ENVIRONMENTAL ASSESSMENT
REGISTRATION DOCUMENT

CONTINENTAL STONE LIMITED
PROPOSED BELLEORAM CRUSHED ROCK EXPORT QUARRY
BELLEORAM, NL

Submitted by:

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PREFACE

Continental Stone Limited (Continental Stone) proposes to develop a crushed rock export quarry in Belleoram on the south coast of Newfoundland. As required under the provincial *Environmental Assessment Regulations, 2003*, the project was registered with the Minister of Environment and Conservation (March 2006).

In response to the Registration, the Minister of Environment and Conservation required Continental Stone to submit an Environmental Preview Report (EPR). Guidelines for the EPR were released in June 2006 and the EPR was submitted in November 2006. In 2007, the project was released from the environmental assessment process with the acceptance and approval of the EPR (January 2007), followed by submission and acceptance of the Environmental Protection Plan and Spill Contingency Plan (July 2007).

As per the *Environmental Assessment Regulations, 2003,* the release from the original Environmental Assessment process has expired and the project requires re-registration. Communications with Canadian Environmental Assessment Agency (CEAA) verify that the project was assessed as a comprehensive study under the former Canadian Environmental Assessment Act and does not require a federal EA. “We consider that section 128 (1)(c) of the *Canadian Environmental Assessment Act, 2012*, applies to this project” (Vanessa Rodrigues, Project Manager, CEAA, pers. comm.).

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1.0 NAME OF UNDERTAKING

Belleoram Crushed Rock Export Quarry

2.0 PROPONENT

2.1 Name of Corporate Body

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2.2 Address

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2.3 Chief Executive Officer

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3.0 THE UNDERTAKING

3.1 Description of the Undertaking

Continental Stone Limited proposes to develop a crushed rock quarry in Belleoram, Newfoundland (Figure 1) to supply raw material to international markets. The project will be carried out in 3 stages: Development, Operations and Decommissioning, as described below.

Development. Excavation and removal of overburden material will be completed to facilitate the construction of a site access road. Core samples of the rock will be taken to ensure that the rock is suitable for market. This phase will also include the excavation of an area for setup of the crusher and associated equipment and a suitable marine terminal for the project. All equipment will be established during this phase. Exact size, location, and type of infrastructure will vary pending final project design and compliance with regulatory body's guidelines for construction and operation.

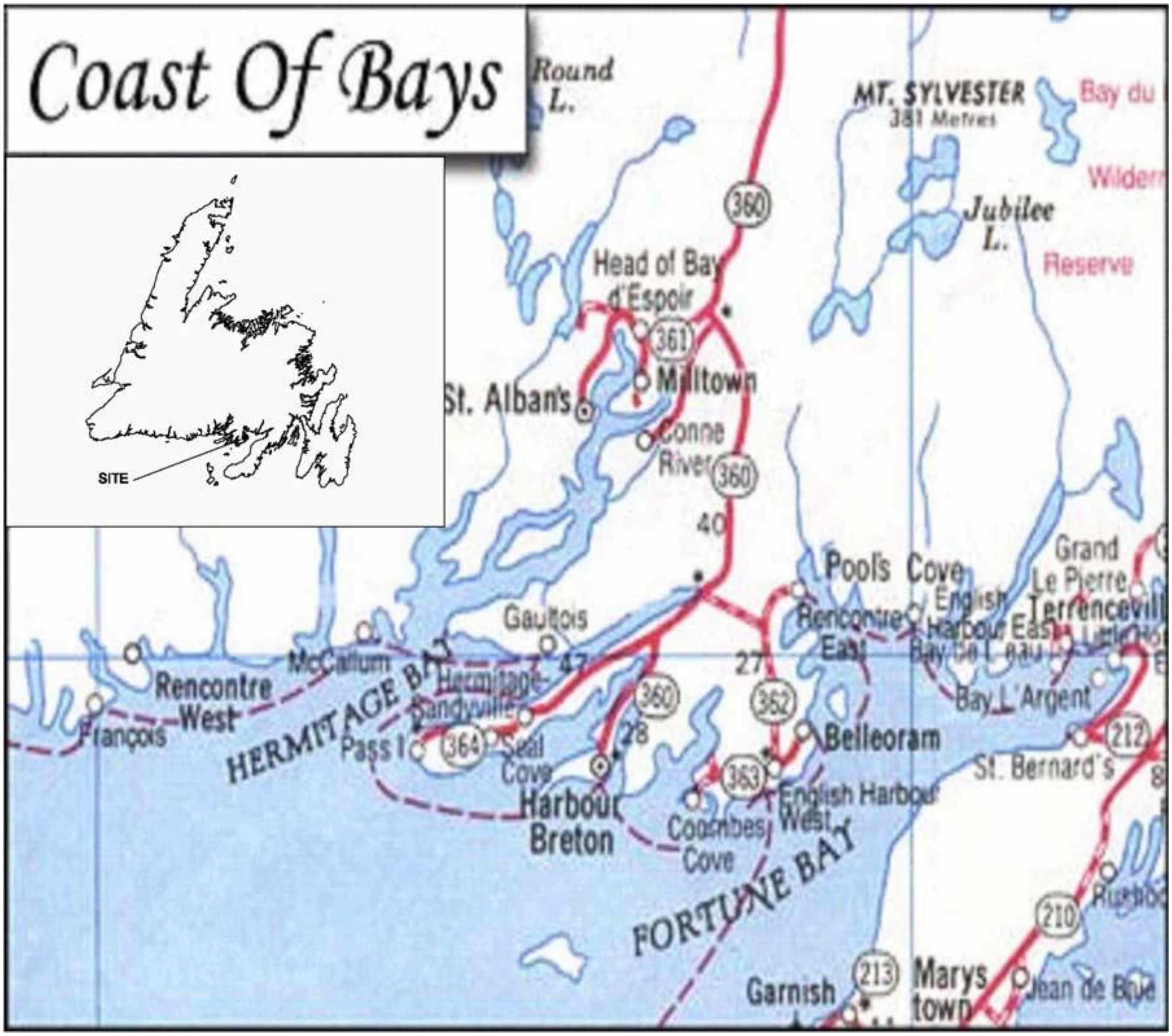

Figure 1. Belleoram, NL

Operation. Operations will consist of drilling and blasting of the rock source, with the fractured rock being crushed into various sizes. The crushed rock will then be conveyed to the marine terminal for loading onto a bulk aggregate carrier and shipped to international markets. It is estimated that 2,000,000 tonnes of aggregate will be shipped in the first year of operation, increasing to 6,000,000 tonnes per year for the remainder of Phase 1 of the project. Phase 1 of Operations is expected to last 20 – 25 years (Figure 2).

Decommissioning. This will involve demobilizing all unsuitable structures at the site and the creation of an area friendly for the community and the environment.

A rehabilitation and closure plan pursuant to the requirements of the Department of Natural Resources as outlined in the *Minerals Act* has been prepared, submitted and approved.

3.2 Purpose/Rationale/Need for the Undertaking

The purpose of the project is to gain a market share of the aggregate industry, with a view of enhancing the long term viability of Continental Stone and the economy of the Connaigre Peninsula through the creation of sustainable employment. The project is expected to bring 80-100 full time direct jobs with the potential for numerous indirect jobs for a project life of up to 50 years.

3.3 Alternative Means of Carrying Out the Project

Continental Stone has evaluated technically and economically feasible alternative means of carrying out the project, including different modes of transportation and alternative project locations.

In terms of transportation, consideration was given to the environmental and socio-economic implications of shipping the crushed aggregate versus moving it overland. Continental Stone has determined that the use of ocean going vessels along established and approved shipping lanes would be less intrusive to the surrounding communities and also less expensive. Furthermore, it was also determined that the use of ocean going vessels would require less construction and maintenance of infrastructure (eg. roads and highways capable of withstanding the repeated heavy loads of trucks). Adopting the shipping mode of transportation is deemed to have the additional benefit of restricting the spatial extent of potential effects on the terrestrial environment in the project area.

The Belleoram site was chosen due to its large deposit of granite, deep ice-free port, proximity to shipping lanes, minimal tidal action, and availability of suitable labour.

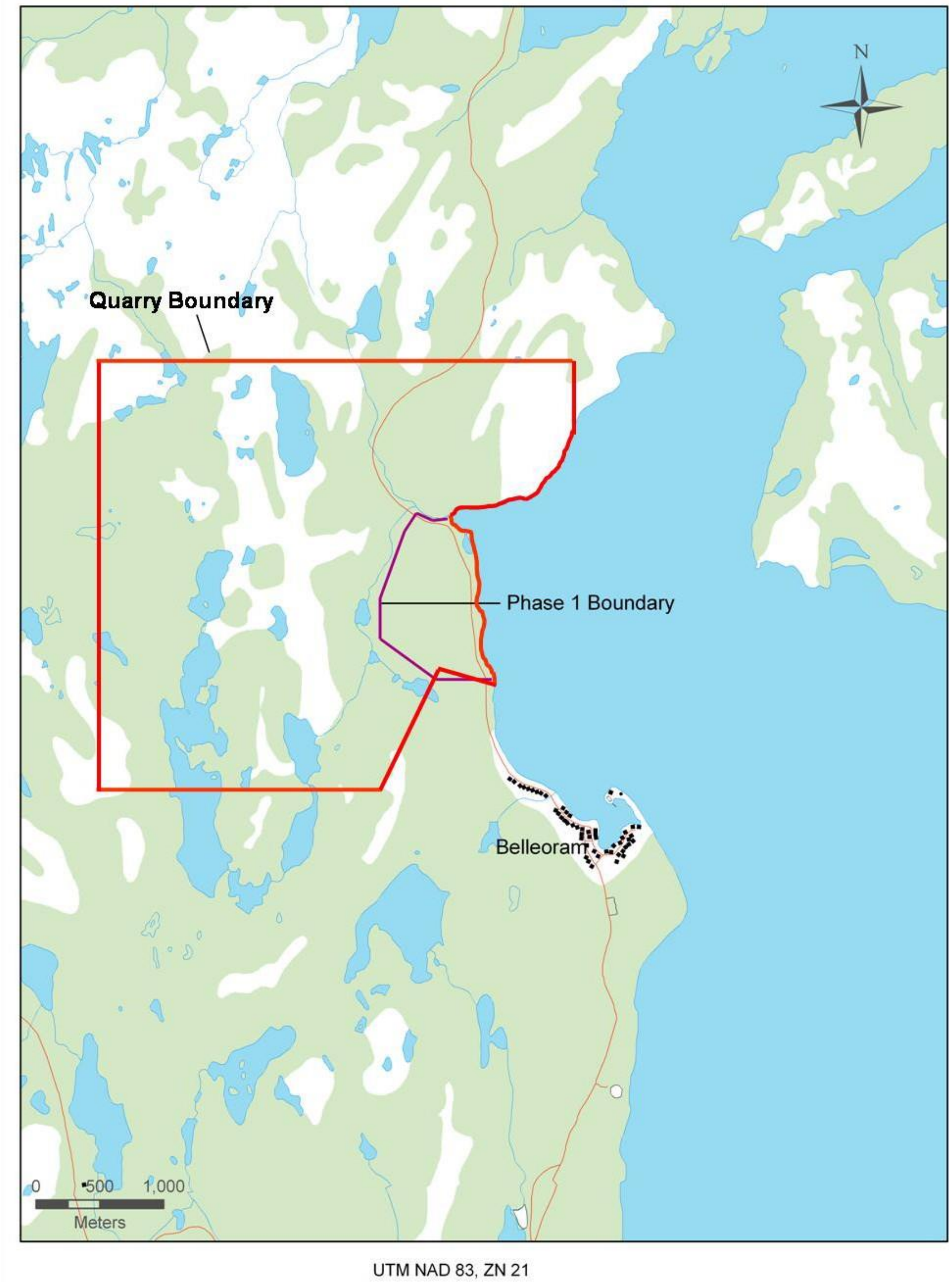

Figure 2. Location of the proposed rock quarry in Belleoram, NL and the Phase 1 boundary

3.4 Project Physical Features

The primary physical features will include the quarry, a marine wharf (Appendix 1) and a new access road. Additional features will include a rock crusher, a conveyor system, administrative and cook house buildings, and a transmission line (see Figure 3).

The access road will be constructed from the community to the quarry site following an established trail along the shoreline. The road will be gated for security and safety. A conveyor system will transport crushed rock from the crushers and screeners to the transport vessel.

A detailed Site Plan is provided in Appendix 2.

