APPENDIX D
Noise and Vibration Technical Report

ATTACHMENT A – Acoustic Terminology

ATTACHMENT B – Noise Monitoring Data

ATTACHMENT C – Equipment and Site Layouts

Black Point Quarry Project
Guysborough County, NS
SLR Project No.: 210.05913.00000

global environmental solutions

Black Point Quarry
Nova Scotia

Noise and Vibration Impact Assessment

February 2015
SLR Project No.: 210.05913.00000

NOISE AND VIBRATION IMPACT ASSESSMENT

BLACK POINT QUARRY

NOVA SCOTIA

SLR Project No.: 210.05913.00000

Prepared by
SLR Consulting (Canada) Ltd.
200 – 1620 West 8th Avenue
Vancouver, BC V6J 1V4

6 February 2015

Prepared by:

Briony Croft Ph.D. MIEAust. CPEng.
Principal Engineer

Reviewed by:

Chris J.D. Bibby, E.I.T., M.A.Sc.
Intermediate Engineer

EXECUTIVE SUMMARY

This report describes the potential noise and vibration impacts of the Black Point Quarry Project, as part of the Environmental Impact Assessment in accordance with the requirements of the Canadian Environmental Assessment Agency and Nova Scotia Environment. The objective of this report is to identify the existing ambient noise and vibration levels within the local area and provide information on typical existing sound sources, and their geographic extent and temporal variations. Existing ambient noise levels were previously measured in a baseline ambient noise survey. The noise and vibration impacts of the Project have also been identified, and recommendations made for mitigation of noise impacts during future aggregate production.

The assessment of Project noise and vibration has considered the following potential areas of impact:

- Construction noise and vibration, both terrestrial and underwater
- Noise from aggregate production and shiploading operations
- Noise and vibration from blasting, including impacts on people and structures and the potential for underwater impacts on wildlife.

This report also discusses the potential *perceived* noise and vibration impacts of the project, since impacts on people may exist even if compliance with numerical noise and vibration criteria is achieved.

Existing Noise and Vibration Environment

The existing noise environment has been determined by measurement at two representative geographic locations (one inland, and one nearer the coast). These locations are the residential receptors located nearest to the Property boundary. As is expected for a remote rural environment, existing background noise levels (L_{90}) are very low, below 30 dBA in all time periods at both locations. At each location, little temporal variation was observed in background noise levels throughout the daytime, evening and night-time. The location near the coast had slightly higher background noise levels than the inland location. However, the average noise levels (L_{eq}), which include the contribution of short-term noise events, were higher at the inland location, probably due to the influence of road traffic noise.

At the measurement location west of the project site near the coast, the dominant noise sources noted were natural, including waves, birds, and the movement of leaves. At the location further inland traffic noise from the road was observed, in addition to natural noise sources.

Ambient vibration levels in the study area have not been measured. Since this is a rural/remote location with no existing anthropogenic vibration sources nearby, existing ambient ground and seabed vibration levels are expected to be low, below the thresholds of human perception and below levels that would affect marine fauna.

Ambient underwater noise levels in the study area have also not been measured. While there are no existing fixed anthropogenic sources of underwater noise and vibration, underwater noise can propagate over very large distances. For this reason, both natural and anthropogenic sources may contribute to the existing underwater noise environment in the project area. Natural underwater noise sources include wind, waves, precipitation, sea ice, marine fauna, and seismic background activity. Anthropogenic noise sources include commercial fishing and shipping traffic, seismic exploration activity, sonar equipment, construction and industrial activity, and distant explosive detonations. Whether natural or anthropogenic sources dominate at any particular time and location depends on changing natural conditions, and the proximity and level of the human activities.

Project Construction Noise and Vibration Impacts

The site development and initial rock processing that will occur during the construction phase of the Black Point operation will involve activities similar to the activities that will occur during full facility operation. The equipment used for the construction will be similar to that used for site operation. The noise generated from the construction activities is anticipated to be similar to the noise generated from facility operations.

The construction of the marine terminal has the potential to impact on the underwater noise and vibration environment, however these impacts would be temporary and localised to the immediate construction area. It is estimated that the underwater noise criteria for lethal impacts on fish (including shellfish and crustaceans) may be exceeded during piling, in an area around the pile location extending up to 10 m. Behavioural modification may occur at greater distances, for the duration of the piling activity.

Project Operational Noise Impacts

The Black Point operation will generate noise from the operation of mobile equipment, the operation of the processing plant, blasting, and product loadout at the marine terminal. The Pit and Quarry Guidelines require that noise levels at the boundaries of the project site are not to exceed the following levels:

- L_{eq} ≤ 65 dBA between 0700 to 1900 hours (daytime)
- L_{eq} ≤ 60 dBA between 1900 to 2300 hours (evening)
- L_{eq} ≤ 55 dBA between 2300 to 0700 hours (night-time, Sunday and statutory holidays)

The assessment of unmitigated worst case noise emissions for the future (fully developed) quarry indicates there is potential for future exceedance of the noise criteria at the site boundary. These impacts can be mitigated by a combination of reasonable and feasible measures such as having the majority of mobile equipment operating in the pit below ground surface, retaining natural barriers such as hillsides to the extent possible, locating product stockpiles to block noise transmission, and by specifying best practice quiet equipment during procurement. A combination of these measures will ensure that the site complies with the Pit and Quarry Guidelines established for operational sound levels.

The nearest sensitive residential receivers are set back from the property boundary, and the predicted noise levels at all residential locations are expected to comply with the applicable operational noise criteria. While compliance with the numeric noise limits at residences is expected, the noise of the quarry will be noticeable, particularly during otherwise quiet periods. Quarry production noise is generally characterised by low-frequency “rumbling” noise that does not vary much with time.

At the levels predicted in this assessment, it is anticipated that future noise from the quarry will dominate the background noise environment in the local area during the daytime and evening periods, and will be audible at “moderate to quiet” levels in nearby residential areas. Noise from night-time shiploading will also contribute to the background noise environment and be audible at a “quiet” level in nearby residential areas. The night-time noise level would not be expected to disturb the sleep of most people.

