during construction of the marine terminal, or vessel traffic during operations for the Project on marine mammals includes (DFO, 2024c):

- Change in behaviour (displacement/avoidance of area)
- Interference with communication
- Permanent or temporary hearing impairment
- Increased stress

Marine mammals such as dolphins and grey seals have been identified in the MSA. In addition, the DFO Aquatic SAR Mapping (2024a) identified that blue whale and North Atlantic right whale are found or potentially found in the MSA. These species were taken into consideration for the potential impacts of Project related underwater noise.

Research suggests that impulsive noise (i.e. short, sudden bursts of sound) such as the noise produced by pile-driving and blasting operations during construction of the marine terminal, is more likely to cause hearing damage in marine mammals, compared to continuous noise. Bailey et al. (2010) found that noise generated by pile-driving had the potential to cause behavioural disturbance in dolphins up to 50 km away, and that auditory injury was most likely to occur within 100 m of the pile driving operation. “Soft start” procedures, in which loud noises are gradually ramped up, allow time for marine mammals and fish to leave the area and may reduce the likelihood of injury (JNCC, 2010).

Impacts from continuous noise sources such as shipping noise may be less likely to cause injury or hearing damage compared to impulsive noise, however impacts related to behaviour, stress, and communication persist and may carry over long distances. A study on the effects of shipping noise on harbour porpoises found that noise from ships over 2 km away still impacted up to 9% of the individuals studied (Frankish et al., 2023). Continuous noise may have a

particularly pronounced impact on communication between marine mammals. A study on humpback whales showed that vessel noise reduced the communication space used by the whales by 50%, from 4 km to 2 km for low-frequency vocalizations, and from 2 km to 1 km for high-frequency vocalizations (Dunlop, 2019). This reduction in the size of the whales' communication network is thought to have detrimental effects on necessary life functions such as feeding and breeding interactions.

Most of the research done on the impacts of noise on marine life has centred on cetaceans, and considerably less is known about the potential impacts on fish. It is known, however, that the presence of a swim bladder in fish can impact their sensitivity to noise. Fish with swim bladders typically have higher hearing sensitivity and are more dependant on sound for communication, suggesting that they may be more susceptible to detrimental effects from noise compared to fish without swim bladders (DFO, 2024c).

Research suggests that demersal (bottom-dwelling) species could be at higher risk for adverse effects from high-impact noise, such as that produced by pile-driving due to the intense vibration travelling across the sea floor (Casper & Popper, 2010). The Atlantic wolffish is a demersal SAR with potential to occur in or near the PDA. It should be noted that this type of vibration is most likely to harm dorsoventrally flattened fishes, which the Atlantic wolffish is not. Winter skate and thorny skate are dorsoventrally flattened species which can occur close to shore and may therefore be at a higher risk for adverse effects from pile-driving and/or blasting. van der Knaap et al., 2022 found that noise from pile driving caused Atlantic cod to move away from the source of the noise. The researchers suggested that the impacts from the pile driving could potentially alter energy expenditures of cod.

3.1.4 Aquatic Invasive Species

Introduction of invasive species into regions or bodies of water frequented by fish where they are not Indigenous is prohibited under section 10 of the Aquatic Invasive Species Regulations (DFO, 2024).

No invasive species were observed during field programs. However, there is potential for green crabs to be present within the MSA as they have been observed along all of Nova Scotia's coastline. Green crabs can disrupt the balance of shoreline ecosystems by out-competing native species for food (DFO, 2019b). The adult green crab is very hardy and can survive out of the water for five or more days, hiding in fishing gear and equipment or, at the bottom of crates, buckets, and boats (DFO, 2021).

Heavy machinery, such as excavators, can spread aquatic invasive species if the equipment is not properly cleaned and/or treated between projects. The risk of aquatic invasive species introduction can be reduced by following standard cleaning protocols and mitigation measures for all site equipment.

Ballast water if not treated or managed properly, can be another potential source of invasive species into the MSA. Ballast water is necessary for vessels to take from the surrounding

marine environment in order to stabilize the vessel. The water can be obtained Internationally and brought into Canada and contain different species of aquatic flora, fauna, and microbes. If these species are invasive, they could outcompete with native species for food and habitat or transfer harmful viruses or bacteria which could negatively impact native species. Zebra mussel is a past example of an invasive species that originated from ballast water (DFO, 2023). For many of these reasons, all vessels from Canada or in Canadian waters must follow the Ballast Water Control and Management Regulations under the *Canada Shipping Act*.

3.1.5 Temporary Increases in Sediment

Work in and around the marine environment during the construction phases of the Project may result in temporary increases in sedimentation. Increases in sediment can cause lethal and sublethal impacts to fish. Examples of sublethal effects can include reduced growth, impaired feeding, and increased risk of predation, inhibiting egg and larvae development (DFO, 2000). Sediment increases risks to fish start at < 25 mg/L above background levels (DFO, 2000). According to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines for the protection of aquatic marine life, the guidelines for turbidity and suspended sediments are “no increases” from background levels above 8 NTU and 25 mg/L for temporary increases in clear water. For turbid waters, suspended sediments and turbidity should not exceed greater than 10% from background levels.

Sublethal and lethal effects from temporary sediment increases can be reduced with the implementation of well-established environmental standards and mitigation measures for construction projects.

3.1.6 Accidents Effecting the Environment

In addition to the direct impacts of the Project, working with industrial equipment (trucks, excavators, etc.) near water carries the risk of accidents impacting the environment. Accidents could include fuel leaks, oil spills, and sediment introduction. Risks from these situations can be reduced with the implementation of well-established environmental standards and mitigation measures for construction projects as described in the Project’s Emergency Response Plan and Spill Contingency Plan and Marine Oil Spill Emergency Plan.

3.1.7 Impacts to Commercial and Mi’kmaq Fisheries

Activities during the construction and operation phases of the Project have the potential to interfere with commercial and Mi’kmaq fishing activities. For example, lobster fishing including trap deployments are currently conducted in the MSA, which was observed during the migratory bird field program for the Project. This observed activity suggested that current lobster fishing areas could be impacted by the Project. Mi’kmaq FSCs for lobster and molluscs are also known to occur in the MSA (Morien Resources Corporation & Vulcan Materials Company, 2015). In addition, commercial and Mi’kmaq fishing vessel traffic to fishing areas in the vicinity of the MSA may also interfere with vessels associated with the construction and operation phases of the Project. Impacts to commercial and Mi’kmaq fishing can be reduced with the implementation of mitigation measures, including implementation of the FSC Fisheries Follow-Up Program, as required by federal condition of Approval 5.9.

3.2 Summary Mitigation Measures

Where avoidance of impacts to fish and fish habitat are not possible, mitigation measures must be employed to further reduce impacts to fish and fish habitat. Standards and best practices for working in and near water are well understood and will be followed (DFO, 2019a).

BPAI will adhere to setback recommendations and other mitigation strategies to minimize impact to fish and fish habitat from blasting activities outlined by DFO in the Measures to Avoid Causing Harm to Fish and Fish Habitat Including Aquatic Species at Risk Pertaining to Blasting (DFO, 2013). A Blast Management Plan for the Project (Appendix K of the Supplemental Information – *Fisheries Act* Authorization Application) has been developed and will be strictly adhered to. The Blast Management Plan outlines blasting design requirements to ensure the potential effects of blasting to fish and fish habitat are minimized. All applicable information for each blast will be documented including hole-depth and the quantity of explosive used, blast timing, and monitoring data. All blasting will adhere to guidelines outlined by Wright and Hopky (1998) and will adhere to Nova Scotia Blasting Regulations.

The Surface Water Monitoring Program (Appendix K of the Supplemental Information – *Fisheries Act* Authorization Application report) is intended to support and guide surface water management through the construction, operation, and closure stages of Project development. The primary objectives of water management are to reduce operational risks and environmental impacts of the Project.

The Spill Contingency Plan has been developed for the prevention of, preparedness for, response to, and recovery from, an unauthorized release of a substance which has caused, is causing, or may cause an adverse effect on fish and fish habitat (Appendix K of the Supplemental Information – *Fisheries Act* Authorization Application report). The Contingency Plan identifies potential environmental, health, and safety emergencies that could potentially arise during operation and decommissioning of the Project and establishes a framework (i.e., responsibilities, spill response procedures, assessment, authority, notification, containment, and clean up) for responding to these situations.

A full list of mitigation measures proposed for the Project is provided in the Supplemental Information – *Fisheries Act* Authorization.

3.3 Quantification of Impacts

The effects assessment to fish and fish habitat described in the FAA has been used to quantify the Project HADD of fish habitat after the implementation of avoidance and mitigation measures. Through the effects assessment, the magnitude, frequency, timing, and duration of the HADD (when applicable), as well as the species, life stages, and type of habitat impacted have been described. These descriptions have been used to evaluate the impacts to fish and fish habitat, which have informed proposed ratios for offsetting.

Table

Table 3.1 provides the quantification of Project HADD in area of fish habitat (m²) and proposed offsetting areas per habitat type. The type of HADD (harmful alteration, disruption, or destruction) has also been defined. A justification for the offsetting ratios is outlined in the FAA.

Table 3.1: Project HADD Quantification and Proposed Offsetting Ratios

Infrastructure	Habitat Classification	Impact Type (HADD)	Area of HADD (m ²)	Proposed Offsetting Ratio	Proposed Offset Area (m ²)
7 Dolphin Structures*	Gravel and sand	Destruction	944	1.5:1	1,416
	Cobble and boulder	Destruction	1,095	3:1	3,285
	Bedrock and boulder	Destruction	932	2.5:1	2,330
53 Piles to Support Ring Beam*	Cobble and boulder	Destruction	98	3:1	294
	Bedrock and boulder	Destruction	68	2.5:1	170
Push Out Fill	Bedrock and boulder	Destruction	7,357	3:1	22,071
Push Out Fill – Placement Efficiency	Cobble and boulder	Disruption	9	2:1	18
	Bedrock and boulder	Disruption	575	1.5:1	863
Total Area of HADD			11,078	Total Proposed Offset Area	30,447

*The number of dolphin structures and piles to support the ring beam may be reduced. This is the maximum number of structures needed.

BPAL is seeking authorization for a HADD of 11,078 m² (1.1 ha) of fish habitat. Based on the range of proposed offset ratios, 30,477 m² (3.0 ha) of fish habitat offsetting is recommended to counterbalance the Project HADD of fish habitat (Drawing 3, Appendix A).

4.0 APPROACH TO FISH HABITAT OFFSETTING

Identification of suitable offsetting opportunities for the Project has been a priority since the EIS approval from the Minister. The process has involved a multi-step review process including consultation with DFO involving the following tasks:

- Desktop review of nautical charts.
- Desktop review of integrated fisheries management plans for species within and adjacent to the PDA with focus on American lobster.
- Engagement with the Mi'kmaq of Nova Scotia to discuss fish habitat restoration priorities.
- Engagement and collaboration with qualified local professionals and stakeholders with experience and expertise in fish habitat offsetting.
- Review of the EIS.
- Review of peer reviewed literature.

- Engagement with local fisher groups.
- Field assessment of potential locations identified to determine their feasibility and to collect pertinent information to support offsetting design.

The “Offsetting Project” presented within this Offsetting Plan (Marine Losses) has been developed using DFO Offsetting Policy guidance (DFO, 2025) and feedback (verbal) provided by DFO during ongoing engagement.

The proposed Offsetting Project includes a location where offsetting measures may be both technically and logistically feasible while also being primarily beneficial for American lobster (*Homarus americanus*). American lobster are prioritized during offsetting due to their proximity to the Project and importance to local fishing groups and Indigenous communities. In addition to lobster, consideration was given to fish species potentially impacted by the Project, SAR, and fish species with integrated fisheries management plans within and/or adjacent to the MSA.

The offsetting measures under consideration are presented in Section 5.2. The proposed Project meets the goals and objectives outlined in the following sections and therefore has been identified as high priority by the Project Team.

4.1 Goals and Objectives

Identification and selection of offsetting sites has been guided by the following principles (not listed in priority) from DFO’s Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat (DFO, 2025):

- Principle 1: Offsetting is last in a hierarchy of measures.
- Principle 2: There are limits to what can be offset.
- Principle 3: The benefits from offsetting measures must counterbalance the harmful impacts, including time lag and uncertainty.
- Principle 4: Indigenous Peoples are engaged in the planning, design, implementation and monitoring of measures to offset.
- Principle 5: Measures to offset are in addition to what would have otherwise occurred.
- Principle 6: Offsetting measures are located to optimize ecological outcomes, taking into account the needs of rights holders and resource users.
- Principle 7: Measures to offset generate benefits that last over the long term.
- Principle 8: Time lags between the impact and offsetting measures are avoided or minimized.