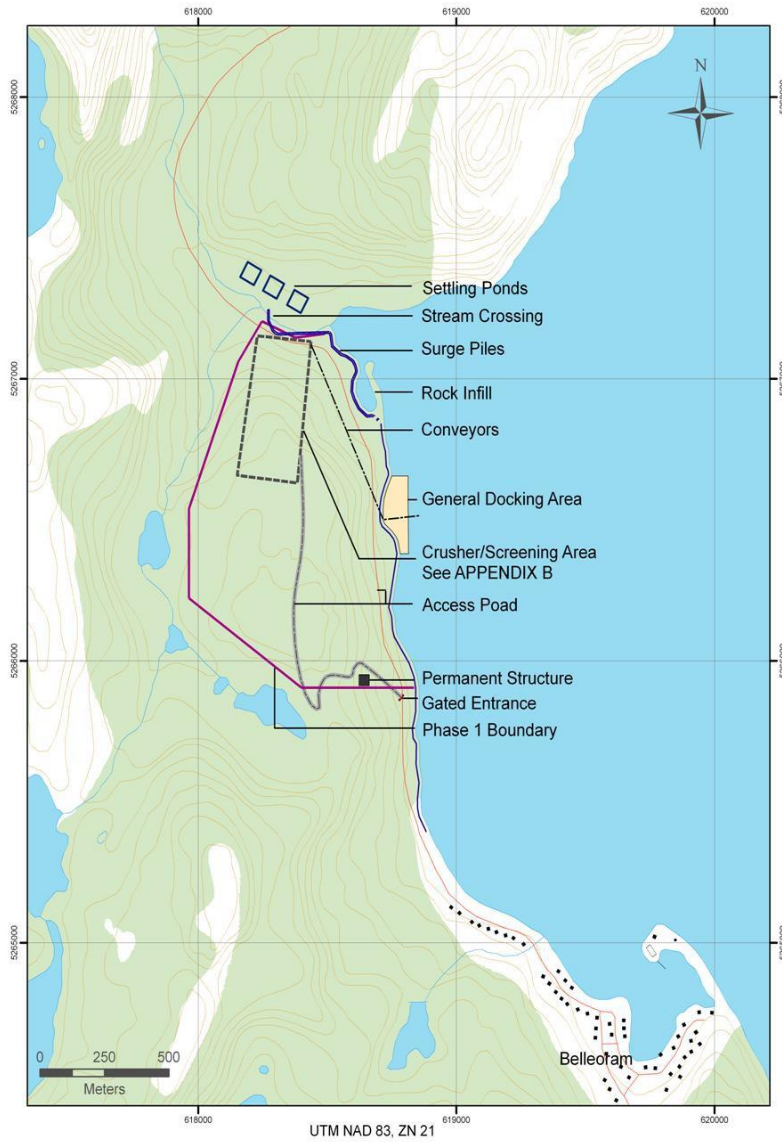

Figure 3. Approximate locations of the quarry's major features, equipment, and related structures.

4.0 PROJECT LOCATION

4.1 Geographical Location

The site is located in the South Coast Barrens Sub-region of the Maritime Barrens Ecoregion of Newfoundland. The proposed site of the Continental Stone quarry is immediately north of the community of Belleoram, Fortune Bay Newfoundland (Figure 4). The town has a population of approximately 450 people. Fishing is currently the main industry in the area. Representative photographs of the site are presented in Appendix 3.

4.2 Existing Environment

The average daily temperature in the area ranges from 15.2 °C in August to -6.3 °C in February. Annual precipitation is 1829 mm with January and November being the months of highest precipitation. The terrain can be described as rugged with steep to gently rolling topography. Site elevation ranges from sea level to approximately 320 metres.

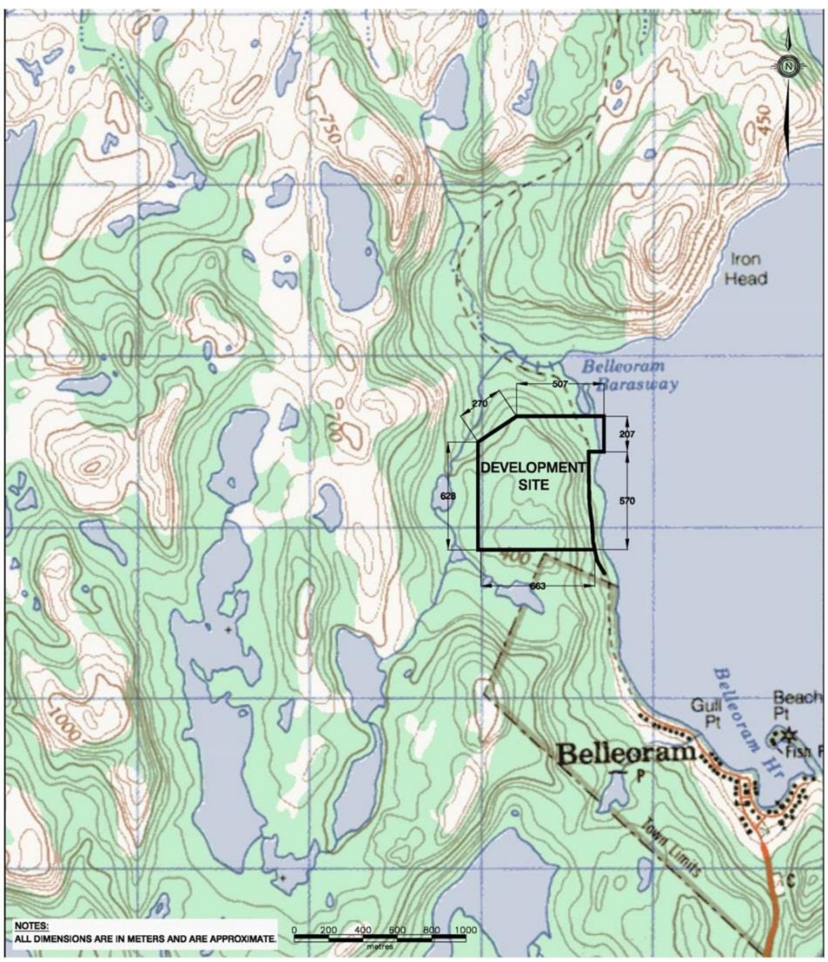

Figure 4. Project Location, Belleoram, NL.

4.2.1 Terrestrial Environment

Vegetation

The site is located in the South Coast Barrens Sub-region of the Maritime Barrens Ecoregion of Newfoundland. This sub-region is characterized by extensive heathland interspersed with bogs, fens and forests. Forests dominated by balsam fir and to a lesser extent black spruce occur primarily in sheltered valleys and on leeward hillsides. Typical heathland shrub species include rhododendron, common juniper, Labrador tea, sheep laurel, blueberry, crowberry, partridge berry, bunch berry and bakeapple (Protected Areas Association 2000). Herbaceous plants are less common but include aster, sedges and minor amounts of grasses. The moss and lichen layer is usually dominated by reindeer lichen with minor amounts of moss that typically includes red-stemmed feathermoss.

Wildlife

Wildlife in the South Coast Barrens Sub-region includes many of the same species found throughout the rest of the island. Mammals such as caribou, moose, black bear, red fox, snowshoe hare and mink are common throughout, while red squirrel, meadow voles, and masked shrews are less abundant. Beaver and muskrat may be found around freshwater bodies. The project area falls within Moose and Black Bear Management Areas 25 and Caribou Management Area 64.

The Connaigre Peninsula in general is subject to migratory shorebirds, waterfowl and seabirds. Birds in the area are also typical of the boreal ecosystem and likely include migratory species such as osprey and bald eagle, and migrant passerines including thrushes, warblers and fly catchers. Common year- round resident birds likely include common raven, boreal chickadee, willow ptarmigan, spruce grouse, dark-eyed junco and pine grosbeak. Common waterfowl such as the Canada goose, black ducks and green-winged teal may frequent the area.

Inland Fish

There are no freshwater bodies within the proposed development site.

4.2.2 Marine Environment

Belleoram is located on the south coast in Fortune Bay. The Fortune Bay area supports moderate lobster, scallop, and ground fish. The region also supports a number of aquaculture sites with the closest to the project being a distance of approximately 2 km. The physical environment in the area of the proposed wharf consists of grass, small trees and a marshy area with no previous construction. The bathymetry from the shore has a sloping drop to a depth of 15m at a distance of approximately 15m from the shore. The marine environment will be investigated by a marine biologist if required by the Department of Fisheries and

Oceans. The investigation will include identification of benthic habitat and species and bottom composition. Consultation with locals indicates the area for the proposed wharfing facility is not fished for lobsters. The shipping route from the loading dock to the mouth of Fortune Bay is not an area of concentrated fishing activities (pers. Comm. Stuart May and Barry Fiander 2006). Historically there has not been any conflict between commercial shipping and fishing vessels.

4.2.3 Air Quality

The region within 10 kilometres of the proposed site, and Newfoundland in general, experiences good air quality because there are few industrial sources of emissions. Climate conditions support good dispersion of air borne particles and the frequent rainfall help dilute those particles in the air. The air quality is also enhanced by the infusion of relatively clean, oceanic air masses from the North Atlantic Ocean. The climate is relatively wet with a winter season that typically lasts for 4 months. This snow cover results in the saturation of the surface and thus it is expected there is little background particulate matter.

5.0 CONSTRUCTION/DEVELOPMENT

Development of the quarry is scheduled to begin in Spring 2014 and will consist of:

- Access development;
- Timber salvage;
- Stripping of overburden; and
- Building and wharf construction.

5.1 Access

An access road will be constructed from the community to the quarry following an established trail along the shoreline. Construction of the access road is expected to take approximately 4 weeks. The access road will be used to transport employees and service vehicles to the site but will not be used on a regular basis for heavy equipment. A network of site roads will be constructed as needed within the quarry for safe and efficient movement of people and equipment; with one road already cut from the gated entry to the crusher/screening site.

5.2 Timber Salvage

Merchantable timber (greater than 10 cm diameter-at-breast-height) will be salvaged by local contractors with an expected start date in Spring 2014. Timber salvage will progress across the Phase 1 site as the aggregate is quarried.

5.3 Stripping of Overburden

Overburden will be removed to uncover bedrock during the development phase. Overburden thickness varies, with the starting pit targeting an area of minimal cover to minimize the volume to be removed and stored. Overburden will be stored in an area north of the settling ponds. The stored overburden and waste rock will be used for future rehabilitation of the quarry site.

5.4 Building and Wharf Construction

The establishment of the quarry operations will require the construction of some permanent structures. These include several crushers and screens which will be connected via an open conveyor belt system (Figure 5). Equipment size, type, and location may vary pending final project design approval. Various stone sizes will be obtained (i.e. 0" dirt to 1-1/2" stone) depending on the stage or type of crusher being employed.

A building will also be built at the main gate entrance to house offices, a laboratory, and a future welding facility.

Construction of the marine wharf is expected to begin in 2014 and will take a year to complete. The wharf will include the construction and placement of caissons, as well as a ship loader with a hopper and conveyors, the installation of a girder supported wharf section, and anchorage emplacement. The rock fill section will be constructed with clean armour stone from within the quarry site along the east facing shore line. These stones will be placed using dump trucks, loaders, and excavators. The docking facility will consist of an on-shore dock or, if the bathymetry requires, a pier structure projecting offshore will be needed. The exact location will be chosen pending the collection of geotechnical information at the site, as a 14 m depth is required for shipping purposes. Formal approval for the wharf construction has been obtained under Section (1) of the Navigable Waters Protection Act by means of an environmental assessment pursuant to the Canadian Environmental Assessment Act (CEAA).

5.5 Potential Sources of Pollution during Construction

The development phase will consist of earth-moving activities. The potential sources of pollution are limited to site drainage (effluent from overburden storage areas/waste rock and wash water), solid waste, equipment exhaust, noise, and the unlikely event of an accidental release of fuel or lubricant.

5.5.1 Effluent

Site run-off water will be directed to vegetated areas within the site, which will filter suspended solids. All water releases will meet the regulatory requirements of the *Environmental Control (Water and Sewage) Regulations* and provincial permits.