Blasting Noise and Vibration Impacts

Blasting will occur anywhere from 30 to 120 days per year, depending on aggregate sales demand. The NSE *Pit and Quarry Guidelines* define acceptable limits for blast overpressure (noise) and vibration, and also require a minimum distance from blasting to the nearest off-site structure greater than 800 m. Minimum blasting distances are respected in all directions from the Property boundary.

The assessment indicates that exceedance of the airblast overpressure limit and vibration limit at sensitive receivers is unlikely throughout the life of the quarry. As required by the NSE *Pit and Quarry Guidelines*, all blasts would be monitored to establish overpressure and vibration levels. This monitoring would be used to develop site-specific propagation constants, to enable refinement of the blast overpressure and vibration predictions as the quarry develops. In this manner, blast designs can be adopted that comply with the overpressure and vibration limits at sensitive receivers throughout the life of the quarry.

While underwater blasting is not anticipated to be required by the Project, the location of the quarry adjacent to the ocean means that there is potential for quarry blasting noise and vibration to impact on the underwater environment and marine fauna. This assessment identifies indicative offset distances between a blast and the ocean to meet the underwater noise and vibration limits defined in *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*. It is recommended that these indicative setback distances be refined following monitoring of initial test blasts at the site. Depending on their proximity to ocean habitats, these initial blasts may need to take place outside of any identified spawning periods for marine fauna. These initial blasts would identify the site-specific vibration transmission characteristics, to enable design of blasts to comply with the underwater noise and vibration limits.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Morien Resources Corporation and Vulcan Materials Company (the Proponent) proposes the construction, operation, decommissioning, and abandonment of a granite quarry at Black Point in Guysborough County, Nova Scotia, and the construction and operation of a marine terminal and load-out facility, adjacent to the quarry, in Chedabucto Bay. The quarry is expected to have a production capacity of up to 7.5 million tonnes of granite per year, over a mine life of approximately 50 years.

This report describes the potential noise and vibration impacts of the Project, as part of the Environmental Impact Statement (EIS) in accordance with the requirements of the Canadian Environmental Assessment Agency (CEA Agency) and Nova Scotia Environment (NSE). The objective of this report is to describe the existing acoustic environment, to predict the noise and vibration impacts of the Project, and to assess the predicted noise levels against relevant criteria. This report also discusses the potential noise and vibration impacts of the project, since impacts on people and wildlife may exist even if compliance with numerical noise and vibration criteria is achieved.

1.1 Project Area

The Project is located in a rural setting with little industrial, commercial or residential development. The local region is generally a rural forested area with an existing noise environment dominated by natural sounds. There is occasional noise associated with forest resources harvesting, some recreational activity (all-terrain vehicle and snowmobile use, hunting), and noise associated with residential land use and traffic along Highway 16 and residential access roads.

A desktop survey of the Project area using topographic maps indicates there are no residences within 500 m of the Property boundary, one residence at 690 m, two within 750 m, seven residences within 875 m, 11 within 1.0 km, and fewer than 45 within 2.0 km. The Project study area for noise and vibration impacts is shown in Figure 1.

1.2 Relevant Guidelines

The following guideline documents are relevant to the assessment of noise and vibration impacts of the Project:

- Canadian Environmental Assessment Agency *Guidelines for the preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012 and Nova Scotia Registration Document pursuant to the Nova Scotia Environment Act Black Point Quarry Project, Morien Resources Corp*. June 9, 2014 (the CEAA EIS guideline)
- Nova Scotia Environment and Labour *Guidelines for Environmental Noise Measurement and Assessment*. April 1990, amended May 18 2005.
- Nova Scotia Environment *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia*. Revised September 2009.
- Nova Scotia Environment *Pit and Quarry Guidelines*. Revised May 1999.
- Fisheries and Oceans Canada *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.* Canadian Technical Report of Fisheries and Aquatic Sciences 2107. D.G. Wright and G.E. Hopky, 1998.

1.3 Terminology

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

This report is considers noise and vibration impacts on land and also underwater. If the type of impact is not specifically indicated, it is a land-based impact. Underwater noise and underwater vibration impacts are described as such.

Figure 1
Project Study Area

2.0 CRITERIA

2.1 Noise Criteria

In 1990, the then Nova Scotia Department of Environment and Labour (NSEL, now the NSE) developed environmental guidelines to allow the evaluation of noise pollution in the environment (*Guidelines for Environmental Noise Measurement and Assessment*). Industrial operations which require an Environmental Approval come under the jurisdiction of this Guideline. The noise criteria defined by this guideline are A-weighted average sound pressure (L_{eq}) limits applicable at locations where people normally live, work, or take part in recreation. The criteria are as follows:

- $L_{eq} \leq 65$ dBA between 0700 to 1900 hours (daytime)
- $L_{eq} \leq 60$ dBA between 1900 to 2300 hours (evening)
- $L_{eq} \leq 55$ dBA between 2300 to 0700 hours (night-time, Sunday and statutory holidays)

The NSE *Pit and Quarry Guidelines* also define noise limits identical to the daytime, evening and night-time limits listed above. Although the magnitude of the noise limits is the same in both guidelines, the *Pit and Quarry Guidelines* require that the limits be observed at the property boundaries of the pit or quarry. This is more stringent than the requirements of the *Guidelines for Environmental Noise Measurement and Assessment*, since residences are set back from the quarry property boundary. Therefore, this study predicts the noise impacts at the quarry property boundary for assessment against the noise criteria.

Quarry noise levels at the nearest residential properties are also described, to enable a discussion of the predicted effects on residents in accordance with the guidance contained in the NSE *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia*. This guide also recommends a discussion of the effect of increased noise levels on wildlife.