4.1.1 Principle 1

The first principle outlined by DFO states that aquatic ecosystems are dynamic and complex, making it difficult to predict how changes from work in or near water will impact the ecosystem. An international “hierarchy of measures” was established as a best practice to reduce risk to aquatic ecosystems (DFO, 2025). These measures are:

1. **Avoid:** Whenever possible avoidance of permanent or temporary changes to fish habitat should be the highest priority. This is the most important step in Project planning.
2. **Mitigate:** When avoidance is not possible, mitigation measures are to be applied to reduce impacts (spatially, temporally and magnitude) to an acceptable level.
3. **Offset:** Measures to offset are to be applied to counterbalance harmful impacts to fish and fish habitat when all other options to avoid and mitigate have been exhausted.

Construction of the marine terminal will result in unavoidable impacts to fish and fish habitat. Where avoidance is not possible mitigation measures will be used. Standard mitigation measures will include, but are not limited to a blast management plan, surface water management, and adherence to timing windows to protect sensitive life cycle periods. For more information on avoidance and mitigation measures refer to Section 9.0 of the Supplemental Information - *Fisheries Act* Authorization Application.

As outlined in this Offsetting Plan (Marine Losses) offsetting measures are proposed to counterbalance the harmful impacts to fish and fish habitat after avoidance and mitigation measures have been applied.

4.1.2 Principle 2

The second principle describes that in some cases offsetting measures cannot compensate for harmful impacts from a Project (DFO, 2025). It is less likely for offsetting measures to counterbalance harmful impacts when:

- The fish species being affected is rare or at risk.
- The habitat is of essential ecological value.
- The habitat is dependent on unique or geographically specific features.
- Restoration or rehabilitation of the habitat is very difficult.
- The site is of significance to Indigenous People.
- The severity of impacts is too large.

Offsetting measures proposed in this Offsetting Plan (Marine Losses) are expected to fully compensate and counterbalance harmful impacts from the Project on fish and fish habitat.

4.1.3 Principle 3

Under the third principle, DFO states that no net loss of fish habitat shall occur when counterbalancing harmful impacts of the proposed Project (2025). Offsetting measures account for not only the harmful impacts from the Project but also losses due to time lag and uncertainties. Section 5.4 of this Offsetting Plan (Marine Losses) quantifies and accounts for time lag and uncertainties of offsetting measures, ensuring no net loss of fish habitat occurs.

4.1.4 Principle 4

The fourth principle states that Indigenous People are engaged with during planning, design and implementation of offsetting measures (2025). The Project Team commenced engagement

with Mi'kmaq of Nova Scotia in 2011 to support the development of the Project and to commence a respectful dialogue relating to impacts to fish and offsetting requirements and potential offsetting project identification. The Project Team will continue to engage with the Mi'kmaq of Nova Scotia during the implementation and monitoring of the Offsetting Plan (Marine Losses).

4.1.5 Principle 5

The fifth principle outlined in DFO's Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat (2025) states that measures to offset must deliver benefits to fish and fish habitat that would not have occurred had there been no obligation. For this Project, the creation of the rock reef is anticipated to achieve benefits to the ecosystem that exceed the outcomes if no offsetting measures had occurred (see Section 5.0 for more details on rock reef structures).

4.1.6 Principle 6

The sixth principle states how most offsetting measures should take place in close proximity to the proposed harmful impacts, thus maintaining functionality of the ecosystem and optimize ecological outcomes (2025). DFO states that there are circumstances where offsetting measures may be undertaken at a more distant location (i.e., few meaningful offsetting opportunities available nearby).

The measures to offset outlined in this Offsetting Plan (Marine Losses) are proposed to occur within the adjacent marine environment to optimize ecological outcomes.

4.1.7 Principle 7

The seventh principle states that measures to offset should strive to generate self-sustaining benefits to fish and fish habitat conservation and protection, wherein the benefits of offsetting should last at least as long as the adverse effects from the project (DFO, 2025). The benefits of the selected offsetting plan for this Project are anticipated to last beyond the duration of the adverse effects.

4.1.8 Principle 8

The eighth and final principle outlines that, when possible, offsetting measures should be implemented before harmful impacts to fish and fish habitat (2025). Proponents should make all reasonable efforts to minimize the time lag between offsetting measures and harmful impacts. If avoiding a time lag is not possible, additional offsetting must be accounted for to successfully counterbalance harmful impacts to fish and fish habitat.

Section 5.4 of this Offsetting Plan (Marine Losses) quantifies and accounts for the anticipated time lag associated with the offsetting measures. Contingency plans are established to ensure the length of time between harmful impacts and offsetting measures does not change if delays in the Project occur (Section 6.4).

4.2 Fish Species of Interest

A list of fish species that may potentially benefit from the proposed offsetting measures is provided below. These species were established based on targeted offsetting measures, importance to local fishers and Indigenous groups, SAR species, and species with integrated fisheries management plans within the area.

4.2.1 American Lobster

Lobsters utilize differing habitat types based on the different life stages they are in with shelter being an important part of their early lives. Lobsters go through several moult stages within the water column before metamorphosing into their post-larval stage, leaving the water column to live on the sea floor (Dinning & Rochette, 2019). Adult lobsters are usually found at depths between 10 to 30 m (Mujiyanto et al., 2024). Juvenile lobsters are highly subject to predation and spend most of this stage hiding, they require shelter and have been shown to prefer coarse sand, gravel, cobble, and boulder habitats (Morrison, 2012). Mud bottoms can be utilized but they can only dig shallow depressions, small cobble, gravel, and coarse sand allow lobsters to excavate and provide ready made sturdy shelters for protection under larger rock substrate such as boulders and rubble (Dinning & Rochette, 2019; Miller et al., 2006). Rocky substrates are generally poor for lobster movement but provide ample camouflage and shelter during the larval stage when lobsters are too small to properly protect themselves. Softer substrate is usually occupied by more mature lobsters as there is less protection provided but allows for easier movement. Soft bottom substrate is important for reproduction, berried females keep to shallow and warmer areas with strong tidal currents in the summer as it allows for rapid dispersal of larvae. Sand and clay substrate are ideal for reproduction and egg development as they can excavate a bowl shaped depression in the substrate to nest in while the eggs develop (Campbell, 1990). Lobsters have been shown to be highly territorial towards shelters, therefore options must be available within given habitats to sustain multiple lobsters (Morrison, 2012).

Across Europe and on Canadian coasts, artificial reefs have been proven to develop successful ecosystems over periods of time. It has been recognized that reef design for appropriate habitats created for species is greatly important for the success rate (Hemmera, 2022; Jensen et al., 2000). In the sense of lobsters, substrate type is believed to greatly impact their movements, habitat occupancy based on life stage, and general abundance (Chang et al., 2010; Wolf, 2024). Distribution and composition of crustacean communities is largely thought to be explained by environmental variables such as the presence of suitable shelter or availability of prey species (Skerritt et al., 2015).

A study conducted in Maine looked at the utilization of kelp beds for lobster habits. The study found that overall lobster size has increased over the past decades, but their abundance has gone down. Historically boulder habitat with lots of opportunities for shelter was preferred but in recent years, lobsters seem to have moved to featureless areas with little to no cover. The shift in habitat utilization may be due to changes in climate. Climate change has caused the water to warm and have shown a drop in kelp habitats, we are now seeing algal turfs with green mats containing multiple species on the sea floor. The lowered abundance may mean less competition or predation (Wolf, 2024).

4.2.2 American Eel

It is believed that American eel have the broadest habitat preferences of all fish species in the world (Government of Ontario, 2021). As a catadromous species, eel spend the majority of their lives in freshwater, moving to the Sargasso Sea to spawn. Once hatched, American eel larvae drift back to the coast, undergoing several phases of metamorphosis. By the time they reach freshwater, most young glass eel have developed pigment and are now referred to as elvers (Scott & Crossman, 1973). In freshwater, elvers develop into yellow eels – immature adults and at which point sexual differentiation occurs. As growth proceeds, the yellow eel metamorphoses into silver eel, or mature adults that are now physiologically prepared to return to the sea to spawn (COSEWIC, 2012a).

During the glass eel phase, American eel typically reside in shallow and sheltered waters of the Atlantic Ocean (COSEWIC, 2012a). Some American eel will move back and forth between the freshwater and marine environment during their continental phase [growth phase (COSEWIC, 2012a)]. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has stated “catadromy is no longer seen as obligate for eels but rather is a facultative life history option (COSEWIC, 2012a). This means some eels may live out their entire life within the marine environment. Whether in the marine or freshwater environment, American eel are primarily benthic beings that seek cover within rocks, mud, sand, and submerged vegetation (COSEWIC, 2012a).

The largest anthropogenic threat are barriers within the freshwater environment, as migration upstream is restricted. Other threats include climate change, fisheries, bioaccumulation of contaminants and a nematode parasite that has been found within Cape Breton (COSEWIC, 2012a). American eel have been assessed as threatened by COSEWIC (2012a) and are considered provincially imperilled by the Atlantic Canada Conservation Data Centre (ACCDC) (S2). American eel are not currently protected under the *Species at Risk Act* (SARA) or *Endangered Species Act*, S.N.S., 1998, c.11 (ESA).

4.2.3 Atlantic Wolffish

Atlantic wolffish occupy different habitats depending on life stages. During the spawning period in spring and summer, the usually solitary wolffish will venture to water depths of 200 m to find a mate (COSEWIC, 2012b). Eggs are deposited into rocky bottoms and crevices while juvenile and adults prefer rocky or sandy bottoms (COSEWIC, 2012b). Eggs production is low, and eggs are fertilized internally, larvae when hatched, are relatively large and do not venture far from where they emerge (Kulka et al., 2004). Nesting sites have been observed to be both shallow inshore waters 5-15 m and in deep offshore water in Newfoundland (Kulka et al., 2004). Rockier areas and boulders appear to be a requirement when deciding where to deposit the egg clusters, once eggs are laid, they are guarded by the male spawner (Kulka et al., 2004; Simpson et al., 2011).

Temperature has been found to be a determining factor in habitat choice. Shelters are often located away from the influence of tidal inputs and below thermoclines (Kulka et al., 2004; Larocque et al., 2008). Simpson et al., (2011) found that Atlantic wolffish on the Scotian shelf

were observed to be present in temperature ranges from 1-9 °C though the preferred range seems to be 1.5-4 °C which was observed by Kulka et al. (2004) in northern Atlantic wolffish populations off the coast of Newfoundland. Habitats which provide refuge such as rocky structures, dense patches of vegetation or soft bottoms with considerable amount of relief may also be determining factors in habitat selection (COSEWIC, 2012b). A dive study conducted by Larocque et al (2008) reported on depth distribution and detailed descriptions of Atlantic wolffish shelter locations in the Gulf of St Lawrence. Atlantic wolffish shelters were found to be located near the base of reefs and below thermoclines and strong tidal influences. Shelters used by wolffish were observed to be often occupied with other species (such as cod, shanny, and redfish) or were in close proximity to similar shelters occupied by other species with no aggression or territorial behaviors shown by the wolffish. During the 2008 study, one pair of wolffish was observed to produce a clutch but it is still unknown whether a shelter is required for successful reproduction such as mating and egg rearing (Dutil et al., 2010; Larocque et al., 2008)

The main threats to the Atlantic wolffish include commercial fisheries, environmental fluctuations, and climate change (COSEWIC, 2012b). Atlantic wolffish have been assessed as Special Concern by COSEWIC (2012b) and are considered provincially unrankable by the ACCDC (SNR). Atlantic wolffish are currently listed under SARA as Special Concern Schedule 1.

4.3 Offsetting Location Selection

DFO's guiding principles clarify a preference for offsetting measures located within the vicinity of a Project, as measures to benefit local fish populations and fish habitat are most likely to balance the residual effects of a project (DFO, 2025).

Through desktop review of the area, four initial offsetting locations were determined to potentially support the offsetting measures proposed in this report (Drawing 4, Appendix A). The four initial offsetting sites (Offset Sites 1 to 4) were deemed suitable through desktop methods based on depth, initial review of nautical charts and fish species. However, these four initial sites were narrowed down to three (Offset Sites 1, 3, and 4) through field studies. Offset site 2 is underlain by a bedrock substrate that is not conducive to the offsetting measures proposed and was eliminated as an offsetting site. Offset Site 3, upon further video review, was determined to have a thin layer hard pack sand over bedrock. Out of an abundance of caution, Offset Site 3 is now being considered poor habitat for offsetting. Out of the remaining two sites, Offset Site 4 has been selected for offsetting measures proposed within this Offsetting Plan (Drawing 5, Appendix A). Additionally, in order to keep all offsetting measures within the same area, the offsetting location proposed in the freshwater FAA has also been moved to Offset Site 4. Offset Site 4 will house both FAA's proposed offsetting measures, thus increasing the overall site complexity. This offsetting location is the furthest away from the marine terminal, this will help minimize underwater noise caused by shipping activity and potential infrequent blasting. The approximate center of Offset Site 4 is at the coordinates: 45°35'39.97" N, 61°18'67.75" W.

