Belleoram Crushed Rock Export Quarry

Environmental Preview Report

Project Description

Continental Stone Limited

CEAR Reference Number: 06-03-19881

Belleoram, NL

November 17, 2006

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 in 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 (Appendix A). This document is submitted as the required EPR.

EPR Guidelines

As required, the EPR focus is on information gaps identified during the government and public review of the Registration document. The EPR does not repeat the contents of the Registration, but is presented as a supplement to them. Where there are differences between the contents of EPR and the Registration, the former takes precedence.

The Guidelines identified one category where specific information is requested:

- Mitigative measures to prevent adverse environmental impacts to fisheries in the **Marine Environment** and in particular the potential effects on proposed (approved) **Aquaculture** sites in the area.

This EPR has been prepared in accordance with the EPR Guidelines and contains supplemental information specifically as to the potential for significant environmental effects from this undertaking on the Marine Environment and Aquaculture.

Regulatory Framework

This EPR is being submitted to satisfy the requirements of the *Environmental Assessment Regulations, 2003* under the *Newfoundland and Labrador Environmental Protection Act*. As part of this provincial environmental assessment process, federal regulatory agencies are invited to participate however other aspects of this project that are federal triggers or are regulated by federal legislation are required to be assessed as per the *Canadian Environmental Assessment Act* (CEAA). In essence for this project, these two environmental assessment processes are not harmonized. Therefore it is important to note that this EPR focuses on the specific scope as required under the EPR Guidelines. Other environmental issues that may pertain to the project that are regulated under federal legislation will be assessed separately in the federal Comprehensive Study Report being prepared by Transport Canada, Department of Fisheries and Oceans and the Atlantic Canada Opportunities Agency as Responsible Authorities as per CEAA. Further information on the federal environmental assessment process may be obtained from the CEAA website (i.e. www.ceaa.gc.ca).

Appendix A

Appendix B

List of Tables

List of Figures

1.0 Name of the Undertaking

Continental Stone Ltd. proposes the development of a granite quarry in Belleoram, NL. The project will be referred to as the 'Belleoram Crushed Rock Export Quarry'.

2.0 Proponent

The following corporate and contact information is provided for the proponent:

Name of Corporate Body: Continental Stone Limited (Ltd.)

Address: P.O. Box 8274, Station A
St. John's, NL A1B 3N4

Chief Executive Officer: Edward Murphy

Contact Person: Robert Rose
(709) 782-3404
rrose@pennecon.com

3.0 The Undertaking

This EPR is to act as a supplement to the Registration Document and will work in conjunction with it to provide additional or complimentary information for the proposed quarry project.

3.1 The Nature of the Proposed Project

Continental Stone Limited proposes to develop a crushed granite quarry in Belleoram Newfoundland to supply raw material to international markets. The project will be carried out in 3 phases (Figure 3.1):

***Phase 1*: Development** - Excavation and removal of overburden material will be done to enable the construction of a road to the site for employees, visitors, and equipment suppliers. 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 suitable for setup of the crusher and associated equipment (Figure 3.2) and a suitable marine terminal for the project. All equipment will be setup during this phase. It is anticipated that this phase will last 20-25 years.