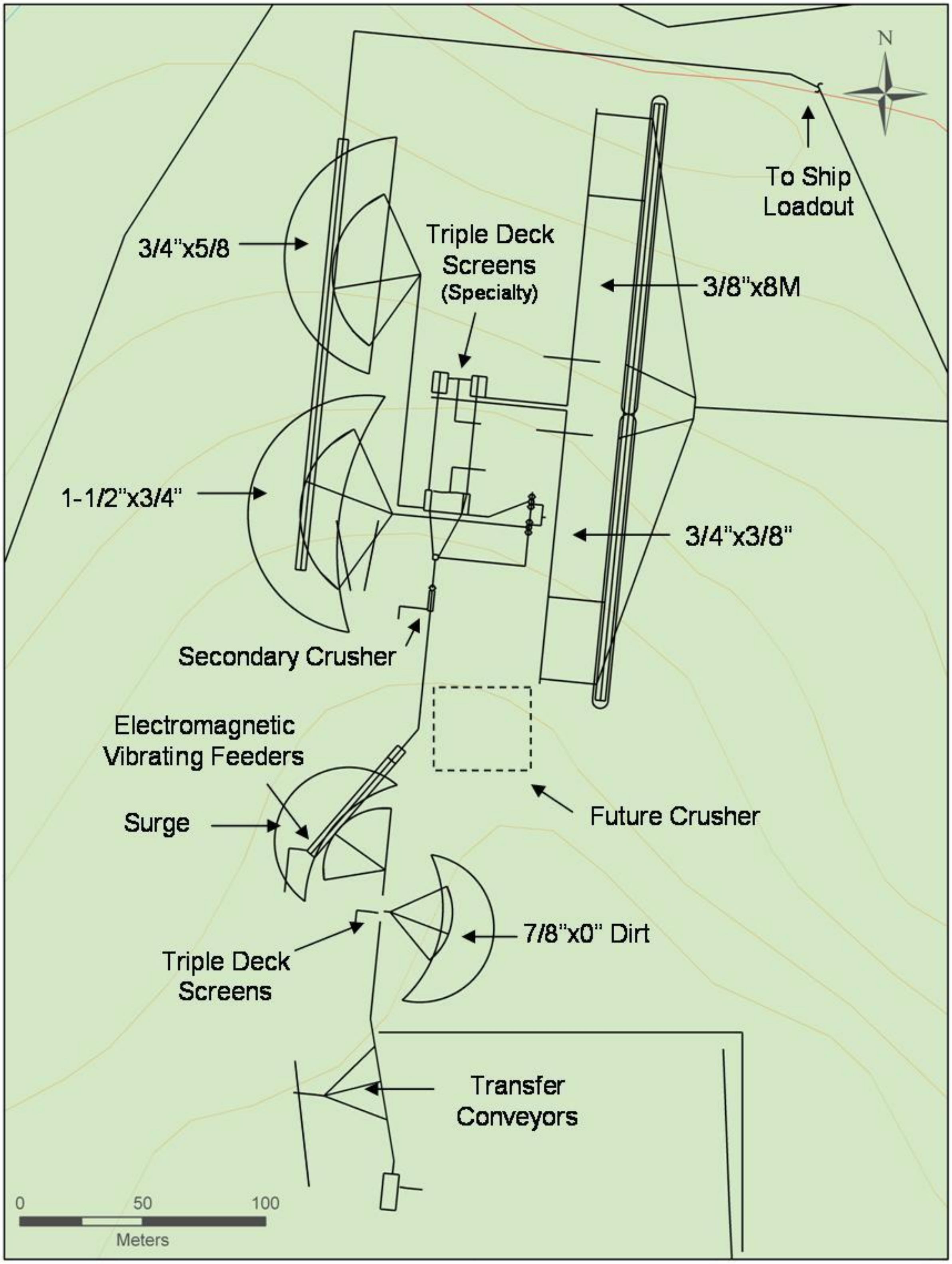

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Figure 5. Approximate design layout of the crusher/screening area.

Sewage will be handled by an approved portable facility during construction. The holding tanks will be emptied by a pump truck on a regular basis and disposed of in an appropriate manner.

All fuel handling and storage will comply with the *Storage and Handling of Gasoline and Associated Products Regulations*. All waste oil generated at the quarry will be disposed of by a licensed disposal agent. There will be no on-site bulk storage of fuel or oil.

5.5.2 Waste and Litter

Domestic garbage will be collected from the construction site and disposed of in the Belleoram landfill. Any food or organic garbage onsite will be held in animal-proof containers to prevent attracting wildlife.

5.5.3 Air Emissions

All equipment will have the appropriate emission-control features. Dust control measures (i.e., water application) will be applied as required for vehicle traffic on the access road.

5.6 Potential Resource Conflicts during Construction

Current resource use of the project area is likely minimal due to the rugged environment, limited access to the area and small local population. Resource conflicts, if any, during construction are likely restricted to big and small game hunting, berry harvesting and domestic wood cutting.

Informal consultations with local residents indicate that wood cutting is confined to an area closer to the town of Belleoram (Robert Rose pers. comm.).

A literature review found no reference to prehistoric sites in the area. If, however, during development or operation, historic resources are encountered, work in the area of the discovery will stop and the foreman will notify the proper authorities.

6.0 OPERATION

The operational phase will include the following operations: 1) drilling and blasting; 2) primary, secondary, and tertiary crushing; 3) dry and wet screening; 4) stockpiling; 5) reclaiming of finished products; and 6) ship loading.

Aggregate washwater will be obtained from the ponds immediately to the east of the Phase 1 boundary via a water intake installed in one of the ponds. As can be seen in Figure 6, an air photo overlay of the approximate locations of the quarry's crushing and

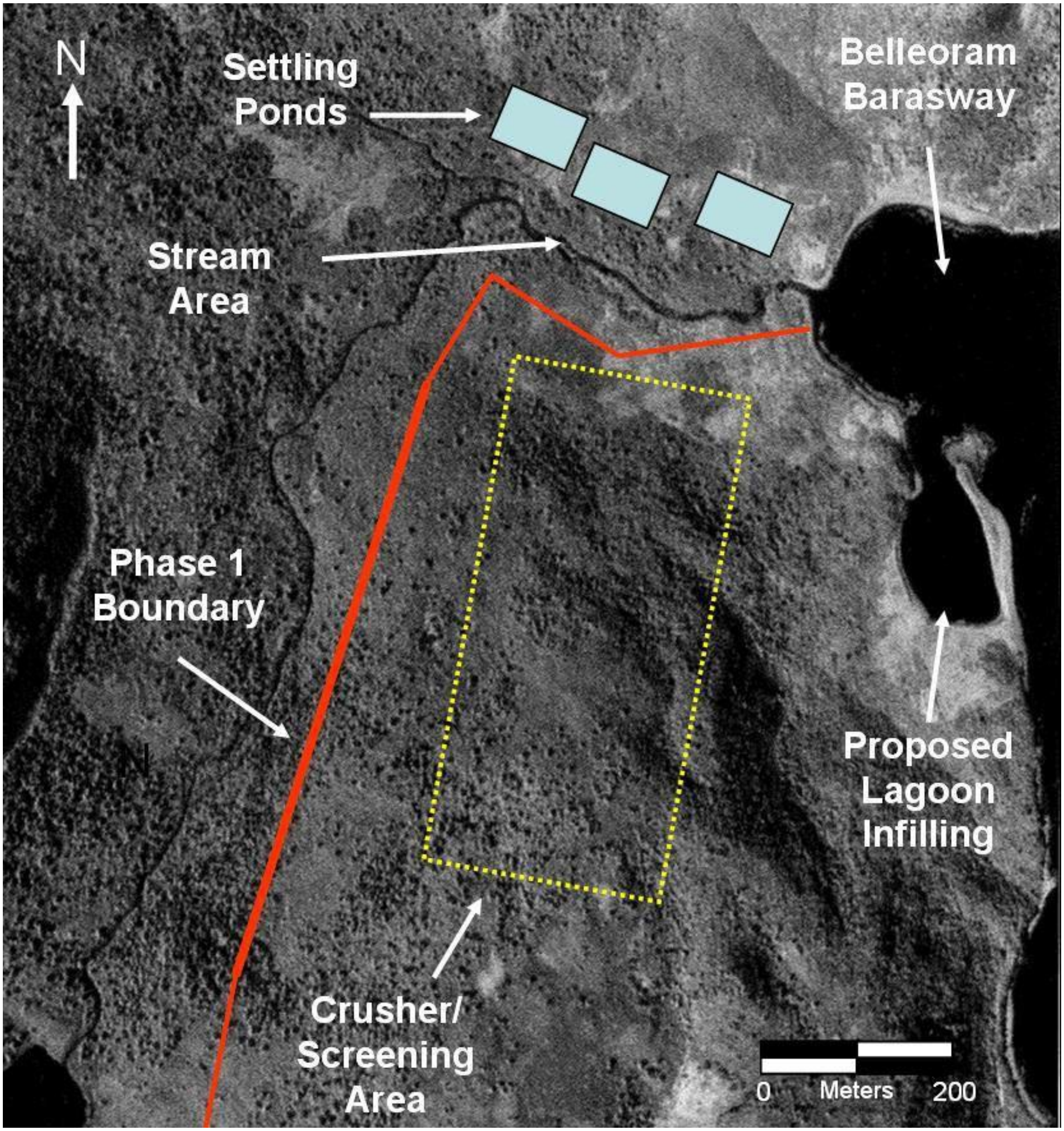

Figure 6. Air photo overlay of the approximate locations of the quarry's crushing and screening equipment and related structures in relation to the local stream system.

screening equipment and related structures in relation to the local stream system, the lower section of the stream will be spanned by a Bailey bridge and a wash water pipeline, with the exact size, location, and type of infrastructure being determined upon final project design approval.

The grounds and facilities will be maintained according to environmental health and safety standards and regulations. Blasting operations will be conducted by contracted licensed blasters. The explosives will not be manufactured or stored on site, but will be ordered on a regular basis from reputable suppliers.

Quarrying operations are expected to run for approximately 40 weeks from March to December each year, having two shifts as required. The ship loading activities are expected to run year round in order to supply contract demands. The quarry is expected to operate for 50 years, with Phase 1 having a lifespan of 20-25 years. As with the construction phase, the BMP Handbook will be adhered to during the operation phase of the quarry.

6.1 Blasting Protocol

Blasting operations will be conducted at the Belleoram Granite Quarry in accordance with:

- The Fisheries Act, DFO Canada
- The Newfoundland and Labrador Environment Act and Occupational Health and Safety Act
- The Explosives Act, Natural Resources Canada
- "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters", DFO Canada, Wright and Hopky (1998)
- Dyno Nobel Canadian Blast Site Safety Procedures.

Blasting during quarry start-up will be once per week during start up, moving to twice per week during full production, corresponding to a weekly production of 40,000 tonnes at startup and increasing to 80,000 tonnes during the life of the quarry. All blasts will be conducted between 0700 hours and 1900 hours. At the entrance to the quarry a 'Blast Notice Board' shall be erected detailing the time and date of any proposed blast as well as a description of the blast signaling system.

Continental Stone Limited will be employing the following blast parameters during production operations:

Bench Height	12.0 m
Hole Diameter	165 mm
Burden	4.87 m

Spacing	4.87 m
Subdrill	1.52 m
Collar	3.04 m

Each bore hole will be loaded with 290 kilograms of Dyno Gold 70-30 Bulk Emulsion Blend explosive pumped in to the bore hole using bulk explosives delivery systems. The bore holes will be double primed using 350 gram cast boosters used in conjunction with Nonel EZ detonators having a 25 millisecond surface delay and a 500 millisecond in-hole delay interval. The Nonel EZ detonators are to be used with Nonel EZ Trunkline Delays in such a fashion that each bore hole in the blast is fired independently and with a minimum of 8 milliseconds of delay interval. The collar of each blast hole will be filled with 20 mm clean crushed stone to contain the gasses within the bore hole and reduce unwanted air overpressure. Drilling will be conducted using Down The Hole (DTH) drills equipped with either a vacuum dust collections system or a water injection dust suppression mechanism.

6.2 Potential Sources of Pollution During Operation

The potential sources of pollution during the operations phase may include pollution from blasting operations (ANFO), dust, site run-off, accidental fuel spills/releases, sewage, waste and litter, and air emissions.

6.2.1 ANFO (Ammonium Nitrate/Fuel Oil)

The use of ANFO explosives has the potential to produce ammonia blast residue in the pit water and waste rock drainage. Although elevated levels of ammonia are toxic to some aquatic life, the discharge to vegetated areas will encourage bio/chemical-degradation of ammonia. Water quality monitoring will be employed to ensure runoff to the marine environment complies with applicable regulations.

6.2.2 Dust

Dust may be generated during blasting operations. To mitigate this, bore hole collars will be filled with 20 mm clean crushed stone to help suppress dust and gases during blasting. Should dust become a problem, water trucks will be used to moisten surfaces and keep dust down.

6.2.3 Site Runoff

Site runoff will be directed to vegetated areas within the project boundaries, which will filter any potential suspended solids. Sedimentation ponds will be installed as required. If the aggregate requires washing, industry approved settling ponds will be constructed that will screen out the silt and other suspended solids. This treated water will be recycled back into the aggregate cleaning process. All water releases will meet the regulatory requirements of the Environmental Control (Water and Sewage) Regulations and provincial permits.

6.2.4 Accidental Fuel Spills and Hydrocarbon Fuel Storage

Machinery must be checked for leakage of lubricants or fuel and must be in good working order. Refueling must be done at least 30 m from any water body. Basic petroleum spill clean-up equipment should be on-site, with adsorbents being used to recover any hydrocarbon sheen in the pit water. All spills or leaks should be promptly contained, cleaned up, and reported to the 24-hour environmental emergencies report system (1-800-563-9089). There will be no on-site bulk storage of fuel or oil, and all fuel handling is to comply with the Storage and Handling of Gasoline and Associated Products Regulations. Any waste oil generated will be handled, stored, and disposed of by a licensed disposal agent in accordance with the Used Oil Regulations.

6.2.5 Sewage

Sewage will be handled by an approved portable facility during operation. The holding tanks will be emptied by a pump truck on a regular basis and disposed of in an appropriate manner. All waters disposed of on the proposed site will comply with the Environmental Control Water and Sewer Regulations, 2003.

6.2.6 Waste and Litter

During operation, domestic garbage will be collected and hauled to the incinerator operated by Belleoram in accordance with the Waste Material Disposal Act. Any food or organic garbage onsite will be held in animal-proof containers to prevent attracting bear, fox, birds, or other wildlife.

6.2.7 Air Emissions

All construction equipment must be fitted with standard and well- maintained emission control and noise suppression devices. Dust control measures will be applied as appropriate and as described in the BMP Handbook. All activities will be carried out in accordance with the Air Pollution Control Regulations, 2004.

6.3 Potential Resource Conflicts During Operation

The potential resource conflicts associated with operation of the quarry are the same as those for construction, as the scope and nature of activities are quite similar. It has been noted that local residents occasionally use the area for hiking (by means of a small foot path that will be developed into a larger access road along the shoreline), hunting, and lumber harvesting. However, this represents a very small minority of the local population, with the area being very rugged and not ideal for game hunting or fishing. Lumber harvesting activities occur only on the outskirts of the project's boundaries. Access to the site will be restricted by means of a gated entry to ensure the safety of the general public, therefore restricting general usage of the area.