Determination of the final location for this Project was completed through a combination of the following variables:

- Proximity to the PDA.
- Shipping route to move material (i.e., sites closer to the Marine Terminal in a sheltered bay pose less of a shipping hazard than sites further away through shipping routes, minimized transportation reduces likelihood of collision with marine species, etc.).
- Adjacent to natural ecosystem that currently supports fish species of interest (i.e., American lobster, American eel, Atlantic wolffish, etc.).
- Constructability of the offsetting site (i.e., presence of hard pact sand, depth, and absence of eel grass).
- Ecological value of offsetting project (i.e., a site that can encompass the entire offsetting extent opposed to multiple small sites to satisfy offsetting requirements).

The Project Team used their combined local experience working in the region, previous successful offsetting projects and engagement with DFO, Indigenous groups and local fishing groups to select an offsetting location. Details of the selected offsetting location and the proposed methods are in the following sections.

4.4 Baseline Data Collection Methods

In order to assess the underlying habitat within the four initial offsetting locations (Offset Site 1-4), Remote Operated Vehicle (ROV) surveys were conducted between August 21-22, 2024. The surveys were conducted by both a Strum biologist and a subcontracted boat crew (Connors Diving Services Limited, “Connors Diving”), this pairing will be referred to as the field crew.

Within each initial offsetting site, the field crew began surveying the area furthest from shore where the field crew closely monitored the boat’s sonar. Boating along the edge of the offsetting area parallel to the shore (typically the deepest area) the field crew conducted spot checks with ROV. The ROV was used to assess substrate visually by the biologist but also by landing the ROV on the substrate to see the amount of sediment kicked up. In areas where the depth was deeper than 16 m (max depth Strum is proposing to create rock reefs) the ROV was not sent down.

By strategically and randomly dropping the ROV down to the bottom, the field crew were able to delineate the various areas present within each offsetting site. The biologist on the boat was able to delineate suitable habitat (i.e., under 16 m deep, hard sand bottom, gravel bottom, etc.) from areas not suitable (i.e., deeper than 16 m deep, muck/silt bottom/bedrock bottom, eel grass, etc.) for the proposed offsetting measures.

Post-restoration survey methods are further detailed in Section 6.3.

4.5 Fish Community

Fish species within the priority offsetting sites are known to consist of the fish species of offsetting interest (American lobster, American eel, and Atlantic whitefish) as well as the habitat potential to support them (i.e., hard pact sand and gravel for American lobster to burrow into). This was confirmed through ROV surveys and anecdotal information from local fish groups (i.e., active lobster trapping location) that the fish species noted above is currently present within the offsetting location.

5.0 PROPOSED OFFSETTING MEASURES – ROCK REEFS

The development of the offsetting plan followed DFO's Policy for applying measures to offset adverse effects on fish and fish habitat under the *Fisheries Act*. These measures will incorporate the following guiding principles:

1. Offsetting is last in a hierarchy of measures.
2. There are limits to what can be offset.
3. The benefits from offsetting measures must counterbalance the harmful impacts, including time lags and uncertainties.
4. Indigenous Peoples are engaged in the planning, design, implementation, and monitoring of measures to offset.
5. Measures to offset are in addition to what would have otherwise occurred.
6. Offsetting measures are located to optimize ecological outcomes, taking into account the needs of rights holders and resource users.
7. Measures to offset generate benefits that last over the long term.
8. Time lags between the impact and offsetting measures are avoided or minimized.

The types of offsetting options considered for this plan aligned with types acceptable to DFO, which include the following (DFO, 2025):

- Habitat restoration.
- Habitat enhancement.
- Habitat construction.
- Stocking and translocation.
- Chemical or biological manipulations.
- Complementary measures (only considered for up to 10% of the offset).
- Combination of measures.

Strum is pursuing the option of enhancing habitat within the marine environment adjacent to the marine impacts. This habitat enhancement will be done in the form of "rock reefs" which will increase habitat diversity for the local flora and fauna. These rock reefs are intended to provide cover for crevice dwelling creatures such as American lobster, American eel, and Atlantic wolffish.

Rock reef offsetting was chosen as American lobster is an important Indigenous and commercial fishery in the Marine Study Area (MSA). Two food, social, and ceremonial fisheries (FSCs) are likely to occur in waters adjacent to the MSA: a molluscs and lobster fishery belonging to Waycobah First Nation, and an undisclosed species fishery by the Paq'tnkek First Nation. Impacts to FSCs were not anticipated if the Proponent committed to the creation of new lobster habitat outside the Project's marine safety exclusion zone and substantial communication efforts to local Mi'kmaq communities (Morien Resources Corporation & Vulcan Materials Company, 2015).

The following sections provide general background information and discuss the process undertaken to finalize the approach for offsetting as part of the baseline data collection and offsetting design work that was completed during summer 2024.

5.1 Underlying Habitat in Offsetting Area

During baseline surveys within the proposed offsetting area (Offset Site 4), ROV surveys provided confirmation that the area was suitable to develop the proposed offsetting habitat (i.e., rock reef habitat). ROV surveys were completed to determine the current substrate found within the area, depth, and that there was no ecologically sensitive species present [i.e., eel grass (*Zostera marina*)].

Offset Site 4 has approximately 295,000 m² (29.5 ha) of marine habitat (Drawing 5, Appendix A). Within Offset Site 4, there are two locations not suitable for offsetting measures based on physical features observed during the ROV surveys. Along the northwestern and southeastern edge of Offset Site 4, water depth and substrate (bedrock/boulders) determined the areas not suitable to offsetting measures. This area accounted for approximately 98,000 m² (9.8 ha) of the total area. Within the central area of Offset Site 4, approximately 11,400 m² (1.14 ha) of marine habitat was determined not suitable for offsetting measures based on the presence of bedrock which will not support the proposed offsetting measures.

Within the area that was determined suitable within Offset Site 4 (186,000 m² or 18.6 ha) there were two main substrates present (fines and boulders). These areas have been described separately in the following sections.

5.1.1 Boulder and Bedrock Dominant

The first of these habitats was comprised of large areas of exposed bedrock and boulders. These areas occurred in two locations, the first was directly from the rocky shoreline on the eastern side of the half island cove wharf until approximately 10 m deep, the second was along the rocky shoreline in the eastern portion of the cove near the end of half island cove road and extended out in Chedabucto Bay until about 20 m deep. Macroflora cover in these areas where bedrock and boulders were the dominant substrate was very extensive, often providing 100% cover for all the available substrate.

Macroflora observed in this habitat type included; *Furcellaria lumbricalis*, *Fucus* sp., *Saccharina latissimi*, *Chondrus Crispus*, *Scytosiphon lomentaria* and *Polysiphonia lanosa*.

Furcellaria lumbricalis and *Fucus* sp. were the macroalgae taxa most commonly observed during marine video interpretation. The only macrofauna species observed in these areas was cunner (*Tautogolabrus adspersus*), which was commonly viewed in this habitat. Other fish were observed in this habitat type but could not be identified to species. It is possible that some macrofauna were not observed during the video interpretation due to the cover provided by the dense macroalgae stands observed in this habitat type.



Figure 5.1: Photograph from ROV within the boulder and bedrock dominant area of the Offset Site 4

5.1.2 Fines Dominant

The second habitat type in this location was primarily composed of a layer of sand and gravel over flat bedrock. This habitat made up the majority of the bay near the end of Half Island Cove Road extending from the sand covered shoreline till about 21 m (70 ft) deep. Little to no macroalgae was observed in this habitat. The only macrofauna observed in this habitat were *Homarus americanus* and *Tautogolabrus adspersus* which were rarely observed during video interpretation.



Figure 5.2: Photograph from ROV within the fines dominant area of the Offset Site 4

5.2 Proposed Structures

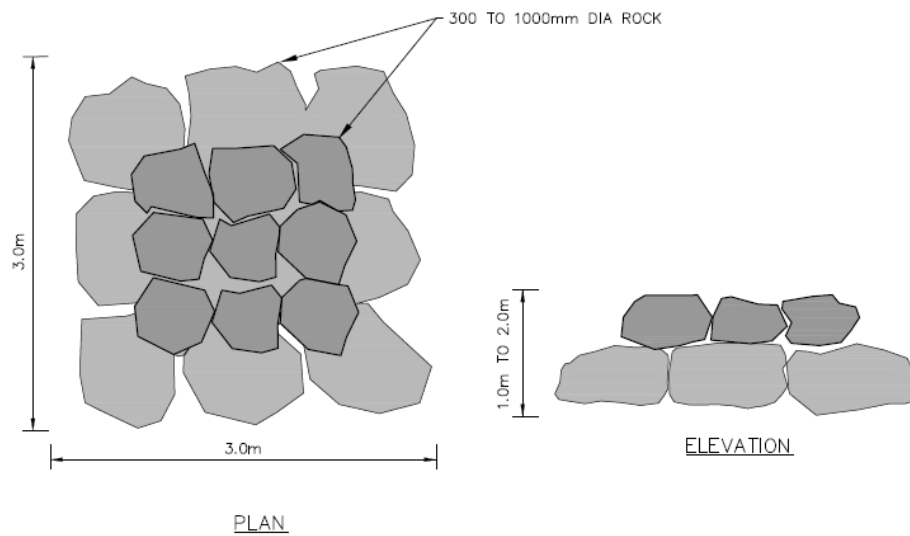
The proposed method for this Offsetting Plan (Marine Losses) is habitat enhancement through rock reef creation with the focus to develop functional habitat for American lobster. This will be achieved through the strategic placement of large rock on hard packed sand or gravel to mimic the natural ecosystem and increase the complexity of the marine habitat. These structures will be designed to provide cover from predators but also increase the productivity of the ecosystem (i.e., increased area for macrophyte attachment thus increasing food production within the area). When properly installed these structures not only increase complexity of the ecosystem, but they also form suitable spawning areas for fish species of interest (e.g., American lobster). These structures will not be placed on complex habitats or ecologically significant habitats such as eel grass beds.

Hemmera (2022) had great success creating habitat with artificial reefs for the expansion of a marine terminal in British Columbia, Canada. Reefs were constructed out of large boulders and concrete rails ties. It was stated that these would not stack neatly, although this was considered a positive since it creates an abundance of interstitial spaces, cracks, and crevices for species to occupy. This in turn allows for the colonization of a multitude of species including benthic invertebrates, encrusting algae and kelps, sea cucumbers, urchins, sea stars, and fauna such as finned fishes and octopus (Hemmera, 2022). Boulders are easy to quarry, especially when using waste rocks blasted from nearby sites. They are easy to manipulate and move and have often been used for coastal infrastructure such as rip rap, seawalls, etc.

Within European studies, successful results were observed five years after reefs were deployed. In terms of lobsters, a commercial fishery within Atlantic Canada, structures need to be much bigger to have a significant effect on the fishery. Any increase in the numbers of individuals will be proportional to the habitat's complexity and the availability of shelter and food (Jensen et al., 2000). Bologna & Steneck's (1993) study results showed positive effects on lobster habitats which included both biotic factors like coral reefs and kelp forests and abiotic factors like rock, metal, and concrete elements. The American lobster has been associated with the abundance of kelp habitats, however this association may be in correlation with other factors such as boulder shelter (Bologna & Steneck, 1993). Miller et al. (2006) conducted a study on artificial reef habitats sizes on different substrate types and size looking at lobster selection. Of the lobsters tested, it was found that they took shelter in rock piles on top of sand-gravel rather than on hard bottom, as they could enlarge the shelters under the rocks via digging with their claws. The coarseness of the substrate affected the ability of lobsters to burrow. The excavation took longer when the gravel was 3-5 or 6-8 cm in diameter rather than 1-2 cm and fewer low shelters were occupied, especially for the smaller 50-59 mm carapace length (CL) lobsters. It shows that pre-existing shelters are important for lobsters to avoid fish predation (Miller et al., 2006).

Strum is proposing rock reefs be constructed in water depths ranging between 10-16 m deep on top of fines (sand) and gravel substrate present within Offset Site 4. A depth of 10-16 m was selected based on depth preferences identified in Section 4.2.1 for American lobster and to promote algae success within the offsetting site. Placing rock reefs composed of boulder, rubble and cobble on top of a sand and gravel dominant substrate increases diversity within the ecosystem, providing an abundance of crevices and negative spaces for species to utilize (e.g., American lobster, Atlantic wolfish, etc.). The sand and gravel substrate provides an area for American lobster to excavate and create burrows to seek refuge from predators.