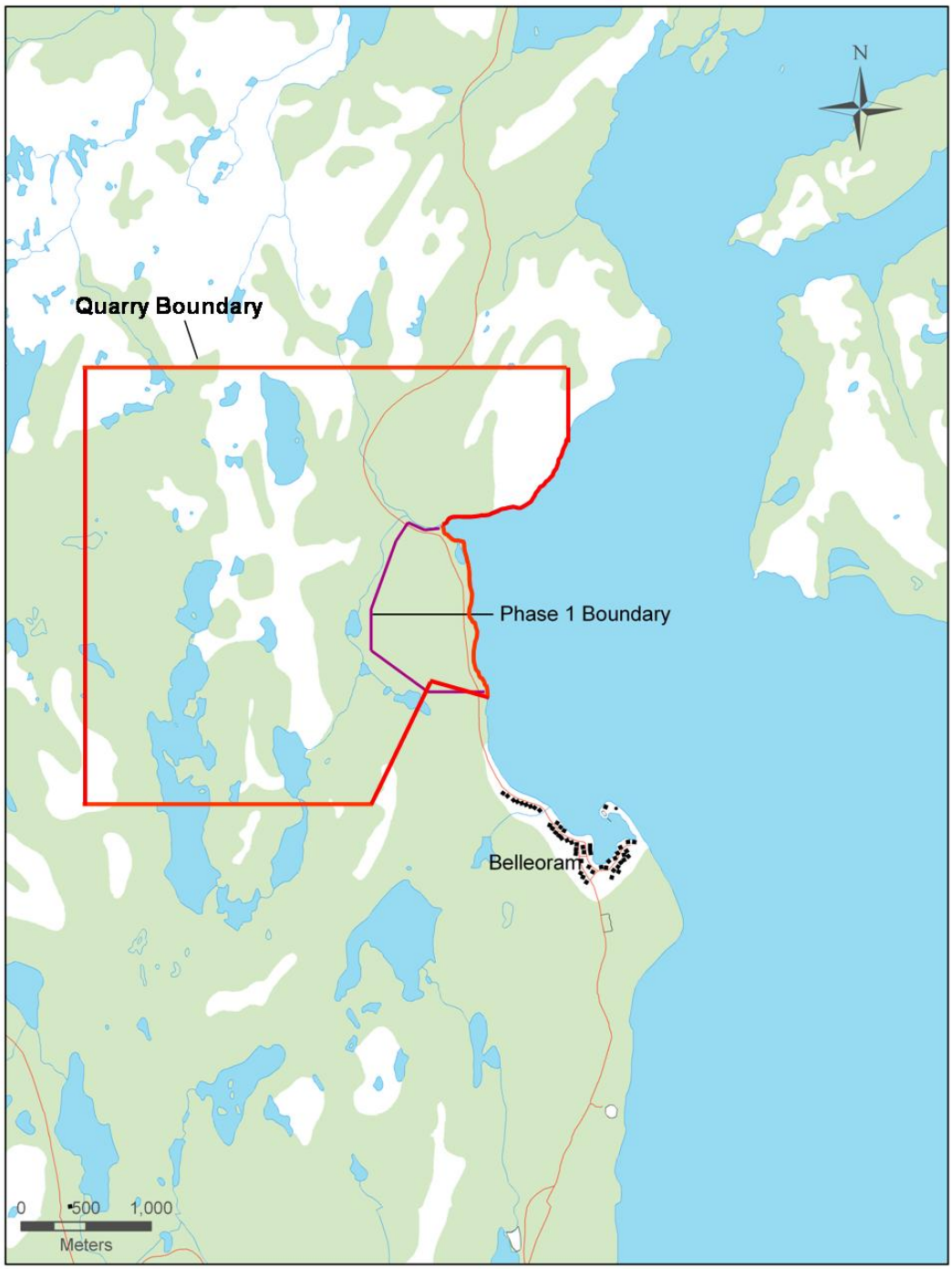

Figure 3.1: Location of the proposed granite quarry in Belleoram, NL. The boundary of Phase 1 and the entire quarry's boundaries are indicated.

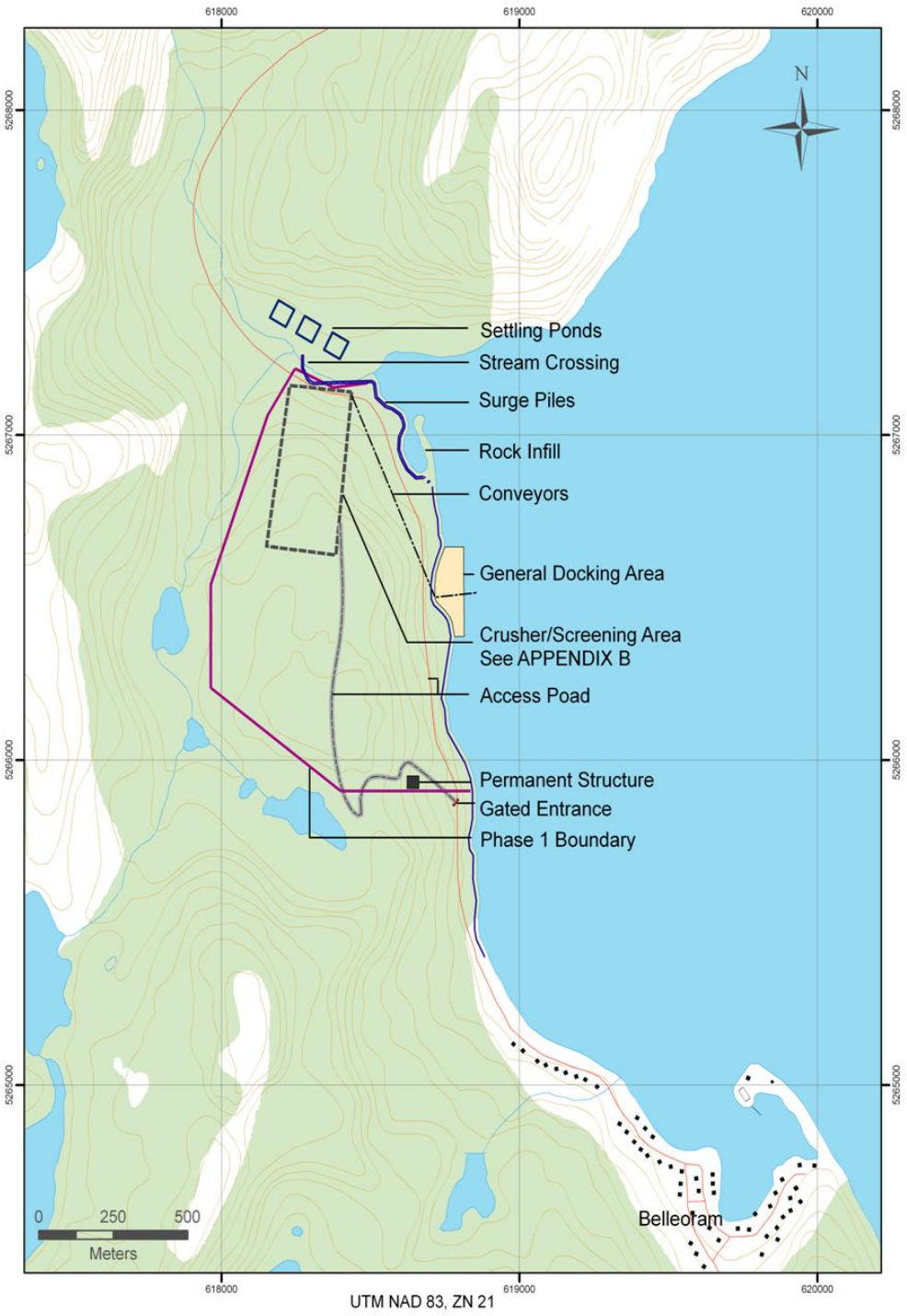

Figure 3.2: Approximate locations of the quarry's major features, equipment, and related structures. Exact size, location, and type of infrastructure will vary pending final project design and compliance with regulatory body's guidelines for construction and operation.

***Phase 2*: Operation** – Operation 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 a 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 for the remainder of the project.

***Phase* 3: 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* is being prepared.

3.2 Purpose of the Project

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 50 years.

4.0 Alternatives to the Undertaking

Continental Stone has examined and evaluated technically and economically feasible alternative means of carrying out the project including different modes of transportation and alternative facility 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 such as roads and highways able to withstand the repeated heavy loads of trucks. Adopting the shipping mode of transportation is deemed to have the additional benefit of restricting the spatial extents 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 supply of suitable labour.

The phasing of the project allows for easy transport of the stone to the dock for shipping. Phase 1 will be located proximal to the dock and near existing roadways. It was decided that the overburden will be stored in an area north of the settling ponds instead of creating a berm around the perimeter of the property. The berm was initially proposed to reduce the visual impact of the quarry as well act as a barrier to unauthorized off-road vehicles. However, it was not deemed necessary as the rock face that can be seen from the Town of Belleoram will be left intact in the initial stages of the project to maintain the aesthetic appeal of the area. Although blasting will cause alterations to the landscape environment,

mitigations to reduce the effects it has have been built into the project and will be outlined below (Section 5.3.1).