Interactions with respect to fisheries and shipping are discussed in detail in later sections and therefore will not be outlined here.

7.0 DECOMMISSIONING/REHABILITATION

The quarry will be progressively rehabilitated. Based on existing decommissioning standards and protocols for mines and quarries, it is anticipated that the following activities will occur:

1) Prior to decommissioning, the public and local stakeholders will be consulted to determine possible further commercial or recreational uses for the site.
2) All facilities and infrastructure, with the possible exception of the marine wharf, will be dismantled. These structures, and all other waste materials, will be disposed of and /or recycled in an appropriate manner, and in accordance with existing environmental regulations. Access roads will also be closed. The site will be restored by re-establishing drainage patterns, re-vegetation, soil stabilization and habitat enhancement methodologies, as appropriate.
3) A Phase 1 Environmental Site Assessment will be required prior to finalization of the decommissioning plans.

8.0 OCCUPATIONS

Contractors will be retained during the Development stage of the quarry (i.e. for blasting operations, materials shipping, etc.).

Site construction and operations for the proposed quarry will likely include the following occupations, classified as per *National Occupational Classification, 2006,* and equipment. All listed personnel are anticipated to be direct-hires, if available.

<u>Construction Phase</u>

1	Health, Safety and Environment Advisor (2263)
1	Site Foreman/Supervisor (7217)
3	Heavy Equipment Operators (7421)
3	Truck Drivers (7411)
2	Heavy Equipment Mechanics (7312)
1	Labourer (7611)
11	Total

<u>Operations</u>

1	Health, Safety and Environment Advisor (2263)
1	Security Attendant (6541)

1	Site Foreman/Supervisor (7217)
3	Heavy Equipment Operators (7421) – Loader, excavator, fork lift
4	Truck Drivers (7411)
1	Heavy Equipment Mechanic (7312)
1	Labourer (7611)
12	Total

Continental Stone is committed to equity in employment and will encourage all qualified individuals to apply.

9.0 ENVIRONMENTAL EVALUATION

This section provides an overview of the evaluation of the potential adverse environmental effects of the project, as identified in EPR guidelines issued in 2007. Specifically, the guidelines identified the marine environment, and in particular the existing (and pending) aquaculture sites in the area, as the Valuable Ecosystem Components (VEC) in need of additional assessment.

9.1 Evaluation Procedure

Evaluation of the potential effects of each phase of the undertaking involved a three-step process:

1. Identification of project and environment interactions (i.e. issue scoping);
2. Identification and evaluation of potential effects; and
3. Identification and description of mitigation measures, identification of residual impacts, and determination of significance.

9.1.1 Identification of Project and Environment Interactions

The 2007 EPR Guidelines identified the following project features as potentially adversely affecting the marine environment, and in particular aquaculture sites in the area (including those that are proposed/approved):

- Potential effects of vibrational and acoustic shock from blasting;
- Potential effects of shipping;
- Potential effects of dust fines;
- Potential effects of sedimentation; and
- Potential effects of explosive chemicals.

9.1.2 Identification and Evaluation of Potential Effects

The 2007 EPR provided additional information on the identified interactions and described their potential effects in terms of whether they are positive/negative, short/long term and direct/indirect. Effects predictions were explicitly stated and the theory or rationale upon which they are based was also presented. The results are summarized herein.

9.1.3 Description of Mitigation Measures and Residual Impacts

Residual impact analysis is conducted following the consideration of standard mitigation measures incorporated into the design of the project, as well as other mitigations to be implemented as per federal and provincial agencies through permit conditions or as protection procedures. All applicable mitigation procedures are described in the following sections. Residual impacts, those which remain after mitigative measures have been implemented, are defined in terms of significance, nature, magnitude, spatial extent, probability, duration, and frequency. Irreversible impacts have been clearly identified. In this manner, the residual environmental impacts of the undertaking can be determined.

9.2 Impact Definitions

The definitions outlined in this section have been applied to all impact predictions in this section unless otherwise noted. For any such exceptions, applicable definitions are presented within the text of that particular section.

9.2.1 Residual Impact Significance Criteria

The terminology used to describe a residual impact should be clear, objective, and easily understood. This section provides criteria for evaluating the significance of residual environmental impacts (negative or positive). Precise definitions for the ranking of residual impacts on populations (or in this case, caged aquaculture sites), where applicable, are used in this EPR, as follows:

A **Major (significant)** residual environmental impact is one affecting a whole stock or population of a VEC in an area in such a way as to cause a change in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return that population, or any populations or species dependent upon it, to its former level within several generations. In this instance where aquaculture facilities are also considered a VEC, a major (significant) residual affect is one affecting a whole size class of penned fish in such a way as to cause a change in abundance beyond typical industry expected mortality and morbidity rates.

A **Moderate (significant)** residual environmental impact is one affecting a portion of a population in an area that results in a change in abundance and/or distribution over one or more generations of that portion of the population, or any populations or species dependent upon it, but does not change the integrity of any population as a whole; it may be localized. A change in habitat (including food sources) that produces the same result in populations would be moderate. In this instance where aquaculture facilities are also considered a VEC, a moderate(significant) residual affect is one affecting a portion of a size class of penned fish in such a way as to cause a change in abundance beyond typical industry expected mortality and morbidity rates.

A **Minor (not significant)** residual environmental impact is one affecting the population or a specific group of individuals in a localized area and/or over a short period (one generation or less), but not affecting other trophic levels or the integrity of the population itself. In this instance where aquaculture facilities are also considered a VEC, a minor (not significant) residual effect is one affecting the behaviour of a portion of a size class of penned fish, but not causing any change in abundance beyond typical industry expected mortality and morbidity rates.

A **Negligible (not significant)** residual environmental impact is one affecting the population or a specific group of individuals in a localized area and/or over a short period in such a way as to be similar in effect to small random changes in the population due to natural irregularities, but having no measurable environmental effect on the population as a whole. In this instance where aquaculture facilities are also considered a VEC, a negligible (not significant) residual effect is one affecting the behavior of a portion of a size class of penned fish for short periods of time. A negligible residual effect would have no measurable effect on the penned group of fish and not cause a change in abundance beyond typical industry expected mortality and morbidity rates.

9.3 Vibrational and Acoustic Shock from Blasting

9.3.1 Project and Environment Interaction

Detonation of explosives during quarrying operations will produce vibrational and acoustic noise in the surrounding environment. The extent to which these factors can cause negative impacts is directly related to the distance from the blast, the magnitude of the blast, and the sensitivity of the organism to vibrations or sound (NRC 2003).

Fish react to sound and vibrations in the water, although there is relatively little knowledge on how they make use of acoustic information. Some species of fish use it for communication and courtship (Popper & Fay 1993; Fay & Popper 2000; Popper *et al*. 2003), aggression (Hawkins and Rasmussen 1978; Hawkins 1993) and some fish may even use sound as a primitive form of echo location (Tavolga 1971). With respect to how fish receive and can be affected by sounds or vibrations, there are two main variables of interest; 1) shock pressure, represented and measured in Peak Particle Velocity (PPV), and 2) compressional seismic waves, measured as a pressure force (kPa). These phenomena can lead to disturbance or damage to fish by affecting their sensory organs (Hawkins and Johnstone 1978; Whalberg and Westererberg 2005). Sound/vibrations are perceived in two ways; 1) through the lateral line or 2) through the buoyancy-regulating air-filled sac, known as the swim bladder. The lateral line system consists of sensory cells called neuromasts located in fluid-filled canals on the side of the fish. These cells do not measure acoustic waves directly, but they detect local low frequency (below 150 Hz) water flow relative to the fish (Sand 1984; Enger *et al*. 1989). Thus, they detect an acoustic field very close to the source and are susceptible to mechanical damage from intense pressures (McCauley *et al*. 2003). The swim bladder is an air-filled sac that is also sensitive to sound/pressure waves depending on how much air it contains; with a greater volume of air making it more sensitive to sound waves. If a fish receives sound pressures above a threshold value (varies depending on species, environmental conditions, wave parameters, etc.), the swim bladder can rupture (along with other organs) causing decreased fitness, disease resistance, growth rate or even death (McCauley *et al*. 2003; Whalberg and Westererberg 2005). The farmed species near the proposed Belleoram Quarry (Atlantic salmon and northern cod) have both lateral line systems and swim bladders and therefore excessive noise and vibration has the potential to impact them.

Past studies of the effects of high intensity sound waves on fish have been conducted with varying results. Fish exposed to short pulses of high intensity sounds in the range of 170-180 dB showed both transitory effects as well as damage to fish sensory cells. A brief alarm response was noted in Chapman and Hawkins (1969), Schwartz and Greer (1984), and Pearson *et al*. (1992) with no detected effect on fish health. McClauley *et al*. (2003) was not able to identify what level of sound is required to cause damage to fish, however the report does state that repeated sound levels of 180 dB from 500 m away did in fact damage fish sensory cells. It should be noted that 180dB from 500m away is a very intense sound pulse and would be considered extreme (eg. a jet engine typically generates 140dB).

9.3.2 Mitigation Measures

Continental Stone recognizes the potential sensitivity of farmed fish and has incorporated this into their designed blasting regime and operational procedures to minimize negative effects while maximizing safety and efficiency. The following standard mitigation measures will be implemented:

- Utilization of the guidelines set out by Wright and Hopky's Technical Report for the use of explosive near Canadian fisheries waters (1998);
- Utilization of the Dyno Nobel North America "Canadian Blast Site Safety Manual" guidelines to ensure for safe, environmentally conscious, blasting procedures;
- No blasting underwater or within a waterbody;
- Use of explosives in compliance with all applicable laws, regulations and orders of the DOEC and the DNR-Mines;

- Restricting explosives handling and detonation to persons properly trained and qualified to use them in accordance with the manufacturer's instructions and government laws and regulations;
- Obtaining Blasters Safety Certificates (from the DOEC) and a Temporary Magazine License (from Energy, Mines, and Resources Canada) prior to drilling and blasting to ensure that the proper procedures are known and followed; and
- Making a blasting plan available to the local interest committee.

While the above standard mitigation measures will be incorporated into the facilities Environmental Protection Plan (EPP) and Contingency Plan, further design of the blasting program is outlined below.

Blast patterns and procedures to minimize shock or instantaneous peak noise levels to ensure that the magnitude of explosions is limited to only what is necessary will be incorporated into any final blast design. Briefly, design considerations include:

- plugging the 12 m bore holes with a 3 m collar of 20 mm, clean, crushed stone to trap gases and dust during blasting;
- optimizing drill hole patterns; using explosives in a manner that will minimize scatter of blasted material beyond the limits of the activity;
- employing the proper working on time-delayed blasting cycles (500 millisecond in-hole delay and a 25 millisecond surface delay); and
- using reliable material such as Nonel EZ Dets, or similar blast initiation system, which allow accurate firing of the explosives.

While the above steps will be taken to reduce vibrations resulting from blasting, it will be impossible to eliminate all unwanted seismic noise from the operation. Therefore, the blast design will be such that interaction with the identified VEC will be minimized to the extent possible. In that regard, this subsection provides estimates of the likelihood that cage-reared Atlantic salmon in Fortune Bay will be affected by the vibrational or acoustic effects as a result of the proposed blast design.

Peak Particle Velocity

DFO guidelines state that: "*no explosive is to be detonated that produces, or is likely to produce a PPV greater than 13mm/second in a spawning bed during the period of egg incubation*" (Wright and Hopky 1998). An estimate of PPV can be calculated using the following equation (Oriard 2002):

$$PPV = 150(SD/W^{0.5})^{-1.6}$$

Where:

PPV: inches per second
SD: distance from the blast in feet
W: weight in pounds per delay

By altering the blast configuration and estimated weight of each charge for the proposed Belleoram Quarry (294kg), the PPV experienced by any nearby aquaculture facilities can be estimated. The current blast design produces the following predicted PPV at various distances:

50 m	187mm/sec
200 m	20 mm/sec
300m	13.0 mm/sec
500 m	4.87 mm/sec
1500 m	0.75 mm/sec
2000 m	0.37 mm/sec

By observing this DFO guideline, blasting would need to be approximately 300m from any area of fish egg incubation. As shown, the particle velocity values for distances between the proposed quarry and the aquaculture facilities (estimated conservatively at 1500m; Figure 7) are not likely detectable using currently available blast monitoring seismographs (Pers. Com., Keith Phelan: Hard Rock Newfoundland, 2006). Further, since spawning is a fish's most sensitive life stage, these values would be considered more conservative for adult rearing operations. In addition, the PPV value at 1500 m is over seventeen times less than that required for egg incubation.

Compressional Seismic Waves

DFO guidelines further state that: "*no explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change greater than 100kPa (14.5 psi) in the swimbladder of the fish*" (Wright and Hopky 1998). To calculate the minimum distance that an onshore blast could occur from fish habitat, the following equation can be used:

$$SD = 5.03(W)^{0.5}$$

Where:

SD: distance from the blast in meters
W: charge weight per delay (pers. com., Keith Phelan, Hard Rock Newfoundland, 2006).