2.2 Vibration Criteria

The NSE *Pit and Quarry Guidelines* do not define vibration criteria, with the exception of specific limits for blasting (see Section 2.3). Instead, separation distances are defined for pit and quarry operations. These separation distances require that the excavation working face of a pit be located no less than 90 m from the foundation or base of a structure located off site. The Project will comply with these separation distances. Adverse vibration impacts from excavation activities and general operation of the site are not anticipated and are not considered further in this assessment; with the exception of blasting vibration impacts (see Section 8.2).

2.3 Noise and Vibration Criteria Specific to Blasting Activities

The NSE *Pit and Quarry Guidelines* require a separation distance for blasting of 800 m, measured from the point of blast to a structure off site. In addition to this separation distance, this guideline defines noise and vibration criteria and control measures specific to blasting activities (NSE *Pit and Quarry Guidelines* Section VIII. Blasting). These criteria and control measures are reproduced as follows:

(1)(a) No person responsible for the operation of a quarry shall permit any blasting on site to exceed the following limits:

Concussion (Air Blast) 128 dBA	*Within 7 m of the nearest structure not located on the property where the blasting operations occur, or other locations as directed by the Minister or Administrator.*
Ground Vibration 0.5 in./sec. (12.5 mm/s) Peak Particle Velocity	*Measured below grade or less than 1 m above grade in any part of the nearest structure not located on the property where blasting occurs, or other locations as directed by the Minister or Administrator.*

(1)(b) No person shall fail to monitor all blasts for the parameters outlined in VIII(1)(a).

(2) Monitoring results shall be forwarded to the Department on a monthly basis unless otherwise indicated.

(3) No blasting shall occur on Sunday, on a statutory holiday prescribed by the Province, or on any day between the hours of 1800 hours and 0800 hours.

(4) Every person responsible for the operation of a quarry shall have a technical blast design prepared by a qualified person which ensures the ground vibration and air concussion outlined in VIII (1) can be achieved.

(5) Every person responsible for the operation of a quarry shall conduct a preblast survey of all structures within 800 m of the point of blast. This survey should be conducted with Nova Scotia Environment and Labour's "Procedure For Conducting a Pre-Blast Survey".

(6) No blasting is to take place if a thermal inversion is anticipated at the time of the proposed blast.

2.4 Underwater Noise and Vibration Criteria

In addition to the blasting noise and vibration criteria relevant to the assessment of impacts on people and structures, the CEA Agency EIS Guideline also requires that the potential for blasting vibration impacts on fish behaviour such as spawning or migrations be considered. The *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* provides information to proponents on the conservation and protection of fish, marine mammals and their habitat from the impacts of explosive use in or near water. Note that in this guideline, the term "fish" is defined to include *"shellfish, crustaceans, marine animals and the eggs, sperm, spawn, spat and juvenile stages of fish, shellfish, crustaceans and marine animals".*

The recommended underwater noise and vibration limits are as follows:

"No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish."

and

"No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm•s^{-1} in a spawning bed during the period of egg incubation."

In decibels, the 100 kPa underwater noise overpressure limit corresponds to 220 dB re 1 µPa.

The guideline provides indicative setback distances from the land-water interface for explosive use to comply with the target levels. In addition, no explosive is to be knowingly detonated within 500 m of any marine mammal.

3.0 NOISE AND VIBRATION PROPAGATION

3.1 Outdoor noise propagation

Outdoor sound propagation between a sound source and a receptor is affected by several sound attenuation and propagation mechanisms. These include dissipation with distance, ground attenuation, atmospheric attenuation, barrier attenuation (such as shielding by buildings or terrain), as well as meteorological effects such as wind and temperature gradients.

Ground cover in the study area is mainly forested. At the quarry site, open areas with exposed rock and crushed rock would become more predominant over the life of the quarry. The ground attenuation properties of forested areas are relatively sound-absorptive. The ground attenuation properties of areas of exposed rock and crushed rock are predominantly sound-reflective.

Wind effects on outdoor sound propagation can cause variations in the sound level of a distant facility. Similar effects are caused by temperature gradients in the atmosphere. The sound level variations caused by wind and temperature gradients are most pronounced for large source/receptor distances. Sound from a distant facility which propagates in a downwind direction (and/or during atmospheric inversion conditions) results in higher sound levels at a receptor than for calm conditions and a neutral atmosphere. This effect is caused by the downward refraction (or bending) of sound rays as they propagate through the atmosphere. Conversely, sound propagating in an upwind direction (and/or during lapse conditions in the atmosphere) is refracted upwards, which results in lower sound levels at the receptor. Sound propagating in a crosswind direction does not exhibit refraction effects and is essentially the same as sound propagation during calm conditions and a neutral atmosphere. This noise assessment assumes atmospheric conditions which produce moderate downward refraction of sound. This condition results in relatively efficient outdoor sound propagation between a source and receptor, and is representative of adverse noise impact effects associated with meteorological factors.

3.2 Underwater Noise Propagation

Underwater noise propagation is also affected by various attenuation and propagation mechanisms. The resulting level at any particular location removed from the source is the result of geometric spreading of the signal, combined with any losses or attenuations. Losses can be due to volume attenuation, to the conversion of acoustic energy to heat, to scattering, as well as losses due to interactions with the seafloor and surface (although a water surface is typically a very efficient reflector of sound, especially when the surface is smooth). Sound propagation underwater is also highly dependent on the speed of sound, which varies as a function of water temperature, ocean salinity and depth.

If all losses due to factors other than geometric spreading are neglected, then the transmission loss (TL) at a distance R from the noise source would be wholly due to spherical spreading (in deep water) or cylindrical spreading (in the case of shallow water, bounded above and below).

Spherical spreading means underwater noise would attenuate by 6 dB with each doubling of distance. Cylindrical spreading means an attenuation of 3 dB with each doubling of distance.