5.0 Description of the Undertaking

5.1 Geographical Location

The terrain can be described as rugged with steep to gently rolling topography. Site elevation ranges from sea level to approximately 320 m. 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 that are dominated by balsam fir, and to a lesser extent black spruce, occur primarily in sheltered valleys and on leeward hillsides. Representative photographs of the site are presented in Appendix B. It should be noted that construction/operation dates throughout the EPR have been kept as those provided in the Registration document. No activities will be undertaken until after environmental approvals have been granted.

5.2 Construction/Development

Development of the quarry is scheduled to begin in June, 2006 and will consist of:

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

Construction activities will adhere to the Aggregate Operators Best Management Practices (BMP) Handbook for British Columbia 2002 Volume 2. The BMP Handbook addresses such issues as: storm water management; erosion control; noise and dust; risk management; and pollution.

5.2.1 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.

5.2.2 Timber Salvage

Merchantable timber (greater than 10 cm diameter-at-breast-height) will be salvaged by local contractors with an expected start date in May 2006. Timber salvage will progress across the Phase 1 site as the aggregate is quarried.

5.2.3 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. The volume of overburden that will be removed will be confirmed once the in-fill drilling program and final detailed designs are completed. It was decided that the overburden will be stored in an area north of the settling ponds instead of creating a berm around the perimeter of the property. The berm was initially proposed to reduce the visual impact of the quarry as well act as a barrier to unauthorized off-road vehicles, however it was not deemed necessary as the southern-facing head will be left intact in the initial stages of the project. The stored overburden and waste rock will be used for future rehabilitation of the quarry site.

5.2.4 Building and Wharf Construction

The establishment of the quarry operations will require the construction of some permanent structures. These include several crushers and screens (types and sizes vary; pending final project design approval) which will be connected via an open conveyor belt system (Figure 5.1). A building will also be built at the main gate entrance to house offices, a laboratory, and a future welding facility.

Rock will be conveyed to the marine wharf; whose construction is expected to begin in late 2006 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 will be obtained under Section (1) of the Navigable Waters Protection Act by means of an environmental assessment pursuant to the Canadian Environmental Assessment Act (CEAA).

5.3 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. Quarry and settling pond

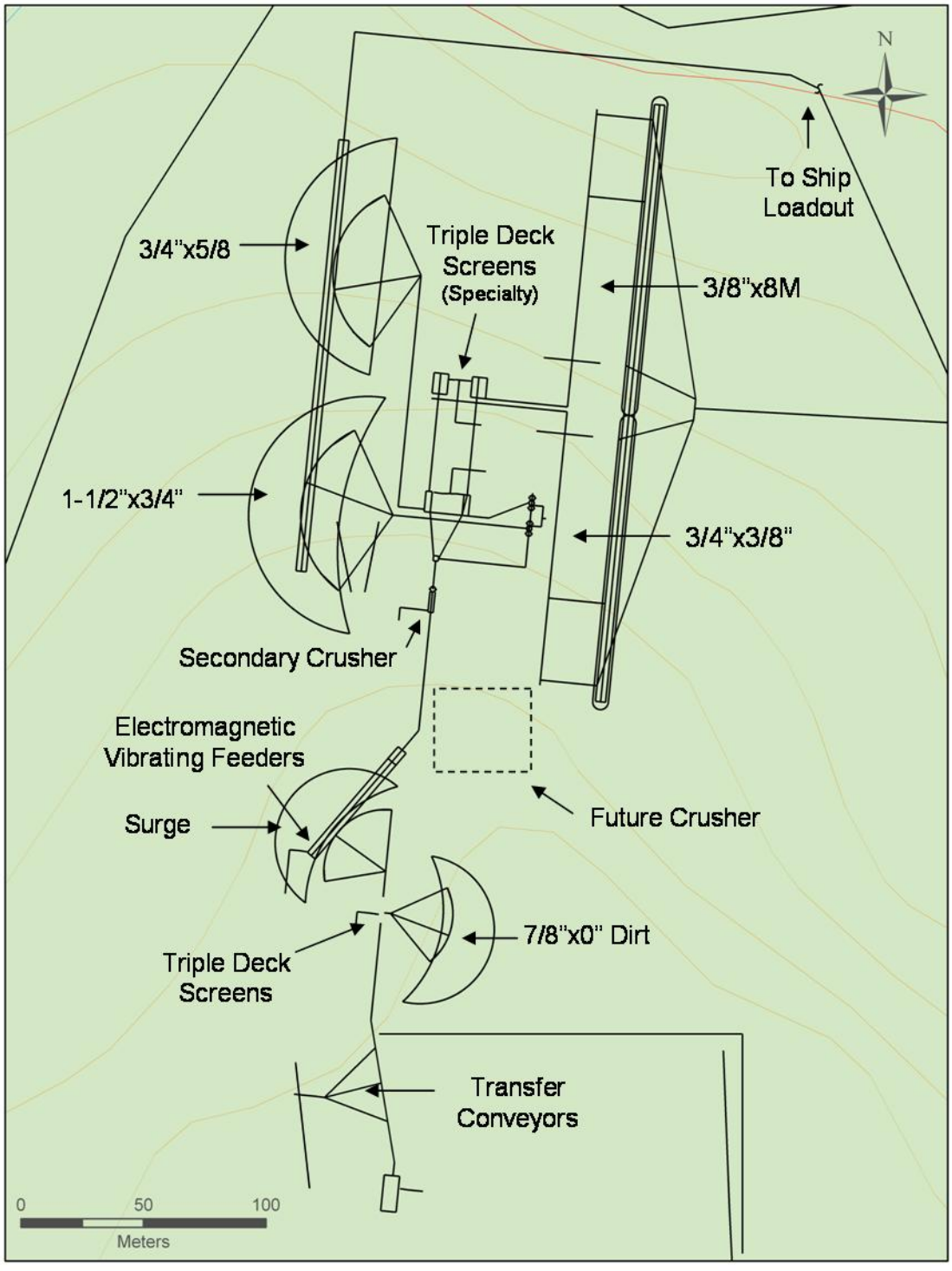

Figure 5.1: Approximate design layout of the crusher/screening area. Equipment size, type, and location may vary pending final project design approval. Various stone sizes will be obtained (i.e. 0" dirt to 1-1/2" stone) depending on the stage or type of crusher being employed.

dewatering will occur as required. Water leaving the site will be tested as needed; however associated metals are not expected to be present.