These structures are proposed to be approximately 3 m x 3 m in size with rocks stacked in a triangular cross-sectional form for stability reaching a vertical height of 1-2 m [(DFO, n.d.), Figure 5.3]. The rock reefs will be constructed using a combination of boulders (0.25-1.0 m), rubble (0.14-0.25 m) and cobble (0.03-0.13 m). These rocks will be blasted from the processing plant area (also referred to as the 'lower platform') and transported to Offset Site 4 (following methods outlined in Section 5.3) via a barge boat. The angular rocks will be placed in such a way as to allow for space between rocks, creating an abundance of interstitial spaces for crevice dwelling species such as American lobster (Figure 5.4). These rock reefs will be spaced 15 m apart to prevent lobster competition between structures (DFO, n.d.). If and when possible, small rocks (cobble) will be placed randomly between each structure to increase habitat complexity between rock reefs.



ROCK REEFS

N.T.S.

Figure 5.3: Example of rock reef design



Figure 5.4: Example of rock reefs proposed for offsetting measures. Figure pulled from Miller et al., 2006

5.3 Construction Methods for Offsetting

Rock used to create rock reefs will be sourced from the bedrock beneath the processing plant. Once this area is leveled and the rock transported to create the rock reefs, the plant will be used for aggregate processing (e.g. crushing, screening, washing, and conveying), as well as stockpiling aggregate products, equipment, fuel and material storage, ship loading, and administrative buildings.

This processing plant is underlain by two sedimentary rock formations: the Halifax Formation and the Goldenville Formation (Drawing 4, Appendix A). The Halifax Formation alone has the potential to generate acid rock drainage (ARD) when exposed to air, which in turn may negatively impact the aquatic environment (NSNR, 2021). The goal of using these potentially acid generating rocks for constructing the rock reefs is to help minimize the potential for ARD within the freshwater environment by placing these rocks within the Atlantic Ocean. By submerging the rock within the alkaline marine environment, it reduces the exposure to oxygen and slows the oxidation process, thus reducing and neutralizing any sulphuric acid produced. Granite from the quarry (a non acid generating igneous rock) may also be utilized to develop rock reefs, depending on the volume of rock generated through leveling the lower platform compared with the volume needed to complete the reefs.

Water-rinsed blasted rock from the processing plant area will be transported via a barge boat to Offset Site 4. Materials will be lowered into the water via crane, clam shell bucket, gabion chute, net, or equivalent depending on contractor preference. The rock will be placed into the water with guidance from an ROV, underwater camera, or equivalent to prevent sedimentation and ensure proper construction of rock reefs. The ROV and/or underwater camera will confirm the substrate type, prior to placement on the seabed.

5.4 Quantification of Offsetting Areas

Total offsetting areas for each site were calculated by multiplying the total width and length of each area. Within DFO's Factsheet relating to Marine Fish Habitat Compensation, it is stated that there is a productivity increase that extends up to 15 m from each structure (Figure 5.5). Therefore, the area adjacent and in between each structure was accounted for within the offsetting area as it is considered an 'edge effect'. This area is assumed to be used by various species as it provides additional complexity to the ecosystem (see Figure 5.5).

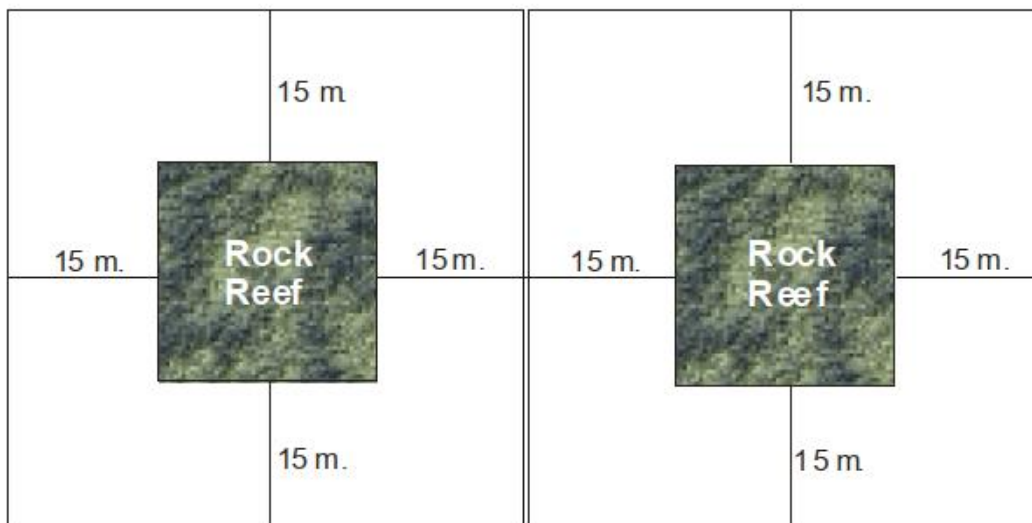


Figure 5.5: DFO's example of compensation area (n.d.)

5.4.1 Equivalency Analysis

A comparison of relative habitat values needs to be completed to achieve equivalency. This equivalency analysis helps balance losses of biodiversity and gains from offsetting (Bradford, 2017).

Bradford proposes a simple equation to compute the amount of offsetting needed to counterbalance area-based habitat impacts:

$$A_i d_i = A_o d_o$$

A_i = is the area of the Project's residual impacts

d_i = is the loss of biodiversity per unit area of the proposed impacts (relative value)

A_o = is the area of the offset

d_o = is the gain per unit area associated with the offsetting activity (relative value)

Relative values (d_i) for the impacted marine environment were proposed in the FAA as offsetting ratios; these ratios took into account the proposed impact (i.e., destruction vs alteration) and the productivity of the habitat (i.e., bedrock vs boulder, etc.). The relative values are pulled from the FAA and outlined in Table 5.1.

Table 5.1: Summary of Local Flora and Fauna and Habitat Characteristics Found within the Proposed Impacted Habitats

Habitat Classification ¹	Substrates Present ²					Macroalgae Cover (%)	Number of Macroalgae Species	Fauna Present and Abundance ³	Impact Type (HADD)	Proposed Relative Value (Offsetting Ratio)	Rationale
	Bed	Bo	Cob	Gr	Sa						
Gravel and sand	0	0	10	35	55	35	8	<i>Tautogloabrus adspersus</i> (C), <i>Asterias rubens</i> (U)	Destruction	1.5:1	Sand and gravel provide okay borrowing habitat for select species. Minimal shelter from predating species. Low abundance of macroalgae.
Cobble and boulder	10	15	35	20	20	60	10	<i>Tautogloabrus adspersus</i> (C), <i>Homarus americanus</i> (U)	Destruction	3:1	Moderate abundance/diversity of macroalgae and diverse substrate allow for various life stages to be completed by multiple species.
									Disruption	2:1	Placement efficiency buffer around pushed out fill to account for potential fill extending beyond footprint. Given a lower value due to the reduced likelihood and extent (i.e., sparse boulders may extend beyond the marine terminal footprint) of this area being impacted.

Habitat Classification ¹	Substrates Present ²					Macroalgae Cover (%)	Number of Macroalgae Species	Fauna Present and Abundance ³	Impact Type (HADD)	Proposed Relative Value (Offsetting Ratio)	Rationale
	Bed	Bo	Cob	Gr	Sa						
Bedrock and boulder	55	25	10	5	0	90	8	<i>Tautoglabrus adspersus</i> (O), <i>Homarus americanus</i> (U)	Destruction	2.5:1	Relatively homogeneous substrate with reduced capacity for borrowing species. High abundance of macroalgae.
									Disruption	1.5:1	Placement efficiency buffer around pushed out fill to account for potential fill extending beyond footprint. Given a lower value due to the reduced likelihood and extent (i.e., sparse boulders may extend beyond the marine terminal footprint) of this area being impacted.

¹No impacts are anticipated within the fines dominant habitat classification, therefore it has not included within this table

²Bed= Bedrock, Bo=Boulder, Cob=Cobble, Gr=Gravel, Sa=Sand

³Abundant (A): Abundant observations (not quantifiable) (>40%), Common (C): Frequent observations (not quantifiable) (>20-40%), Occasional (O): Intermittent observations (quantifiable) (5% to 20%), Uncommon (U): Infrequent observations (quantifiable) (<5%)

The relative value for the habitat underlying the offsetting site (Offset Site 4) is proposed at a value of “1”. The rationale for this value is that fines and small gravel dominant area lacks diversity in substrates and provides minimal to no cover for various species. Macroalgae attachment and encrusting invertebrates cannot attached to fine substrate and is minimal in gravel substrates in comparison to cobble, boulder, and bedrock substrates.

A relative value for the proposed offsetting measures (d_0) is valued at “3”. These rock reefs are expected to promote primary production through attachment of various local macroflora. Promoting primary production will support herbivore communities and the associated higher trophic levels. These rock reefs will provide an abundance of cover to promote fish recruitment, spawning, and benthic invertebrates.

Equivalency analysis was conducted within Table 5.2.

5.4.2 Time Lags

Habitat within Offset Site 4 provides ecological services to the existing environment. Naturally when the rock reefs are deployed, there will be a lag between current conditions and when the rock reef will function ecologically as intended. This lag between the adverse effects of the Project and the benefits of the Offsetting Project is referred to as a ‘time lag’ and needs to be accounted for in the offsetting area (Bradford, 2017).

Bradford gives an equation to calculate time lag using net present value (NPV) (Bradford, 2017). This calculation accounts for the losses between Project impacts and the accrued benefits of the offsetting measures. The equation for time lag is:

$$M_{lag} = (1+r)^{t_{lag}}$$

t_{lag} = is the number of years needed to see full benefits from the offsetting measures

r = discount rate

M_{lag} = accounts for discounted loss due to time lag

Bradford (2017) shows that for lags under 10 years a multiplier required to achieve equivalency ranges from 1 to 1.3%; this equates to a 3% discount rate (*r*).

A paper published by Dalhousie University outlined an experiment on the colonization of local algae within the intertidal zone of Nova Scotia after mass removal through anthropogenic activity (Mildon, 2011). In this paper, Mildon monitored a section of shoreline that had sterile rocks replace rocks with established flora and fauna to build an erosion control rock wall. In the first year post anthropogenic disturbance, the area increased in algal cover by 850% with the transects closest to undisturbed algal communities seeing the quickest colonization (Mildon, 2011). The algal coverage increased from 0 to 69% over four years in the disturbed area, with local flora becoming present within two years (arthropods, periwinkles, and barnacles). It should be noted that surveyed rocks furthest from shore (low intertidal zone) were reported to be colonized quickest and had the highest biomass (Mildon, 2011). This was considered to be

reflective of the absence of the stressor associated with the high intertidal zone that fluctuates between submerged and merged conditions. It can be assumed through the research conducted by Mildon, that it will take approximately four years for the rock reefs to be colonized by local flora and fauna (M_{lag}).

Following Bradford's equation above, M_{lag} is calculated at 1.125, which can be rounded to 1.1 equating to a 11% increase to account for time lag. To account for time lag, an 11% multiplier will be applied to the final offsetting habitat. Therefore, if 10,000 m² is being offset an additional 1,100 m² (11%) of additional offsetting habitat is needed to account for time lag. It is anticipated that the rock reefs will fully function as intended within four years of development. Table 5.2 accounts for the time lag needed with respect to the Project.

5.4.3 Uncertainty

As outlined in the DFO's Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat (DFO, 2025), when developing an offsetting plan, uncertainty needs to be considered. DFO states the following sources as areas of uncertainty:

- Initial prediction of residual HADD.
- Measures to mitigate the adverse effects.
- Design and implementation of offsetting measures may fail.
- Overestimation of ecological benefits.
- The unknown state of fish habitat.

The proposed offsetting measures outlined within this Offsetting Plan (Marine Losses) have been designed following DFO guidance, best practices, peer-reviewed literature, and accepted standards. These measures are anticipated to be low-risk, straightforward, and successful in providing abundant habitat diversity for both the local flora and fauna.

Removing all uncertainty regarding the offsetting measures is impossible, therefore an additional area of 10% of offsetting has been added to reflect the uncertainty that remains (Table 5.2). Therefore, if 10,000 m² is being offset an additional 1,000 m² (10%) of additional offsetting habitat is needed.

It should be noted that the additional 10% needed to account for uncertainty will not be applied to the additional area offset for time lag (described in the previous Section).

5.5 **Offset Summary**

In total, the offsetting measures proposed are expected to increase diversity and promote colonization, feeding and reproduction of the local flora and fauna with a focus on developing habitat for American lobster, while recognizing that other species such as American eel, and Atlantic whitefish will benefit from the structures.

A detailed summary of the total offsetting requirement calculation, including uncertainty and time lag is presented in Table 5.2.