Using this formula and based on the predetermined charge weight of 294 kg, the distance that the blast must be from fish habitat is estimated at 86 meters.

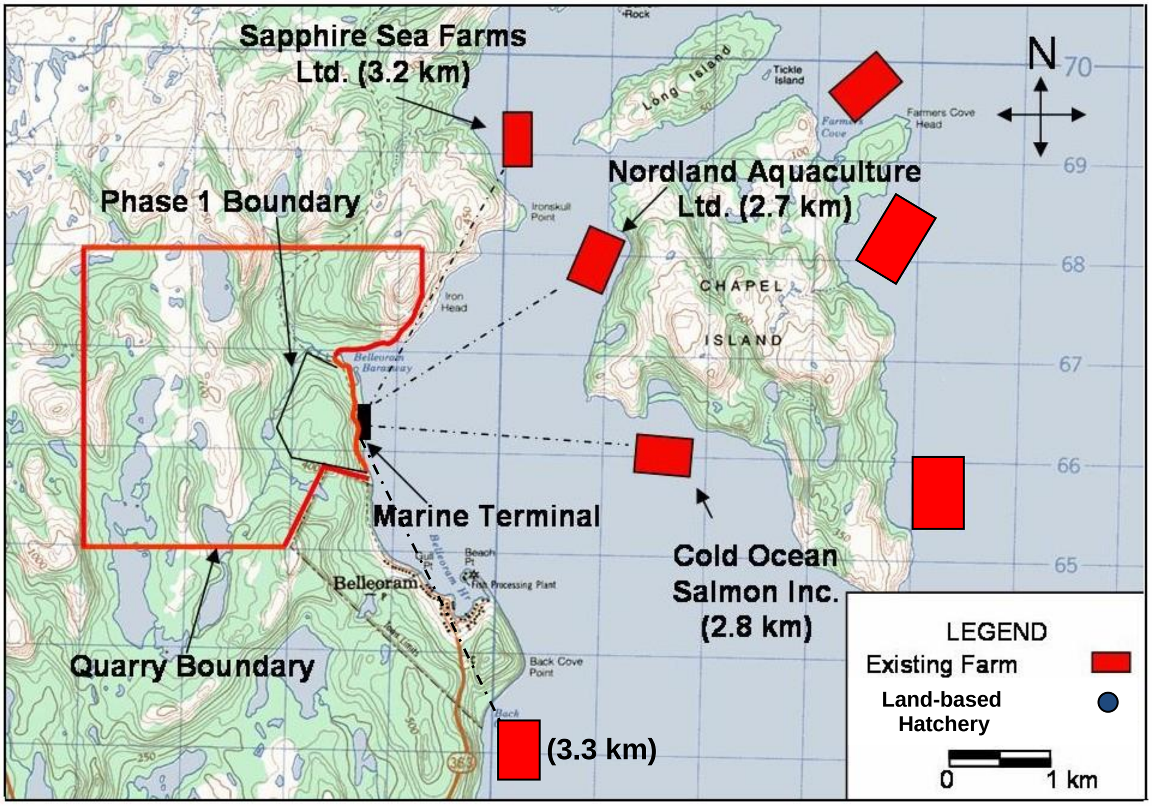

Figure 7. Locations of local fish farms in relation to proposed Phase 1 activities.
Note: fish farm location data obtained from the Department of Fisheries and Aquaculture, August 2013.

Propagation of Sound from Air to Water

Although sound may propagate in air over several kilometers as a result of blast detonations, its effect relative to submerged marine fishes is considered to be minimal. This statement is

supported by Rayles Equation which describes the reflective abilities as sound passes from one medium to another. Salt water is a far more dense substance than air (1,027 kg/m^3 and 1.2 kg/m^3, respectively). Using the Rayles Equation, the following results are obtained.

$$R = \frac{z_2 - z_1}{z_2 + z_1}$$

Where:

z_1 (acoustic impedance of air) = density (1.2 kg/m^3) x the speed of sound in air (343 m/s) = 411.6

z_2 (acoustic impedance of salt water) = density (1027 kg/m^3) x the speed of sound in salt water (1500 m/s) = 1540500

Solving for R, we get a value of 0.99. An R-value of <1 indicates a rigid boundary where most of the sound energy will be reflected off the surface with little transmission. Due to the distance between the aquaculture sites and the proposed quarry operation, the sound pressure in air would not likely be enough to penetrate the water's surface.

Additional Blast Monitoring Commitment

Since real-world data has not been obtained to support the above calculations, additional monitoring is being considered within Fortune Bay. During the initial stages of blasting, sound/vibration measuring equipment (i.e. hydrophones) will be deployed to measure the effects at various points within Fortune Bay to validate the above calculations/predictions.

9.3.3 Residual Impact

Blasting will occur at the proposed quarry to allow efficient processing of granite aggregate. Blasting, and any associated residual impact on the VEC, will happen approximately 1-2 times per week, only within the quarry boundary, and outside of any waterbody. As the above calculations demonstrate, the probability that fish will be exposed to levels of sound/vibration intense enough to cause damage or any reaction outside mild, transitory, avoidance behavior, are highly remote. Due to the physical distance between the aquaculture facilities and the proposed quarry, the mitigations outlined above and the design of the proposed blast operations, it was determined the impact will be **Minor (not significant)**.

9.4 Shipping

9.4.1 Project and Environment Interaction

The economic transport of crushed granite aggregate from the proposed quarry site to market will be via marine bulk carriers. With an anticipated aggregate production level between 40,000 and 80,000 tonnes weekly, carriers will be required to enter Fortune Bay and dock at the proposed marine terminal on an estimated weekly basis and will have an anticipated 60,000 tonne capacity. Due to their large size and the need for these vessels to turn one-hundred-eighty degrees once they reach the dock for loading, speeds within Fortune Bay are anticipated to be less than two knots. Potential interactions between the bulk carriers and aquaculture sites in the area are related to sounds/vibrational disturbance, wake, water quality and the possible amplification of the risks involved with superchill events.

Shipping activities will be contracted out to a third party, who will be responsible for the vessels and shipping as well as its operation and maintenance. All ships will be double- hulled and will be required to adhere to all EPP and Contingency Planning committed and implemented by Continental Stone Limited. All ships will also adhere to, and be responsible for, all environmental compliance, permits and certificates, and meet all regulatory standards pursuant to the *Canadian Shipping Act*. It should be noted that no "tanker" traffic will occur as part of the Project and that there will be no bulk oil/fuel transport, no oil/fuel refueling of ships and no bilge water discharge at the Project site.

Studies on the potential effect of vessel noise on caged fish have been conducted. When simulated vessel noise was played back to caged schools of cod and herring (species that are more sensitive to sound than salmon), a moderate avoidance reaction was observed at sound levels of 120 to 130 dB (Engås *et al*. 1995). No alarm responses were observed, suggesting that even if the fish does perceive a ship's sound, there is little adverse reaction.

9.4.2 Mitigation Measures

While shipping by bulk carrier was determined to be the most economical method of transporting the material to market, the potential interaction between this option and the marine environment, particularly the local aquaculture operations, has been recognized. Standard mitigations with respect to vessel traffic have been outlined below and will also be included in Continental Stone's EPP and Contingency Plan.

Mitigations to reduce any potential effects include:

- All bulk carriers will be required to travel within a predetermined pathway that will allow for both adequate passage into the bay as well as maximizing the distance the ship will be from the farms at any one time. As can be seen on Figure 8, the central brown line indicates the path that is a maximum possible distance for the nearest farm (Cold Ocean Salmon Inc., approximately 750 m at the nearest point);
- All bulk carrier speeds will be such that they do not create an excessive wake or vibrations at the farm sites;
- All bulk carriers will turn off engines (except for any generators required for power) when ships are docked at the marine terminal for loading to minimize exposure to mechanical noise;
- All bulk carriers will carry oil spill clean-up equipment (eg. absorbants, inflatable dykes) with trained crew members in spill prevention and clean up techniques;
- No bulk carrier will be refueled at the marine terminal;
- No dumping of bilge or ballast water outside the allowable restrictions of the Canadian Shipping Act (i.e. not within the Fortune Bay area); and
- All bulk carriers will be double hulled.

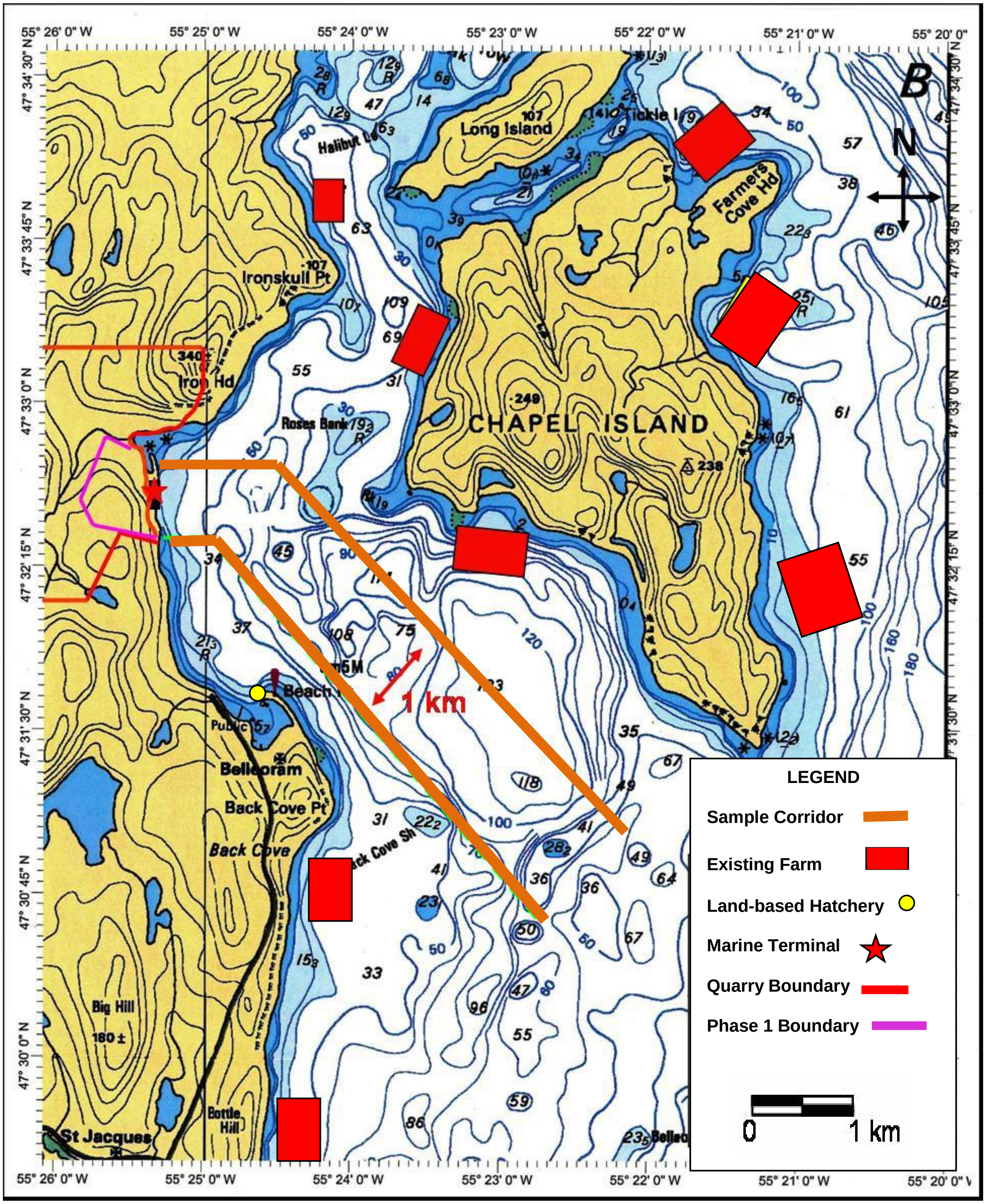

Figure 8. Proposed bulk carrier shipping route into the Fortune Bay area in relation to the local fish farms.

Note: fish farm location data obtained from the Department of Fisheries and Aquaculture, August 2013.

9.4.3 Residual Impact

Shipping will occur approximately once per week using a 60,000 tonne bulk carrier inside a designated shipping corridor. This corridor is located at least 750m away from the nearest aquaculture site. Due to the slow movement of the vessels, low frequency of visits relative to other traffic (i.e. boats associated with the operation of the aquaculture facilities and local fishermen), the probability is very low that fish will be exposed to any of the following:

- levels of sound/vibration intense enough to cause damage or any reaction outside a mild, transitory, avoidance behavior;
- wake action to cause any damage to fish or facilities;
- degraded water quality due to fuel spills or bilge water discharge.

Due to the physical distance between the aquaculture facilities and the proposed bulk carrier travel corridor and the mitigations outlined above, it is determined that shipping will have a **Negligible (not significant)** impact on the wild and farmed fish within Fortune Bay.

It should be noted that superchill and the potential interaction with the Project are addressed in the section below.