In terms of underwater noise, bodies of water up to 200 m deep are considered to be “shallow”. In shallow water, noise propagation is highly dependent on the properties of the bottom and the surface as well as the properties of the fluid. The following points are relevant to the prediction of noise propagation in shallow water[1]:

- The properties of the water are reasonably constant with depth. In particular, the speed of sound may be assumed to be constant (although it may vary seasonally with water temperature).
- Sources of transmission loss other than cylindrical spreading are dominated by bottom interaction effects (absorption) at lower frequencies (< 1 kHz) and by scattering losses at high frequencies.
- There is a low-frequency cut-off, below which energy is transferred directly into the sea floor.
- There is an optimum transmission frequency which is dependent on the water depth.
- Parameters such as depth and the bottom properties can vary with range.

3.3 Vibration Propagation

Vibration (both on land and underwater) propagates through the ground mass and to a large extent is unaffected by external factors such as topography and weather or water conditions. Key factors in the propagation and attenuation of ground vibration are the distance from the source (for example the blast point or excavation equipment), and site-specific elements such as rock or seabed type, geology and thickness of ground layers.

4.0 EXISTING NOISE AND VIBRATION LEVELS

4.1 Baseline Noise Monitoring Survey

Baseline sound monitoring surveys were completed by AECOM over 48 hours in November 2011 at the two residential dwellings nearest the property boundary:

- Location 1: 950 km west of the Project property boundary and 1.65 km west of the proposed quarry. The monitoring station was installed near the house trailer (currently uninhabited) at the eastern extremity of Half Island Cove Road; and
- Location 2: 870 m south of the property boundary and 920 m south of the proposed quarry. The station was installed at the entrance to Eagle Valley Road, just off Route 16.

The equipment used for the ambient noise surveys was two 2900 integrating/logging sound level meters (unit version 02.4, serial numbers CDF060006 and CDE020012). The meters were

[1] Jensen, F.B., W.A. Kuperman, M.B. Porter, H.Schmidt (2000). Computational Ocean Acoustics Springer-Verlag, New York.

calibrated prior to the study commencing. The monitoring took place over 48 hours in total with a logging interval of one hour.

At Location 1 to the west of the project site near the coast, the dominant noise sources noted were waves, birds, and the movement of leaves. At Location 2 the predominant noise source noted was traffic passing along the road.

The noise readings were recorded in A-weighted decibels (dBA) and reported in three categories (see Appendix A for definitions of noise parameters):

1. as equivalent continuous noise level (L_{eq}),
2. as the noise level exceeded for 10% of the time (L_{10}), which is used to give an indication of the upper limit of fluctuating noise, such as that from road traffic; and
3. as the noise level exceeded 90% of the time (L_{90}). This last parameter is generally taken to be the ambient or background noise level.

At both stations, measurements were collected over 1-hour intervals. This data has been collated to report results over each of the three time periods designated in the Guidelines: daytime (7am to 7pm), evening (7pm to11pm), and night-time (11pm to 7am). Time periods corresponding to wind speeds greater than 20 km/h or periods of precipitation have not been included in the summary analysis. The results are summarised in Table 4-1. The measurement data is also attached as Appendix B.

Table 4-1
Measured Ambient Noise Levels

Location	Time Period	Sound Level (dBA)		
		L_{eq}	L_{90}	L_{10}
Location #1 Half Island Cove Road	Daytime (7am to 7pm)	38.3	27.1	43.2
	Evening (7pm to 11pm)	31.7	28.9	34.4
	Night-time (11pm to 7am)	33.1	28.2	37.0
Location #2 Eagle Valley Road	Daytime (7am to 7pm)	51.0	24.2	56.3
	Evening (7pm to 11pm)	48.9	25.8	53.9
	Night-time (11pm to 7am)	42.1	24.3	35.8

The monitoring survey results in Table 4-1 indicate a noise environment with very low existing background noise levels, as is expected for a remote rural environment. The L_{90} background levels are lower at Location 2 (which is inland) than at Location 1 (nearer the coast). However the L_{eq} (or average) noise levels were typically higher at Location 2, probably due to the influence of road traffic noise at this location.

The background noise levels at both locations are similar during the daytime, evening and night-time periods.

4.2 Comments on Baseline Vibration

Ambient vibration levels in the study area have not been measured. Since this is a rural/remote location with no existing anthropogenic vibration sources nearby, existing ambient ground vibration levels are expected to be low, below the thresholds of human perception.

4.3 Comments on Baseline Underwater Noise and Vibration

Ambient underwater noise and vibration levels in the study area have not been measured. While there are no existing localised anthropogenic sources of underwater noise and vibration, underwater noise can propagate over very large distances. For this reason, both natural and anthropogenic sources may contribute to the existing environment in the project area.

Natural underwater noise sources include wind, waves, precipitation, sea ice, marine fauna, and seismic background activity. Anthropogenic noise sources include shipping, seismic exploration activity, sonar equipment, construction and industrial activity, and explosive detonations. Whether natural or anthropogenic sources dominate at any particular time and location depends on changing natural conditions, and the proximity and level of the human activities. This assessment focuses on the identification of the underwater noise and vibration impacts of the Project, and does not consider the varying influence of the ambient environment on overall underwater noise or vibration levels.

5.0 CONSTRUCTION NOISE AND VIBRATION

The relevant guidelines do not include specific requirements for the assessment of noise and vibration during construction. Since construction activities would occur predominantly within the quarry operation and processing areas, and the construction activities are anticipated to generate noise at levels similar to or less than noise from quarry operations, it is assumed that the noise and vibration impacts during construction would generally be similar to or less than impacts during operation.

One possible exception to this is that the number of heavy vehicles accessing the quarry site by road may be higher during some periods of construction than during operations. It is anticipated that trucks would be used for the final stage of transport of equipment onto the site. Increased heavy vehicle noise on local roads may be noticeable at times during construction.

Where possible, heavy vehicles would be scheduled to arrive and depart the construction site during daytime hours to minimise potential noise impacts at locations near the site road access.

6.0 UNDERWATER CONSTRUCTION NOISE AND VIBRATION

6.1 Overview of Marine Terminal Construction

The preferred construction method for the marine terminal employs a fill and rock technique along the shore. The fill and rock material will be sourced from the site. Blasting in the terrestrial near shore area for construction of the laydown area and approach to the wharf may also be required. Underwater blasting is not expected to be required.