Table 5.2: Summary of Habitat Offsetting Area

Habitat Experiencing HADD		HADD Area – (A _i)	Habitat Relative Value (d _i)	Corrected HADD Area	Proposed Habitat to Offset for HADD	Offsetting Habitat Area (A _o) ²	Offset Relative Value – (d _o)	Corrected Offset Area	Net Gain in Habitat
7 Dolphin Structures	Destruction – Gravel and sand	944	1.5	1,416	Rock reef	472	3	1,416	0
	Destruction - Cobble and boulder	1,095	3	3,285		1,095		3,285	0
	Destruction - Bedrock and boulder	932	2.5	2,330		777		2,331	+1
53 Piles to Support Ring Beam	Destruction - Cobble and boulder	98	3	294		98		294	0
	Destruction - Bedrock and boulder	68	2.5	170		57		171	+1
Push Out Fill	Destruction - Bedrock and boulder	7,357	3	22,071		7,357		22,071	
Push Out Fill – Placement Efficiency	Disruption - Bedrock and boulder	9	2	18		6		18	0
	Disruption - Cobble and boulder	575	1.5	863		288		864	+1
Project Subtotal		11,078		30,447				9,862	
Area Underlying Offset Location	Hard packed sand	108 ¹	1	108	Rock reef	36	3	108	0
Offsetting Subtotal		108		108		36		108	0
Project and Offsetting Subtotal						9,898			+3
Additional Habitat Allocated to Offset "Time Lag" ³						1,089			
Additional Habitat Allocated to Offset "Uncertainty" ³						990			

Habitat Experiencing HADD	HADD Area – (A _i)	Habitat Relative Value (d _i)	Corrected HADD Area	Proposed Habitat to Offset for HADD	Offsetting Habitat Area (A _o) ²	Offset Relative Value – (d _o)	Corrected Offset Area	Net Gain in Habitat
Total Area of Habitat Offsetting for Project					11,997	Net Gain in Habitat		+3
Size of Area Proposed for Offsetting⁴					13,068			

¹HADD area relating to underlying offsetting location only accounts for area directly under rock reefs. Area between rock reefs is undisturbed and not accounted for in HADD area.

²Offsetting Habitat Area calculated as $A_o = A_i (d_i/d_o)$. This accounts for the greater diversity value in the offsetting area than the affected area, thus equating to a smaller offsetting area than predicted impact area.

³Both time lag and uncertainty is an additional offsetting amount (10% for uncertainty and 11% for time lag)

⁴Size of proposed offsetting area could not be calculated to match offsetting needs of the Project. See Section 5.4 on quantification of offsetting area. All areas calculated are in m².

BPAI is seeking authorization for a HADD of 11,078 m² (1.1 ha) of fish habitat. Based on the range of proposed offset ratios, 30,477 m² (3.0 ha) of fish habitat offsetting has been calculated to counterbalance the Project HADD of fish habitat. Accounting for habitat type, time lag, and uncertainty, the total offsetting required is 11,997 m² (1.2 ha).

However, due to the size of the rock reefs, the layout of the proposed offsetting measures and the edge effect that extends 15 m beyond all structures, an area that exactly matches the offsetting needs to counterbalance the Project HADD (11,997 m²) is not possible.

To offset habitat loss, Strum is proposing 12 reefs spaced 30 m apart (15 m edge effect coming from each structure). Accounting for each structure being 3 m wide and the edge effect outlined in Section 5.4, the offsetting site is proposed to be 99 m wide and 132 m long (Figure 5.6).

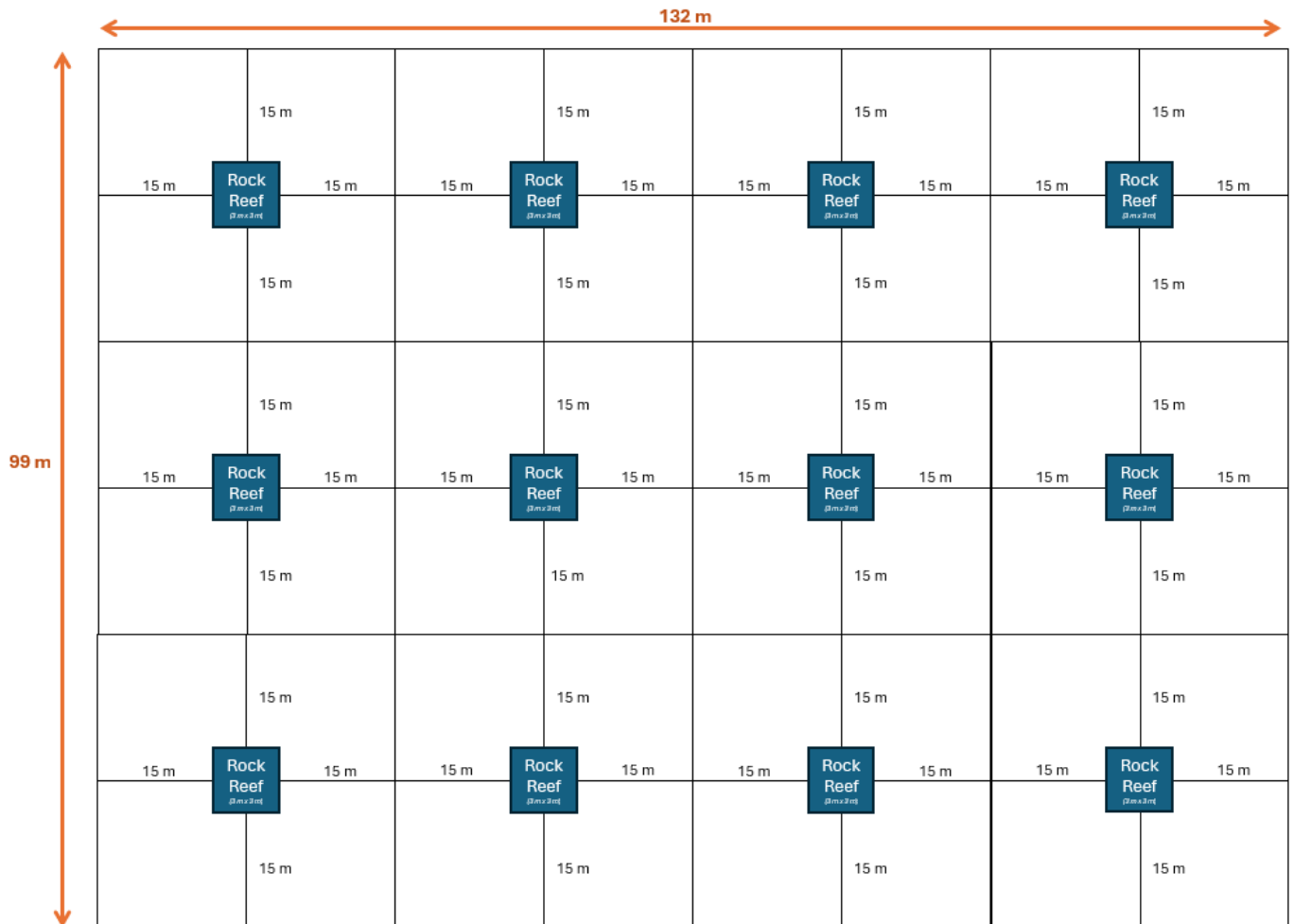


Figure 5.6: Proposed Reef offsetting area layout

Combined, the rock reef fisheries offsetting projects amounts to 13,068 m² (or 1.3 ha) of habitat offsetting area. This area is considered sufficient to counterbalance the Project HADD (including proposed offsetting ratios).

6.0 OFFSETTING REQUIREMENTS AND IMPLEMENTATION

6.1 Timelines

Timelines for the implementation of the offsetting project have been selected based on the anticipated timing of Project impacts within the marine environment. The feasibility of construction within the DFO Timing Window (June 1 – September 30) does not apply for marine activities.

Offsetting measures are proposed to be constructed within a year of expected impacts to the marine environment to counterbalance these impacts (Table 6.1). The commencement of offsetting measures will begin during the development of the lower platform where the processing plant will be constructed, since this being the source of substrate that will be used to create the rock reefs. Contingency measures have been identified in Section 6.4 in the event there is a delay between impacts to the environment and the development of the Marine Terminal.

The timing of offsetting measures may change depending on when permits are issued and construction at the lower platform begin. However, offsetting measures will commence within a year of predicted impacts to the marine environment whether the blasting of the platform is delayed or not, through contingency measures outlined in Section 6.4.

6.2 Potential Effects and Mitigation Measures

The offsetting measures proposed will employ well established techniques that are designed to mimic the natural ecosystem function of boulder habitat within the marine ecosystem. Methods and structures have been chosen to provide the most benefit to the marine environment while avoiding unnecessary disturbance to productive habitats.

The monitoring programs proposed (Section 6.3) incorporate measures to verify that structures have been installed as per the approved designs. Various groups throughout the world have been doing this work for several decades and have developed design and installation techniques that avoid adverse effects on the local fish community. This type of work is low-impact, and the likelihood of adverse effects is very low.

The following standards and best practices will be employed to reduce or avoid adverse effects to fish and fish habitat from the implementation of offsetting measures:

- Tools and equipment shall arrive on the site in clean condition and maintained free of fluid leaks.
- Ships and boats involved with the offsetting area should have biofouling and ballast water management to reduce the introduction of invasive species to the area.

- Fuel associated with the Project shall be stored a minimum of 30 m away from the marine environment and waterbodies.
- Avoid replenishment at sea whenever possible during construction of offsetting measures and fuel ships and boats in a designated harbour or port while anchored.
- A spill response kit should be kept on the ships and boats used for the Offsetting Project.
- Follow the spill contingency, blasting, erosion and sediment control, and emergency response plans for the Project.
- The placement of the rock reef on the seabed will be conducted in a manner that reduces sediment plumes.
- Tools shall be washed and serviced in such a way as to prevent any deleterious substances from entering the water.

6.3 Monitoring

To ensure that the offsetting measures are implemented and functioning as proposed, qualified personnel with experience and/or training in marine fish habitat enhancement, marine habitat monitoring, and data collection will monitor construction, implementation, and effectiveness of the measures through select monitoring criteria. BPAI is proposing pre and post construction monitoring within the Offset Site 4 and a control site (Drawing 5, Appendix A), also located in Offset Site 4. Monitoring will be completed to ensure offsetting measures meet the objectives outlined in this Offsetting Plan (Marine Losses). Objectives of the monitoring plan include:

- Rock reef structure effectiveness.
- Rock reefs functionality according to DFO objectives.
- Confirmation of increase in local biota community and abundance.

A summary of monitoring plan components and applicable success and supporting criteria is provided in Table 6.2.

As outlined in DFO's guidance policy (DFO, 2019c), monitoring should be designed to confirm that measures to offset are effective in counterbalancing the HADD and identify corrective actions or contingency measures if deficiencies are found. The monitoring program design has integrated DFO guidance on functional monitoring of offsetting measures (DFO, 2019c). As defined by DFO (DFO, 2019c), functional monitoring is a "science-based, scaled-down version of effectiveness monitoring that relies on surrogate metrics to assess whether management measures provide expected conditions suitable for fish to carry out their life processes". The purpose of functional monitoring is to provide a relatively rapid and objective assessment of the performance of offsetting measures that goes beyond compliance. DFO notes that "functional monitoring should only be implemented when there is low uncertainty of both the expected performance of the management measure, and the strength of the linkage between the surrogate metric(s) measured and the desired fish outcome" (DFO, 2019c). The offsetting measures described within this plan have been demonstrated to be effective in meeting their objectives in Nova Scotia. As such, these uncertainties are considered low and functional monitoring is appropriate.

The proposed monitoring program includes both offsetting success and supporting metrics. Success metrics (fish habitat components) comprise the functional monitoring component of the overall monitoring program to assess the performance of the offsetting measures. Supporting metrics (fish community and usage) will be implemented to evaluate general trends in productivity as a result of offsetting measures but are not definitive of offsetting measure performance.

BPAI has adopted an adaptive management approach to periodically identify the need for any further mitigation or compensation measures if deficiencies are detected (see Section 6.4).

Table 6.1: Summary of Monitoring Program Components

Component	Endpoints	Objective	Location	Scope	Timing/Frequency ¹	Success Criteria
Habitat	Function	To document whether the rock reef is functioning as designed and meeting DFO objectives (i.e., diversifying habitat within the offsetting site).	The entire offsetting location and control site.	Visual inspection of the site. Details of inspection methods provided in Section 6.3.1.1.	Conducted prior to construction, immediately after construction and during Year 2, 3, and 5 post construction.	Structures are functioning as intended. Site is meeting the objectives outlined in Section 4.1.
	Structures	To document whether rock reef structures are performing as designed (e.g., providing negative space for species to seek refuge, not sinking, or embedded in sediment).	All rock reef structures and control site.	Visual inspection (photo documentation) of structure and function. Details of inspection methods provided in Section 6.3.1.2.	Conducted prior to construction, immediately after construction and during Year 2, 3, and 5 post construction.	Structures have not moved due to currents, are not sinking or embedded in sediment.
Local biota community	Abundance	To track temporal change in local flora and fauna occupancy and abundance.	Established transects.	Document abundance of fish within a standardized transect Details of survey methods are provided in Section 6.3.2.	Conducted prior to construction, immediately after construction and during Year 2, 3, and 5 post construction.	Increase in abundance of biota present from baseline to post construction.
	Diversity	To track temporal change in diversity.	Established transects.	Document diversity of species within a standardized transect Details of survey methods are provided in Section 6.3.2.	Conducted prior to construction, immediately after construction and during Year 2, 3, and 5 post construction.	Increase in diversity of biota present from baseline to post construction.