9.5 Superchill

9.5.1 Project and Environment Interaction

Superchilling occurs when the ambient water temperature reaches -0.7° C, or lower (Hew *et al*. 1991). This temperature is usually only attained in the top few meters of the water column when there is no ice formation and generally when it is windy, lasting anywhere from a few hours to a couple days (Jeff Perry, personal communication). Such an environment is lethal to most teleost fish, such as commercially important salmonids (Fletcher *et al*. 2004). At the superchill point, if these fish come into contact with an ice crystal, its tissues freeze solid (a process known as nucleation) causing instantaneous death or, in some cases, sublethal destruction of their gills which permanently impairs their function (Hew *et al*., 1991). Therefore, aquaculture operations are physically restricted to a relatively small area in the most southerly part of the region where the waters freeze infrequently (Hew *et al*. 1995; Aiken 1986). Although these events are rare, they have the potential to cause serious financial damage to an aquaculture operation. During the winter of 2003, losses were estimated at CAN$12 million (Raynor and Campbell 2003) due to superchill.

Table 1. Monthly average temperature (over the past ~5 to 10 years, varies by month) data for the 3PS NAFO Sea Area of Newfoundland and Labrador.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	-1.7	-2.3	-2.0	-1.6	-1.2	-1.0	-0.5	0.0	0.3	-0.8	1.1	-0.9
Max	4.6	3.5	2.3	4.9	17.9	19.9	24.9	23.2	20.7	16.0	13.0	10.0
Mean	0.9	-0.3	-0.5	0.4	2.5	6.3	10.7	12.6	12.2	10.0	6.8	3.4
Stdev	0.6	0.7	0.7	0.9	1.5	1.9	2.8	3.4	1.3	1.2	1.3	1.3
Years	21	20	20	22	20	20	21	20	21	21	19	21
Days	1916	1870	1935	1785	2292	3085	3569	3021	2537	2337	1881	1967

Note: Data obtained from the Department of Fisheries and Ocean's Bedford Institute of Oceanography website.

The Belleoram Bay area is in the 3PS Northwest Atlantic Fisheries Organization (NAFO) Sea Region of Newfoundland, an area that can reach sub-freezing water temperatures during the year (Table 1). Figure 9 shows historical data (1986-1987) for specific monitoring stations in the vicinity of Fortune Bay. The stations are at depths similar to the near shore cages (1-22 m), and show that sub-zero temperatures have been possible in the past. However, the waters within Fortune Bay have not been observed at a temperature less than 0.7°C in recent years (Cooke Aquaculture, personal communication). It is possible that fresh water inputs may have influenced temperature readings, artificially lowering readings in the vicinity of these monitoring stations, as they were located near the mouths of much larger watersheds. This, coupled with the moderating effects of the on-shore prevailing winds, allows Fortune Bay to stay mostly ice free, making the chance of a superchill event very rare.

Under normal aquaculture operations, fish will naturally avoid superchill by remaining on the bottom of the cages where it is slightly warmer and the water less turbulent than at the immediate surface. If, however, they move into the upper superchill layer, damage can occur. Aquaculture operations monitor water temperatures near cages and have Contingency Plans for when temperatures reach near superchill, which include such measures as reducing vessel movement around the cages and restricting feeding, as these may bring fish to the surface and potentially expose them to superchilled water. With this in mind, both blasting and bulk carrier traffic have the potential to interact with aquaculture operations by causing a behavioral avoidance reaction which may bring them to the surface into superchill.

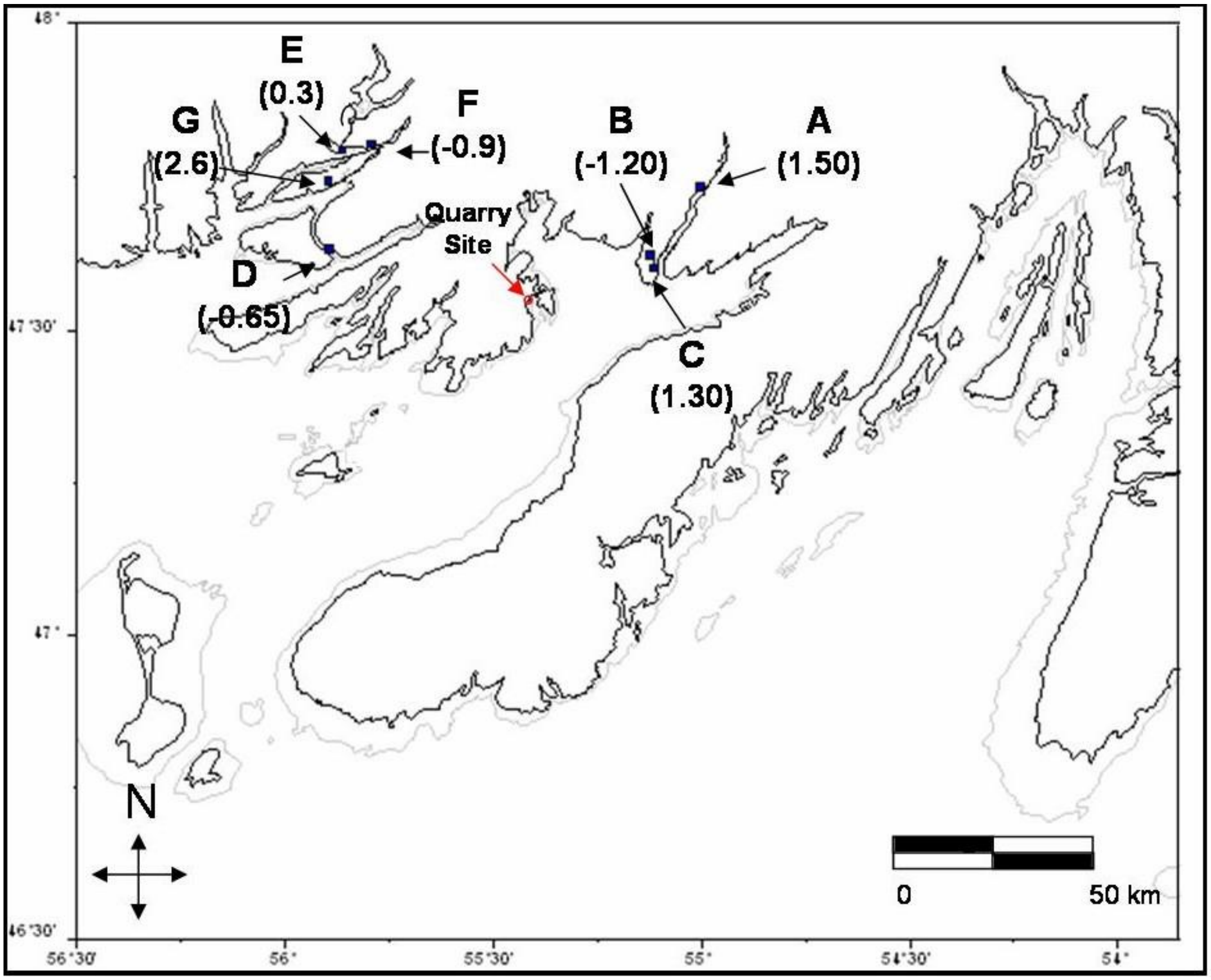

Figure 9. Selected local water monitoring station's (depth ranges from 1-20 m) showing a temperature profile that can be expected in the area.

Note: Temperatures given are the lowest recorded (in ^{o}C). Information obtained from the DFO database.

9.5.2 Mitigation Measures

Despite the remote chance of superchill in Fortune Bay, the following mitigations are included: communication and scheduling. These mitigations will be on-going and increased diligence if it is suspected that a superchill event may occur (due to observed weather and ice conditions) will ensure these mitigations are effective.

The single-most important mitigation is the constant communication between the aquaculture operators and the Project, as both blasting and shipping man be re-scheduled to some degree to avoid times when superchill is identified. As stated in previous sections, both blasting and shipping will occur on a weekly basis, therefore any superchill event lasting hours or a couple of days may be avoided to suit the needs of the local residents and business owners.

9.5.3 Residual Impact

As noted above, superchill would be considered an extremely rare event in Fortune Bay and mitigations such as scheduling and communication can reduce any interaction between the Project and aquaculture operations during such events. Due to the physical distance between the aquaculture facilities, the extreme low frequency of superchill, and the mitigations outlined above, it is determined that blasting and shipping will have a **Negligible (not significant)** impact on the wild and farmed fish within Fortune Bay.

9.6 Dust Fines

9.6.1 Project and Environment Interaction

Dust fines can become airborne as a result of a blasting event or from the operation of equipment and vehicles during quarrying operations (i.e. crushing, screening, and conveying the aggregate granite). The potential effects dust may have on the marine environment include: increased siltation, decreased water clarity and visibility, and the disruption of fish gill function (in extremely high amounts).

Natural factors of the area will assist in minimizing any interactions between dust and the surrounding environment. The impact of fugitive dust sources depends on the quantity and drift potential of the dust particles injected into the atmosphere. Since the ground material in the area is predominately granite, with very little overburden (<5 m; which will be cleared prior to blasting), the amount of dust escaping after a blast would be small and localized. Further, due to granite's high density, particles ejected by a blast will be restricted to the vicinity of the quarry site, with very little blow-over to the neighboring land or water. Climate conditions in the area supports good dispersion of air borne particles and the frequent rainfall will help dilute those particles in the air. This wet climate has a winter season that typically lasts for 4 months, with snow cover resulting in surface saturation, thus little background particulate matter is expected. Air quality is also enhanced by the infusion of relatively clean, oceanic air masses from the North Atlantic Ocean. Winds on the south coast of Newfoundland blow predominantly from the south–west, however, local conditions at Belleoram have a great effect on their direction. The topography of the area will act to shelter the quarry site, slowing winds in the area (Bowyer and Gray 1995), thereby reducing the distance that any dust released from the quarry will travel. Also, there is a channeling effect between Belleoram and Chapel Island, causing winds to be forced up to the north, to north-west. Therefore, the majority of airborne dust would be directed away from the nearest aquaculture sites.

9.6.2 Mitigation Measures

Continental Stone Limited has, as part of its EPP and Contingency Planning, mitigation measures to control quarry-related dust both for an environmental as well as occupational health and safety perspective. Outlined mitigations include:

- Wright Hopky's 'Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters" (1998) will be incorporated into the blasting operations and the EPP;
- the Aggregate Operators Best Management Practices Handbook for British Columbia, volume 2 (2002) will be incorporated into the blasting operations and EPP;
- Dust suppression and/or collection equipment during drilling will be used as well as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
- All blast bore holes will be plugged with 3m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting;
- Wash water will be directed to settling ponds which will remove accumulated silt (wash water will be recycled back into production rather than allowing it to runoff into the streams or marine environment); and
- Equipment will be sprayed with water to suppress airborne particles if high dust levels occur as a result of crushing, screening, conveying.

9.6.3 Residual Impact

Blasting will take place twice a week, on average, and crushing and screening operations will be ongoing throughout the quarry's lifespan. Due to the rocktype and overburden levels, the frequency of blasting is not expected to release sizable amounts of dust, in comparison to vehicular traffic on a dirt road for instance. Also, through the adherence to the above mitigations, and the design of the proposed blast operations, is determined to be a **Negligible (not significant)** impact.

9.7 Sedimentation

9.7.1 Project and Environment Interaction

Phase 1 of the quarry project is located adjacent to the ocean shore and also contains the lower end of a small stream/pond system which flows into the Belleoram Barasway. The quarry site naturally has a shallow overburden layer (<5 m) and stripping of this material has the potential to increase runoff into the surrounding terrestrial, freshwater, and marine environments. Further, the nature of the quarrying activities leads to the potential for the runoff to carry silt, hydrocarbons, and ammonia from explosives.

9.7.2 Mitigation Measures

The possibility of detrimental effects from runoff is a recognized part of operating a quarry and is addressed by adequate planning and operating practices. The mitigations outlined below will be incorporated into the Project's construction and operation EPP and Contingency Plans:

- A 50 m buffer zone of undisturbed natural vegetation between construction areas and all waterbodies will be maintained, where possible (fish habitat protection guidelines recommend a buffer width of 12 m + 1.5 x % slope, Scruton *et al*. 1997);
- Siltation control structures (i.e. silt curtains, cofferdams, sediment fences, etc.) will be constructed prior to commencing activities that involve the disturbance of the site and work along the shoreline;
- Soil disturbance will be minimized by limiting the area exposed at any one time, stabilizing exposed soil with anti-erosion devices (i.e. rip rap, filter fabrics, gravel or wood chips), and revegetation of disturbed areas;
- To facilitate filtering of suspended solids, water will be directed from the site to vegetated areas (natural or man- made) within the project boundaries;
- Wash water will be collected and piped through an enclosed steel pipeline to industry approved settling ponds to allow suspended solids to settle out;
- Wash water will be recycled from the settling ponds back into the operations for reuse in aggregate washing, dust suppression, etc;
- Sewage will be collected and temporarily stored in approved portable facilities which will be emptied by a pump truck on a regular basis and disposed of in an approved, off-site, waste disposal facility;
- Machinery will be in good working order and thoroughly checked for leakage of lubricants or fuel;
- Fuels and other hazardous substances will be handled only by persons who are trained and qualified in handling these materials in accordance with the manufacturer's instructions and governmental laws and regulations;
- Operators will be present for the duration of refueling;
- Vehicle refueling will occur at least 30 m from any water body;
- Hydrocarbon spill clean-up equipment will be on-site, with adsorbents being used to recover any hydrocarbon sheen in pit water;
- All spills or leaks on land or in the water will be promptly contained, cleaned up, and reported to the 24-hour environmental emergencies report system (1-800-563- 9089) as required by the *Fisheries Act*;
- No on-site bulk storage of fuel or oil (used or new) will be conducted; and
- Water testing as per criteria listed in Schedule A of the Environmental Control Water and Sewage Regulations (2003) under the *Water Resources Act* will be performed before it is discharged to a water body.