Construction of the marine terminal will also require construction of caissons, piers/dolphins, a rubble approach and finally the slewing rail and shiploader.

The direct underwater construction noise and vibration impacts would be temporary and restricted to the immediate construction area. The activity with the greatest potential for underwater impacts is piling to support the piers and dolphins. These piles will be installed to anchor in the bedrock, from a barge using pile driving hammers and churn drills. Any piles required for the loadout conveyor in the nearshore area will be installed from land and at low tide.

6.2 Piling Underwater Noise Source Levels

Piling activities may give a wide range of possible noise source levels depending on the equipment used. Typically, pile driving sounds underwater are characterised by multiple rapid increases and decreases in sound pressure over time lasting approximately 300 to 500 ms. Most pile driving acoustic energy is relatively low frequency (< 2000 Hz).

SLR Consulting has conducted underwater noise measurements during pile driving for the construction of ship berths for previous projects. On the basis of these measurements, an indicative peak source noise level for piling of 230 dB re. 1 μPa at 1m is assumed for this assessment.

6.3 Piling Underwater Noise Impacts

The *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* recommend a peak underwater overpressure of 100 kPa. While this limit is defined to manage blasting impacts, it may also be used as an indication of the extent of impacts due to piling. The overpressure limit of 100 kPa corresponds to 220 dB re 1 μPa, and represents a theoretical lethal level. In practice, the susceptibility of different types and sizes of fish to injury due to underwater noise can vary considerably. For this reason, this assessment is intended only to give an order of magnitude indication of the potential range of impacts.

On the basis of the assumed piling source noise level, it is estimated that the 100 kPa overpressure level may be exceeded in an area around the pile location extending up to 10m from the pile (conservatively assuming cylindrical spreading, and neglecting all other losses).

It is concluded that the direct impacts of piling on fish (including shellfish and crustaceans) are likely to be restricted to an area with indicative radius up to 10 m around each pile. Behavioural modification would be expected to occur at greater distances, during underwater piling activities.

7.0 OPERATIONAL NOISE IMPACT ASSESSMENT

7.1 Operational Noise Modelling Overview

The quarry will remove material from the pit which will increase in size throughout the life of the quarry, as illustrated in Figure 2. This assessment considers the future operation of the quarry, in a scenario when all equipment is operating at the maximum anticipated capacity and the pit is expanded to its maximum size. This situation represents a “worst-case” scenario for noise impacts.

The quarry would be operational 24 hours a day in the future scenario, with a production schedule of 16 hours and a maintenance schedule of 8 hours. Shipping of material produced could occur at any time of the day or night. It is assumed for the purpose of this assessment that all potential production and shipping noise sources are operational during the daytime and evening time periods, i.e. from 7:00 am to 11:00 pm. During the night-time, it is assumed that the majority of noise sources would shut down, with the exception of conveyors from stockpiles out to the ship-loading equipment, and some mobile plant in the maintenance area.

While shiploading may take place at any time, it is estimated that that approximately 100 ships will be loaded per year once the plant reaches peak production. Since it will take approximately

18 to 24 hours to load the largest ships, noise impacts due to shiploading at night-time would be expected on less than a third of all nights.