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 (Figure 5.2). 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.

5.3.1 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 and 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 the hours of 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

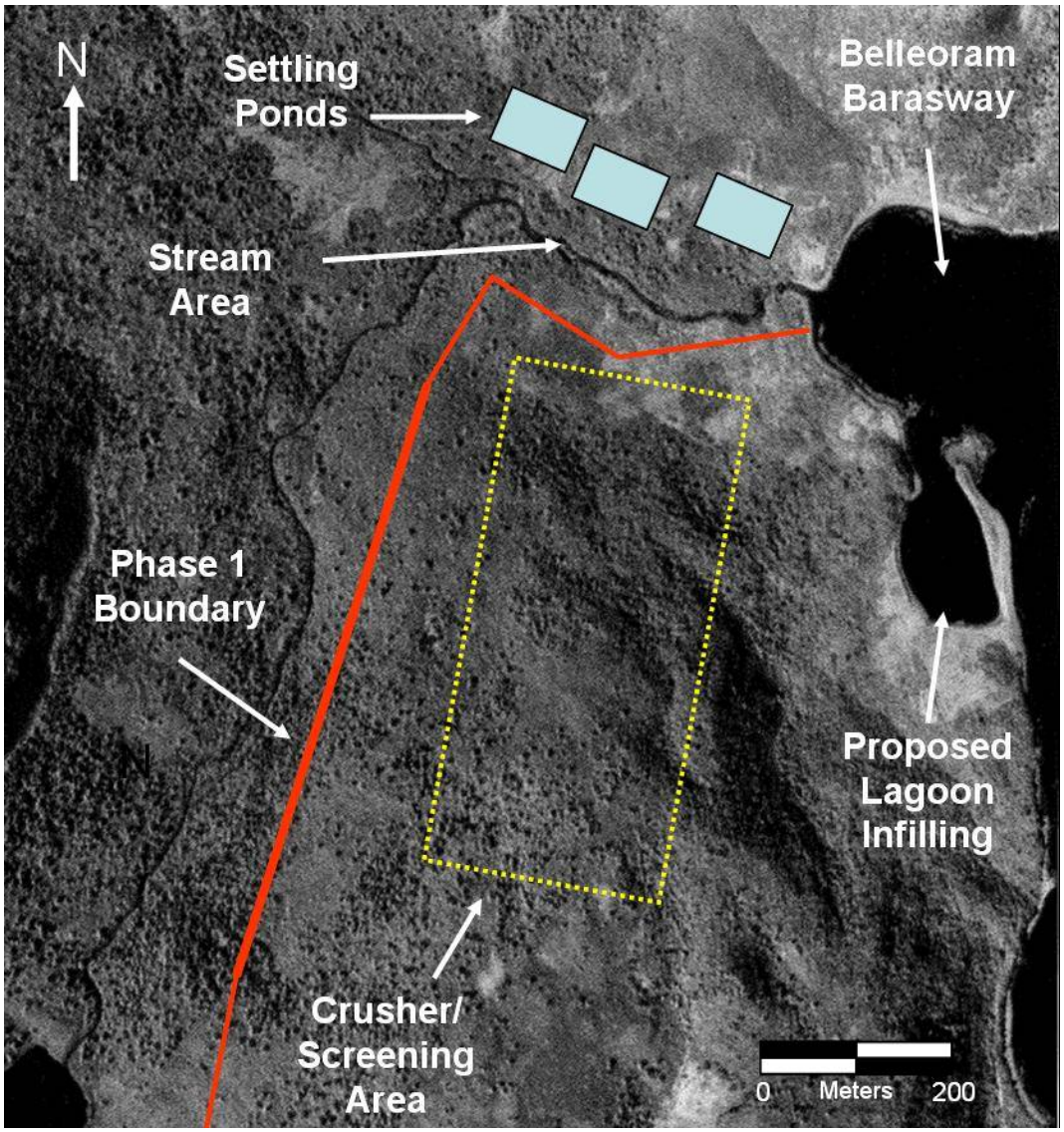

Figure 5.2: Air photo overlay of the approximate locations of the quarry's crushing and screening equipment and related structures in relation to the local stream system. The lower section of the stream will be spanned by a Bailey bridge and a wash water pipeline, with the exact size, location, and type of infrastructure being determined upon final project design approval.

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.

5.3.2 Potential Sources of Pollution During Operation and Their Mitigations

The potential sources of pollution will be:

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 CEAA.

2) ***Dust*** - The only dust emissions from the quarry will result from blasting. 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.

3) ***Site Runoff*** - Effluent Site runoff will be directed to vegetated areas within the project boundaries, which will filter any potential suspended solids. 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.

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.

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) ***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.

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.

5.3.3 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, thus the any use of the area will be no longer possible due to the dangers involved with a quarry operation.

Interactions with respect to fisheries and shipping are discussed in detail in Section 6.1 in the and therefore will not be outlined here.

5.3.4 Decommissioning/Rehabilitation

The quarry will be progressively rehabilitated. The details of the decommissioning will be provided in the Development Plan. However, 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.

5.3.5 Occupations

Contractors will be retained during the Development phase of the quarry (i.e. for blasting operations, materials shipping, etc.). The overburden removal and site preparation phase will require mobile equipment operators (i.e. excavators, haul trucks, dozers, graders, etc.). Drilling and blasting operations will require experienced drillers and blasters. It is anticipated that at peak times during construction, there will be 60 to 70 personnel on site and approximately 80 to 100 during the operation phase. Many of these jobs will provide 40 weeks of work to employees for the next 50 years. Quarry operations will be contracted out to meet inventory and consumption requirements. All operational occupations will be determined by the contractor as deemed necessary to fulfill requirements.