Component	Endpoints	Objective	Location	Scope	Timing/Frequency¹	Success Criteria
	Corridor Usage	To document the corridor usage of fish species "edge effect".	Established transects with focus between rock reefs.	Document abundance and diversity of fish species present between rock reefs utilizing corridors. Details of survey methods are provided in Section 6.3.2.	Conducted prior to construction, immediately after construction and during Year 2, 3, and 5 post construction.	Increase in abundance and/or diversity from baseline to post construction.

¹ Post construction monitoring is proposed immediately after construction and in Year 2, 3, and 5. Should malfunctions within the structures occur or success criteria not be met within 5 years of construction then a meeting with DFO will occur to discuss further monitoring (up to Year 7).

To assess each component, a ROV, drop camera, or equivalent will be used. During these observations, field crews will record specific data, photographs and video data in addition to observations made. These surveys will be conducted using transect lines that are spaced approximately 15 m apart (ensuring a transect intersects each structure and corridor) extending up to 30 m beyond the rock reefs to assess edge effect (Figure 6.1). Orientation of transects will be up to the preference of the contracted diving company, once established transects will be consistent year to year for repeatability.

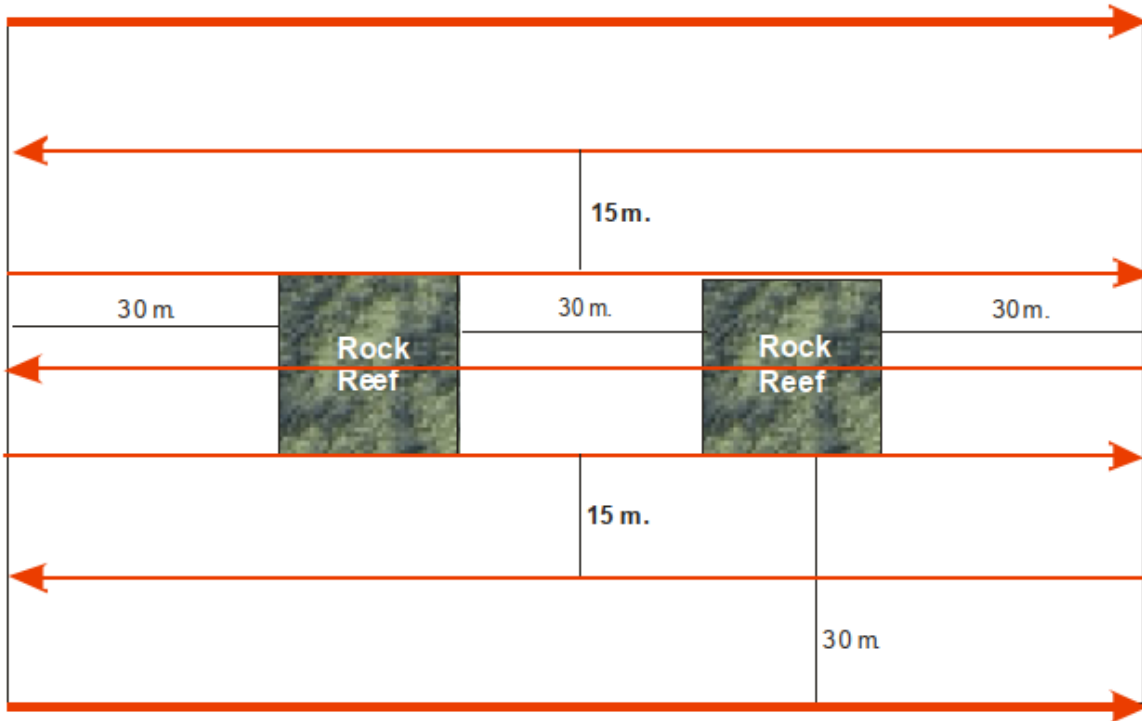


Figure 6.1: Proposed transect spacing for monitoring (DFO, n.d.)

Habitat component surveys will be conducted at all rock reefs along the transects proposed to intersect the structures (Section 6.3.1) with the exception of the function assessment which will assess the entire offset site. Survey of the local biota community will be conducted along each transect whether the transects intersects the rock or not to assess corridor usage (Section 6.3.2).

6.3.1 Habitat Component

6.3.1.1 *Function Assessment*

Visual inspection of the offsetting project will be conducted for the entirety of the site to ensure it is functioning as intended (i.e., creating habitat diversity within the offsetting area, etc.). The inspection will be compared to the overall objective of the rock reefs outlined in Section 5.2.

Certain methods proposed in this Offsetting Plan (Marine Losses) take time to establish the outlined objectives (i.e., colonization of local flora and fauna, etc.). Therefore, it is proposed that the success criteria of this monitoring component be based on the function of the offsetting site and how it is progressing towards to the outlined objective (i.e., the site is functioning as outlined in the objectives or is working towards the outlined objective).

Observations will be made prior to construction, during construction, immediately after construction and during Year 2, 3, and 5 post construction to confirm that the offset site is functioning as designed. Additionally, comparisons will be made to a control site.

6.3.1.2 Structure Assessment

Visual structure assessments will be conducted to ensure the structure is functioning as intended. Assessments will include collecting information on the following parameters:

- The structure is present (omit for pre-construction surveys).
- Structure dimensions.
- Height of structure (to assess for sinking).
- Structural soundness.
- Voids (crevices) present.
- Estimate of structure embeddedness in the sediment

Photographic documentation will be taken during construction and post-construction monitoring programs to document that all structures were installed as per the approved designs. The success criteria of this monitoring component are therefore proposed to be based on the resulting function of the structure rather than the physical appearance of the structure (i.e., the structure is meeting or has successfully met the objective of its installation).

Photographs will be taken from designated vantage points corresponding to pre-construction photographs so that comparisons can be made for “as-built” purposes as well as comparisons across monitoring years. A comparison of the constructed habitat to the approved plan will be made to confirm that the habitat is increasing the complexity of the ecosystem.

Observations will be made prior to construction, immediately after construction and during Year 2, 3, and 5 post construction to confirm that the structures are functioning as designed. Comparisons will also be made to a control site.

Stability of the structures and general condition will be assessed by mapping and photographic documentation of the habitats.

6.3.2 Local Biota Community Component

The local biota community will be assessed along each transect for abundance and diversity. Additionally, corridor usage will be assessed along transects not intersecting structures. Parameters to be recorded along each transect to assess the success of the rock reefs through the biota community are as follows:

- Species present (flora and fauna).
- Abundance of each species.
- Approximate location or habitat space utilization of species (rock reef crevice, corridor, etc.).

Photographs and video will be taken for species identification purposes. Observations will be made prior to construction, immediately after construction and during Year 2, 3, and 5 post construction to confirm abundance and diversity of species within Offset Site 4 and the control site for comparison. A calculation of species richness will be conducted.

6.4 Adaptive Management and Contingency Measures

As discussed in Section 6.3, monitoring will be completed at the Offsetting Project site to assess the effectiveness of the measures implemented to counterbalance the HADD. Should the monitoring work identify deficiencies in the effectiveness of the offsetting measures, or not meet their objectives within the monitoring period, relevant aspects of the following Adaptive Management and Contingencies plan will be administered if and when needed as determined through consultation with DFO:

1. Potential deficiencies identified during the post construction monitoring program will be carefully observed to determine if conditions are likely to resolve themselves throughout the full extent of the monitoring program, or if early intervention (corrective actions) are required to remedy offsetting project effectiveness/conditions. Potential deficiencies are those related to structure integrity and the resulting function of the structure noted in Section 5.2. Success of structure installation will be determined based on the structure having achieved its desired outcome (i.e., habitat function).
2. In some circumstances, corrective actions may be determined early on (i.e., monitoring following construction or during the first two years of the five-year post-construction monitoring period), or at the completion of the five-year monitoring period. Corrective actions may include:
 - a. small scale modifications to structures
 - b. replacement of deficient/nonfunctional structures
 - c. installation of additional structures to achieve objectives
3. Potential deficiencies and recommendations for corrective actions will be identified to DFO in post construction monitoring reports.
4. Any corrective actions will include an updated monitoring plan to evaluate the effectiveness of the proposed work, along with a revised timeline for monitoring that specific corrective action. Any proposed revised timelines will be recommended in annual reports and determined in consultation with DFO.
5. In the event that the Offsetting Project cannot be conducted due to a delay in construction timelines regarding the development of the lower platform (the source of material for rock reefs) the following contingency options are proposed:
 - a. Material (boulders, rubble, and cobble) will be used from the construction activities in the PDA on land or materials bought from an external source, transported to site and used to construct rock reefs as identified in this Offsetting Plan (Marine Losses).

- b. Reef balls will be bought from an external source through consultation with Dalhousie University or Mi'kmaq Conservation Group (MCG) who both have successfully installed reef balls throughout Nova Scotia.
- c. A combination of the two above contingency measures may be used.
6. In the event that the Offsetting Project cannot be conducted within the proposed offsetting location the following contingency options are in place:
 - a. Implementation of an alternate offsetting option. The option would be chosen from one of the previously investigated offsetting option location, with further consultation with DFO (Drawing 4, Appendix A), Rightsholders and stakeholders. Strum proposes the alternate offsetting site be Offset Site 3, as it meets the goals and objectives outlined in this Offsetting Plan (Marine Losses). To support this process, BPAI completed baseline work on some of these alternate options as a contingency measure to support future development if required.
 - b. Consult with DFO, Mi'kmaq of Nova Scotia, municipal officials, and local fisheries organizations, as applicable, to identify a list of other high priority offsetting options that could be implemented.

6.5 Reporting

The implementation of offsetting measures will be conveyed to DFO in an “as-built” report to be provided within 12 months of the works being completed for each specific offsetting site. Within a month of submission to DFO, all reports will be conveyed to all other appropriate groups (i.e., indigenous groups, local commercial fishers, etc.). The intention of the “as-built” report will be to verify that each offsetting measure was implemented as designed and approved. BPAI will maintain a photographic record of all structures and provide final locations (GPS waypoints) and maps of all rock reefs installed.

The data collected using the methods described in Section 6.3 will be summarized in a monitoring report for each year of the monitoring program (Years 2, 3, and 5 after construction). The as-built report will include results from pre-construction to allow for comparison year to year. Results will be interpreted by comparing data from the offsetting sites with baseline data collected pre-construction, and the control site. In addition, data interpretation will be based on comparisons of the current year’s data with those of previous monitoring years to illustrate trends, if any.

The annual monitoring reports will discuss and interpret results for the offsetting site and see if results are meeting the success criteria and objectives. The reports will discuss whether the offsetting measures are generally progressing effectively in achieving the habitat improvements intended by the design and installation of the rock reefs. A proposed reporting schedule is provided in Table 6.3. Modifications to the proposed monitoring schedule may be requested by BPAI, in writing, to DFO to reflect changes in the construction schedule and monitoring results.

Table 6.2: Reporting Schedule for Offsetting Measures

Report	Components	Schedule
As-built	<p>As-built survey will be conducted within 12 months of construction of the offset measures. This report will include pre-construction survey results for comparison in the post construction monitoring.</p> <p>Photo documentation will be taken during construction to document that all offsetting measures were constructed as per the described designs. Locations (GPS waypoints) and maps of structures to be provided in report.</p> <p>A comparison will be conducted between the construction and the approved plan to ensure that the offset area is equal to or larger than what is specified in the plan.</p>	Submitted to DFO within 12 months of construction.
Monitoring Reports	<p>To present outcomes of both Habitat and Local Biota Community monitoring components (Table 6.2):</p> <ul style="list-style-type: none"> • Function Assessment • Structure Assessment • Suitability Assessment • Abundance Survey • Diversity Survey • Corridor Usage Survey <p>Monitoring reports will note any deficiencies in offsetting measures and provide recommendations for implementation of adaptive management or contingency strategies to ensure offsetting objectives are met.</p>	Submitted to DFO on or before February 28 following each monitoring year (Years 2, 3, and 5 post-construction).

The monitoring program will also include recommendations for adaptive management and contingency strategies (Section 6.4) in the event of identified deficiencies. It will provide suggestions for replacing structures, expanding offset areas, and/or adding new offset sites, if needed, to meet offsetting objectives. The determination of whether an offsetting site is not functioning as designed will be informed based on monitoring data, assessment of results, and professional judgment on the part of BPAI and qualified professionals.