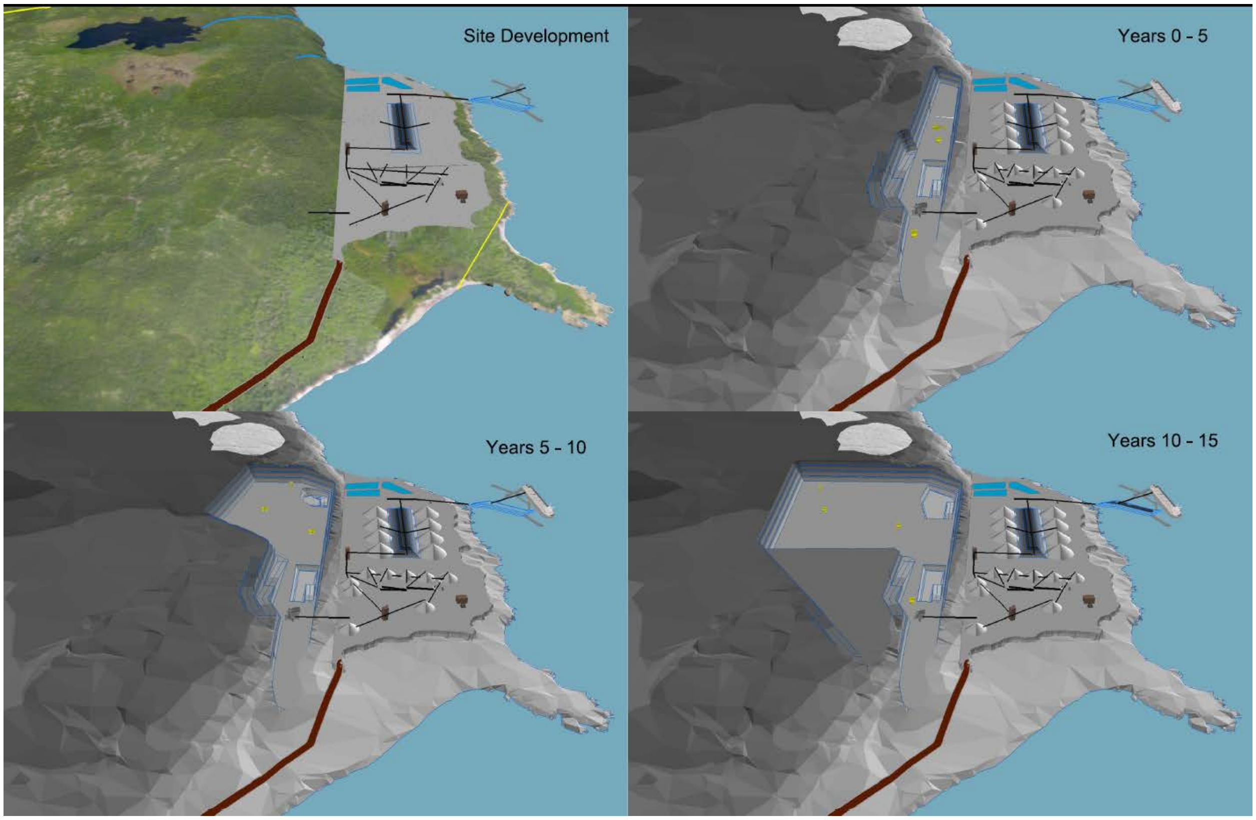


Figure 2
Simplified quarry development over time

7.2 Noise Modelling Procedure

In order to calculate the noise emission levels at the site boundary and at residential receiver locations, a SoundPLAN (Version 7.2) environmental computer model was developed. SoundPLAN is a software package which enables compilation of a sophisticated computer model comprising a digitised ground map (containing ground contours and buildings), the location and acoustic sound power levels of potentially critical noise sources on site and the location of receivers for assessment purposes.

The computer model can generate noise emission levels taking into account such factors as the source sound power levels and locations, distance attenuation, ground absorption, air absorption and shielding attenuation, as well as meteorological conditions, including wind effects.

The computer noise models utilize the ISO 9613-1[2] calculation method for absorption of sound by the atmosphere, and the CONCAWE[3] calculation method for outdoor sound propagation from industrial facilities.

Meteorological parameters and ground attenuation values typical of summer seasonal conditions are used in the noise model calculations. Predicted sound levels were calculated for a temperature of 10°C, a relative humidity of 70%, and downwind sound propagation from source to receptor based on a wind speed of 7.5 km/hr. Hard ground was assumed across the Project site and over the ocean, with soft ground elsewhere. The computer model calculations also take into account the topography of the study area, which was imported into the modelling software in the form of digital elevation data.

The noise model results presented in this report include only the effects of industrial noise in the study area; they do not include the effects of non-industrial ambient noise, such as road traffic, or natural sounds.

7.3 Quarry Noise Sources

Table 7-1 summarises the equipment that is expected to be operating on the site in the future scenario, along with the source sound power levels assumed for this study. The layout of the equipment including elevations is shown in Appendix C.

Equipment sound power levels have been derived from SLR Consulting's experience of the unmitigated noise emissions of equipment in similar applications. The source levels assumed are therefore considered to be conservative. There is potential to mitigate the noise emissions of equipment during the detail design of the Project to minimise noise impacts.

Table 7-1
Equipment List and Sound Power Levels

Equipment	Quantity	Sound Power Level (dBA)	Notes
Mobile Plant			
CAT 772G Off-Highway Truck	2	115	One only at night
CAT 966M Medium Wheel Loader	2	110	One only at night
CAT 988K Large Wheel Loader	2	109	One only at night
CAT 990K Large Wheel Loader	2	113	One only at night
MD5050 Track Drill	1	119	Daytime / evening only
Ship-board noise sources	1	110	Daytime and night-time
Screen Towers			
Scalping Screen	1	128	Daytime / evening only
Sizing Screen	2	119	Daytime / evening only
Sizing Screen	4	116	Daytime / evening only

[2] International Standards Organization (ISO). 1993. *ISO 9613-1, Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere*, Geneva, 1993.

[3] Conservation of Clean Air and Water – Europe (CONCAWE), 1981. *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities.* Report No. 4/81, May 1981.

Equipment	Quantity	Sound Power Level (dBA)	Notes
Sizing Screen	4	110	Daytime / evening only
Sizing Screen	2	110	Daytime / evening only
Wash Screen	2	114	Daytime / evening only
Crushers			
Gyratory	1	130	Daytime / evening only
Secondary Standard	1	127	Daytime / evening only
Tertiary Short Head	2	124	Daytime / evening only
Tertiary Short Head	4	124	Daytime / evening only
Conveyors			
Primary Crusher to Transfer 1	1	110/100m	Daytime / evening only
Transfer 1 to Primary Surge	1	110/100m	Daytime / evening only
Primary Reclaim to Scalping Tower	1	110/100m	Daytime / evening only
Scalping Tower to Secondary Surge	1	110/100m	Daytime / evening only
Base Stacker	1	110/100m	Daytime / evening only
Secondary Surge Reclaim	1	110/100m	Daytime / evening only
Tower 2 to CNV008 Stacker, 1 1/2x1	1	110/100m	Daytime / evening only
Stacker, 1 1/2x1	1	110/100m	Daytime / evening only
Tertiary Discharge Belt to Transfer 1	2	110/100m	Daytime / evening only
Transfer 1 to Tower 3	4	110/100m	Daytime / evening only
Tower 3 to H6800 Crushers	4	110/100m	Daytime / evening only
Tower 3 to 1x3/4 Pile	2	110/100m	Daytime / evening only
Tower 3 to 3/4x1/2 Pile	2	110/100m	Daytime / evening only
Tower 3 to Tower 4	10	110/100m	Daytime / evening only
Tower 4 to CNV020 to 1/2x3/8 Pile	2	110/100m	Daytime / evening only
Tower 4 to CNV022 to 3/8x#8 Pile	2	110/100m	Daytime / evening only
Tower 4 to CNV011A&B	2	110/100m	Daytime / evening only
Tower 4 to Screenings Pile	2	110/100m	Daytime / evening only
Base/Screenings Reclaim	1	110/100m	Daytime / evening only
Fraction Reclaim	1	110/100m	Daytime / evening only
Fraction Reclaim to Wash Tower	3	110/100m	Daytime / evening only
Sand Screws to Reclaim	1	110/100m	Daytime / evening only
Wash Tower Bypass Belt	1	110/100m	Daytime / evening only
Wash Tower to Tripper	1	110/100m	Daytime / evening only
Tripper and Stackers	3	110/100m	Daytime / evening only
Reclaim to Ship Loader	3	110/100m	Daytime and night-time
Ship Loader	2	110/100m	Daytime and night-time

7.4 Predicted Operational Noise Levels

The predicted worst-case noise impacts in the future operational scenario are summarised in Table 7-2 at locations around the site boundary and in Table 7-3 at residential receiver locations.