6.0 ENVIRONMENTAL EVALUATION

This Environmental Preview Report provides an evaluation of the potential adverse environmental effect of the Belleoram Crushed Rock Export Quarry. Specifically, the EPR Guidelines have identified the marine environment, and in particular the existing (and pending) aquaculture sites in the area as the Valuable Ecosystem Component (VEC) to be further assessed. Other select environmental issues, as discussed in the Preface of this document, are being assessed for environmental effects as per other environmental impact assessment processes.

6.1 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 significance.

6.1.1 Identification of Project and Environment Interactions

The 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.

6.1.2 Identification and Evaluation of Potential Effects

The EPR provides additional information on the identified interactions and describes their potential effects in terms of whether they are positive/negative, short/long term and direct/indirect. Effects predictions are explicitly stated and the theory or rationale upon which they are based is also presented.

6.1.3 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 have been described in the appropriate sections of the EPR. 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.

6.2 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.

6.2.1 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 dependant 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 dependant 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 behaviour 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.

6.3 Vibrational and Acoustic Shock from Blasting

6.3.1 Project and Environment Interaction

Detonation of explosives during the 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 pressures intense enough to fracture the fragile neuromasts (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 interact with 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).

6.3.2 Mitigation Measures

Continental Stone Ltd. 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;

- Using 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 governmental 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;
- Only allowing persons properly trained and qualified to handle explosives in accordance with the manufacturer's instructions and governmental laws and regulations; and
- Making a blasting plan available to the local interest committee.

While the above standard mitigative 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 is in inches per second, SD is the distance from the blast in feet, and W is the 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 6.1) 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 1500m 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 is the distance from the blast in meters, and W is the 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.

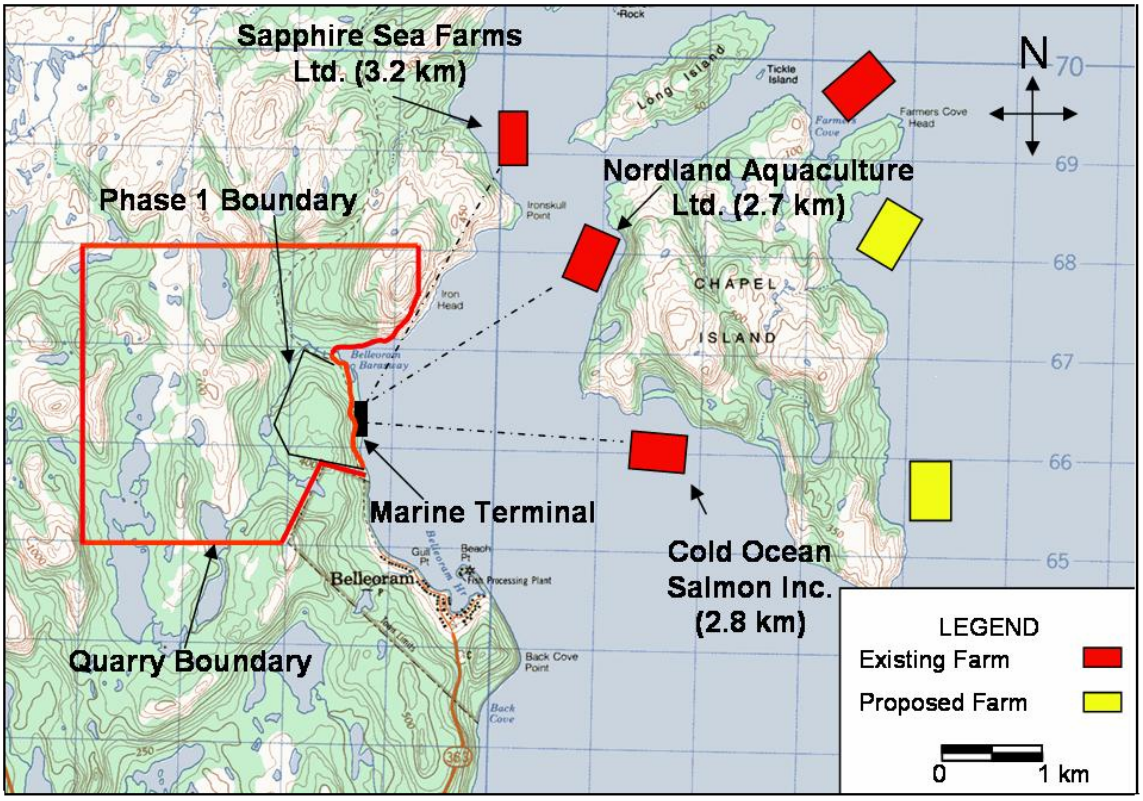

Figure 6.1: Locations of local fish farms in relation to Phase 1 activities. Locations and distances are approximations based on the best available mapping and data. Distances indicated are estimations of the nearest distance any aquaculture site is to the quarrying operations of Phase 1. Aquaculture site mapping obtained from the Newfoundland and Labrador Aquaculture GIS database.

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 when Rayles Equation, the following results are obtained.

Rayles Equation: $R = \frac{(z_2 - z_1)}{(z_2 + z_1)}$

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 sties 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 no real-world data has 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.

6.3.3 Residual Impact

Blasting will occur at the proposed quarry to allow efficient processing of granite aggregate. The residual impact of blasting on the VEC will occur approximately 1-2 times per week, only within the quarry boundary and outside 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 behaviour, 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, is determined to be a **Minor (not significant)** impact.

6.4 Shipping

6.4.1 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 and be responsible for all environmental compliance, all 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.