At such a time when the site has been determined to meet its original offsetting objectives, a recommendation will be provided to DFO in the applicable monitoring report that the site should be considered complete. At a minimum, this would occur in the Year 5 monitoring report, unless deficiencies and modifications have been implemented that could extend the duration of the monitoring plan. BPAI will meet with DFO following review of each monitoring report to ensure the offsetting measures are meeting objectives. BPAI acknowledges that DFO

will have final authority on whether each offsetting measures' objectives have been achieved, and what/if any actions are required to ensure Project offsetting requirements are met.

6.6 Anticipated Permits and Approvals

A list of anticipated permits, licenses, approvals, and agreements associated with this Offsetting Plan (Marine Losses) are outlined in Table 6.3.

Table 6.3: Approval Submission Timelines

Plan Title	Submission Date
Freshwater Fisheries Act Authorization	Q2 2025
Marine Fisheries Act Authorization	Q3 2025
Navigable Waters Application	Q2 2025
Offsetting Plan (Freshwater Losses)	Q2 2025
Submerged Crown Land Permit	2026
Watercourse Alteration Applications	December 2024
Wetland Alteration Applications	October 2024

6.7 Costs

Costs have been determined for implementation of each offsetting site. This process has been completed to meet DFO Offsetting Policy guidance (DFO, 2025) and an associated requirement to provide a financial guarantee for the offsetting projects proposed for implementation. As per the policy guidance *“the monetary value of the financial guarantee is determined by estimating the cost for implementing all elements of the offsetting plan, including elements related to monitoring, and maintenance of the measures to offset. The estimate should consider any additional expenses that could be incurred by the Department to complete the offsetting plan (e.g., costs for administration, costs for mobilization, cost of external expertise, etc.), and allow for cost overruns for remobilizing machinery onto the work site”*.

Costing is based on two overall implementation components: 1) Construction Costs and 2) Post Construction Monitoring Costs. Each overall component comprises individual components presented in Table 6.4, that have been applied to the costing determination for each offsetting project.

Table 6.4: Offsetting Costing Components

Overall Component	Individual Component	Cost Consideration
Pre-Construction	Pre-construction surveys to confirm habitat including: <ul style="list-style-type: none"> • Project supervision • Equipment • ROV surveys • Regulatory consultation 	Costs to complete the individual components listed for pre-construction has been estimated at \$5.23 per m²

Overall Component	Individual Component	Cost Consideration
Construction	Construction of the proposed offsetting measures including: <ul style="list-style-type: none"> • Construction labour • Project supervision • Equipment • Construction materials • ROV surveys • Barge (estimated – will need to obtain a cost estimate from selected company) • Regulatory consultation • As-built report 	Costs to complete the individual components listed has been estimated at \$7.51 per m²
	Contingency: contingencies include additional costs likely to apply if a third party has to take over the project: <ul style="list-style-type: none"> • Additional project management costs • Seasonality of when the project takes place • Availability of staff and their associated contractor costs • Construction materials 	A contingency of 20% has been added to the per m ² cost presented above resulting in a \$9.38 per m² cost
	Inflation Costs have been considered for construction of projects that initiate in 2026 onward.	The rate of inflation has been determined based on a 2% annual increase ¹ .
Post Construction Monitoring	Post Construction Monitoring efforts to complete the following tasks at each offsetting site: <ul style="list-style-type: none"> • Structure assessments – Year 2, 3, and 5. • Local Biota Surveys – three times a year for Year 2, 3, 5, and 7 • Annual Reporting 	Costed on a year-to-year basis.
	Inflation costs have been considered yearly depending on when each monitoring program is proposed to be started.	The rate of inflation has been determined based on a 2% annual increase ¹ .

¹ The Bank of Canada aims to keep inflation at the 2 % midpoint of an inflation-control target range of 1 to 3 %. The inflation target is expressed as the year-over-year increase in the total consumer price index (CPI).

Utilizing the information presented in Table 6.4, proposed costs for the purposes of the financial guarantee have been determined in Table 6.5.

Table 6.5: Offsetting Cost

Monitoring Year	Year	Main Component	Cost
Pre-construction	2026	<ul style="list-style-type: none"> ROV surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$34,190.00
Construction	2027	<ul style="list-style-type: none"> Barge rental (estimated) ROV surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$86,613.30
	2028	Additional 20% for contingency	\$17,322.66
As-Built	2029	<ul style="list-style-type: none"> Post construction monitoring report within 12 months of construction (includes pre-construction) ROV Surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$54,376.30
Year 2	2030	<ul style="list-style-type: none"> Year 2 post construction monitoring report (ROV Surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$49,921.77
Year 3	2031	<ul style="list-style-type: none"> Year 3 post construction monitoring report ROV Surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$48,491.23
Year 5	2032	<ul style="list-style-type: none"> Year 5 post construction monitoring report ROV Surveys Project supervision Regulatory consultation Expenses (equipment, accommodations, per diems, etc.) 	\$49,461.06
Total Cost (including contingency), excluding HST			\$340,376.32

*Should additional monitoring be deemed necessary by DFO (e.g., Year 7 post-construction) further costing will be needed. This costing is table is a preliminary costing exercise and may change based on several factors.

BPAI is currently in the process of obtaining a Letter of Credit/Bond or Surety Bond for the total estimated amount of **\$340,376.32 + HST**. This will be provided to DFO within 60 days of the submission of the FAA application.

7.0 CONCLUSION

Strum is pursuing the option of enhancing habitat within the marine environment at a site adjacent to the anticipated marine impacts. This habitat enhancement will be done in the form of “rock reefs” which will increase habitat diversity for the local flora and fauna. These rock reefs are intended to provide cover for crevice dwelling creatures such as American lobster, American eel, and Atlantic wolffish. The offsetting measures described herein have been selected based on the advice and recommendations received from DFO.

BPAI is seeking authorization for a HADD of 11,078 m² (1.1 ha) of fish habitat. Based on the range of proposed offset ratios, 30,477 m² (3.0 ha) of fish habitat offsetting is recommended to counterbalance the Project HADD of fish habitat (Drawing 5, Appendix A). Accounting for habitat type, time lag and uncertainty, the total offsetting required is 11,997 m² (1.2 ha). However, due to the size of the rock reefs, the layout of the proposed offsetting measures, and the edge effect that extends 15 m beyond all structures, the combined rock reef fisheries offsetting projects amounts to 13,068 m² (or 1.3 ha) of new habitat area. This area is considered sufficient to counterbalance the Project HADD (including proposed offsetting ratios).

Monitoring and contingency measures are proposed to ensure that the measures to offset are effective in meeting their stated objectives.

Based on the nature of the habitat losses and alterations as a result of the Project, the fisheries offsetting measures presented in this Offsetting Plan (Marine Losses) are expected to counterbalance Project impacts successfully.

8.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS

This Report (the “Report”) has been prepared by Strum Consulting (“Consultant”) for the benefit of Black Point Aggregates Inc. (“Client”) in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations, and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represents Consultant’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental, or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental, or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed in writing by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

Consultant accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss, or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information (“improper use of the Report”), except to the extent those parties have obtained the prior written consent of Consultant to use and rely upon the Report and the Information. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations forms part of the Report and any use of the Report is subject to the terms hereof.

Should additional information become available, Strum requests that this information be brought to our attention immediately so that we can re-assess the conclusions presented in this report. This report was prepared by Katrina Ferrari, BSc., Aquatic Specialist, and was reviewed by Carrie Jardine, MSc., Senior Ecology Lead.

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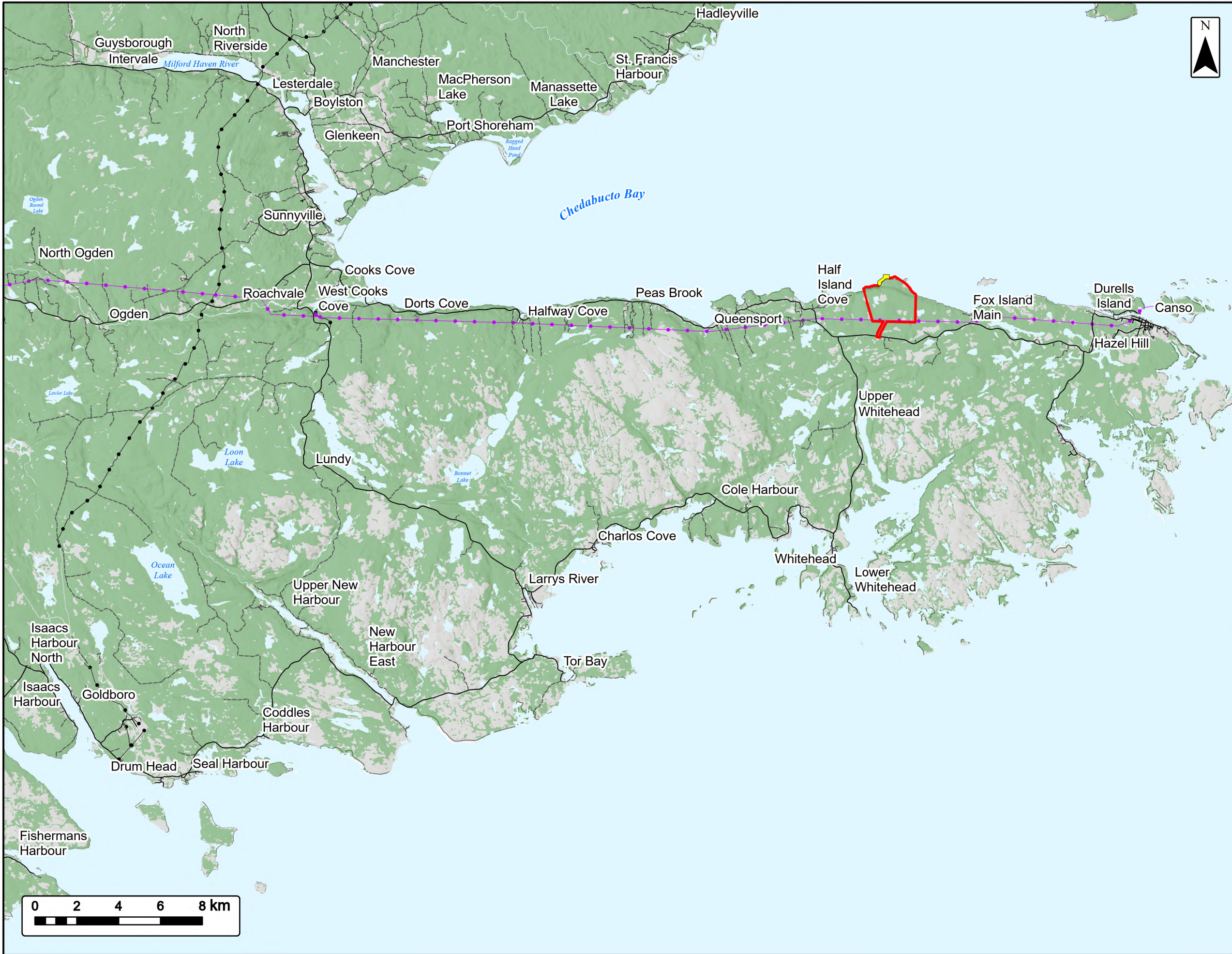
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APPENDIX A
DRAWINGS



Black Point Quarry

Project Location



- Project Development Area
- Marine Study Area
- Transportation**
- Road
- Unpaved Road
- Utilities (Line)**
- Existing Pipeline
- Existing Transmission Lines
- Water Features**
- Mapped Lakes and Rivers



Coordinate System: NAD83 UTM Zone 20N Sources: ESRI Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

Date: 2025-05-08	Project #: 24-10695
Scale: 1:175,000	1
Drawn By: M. Partridge	
Checked By: K. Ferrari	



Chedabucto Bay



Black Point Quarry

Impact to Habitat



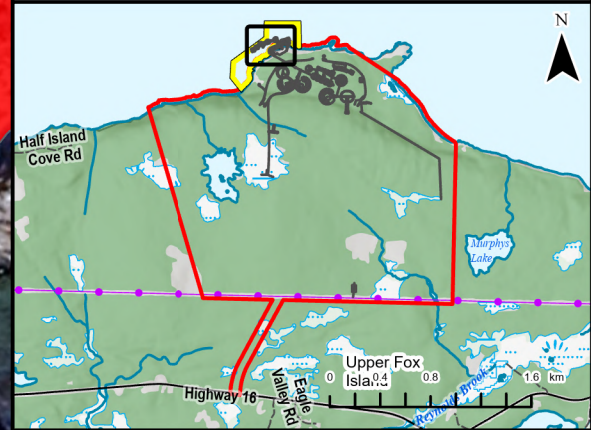
Push Out Fill	
Marine Structure	
Bedrock and Boulders	
Cobbles and Boulders	
Gravel and Sand	
Sand and Silt	
Habitat Destruction	
Habitat Disruption	