Table 7-2
Predicted Worst Case Project Noise Levels – Site Boundary

Location	Leq Sound Level (dBA)	
	Daytime and Evening (7am to 11pm)	Night-time (11pm to 7am)
Western Boundary	66-67	47-57
Southern Boundary	47-64	29-39
Eastern Boundary	56-73	34-58

Table 7-3
Predicted Worst Case Project Noise Levels – Residential Receivers

Location	Leq Sound Level (dBA)	
	Daytime and Evening (7am to 11pm)	Night-time (11pm to 7am)
272 Half Island Cove Road	51	40
267 Half Island Cove Road	53	41
257 Half Island Cove Road	52	40
246 Half Island Cove Road	52	40
230 Half Island Cove Road	51	39
215 Half Island Cove Road	52	40
212 Half Island Cove Road	51	39
155 Half Island Cove Road	50	38
3595 Highway 16	47	25
3596 Highway 16	48	25
3581 Highway 16	45	26
3421 Highway 16	55	26
2927 Highway 16	54	30
2823 Upper Fox Island	52	35
2574 Highway 16	48	34
48 Fox Island Main Road	48	33
59 Fox Island Main, Canso	49	34
79 Fox Island Main Road	49	34
75 Fox Island Main Road	49	34
130 Fox Island Main Road	49	34
149 Fox Island Main Road	49	35
169 Fox Island Main Road	50	35
235 Fox Island Main Rd	48	34
RR 1 Canso	50	35

7.5 Discussion of Operational Noise Impacts

The predicted worst case daytime operational noise impacts at residential receivers (Table 7-3) indicate that the Project is expected to comply with of the *Guidelines for Environmental Noise Measurement and Assessment*. This guideline defines noise limits being:

- $L_{eq} \leq 65$ dBA between 0700 to 1900 hours (daytime)

- L_{eq} ≤ 60 dBA between 1900 to 2300 hours (evening)
- L_{eq} ≤ 55 dBA between 2300 to 0700 hours (night-time, Sunday and statutory holidays)

The *NSE Pit and Quarry Guidelines* also define noise limits identical to the daytime, evening and night-time limits above, but require that the limits be observed at the property boundaries of the pit or quarry. The predicted worst case noise impacts at the site boundary (see Table 7-2) indicate that the Project has the potential to exceed the noise limits at the property boundary in an unmitigated future operating scenario. Industry standard mitigation measures are described in Section 7.6.

7.5.1 Daytime and Evening Noise Impacts on Residences

For the purpose of this assessment, the daytime and evening noise emissions are assumed to be the same. The predicted noise levels at the nearest residential receivers during the daytime and evening range from 47 dBA to 55 dBA, complying with the most stringent noise limit of 55 dBA. These predicted noise impacts represent a worst-case scenario, once the quarry is fully developed, and with no noise mitigation measures included in the detailed design. At the commencement of quarry construction and operation, noise levels would be expected to be considerably less than indicated in this assessment.

The dominant noise sources during daytime operations would be the crushers and screen towers.

While compliance with the numeric noise limits at residences is expected, the noise of the quarry will be noticeable at residences during the daytime and evening, particularly during otherwise quiet periods. Quarry production noise is generally characterised by low-frequency “rumbling” noise that does not vary much with time. At the levels predicted in this assessment, it is anticipated that in future noise from the quarry would dominate the background noise environment in the local area during the daytime and evening periods, and will be audible at a “moderate to quiet” level in nearby residential areas (see Appendix A for more information on perception of noise levels).

7.5.2 Night-time Noise Impacts on Residences

The predicted noise levels at the nearest residential receivers during night-time shiploading and site maintenance activities range from 25 dBA to 41 dBA, complying with the night-time limit of 55 dBA. These predicted noise impacts represent a worst-case scenario on nights when ship-loading takes place, and with no noise mitigation measures included in the detailed design. Shiploading is expected to occur on around 100 nights per year once operations reach full capacity.

The dominant noise sources during night-time shiploading and maintenance operations would be the conveyors leading out to the ship.

While compliance with the numeric night-time noise limits at residences is expected, the noise impact of night-time shiploading will be noticeable at residences. At the levels predicted in this assessment, it is anticipated that in future noise from night-time shiploading would contribute to the background noise environment in the local area, and will be audible at a “quiet” level in nearby residential areas (see Appendix A for more information on perception of noise levels). The character of night-time noise would be a steady low-frequency “rumbling” noise. The night-time noise level would not be expected to disturb the sleep of most people.

7.5.3 Noise Impacts at Project Boundary

The predicted noise levels around the project boundary indicate there is potential for exceedances of the noise goals at the project boundary both during daytime operations and during night-time shiploading and site maintenance activities. These predicted noise impacts represent a worst-case scenario with no noise mitigation measures included in the detailed design. The highest noise levels are predicted at the boundary on the coast both to the east and to the west of the site – this is because these project boundaries are closest to the dominant production equipment noise sources, and do not benefit from as much shielding by the terrain as the areas south of the site.

7.6 Operational Noise Mitigation

There is opportunity to reduce the noise impacts below the levels identified in this report by design and implementation of noise mitigation measures. Design-related mitigation measures included in the model are having the majority of mobile equipment operating in the pit below ground surface, and retaining natural barriers such as hillsides to the extent possible. Product stockpiles would also be located to block noise transmission – this benefit has not been modelled since the height of stockpiles would be variable. Additional reasonable and feasible mitigation options include the specification of best practice equipment noise emissions during the procurement stage, and/or the incorporation of equipment enclosures or other noise shielding such as localised walls or earth mounds for noisy equipment items. For example, for conveyor systems it is anticipated that noise emissions 5-10 dB lower than assumed in this assessment could be achieved by specification of low noise conveyor systems[4].