6.4.2 Mitigation Measures

While shipping by bulk carrier was determined to be the most economical, 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 (Figure 6.2);

- All bulk carrier speeds will be such that they do not create an excessive wake or vibrations at the farm sites;

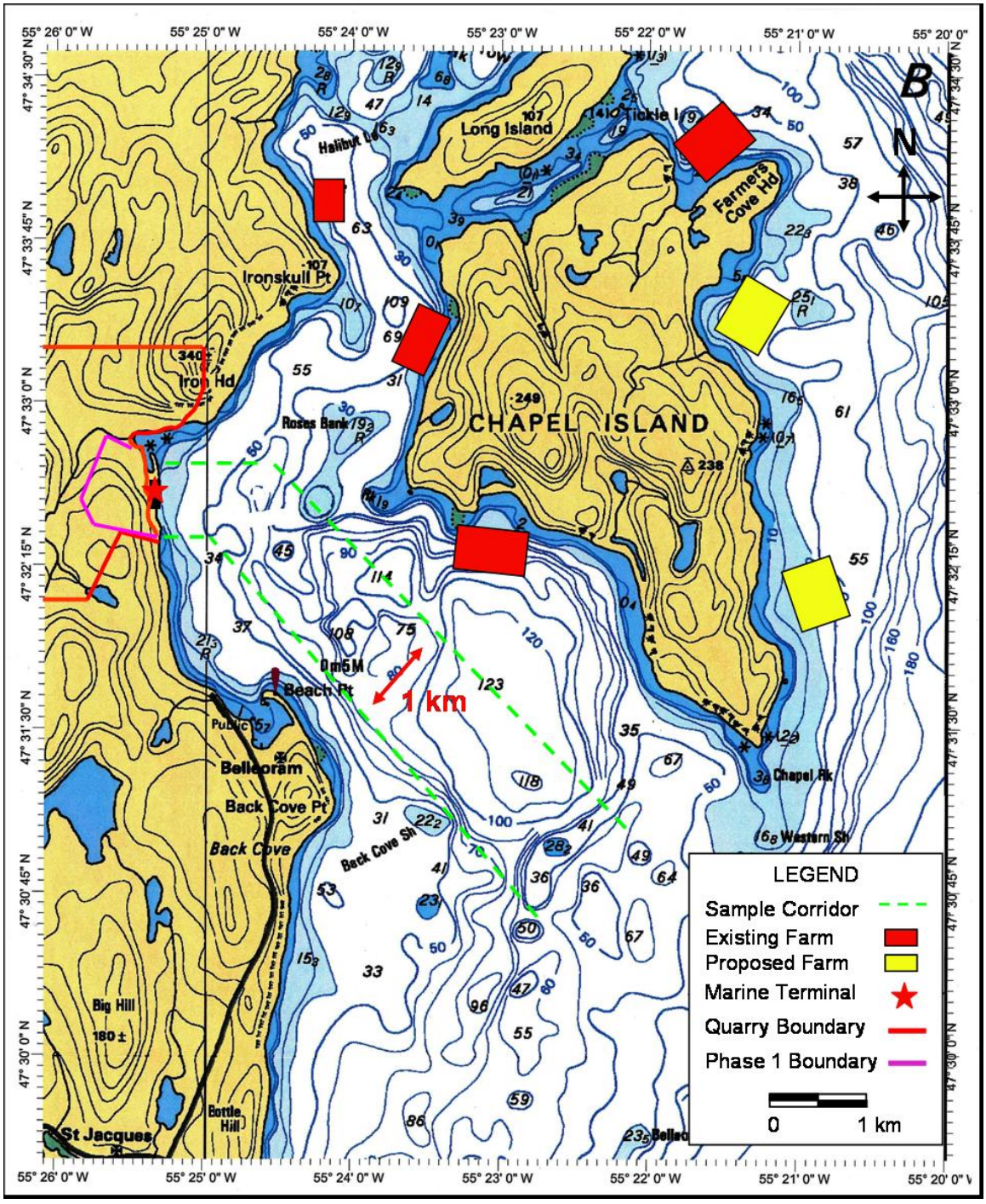

Figure 6.2: Proposed bulk carrier shipping route into the Fortune Bay area in relation to the local fish farms. The central green line indicates the path that is a maximum possible distance for the nearest farm (Cold Ocean Salmon Inc., approximately 750 m at the

nearest point). Aquaculture site mapping obtained from the Newfoundland and Labrador AquaGIS database.

- 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.

6.4.3 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, local traffic (i.e. boats associated with the operation of the aquaculture facilities and local fishermen), the probability that fish will be exposed to:

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

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.

6.5 Superchill

6.5.1 Project and Environment Interaction

Superchilling occurs when the ambient water temperature reaches -0.7 ^{0}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 fishes, 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.

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 6.1). Figure 6.3 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 do show that subzero temperatures have been possible in the past. However, the waters within Fortune Bay have not been observed at a temperature less than 0.7^0C in recent years (Cooke Aquaculture, personal communication). The influence of fresh water inputs on the past temperature stations during the winter months could have artificially lowered their readings. They are located near the mouths of much larger watersheds than that with drains into the in comparison to the Belleoram Barasway. This, coupled with the moderating effects of the on-shore prevailing winds, allows Fortunes 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 that 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 when temperatures reach near superchill such 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 behavioural avoidance reaction which may bring them to the surface into superchill.

6.4.2 Mitigation Measures

Despite the remote chance of superchill in Fortune Bay, the following standard mitigations are outlined if it suspected that an event may occur (due to observed weather and ice conditions). The single-most important mitigation is the constant communication between the aquaculture operators and the Project as both blasting and shipping can be re-scheduled to some degree to avoid times when superchill is identified. As stated in previous section, both blasting and shipping will occur on a weekly basis therefore any superchill event lasting hours or a couple of days can be avoided as both blasting and shipping can potentially be altered to suit the needs of the local residents and business owners. The commitment of a local communication community is outlined below.

6.4.3 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 superchill events. Due to the

Table 6.1: Monthly average temperature (over the past ~5 to 10 years, varies by month) data for the 3PS NAFO Sea Area of Newfoundland and Labrador. Highlighted cells refer to negative values (in ^{o}C). Data obtained from the Department of Fisheries and Ocean's Bedford Institute of Oceanography website.