9.7.3 Residual Impact

Taking in to consideration the rock type and overburden levels, adherence to the above mitigations, and the design of the proposed blast operations, it is determined that the residual impact is **Negligible (not significant)**.

9.8 Explosive Chemicals

9.8.1 Project and Environment Interaction

The quarry will use a Dyno Gold bulk emulsion explosive, containing ANFO (Ammonium Nitrate/Fuel Oil). This type of explosive, like all explosives, contains ammonia (ammonium) that has the potential to be released into the water from contaminated shot rock, through spillage, incomplete detonation, and through pit drainage/runoff. The toxicity of ammonia varies with pH and temperature, with lower temperature and pH causing an increase in the toxicity of free ammonia (Wiber, *et al.*, 1991). In aqueous solutions, ammonia exists in two forms: free ammonia which carries no ionic charge (NH_3), and ammonium which carries a positive charge (NH_4). The free ammonia is the more toxic of the two, and converts hemoglobin to methaemoglobin which impairs oxygen transport.

9.8.2 Mitigation Measures

In light of the hazards involved with ammonia release, the following measures will be put into place; including:

- using a bulk emulsion explosive that is proven to reduce ammonia's release rate, which will allow any wastage to assimilate into the environment at a more sustainable rate;
- using suppression and/or collection equipment during drilling, *ie.* using DTH drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
- discharging pit water to vegetated areas to encourage bio/chemical-degradation of ammonia;
- constantly monitoring water quality to ensure runoff to the marine environment complies with provincial and federal regulations; non-compliant water will be treated by alternate means;
- ensuring that the handling, transportation, storage and use of explosives will be conducted in compliance with all applicable laws, regulations, and orders of the Department of Energy and Conservation (DOEC) and the Department of Natural Resources-Mines;
- only allowing persons properly trained and qualified to handle explosives in accordance with the manufacturer's instructions and governmental laws and regulations;

- maintaining the integrity of all storage containers, tanks, and loading equipment to prevent explosives spills, and following the manufacturer's spill clean-up recommendations;
- using explosives in a manner that will minimize scatter of blasted material beyond the limits of the activity; developing blasting patterns and procedures that minimize shock or instantaneous peak noise levels and ensures that the magnitude of explosions are limited to only that which is necessary, such as:
  - plugging the 12 m bore holes with a 3 m collar of 20 mm, clean, crushed stone to trap gases and dust during blasting
  - optimizing drill hole patterns
  - using explosives in a manner that will minimize scatter of blasted material beyond the limits of the activity
  - employing the proper working on time-delayed blasting cycles (500 ms in-hole delay and a 25 ms surface delay using a Nonel EZ Dets or similar blast initiation system which allows accurate firing of the explosives);
  - making a blasting plan available to the local committee; and
  - not blasting underwater or within a waterbody.

9.8.3 Residual Impact

Continental Stone Ltd. acknowledges that ammonia loses are most effectively prevented prior to the explosion ever occurring. Poor handling, storage, and loading practices can lead to significant material losses, particularly when bulk explosives are used. Further, improper drilling can cause incomplete detonation and incorrect timing increases the chance of misfires, which can increase waste ammonia runoff. It is for these reasons that the blasting protocol has been adjusted (reflected herein) to maximize efficiency and minimize losses. This has been achieved through the optimization of drill patterns, collar length, explosive type, priming, and timing delays as well as having only properly trained personnel handle and set the explosives. Therefore, with this thorough evaluation of its blasting procedures and the mitigations stated above, the impacts of ammonia release is determined to be a **Negligible (not significant)** impact.

9.9 Local Special Interest Committee

In keeping with Continental Stone's commitment to ensuring a minimum impact on the local environment and its residents, it will invite all interested parties to take part in a committee which will allow them to voice their concerns and offer any comments they have. This committee could include residents of Belleoram, property owners in the area, local business owners, owners/operators of aquaculture sites within Fortune Bay, and recreational users of the area. It is also recommended that a scientific advisor be on a member, such as a veterinarian specializing in fish aquaculture or an aquatic scientist. Continental Stone will openly accept and consider all comments and concerns expressed by these interested parties and strive to provide any information requested by them. The ultimate goal of this committee will be to provide an avenue for efficient communication between stakeholders and to prevent conflicts from escalating to situations that may negatively affect any of the parties involved, whether the issues are social, environmental, or quality of life. Thus, this preventative, hands-on, approach should ensure the prosperity, stability and long term viability of the region through the elimination of potential conflicts and the minimization of the quarry's effects.

9.10 Monitoring

Continental Stone Ltd. will be responsible for both environmental compliance and effects monitoring at appropriate stages of the quarry's operation. The environmental compliance monitoring will include activities that require monitoring to ensure compliance with regulatory and self-imposed environmental requirements. These will be conducted as per permit requirements and regulatory frameworks. For example, runoff will be periodically tested, as needed, to ensure it conforms to all regulatory requirements. All permit requirements will be identified in the EPP and Contingency Plan to ensure adherence to schedule.

The EPP and a field- usable Contingency Plan shall:

- Reflect, at a minimum, the mitigative measured outlined in this EPR;
- Include additional measures that may be included as permits conditions; and
- Outline contingency procedures for possible unforeseen events.

Environmental effects monitoring is conducted to validate impact predictions and to evaluate the effectiveness of and identify the need for altering or improving mitigative measures. The impact predictions outlined above which are based on past research and calculations will be part of an environmental effects monitoring program as outlined below.

The marine environment will be monitored for temperatures in the waters adjacent to the quarry. Blast vibrations will be measured for the first ten firings at locations throughout the Fortune Bay area, with particular attention being paid to seismic readings near aquaculture sites. The local committee's observations and recommendations will also be considered, and any concerns they may have will be addressed by Continental Stone Ltd.

10.0 Project Related Documents

The project has been submitted to CEAA and the Department of Fisheries and Oceans Canada for review and assessment. CEAA has determined because the project was assessed as a comprehensive study under the former Canadian Environmental Assessment Act, it does not require a federal EA. "We consider that section 128 (1)(c) of the *Canadian Environmental Assessment Act, 2012*, applies to this project" (Vanessa Rodrigues, Project Manager, CEAA, pers.comm.).

Applications have been submitted to Crown Lands for the Laydown Area/Wharf and the Access Road (Application No. 128756, File Reference No. 2024088)

The Town of Forteau has provided a “Municipal Recommendation Form for Crown Land Applications within Municipal and Planning Area Boundaries” (Appendix 4) and the area has been successfully rezoned.

11.0 APPROVAL OF THE UNDERTAKING

The following is a list of the likely permits, licences and approvals required for this project, some of which are already in progress, as previously noted. **Table 2.** Potential Project Permits.

APPROVALS/CERTIFICATE/PERMITS	REGULATORY AUTHORITY
NL Environmental Assessment Registration	NL Department of Environment and Conservation, Environmental Assessment Division
Fish Habitat Approval	Fisheries and Oceans Canada, Habitat Protection Division
Application to Alter a Body of Water	NL Department of Environment and Conservation, Water Resources Division
Navigable Waters Protection Approval	Transport Canada
Lease / Permit to Occupy Crown Lands	NL Department of Environment and Conservation, Crown Lands Division

12.0 SCHEDULE

Registration Document Submission	September 2013
Government Review and Decision	November 2013
Road Construction	April 2014
Wharf Construction	May 2014
Operations	September 2014

13.0 FUNDING

The approximate cost of the project will be 1.75 million CAD. The funding for this project will be provided by Pennecon Limited.

14.0 SUBMISSION

__________________ ____

Date

Name: Mr. Ed Murphy
Position: CFO, Pennecon Limited

15.0 REFERENCES

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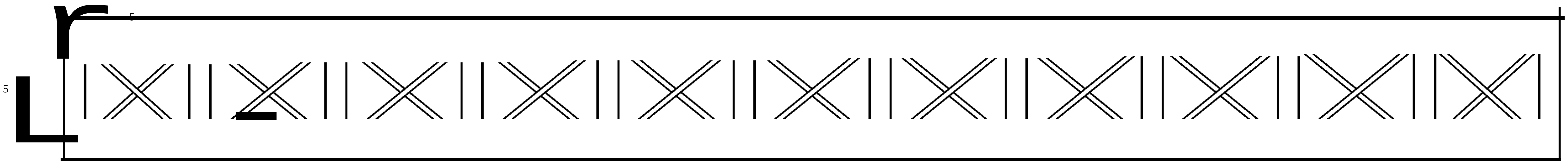
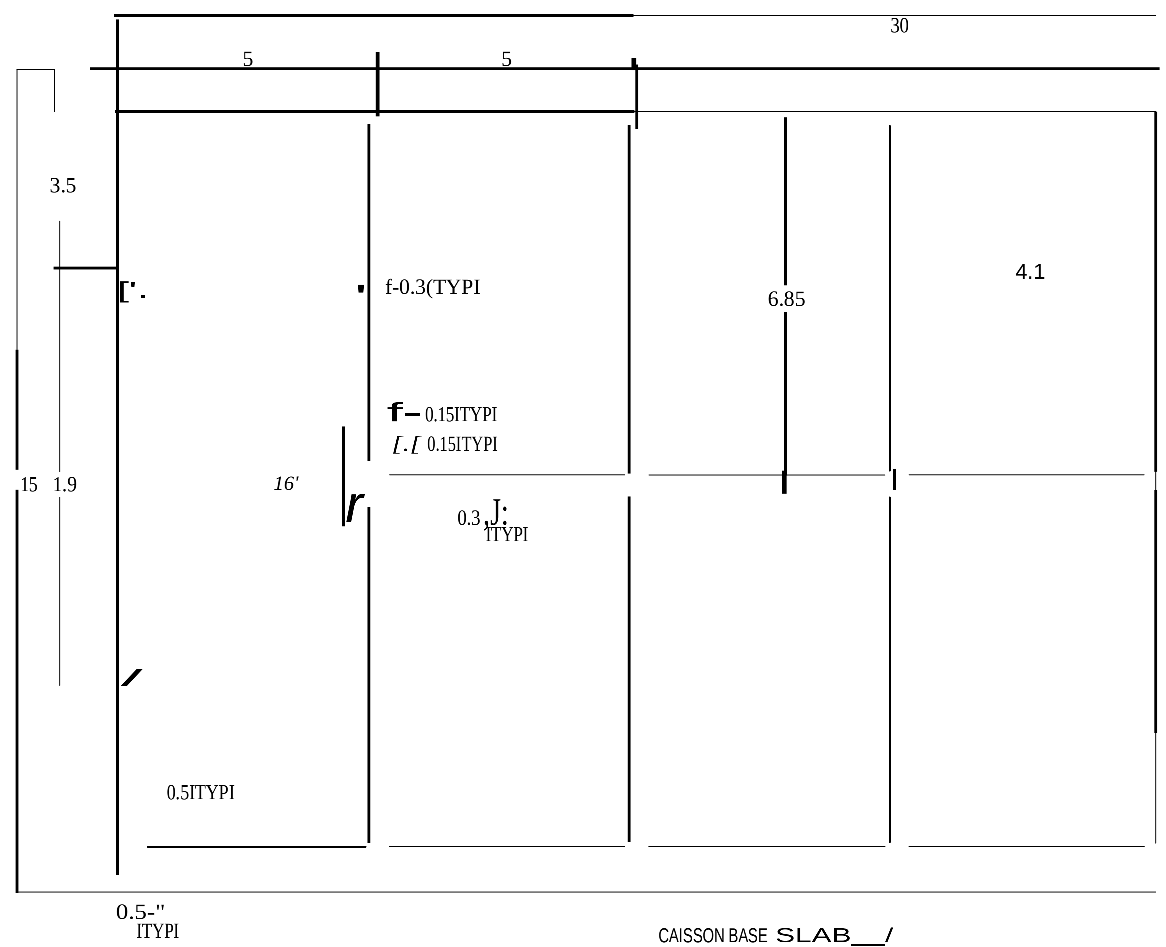
APPENDIX 1

Marine Wharf Design



TYPICAL GIRDER SECTION



TYPICAL CAISSON LAYOUT

NOTES

Northland Contracting Inc.