7 Dolphin Structures
 Areas of Habitat Destruction
 Gravel and Sand: 944 m²
 Cobble and Boulder: 1,095 m²
 Bedrock and Boulder: 932 m²

53 Piles to Support Ring Beam
 Areas of Habitat Destruction
 Cobble and Boulder: 98 m²
 Bedrock and Boulder: 68 m²

Push Out Fill
 Areas of Habitat Destruction
 Bedrock and Boulder: 7,357 m²

Push Out Fill - Placement Efficiency
 Areas of Habitat Disruption
 Cobble and Boulder: 9 m²
 Bedrock and Boulder: 575 m²



Coordinate System: NAD83 UTM Zone 20N
 Sources: ESRI Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

Date: 2025-05-09	Project #: 24-10695
Scale: 1:1,000	Drawing #: 2
Drawn By: M. Partridge	
Checked By: K. Ferrari	



Chedabucto Bay



Black Point Quarry

Offsetting Ratios



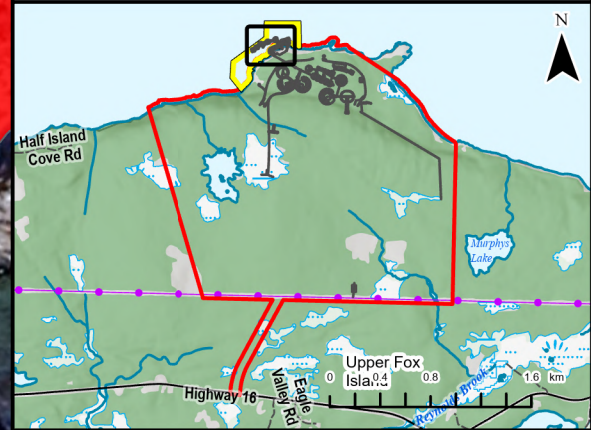
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Marine Structure	
Bedrock and Boulders	
Cobbles and Boulders	
Gravel and Sand	
Sand and Silt	
Habitat Destruction	
Habitat Disruption	

53 Piles to Support Ring Beam
 Areas of Habitat Destruction
 Cobble and Boulder: 3:1
 Bedrock and Boulder: 2:5:1

Push Out Fill
 Areas of Habitat Destruction
 Bedrock and Boulder: 3:1

7 Dolphin Structures
 Areas of Habitat Destruction
 Gravel and Sand: 1:5:1
 Cobble and Boulder: 3:1
 Bedrock and Boulder: 2:5:1

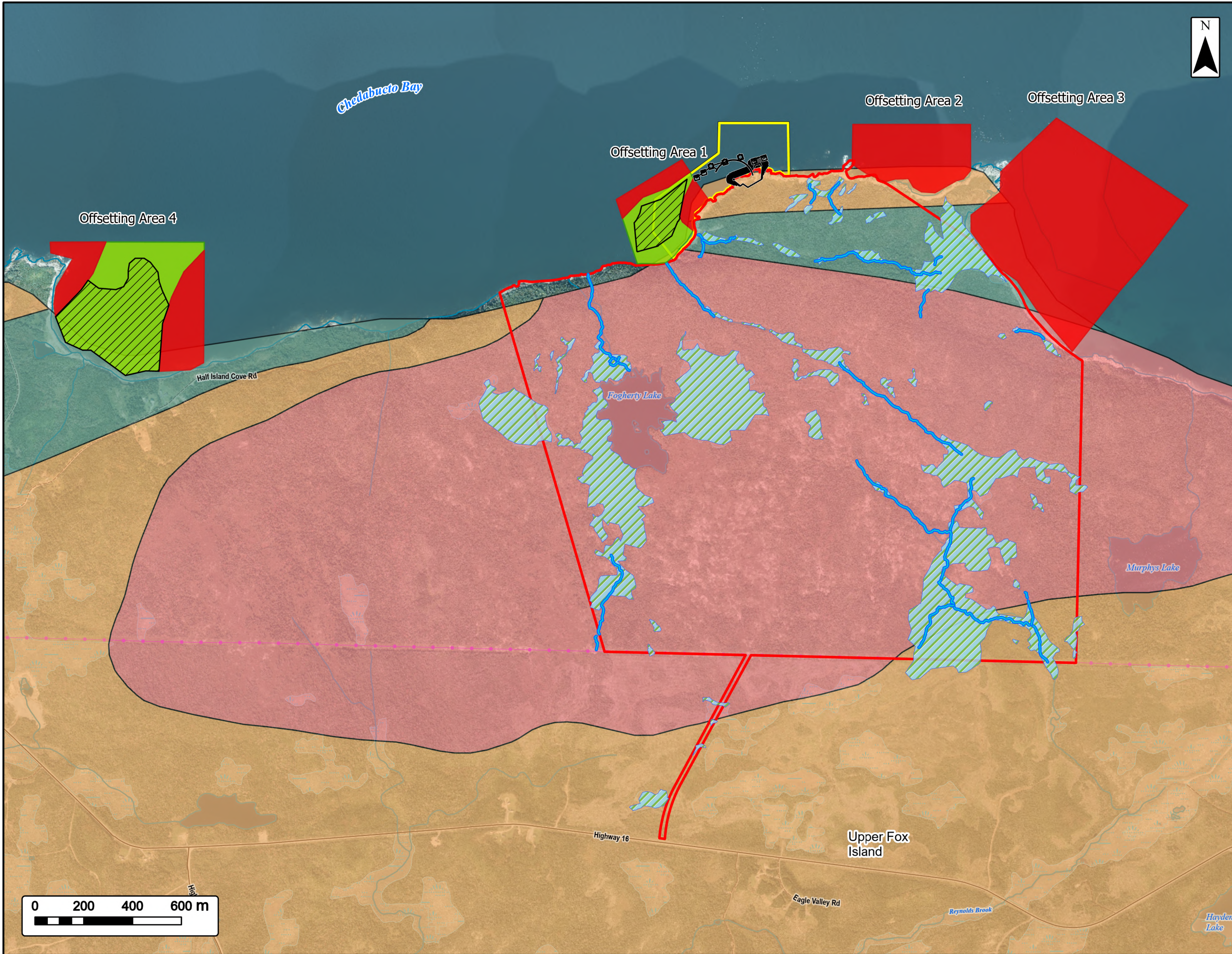
Push Out Fill - Placement Efficiency
 Areas of Habitat Disruption
 Cobble and Boulder: 2:1
 Bedrock and Boulder: 1:5:1



Coordinate System: NAD83 UTM Zone 20N
 Sources: ESRI Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

Date: 2025-05-09	Project #: 24-10695
Scale: 1:1,000	Drawing #: 3
Drawn By: M. Partridge	
Checked By: K. Ferrari	





Black Point Quarry
Initial Offsetting Locations



- Project Development Area
- Marine Study Area
- Marine Terminal Components
- Suitable Substrate (Sand)
- Unsuitable Substrate (Mostly Bedrock)
- Suitable Habitat (Depth less than 16 m)
- Field Delineated Watercourse
- Field Delineated Wetland
- Bedrock Geology By Formation**
- Halifax Formation
- Goldenville Formation
- Middle - Late Devonian muscovite biotite monzogranite
- Transportation**
- Road
- Unpaved Road
- Utilities (Line)**
- Existing Transmission Lines
- Water Features**
- NSE Mapped Watercourses
- Mapped Wetlands



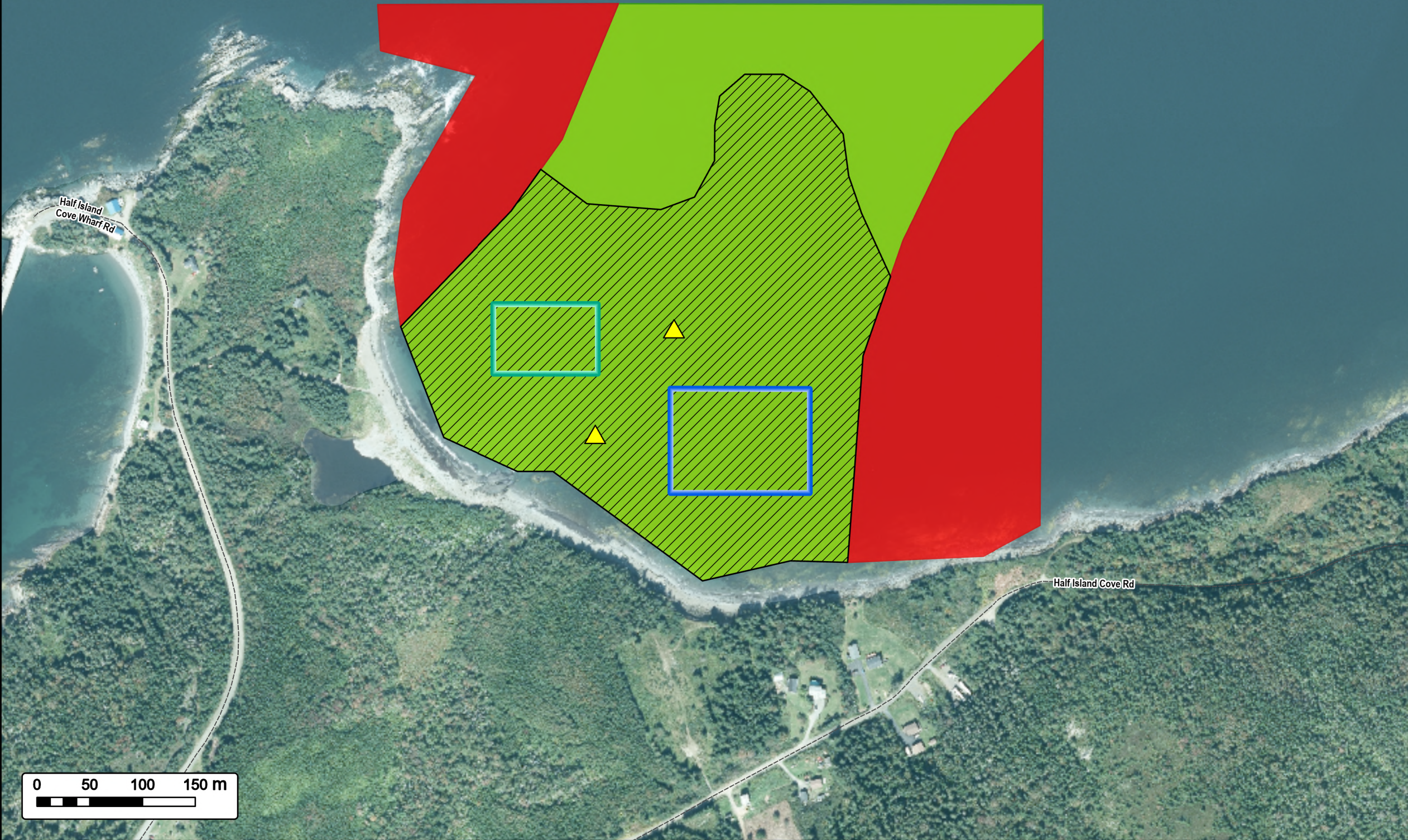
Coordinate System: NAD83 UTM Zone 20N Sources: ESRI Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

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Scale: 1:15,000	Drawing #: 4
Drawn By: M. Partridge	
Checked By: K. Ferrari	



Chelabucto Bay

Offsetting Area 4



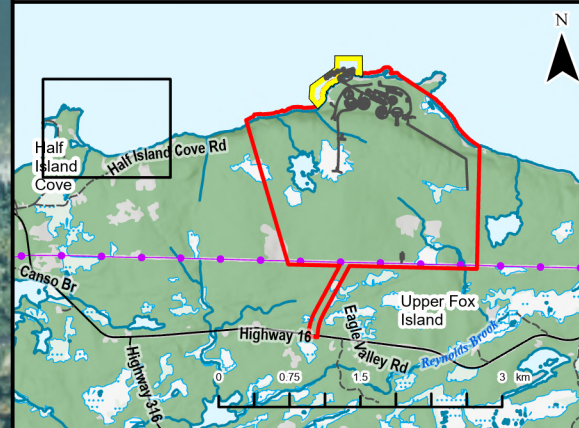
Black Point Quarry

Offsetting Area 4



Offsetting Area 4

- Hard Packed Sand
- Bedrock
- Suitable Habitat (Depth less than 16 m)
- Proposed Marine Offsetting Location
- Proposed Freshwater Offsetting Location
- Control Site
- Transportation**
- Unpaved Road



Coordinate System: NAD83 UTM Zone 20N Sources: ESRI Basemaps, GeoNOVA, SNSIS, NSNRR, ACCDC, IBA Canada, CNWI, HERE, Garmin, USGS

Date: 2025-07-15	Project #: 24-10695
Scale: 1:4,000	<h1>5</h1>
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Checked By: K. Ferrari	