	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

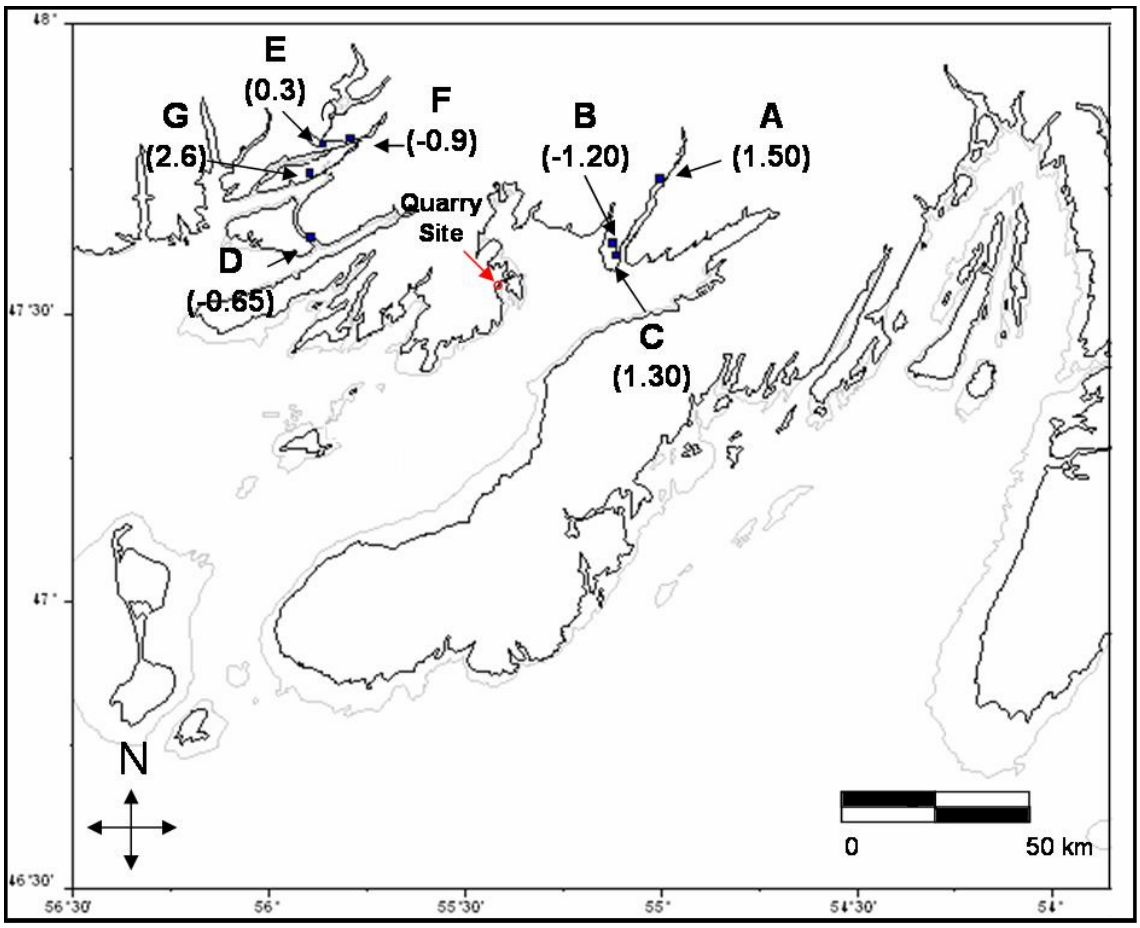

Figure 6.3: Selected local water monitoring station's (depth ranges from 1-20 m) showing a temperature profile that can be expected in the area. Temperatures given are the lowest recorded (in ^{o}C). Information obtained from the DFO database.

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.

6.6 Dust Fines

6.6.1 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 this dusting may have on the marine environment include: increased siltation, decrease 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 support good dispersion of air borne particles and the frequent rainfall 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 acts to shelter quarry site, slowing winds in the area (Bowyer and Gray 1995). This would generally reduce the distance that any dust released from the quarry will be able to 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 aquaculture site.

6.6.2 Mitigation Measures

Continental Stone Limited has as part of its EPP and Contingency Planning, mitigation measures to control quarry-related dusting 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 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.

6.6.3 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.

6.7 Sedimentation

6.7.1 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.

6.7.2 Mitigation Measures

The possibility of detrimental effects from runoff is part of every quarries concern and is addressed by adequate planning and operation. Standard 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 beginning any activities involving 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;
- Water will be directed from the site to vegetated areas (natural or man made) within the project boundaries, which will filter any potential suspended solids;
- Wash water will be collected and piping through an enclosed steel pipeline to industry approved settling ponds to allow suspended solids to precipitate 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;
- Any vehicle refueling must be done at least 30 m from any water body;
- Basic petroleum 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.

6.7.3 Residual Impact

Due to the rocktype and overburden levels, the adherence to the above mitigations, and the design of the proposed blast operations, is determined to be a **Negligible (not significant)** impact.

6.8 Explosive Chemicals

6.8.1 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.

6.8.2 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, using DTH drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
- plugging the 12 m bore holes with 3 m of 20 mm, clean, crushed stone to trap gases and dust during blasts;
- 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 CEAA, with non-compliant water being 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;
- designing blasting patterns and procedures which minimize shock or instantaneous peak noise levels and ensures that the magnitude of explosions is limited to only what 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.

6.8.3 Residual Impact

Continental Stone Ltd. acknowledges that ammonia loses are most effectively prevented prior to the explosion ever occurring. Sloppy handling, storage, and loading practices can lead to significant amount of 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 (*see* above and refer to the '*Blasting Protoco*l' in Section 5.3.1) 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.

6.9 Local Special Interest Committee

In keeping with Continental Stone Ltd'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 also 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.

7.0 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.

Prior to construction, Continental Stone Ltd. Commits to preparing an EPP and a field-usable Contingency Plan that will:

- bring forward 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.

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Where the Wind Blows. 1995. Minister of Public Works and Government Services Canada. P.J. Bower eds. Breakwater Books, St. John's NL.

Wright, D.G., and Hopky, G.E. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Department of Fisheries and Oceans. Canadian Technical Report of Fisheries and Aquatic Sciences 2107.

9.0 Project-Related Documents

The following documents have been generated (or will be completed) by, or for, the proponent. Continental Stone Ltd. will make available any of these documents upon request.