1309 Topsail Rd.
St. John's, NL, canada
AIB 3N4

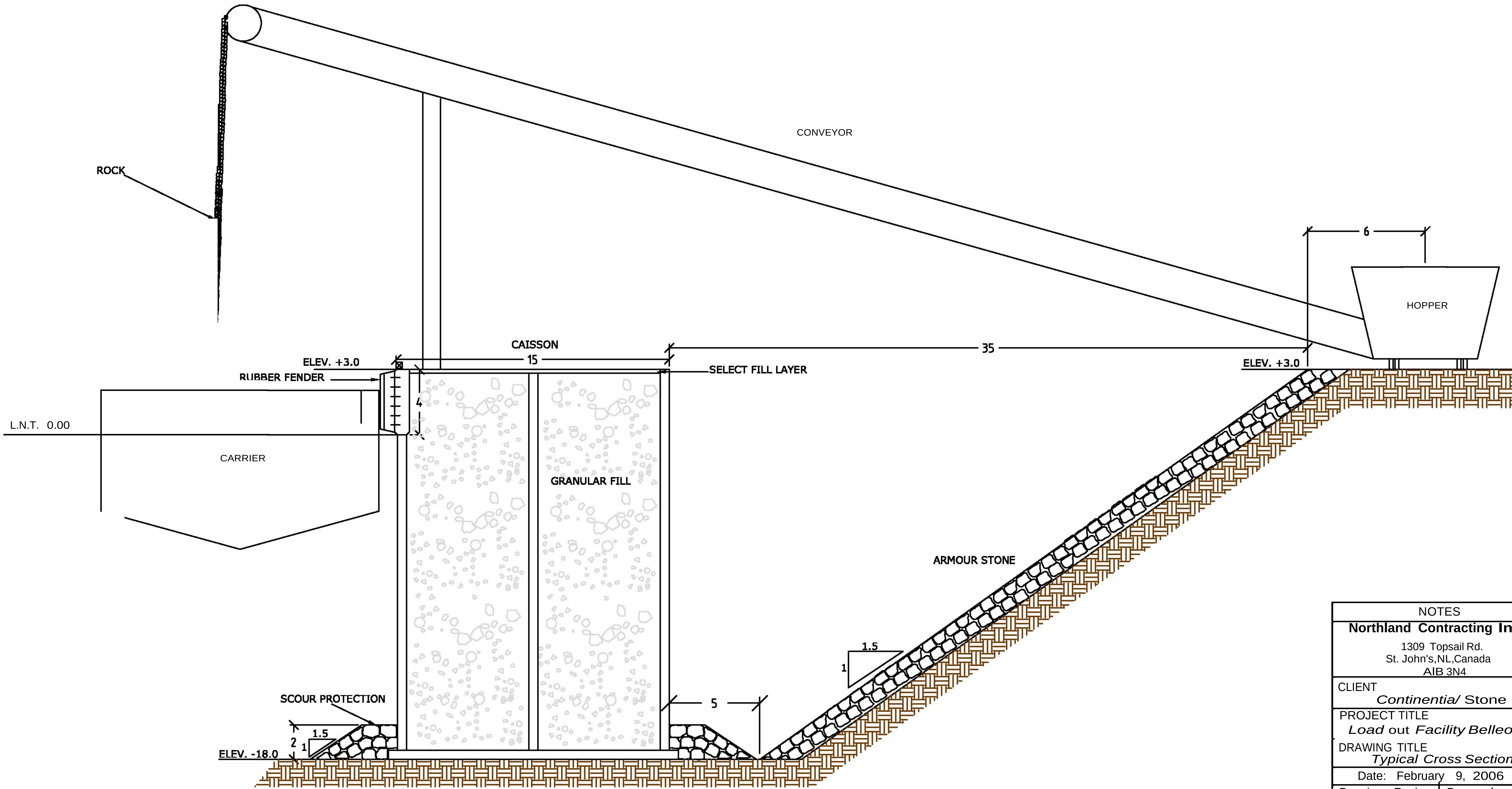
CLIENT
Continentia/ Stone

PROJECT TITLE
Load out Facility Belleoram

DRAWING TITLE
~~*Caisson & Girder Layout*~~

Date: February 9, 2006

~~Drawin~~ ~~Review~~	~~Drawn b~~
L. PUDDISTER	*J.O'Brien*
Scale: NTS	Sheet REV.
UNITS: METRIC	B-03



TYPICAL SECTION A-A

NOTES

Northland Contracting Inc.
1309 Topsail Rd.
St. John's,NL,Canada
AIB 3N4

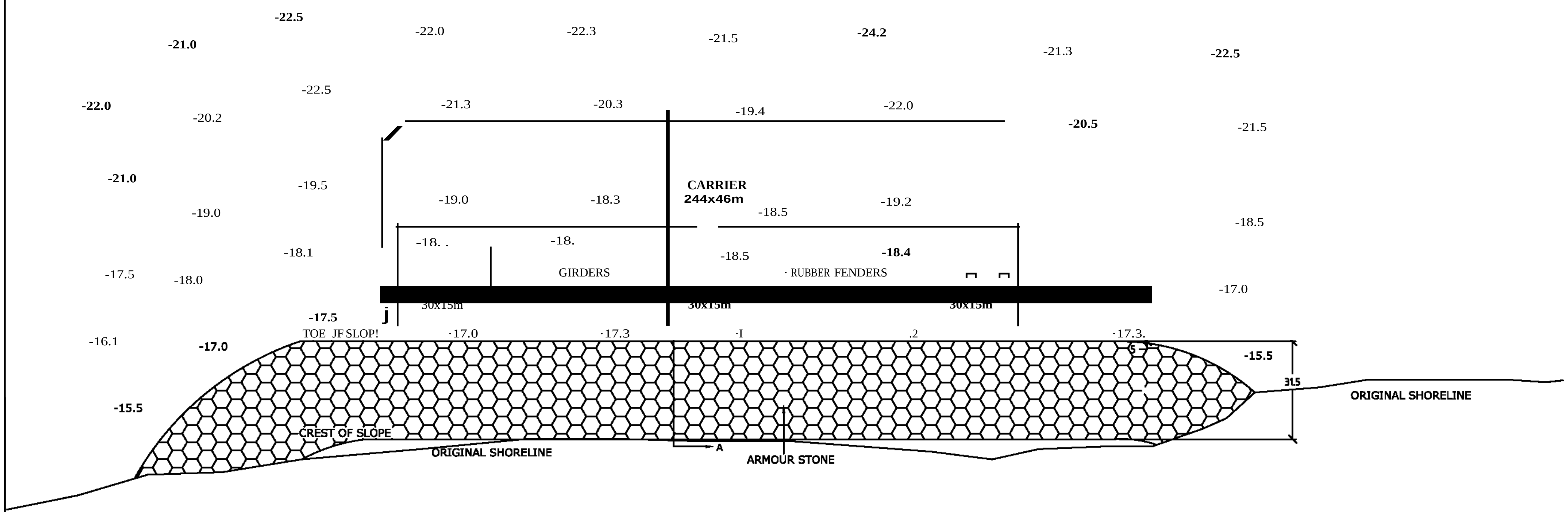
CLIENT
Continentia/ Stone

PROJECT TITLE
Load out Facility Belleoram

DRAWING TITLE
Typical Cross Section

Date: February 9, 2006

Drawin Review	Drawn by
L. PUDDISTER	*J.O'Brien*
Scale: NTS	Sheet # | REV. #
UNITS: METRIC	*B-02*



NOTES

>Topsail Rd. Inc.
St. JohB Canada

CUENT *Contlnentlal* Stone

DRAWING TIT}!ite *Plan*

Date: 9, 2006

[redacted]

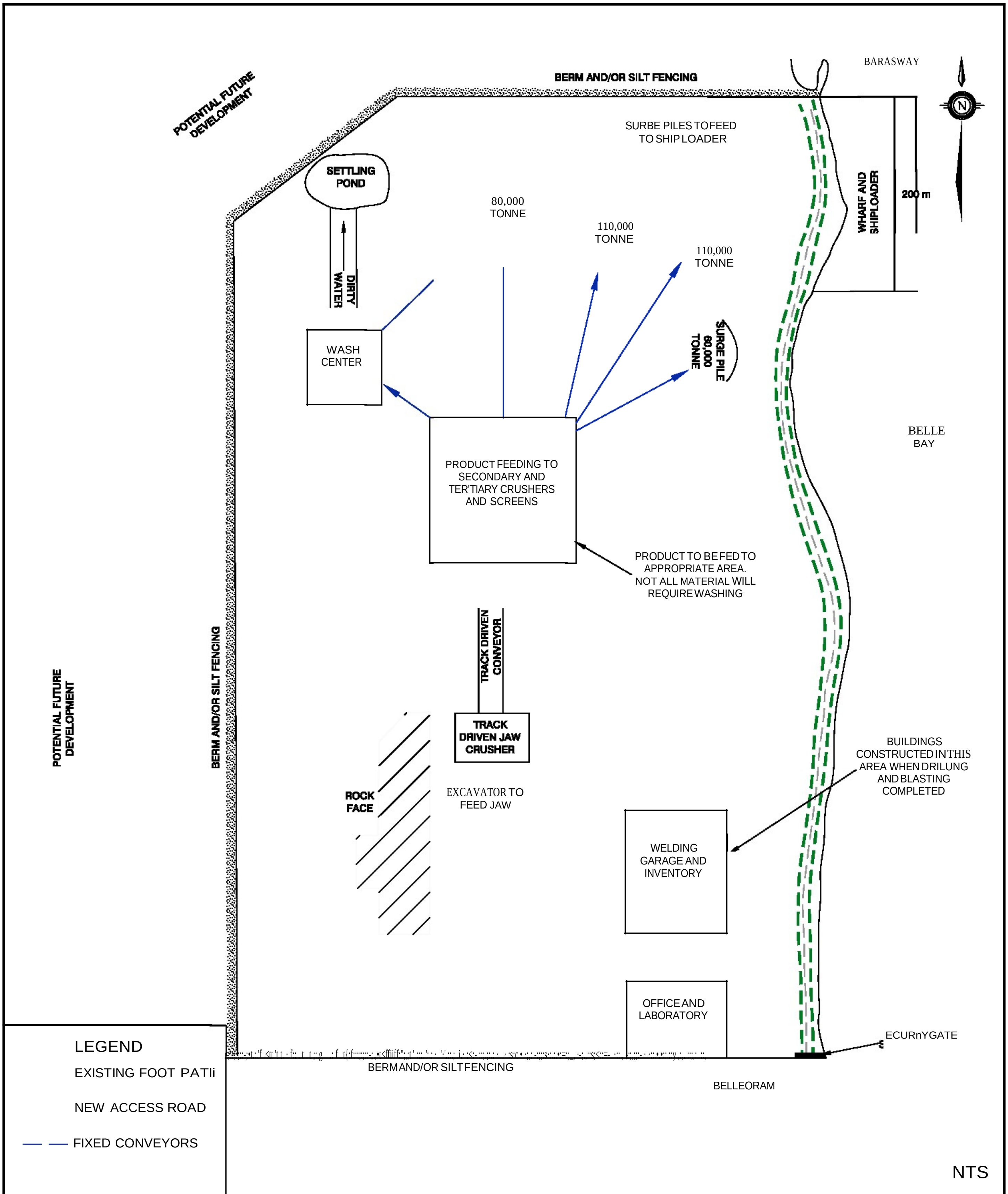
L.Pu *.In-R-*

Scale: NTS Sheet *II* REV.

UNITS: METRIC *B-01*

APPENDIX 2

Site Plan



SITE PLAN

100743&-FIBURE1B.DWO

27APR06 8:45AM

APPENDIX 3

Site Photos







APPENDIX 4

Municipal Recommendation Form

Newfoundland Labrador

NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
LANDS BRANCH

Municipal Recommendation Form for Crown Land Applications Within Municipal and Planning Area Boundaries

A. TO BE COMPLETED BY APPLICANT

Name of Applicant: Continental Holdings Ltd Date of Application:

Mailing Address: 1309 Topsail Road St. John's A1B 3N4

Telephone No.: Home: ________ Bus: 782 3404 Fax: ________

Land to be used for: Quarry

Location of Land: Belleoram Dimensions of Land

B. TO BE COMPLETED BY MUNICIPAL COUNCIL

1. Does your community have: An approved Municipal Plan? ✓ Concept Plan? ___ Neither? ___
2. The area applied for is zoned mixed by the Development Regulations.
3. Is the proposed use (a) Permitted Use? ✓ (b) Discretionary Use? ___ or (c) A use not included in the Development Regulations? ___ (Attach copy of zoning map showing location of site)
4. Does the proposed use conform to the standards and conditions set out in the Development Regulations? Yes ✓ No ___
5. Describe the land use in the surrounding area: Residential ___ Commercial ___ Agriculture ___ Unused ✓ Other ___

   North side ___ East Side ___
   South side ___ West Side ___
6. If the proposed use will conflict with existing land use in the general area, please explain: n/a
7. Indicate which of the following Municipal services are available at the site: ___ Water and Sewer ___ Water Only ___ Sewer Only ✓ No Services
8. i) Describe type and condition of the road to the site rough
   ii) Is the road presently maintained year round? Yes ___ No ✓
   By Whom? Council ___ Transportation ___ Applicant ___
   iii) Will road extension or improvements be needed if the application is approved? Yes ✓ No ___
9. In the opinion of the Council, the land applied for is:
   A) Crown ✓ B) Private ___ C) Ownership Unclear ___
10. If site is presently occupied, please give details ___

THE COUNCIL OF Belleoram TELEPHONE NO. 709-881-6161

✓ Approved ___ Refused (give reason)

___ Approved subject to the following conditions ___ Deferred (give reason)

COMMENTS: ___

SIGNED: Stewart May TITLE: Mayor DATE: Feb 11/2013

SEE REVERSE OF FORM FOR FURTHER INSTRUCTIONS