Registration Document
Proposed Development – Belleoram Crushed Granite Rock Quarry
Continental Stone Limited
March 29, 2006

Canadian Environmental Assessment Act Scoping Document
Crushed Granite Rock Quarry, Belleoram, NL

Continental Stone Limited
CEAR Reference Number: 06-03-19881
September 19, 2006

Environmental Protection Plan (EPP) and Contingency Plan
To be completed

Freshwater Fish and Habitat Quantification/Qualification Survey
To be completed

Marine Habitat Survey
To be completed

Stage 1 Historic Resources Study
To be completed

Rehabilitation and Closure Plan
To be completed

10.0 Approval of the Undertaking

The following is a list of the main permits, licences, approvals, and other forms or authorizations that may be required for the proposed quarry.

GOVERNMENT	DEPARTMENT	REQUIREMENT
Federal	Fisheries and Oceans	*Release from EA process*
		Authorization for the Harmful Alteration, Disruption or Destruction of fish habitat
	Transport Canada	*Permit for construction within navigable waters*
		Permit to store, handle and transport dangerous goods
Provincial	Natural Resources	*Quarry Permit (Mines and Energy Division)*
		Exploration Licence (already obtained)
		Permit to cut crown
	Environment and Conservation	*Release from the EA*
		Certificate of environmental approval to alter a body of water
		Certificate of approval for construction (site drainage)
		Permit for water withdrawal
		Water use Permit
		Authorization to control nuisance animals
		Permit to burn
	Department of Education, Industrial Training Section	*Blasters Safety Certificate*
Municipal	Town of Belleoram	*Development Permit*
		Approval for waste disposal
Guidelines and Recommendations to		*Fisheries Act, DFO Canada.*
		Canadian Environmental Assessment Act

be Followed	*Newfoundland and Labrador Environment Act and Occupational Health and Safety Act.*
	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.

Appendix A: Environmental Preview Report Guidelines for the Belleoram crushed rock export quarry (June 2006)

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR
Department of Environment and Conservation

Honourable Clyde Jackman
Minister

June 2006

GUIDELINES

for

Environmental Preview Report

for the

BELLEORAM CRUSHED ROCK

EXPORT QUARRY

P.O. Box 8700, St. John's, Newfoundland, Canada, A1B 4J6, Telephone (709) 729-2562, Facsimile (709) 729-1930

ENVIRONMENTAL PREVIEW REPORT GUIDELINES

The following guidelines are intended to assist the proponent, Continental Stone Ltd., with the preparation of the Environmental Preview Report (EPR) for the proposed Belleoram Crushed Rock Export Quarry. The EPR presents the report of an investigation based upon readily available information which supplements that already provided by the proponent in the registration of the undertaking. The purpose of the information provided in the EPR is to assist the Minister of Environment and Conservation in making a determination as to whether an Environmental Impact Statement (EIS) will be required for the undertaking. The EPR is expected to be as concise as possible, while presenting the comprehensive information necessary to make an informed decision.

The EPR should include and update the information provided in the registration document and focus on information gaps identified during the government and public review of the registration. The EPR should address the information gaps in sufficient detail to enable the Minister of Environment and Conservation to make an informed decision as to the potential for significant environmental effects from the undertaking.

The EPR should be organized according to the following outline:

1. NAME OF THE UNDERTAKING

The undertaking has been given the name "Belleoram Crushed Rock Export Quarry."

2. PROPONENT

Name the proponent and the corporate body (if applicable), and state the mailing address.

Name the Chief Executive Officer (if a corporate body), give telephone number, facsimile number and E-mail address (if any).

Name the principal contact person for the purposes of environmental assessment and state the official title, telephone number, facsimile number and E-mail address (if any).

3. THE UNDERTAKING

State the nature of the proposed project.

State the purpose, rationale and need for the undertaking.

4. ALTERNATIVES TO THE UNDERTAKING

Provide a description of alternatives to the undertaking. Alternatives consist of functionally different ways of meeting the project need and achieving the project purpose and would include alternatives which may have been considered and rejected.

5. DESCRIPTION OF THE UNDERTAKING

Describe the technically and economically feasible alternatives that meet the project need and their biophysical and socio-economic selection criteria.. Provide complete details regarding the preferred choice of location and additional information on alternative methods of carrying out the undertaking. Alternatives which may have been considered and rejected, but which may still be regarded as viable should be described. State the reason for the rejection of any alternative methods of carrying out the undertaking.

5.1 Geographical Location

Describe the proposed site, planned layout and infrastructure, roads, settling ponds, transmission line, marine terminal, on site buildings, conveyor system, etc., including boundaries for each viable alternative. A site plan showing the layout of the proposed project and infrastructure should be drawn to scale. The appropriate 1:50,000 National Topographic Map should be used as a base map.

5.2 Construction/Operation

State the total estimated construction and operation period for the project and the proposed date of first physical start-up of construction related activity for each viable alternative (if any).

6. ENVIRONMENT

6.1 Fisheries

Present proposed mitigation measures to prevent adverse environmental impacts to fisheries in the marine environment. In particular, the potential effects on proposed (approved) aquaculture sites in the area regarding the potential for dust fines, explosive chemicals, bilge water from tanker traffic, oil spills, and the impact of shock waves from blasting should be addressed. A contingency plan which will describe how these potential environmental effects may be mitigated should be included as part of the EPR.

6.2 Monitoring

A proposed monitoring plan must be developed to assess the potential effects of blasting related activities upon aquaculture sites in the area. This would include, but not necessarily be limited to, seismic testing in the marine environment to detect any effects to aquaculture sites from shockwaves generated by blasting, as well as monitoring for temperatures related to "surface chill" during winter months when ships are traveling through the area.

7. PROJECT-RELATED DOCUMENTS

Provide a bibliography of all project-related documents already generated by or for the proponent (ie., business plan, feasibility studies, engineering reports, etc.)

8. APPROVAL OF THE UNDERTAKING

List the main permits, licences, approvals, and other forms of authorizations required for the undertaking, including the names of the authorities responsible for issuing them.

9. FUNDING

If this undertaking will require a grant or loan of capital funds from a government agency (provincial or federal), state the name and address of the department or agency from which the funding have (or will be) requested.

The required 12 copies of the EPR and an electronic version for posting on the Environmental Assessment Website should be forwarded with a covering letter to:

Minister
Environment and Conservation
P.O. Box 8700
St. John's, NL
A1B 4J6

Appendix B: Representative photographs of the area at the proposed crushed rock quarry site, Belleoram, NL.