The staged development of the quarry means that there is scope to monitor noise emissions as the quarry develops, and to include additional noise mitigation in the later stages if required to comply with the noise limits at the site boundary.

8.0 BLASTING NOISE AND VIBRATION IMPACT ASSESSMENT

Blasting will occur anywhere from 30 to 200 days per year, depending on aggregate sales demand. Blasting locations will be based on pit geometry and will vary over the the life of the quarry. Face heights will range from 13 m to 20 m with an average height of approximately 15 m. The average number of holes in an individual blast will be approximately 60 but this number would vary in a range from 20 to 100. Shot patterns will be staggered or square and typically placed in no more than four rows. Holes would be spaced approximately 3 m to 5 m apart. Typical charge weights (kg per delay) per hole will be approximately 270 kg but may range from less than 25 kg (during plant construction) to 400 kg.

The minimum distance to nearest off-site structure will be greater than 800 m, complying with the NSE *Pit and Quarry Guidelines* minimum distance. Initial blasts at the commencement of quarrying operations would take place at much greater offset distances, with the nearest sensitive receivers more than 1500 m from the blast location.

[4] Brown, S.C. *Conveyor Noise Specification and Control*. Proceedings of Acoustics 2004, Gold Coast, Australia, pp269-275.

On the basis of this nominated indicative blast design, the level of blast noise (overpressure) and vibration emissions can be predicted using standard formulae and assuming blasting in average rock.

8.1 Blasting Overpressure

The relevant formula for airblast overpressure is:

$$P = K_a \left(\frac{R}{Q^{1/3}} \right)^A$$

Equation 1

Where,

P = pressure (kPa)

K_a, A = constants related to site specific propagation

R = distance between charge and receiver (m)

Q = Charge mass per delay (kg)

For the purpose of this assessment, the site exponent A is assumed to be -1.45, which corresponds to an attenuation rate of 8.6 dB with doubling of distance. For confined blasthole charges, the site constant K_a is commonly in the range 10 to 100. The resulting estimates of blasting overpressure levels for the maximum anticipated charge mass per delay are presented in Table 8-1.

Table 8-1
Estimated Blasting Overpressure Levels at Maximum Charge Mass per Delay

Receiver Distance (m)	Overpressure Level (dB)	
	Q=550 kg, K_a=10	Q=550 kg, K_a=100
900	115	135
1000	113	133
1500	108	128
2000	105	125

Equation 1 is a generic equation, and in practice the site specific constants may vary considerably, as indicated by the 20 dB range of estimated overpressure levels in Table 8-1 for the range of likely values of K_a. Factors that affect the site specific propagation include the pit geometry, the blast location relative to the receiver, the amount of shielding provided by terrain and meteorological conditions. In unfavourable meteorological conditions, it is common for airblast levels to be increased by up to 20 dB due to the combined effects of temperature inversions and/or wind velocity. Alternatively, airblast levels would be reduced from the levels estimated in Table 8-1 at blast locations where shielding is provided by the pit geometry or surrounding terrain.

Table 8-1 indicates that compliance with the airblast overpressure limit of 128 dB is expected at sensitive receiver locations at the commencement of quarry operations, for the potential range of site propagation constants considered in this assessment (including the most conservative assumptions).

At the minimum blast distances anticipated to occur as the pit expands, it is possible the airblast overpressure limit of 128 dB may be exceeded, depending on blast location relative to the receiver, site specific propagation factors and meteorological conditions. However, the layout of the Project site and indicative pit geometry indicates that the potentially affected receivers would benefit from shielding due to pit geometry. For this reason, it is considered that exceedance of the airblast overpressure limit at sensitive receivers is unlikely throughout the life of the quarry. Furthermore, there is scope to mitigate the potential impacts further if required by adjusting the individual blast designs and considering meteorological conditions.

As required by the NSE *Pit and Quarry Guidelines*, all blasts would be monitored to establish overpressure levels. This monitoring would be used to develop site-specific propagation constants, to enable refinement of the blast overpressure predictions as the quarry develops. In this manner, blast designs can be adopted that comply with the overpressure limits at sensitive receivers throughout the life of the quarry.

8.2 Blasting Vibration

The relevant formula for the prediction of blasting ground vibration is:

$$V = K_b \left(\frac{R}{Q^{1/2}}\right)^{-B}$$

Equation 2

Where,

V = ground vibration as vector peak particle velocity (mm/s)

K_b, B = constants related to site and rock properties for estimation purposes

R = distance between charge and receiver (m)

Q = Charge mass per delay (kg)

As many site factors will affect the transmission of vibration through the ground, the following levels are considered to be estimates, based on blasting in average rock to a free face under average field conditions. The estimates are of mean vibration level (50% exceedance level). The corresponding assumed site constants are K_b of 1140, and B of 1.6. The resulting mean estimated ground vibration levels are shown in Table 8-2. In practice, due to variations in ground conditions and other factors, the resulting ground vibration levels can vary from two-fifths to four times that estimated in Table 8-2.

Table 8-2
Estimated Mean Blasting Ground Vibration at Maximum Charge Mass per Delay

Receiver Distance (m)	Vibration (mm/s)
900	3.3
1000	2.8
1500	1.5
2000	0.9

Table 8-2 indicates that compliance with the vibration limit of 12.5 mm/s is likely at all sensitive receiver locations both at the commencement of quarry operations and throughout the life of the quarry.

As required by the NSE *Pit and Quarry Guidelines*, all blasts would be monitored to establish vibration levels. This monitoring would be used to develop site-specific propagation constants, to enable refinement of the blast vibration predictions as the quarry develops. In this manner, blast designs can be refined as required to comply with the vibration limits at sensitive receivers throughout the life of the quarry.

8.3 Blasting Noise and Vibration Mitigation Measures

The NSE Pit and Quarry Guidelines Section VIII. Blasting describes control measures for blasting noise and vibration. These measures are reproduced as follows:

(1)(b) No person shall fail to monitor all blasts for the parameters outlined in VIII(1)(a).

(2) Monitoring results shall be forwarded to the Department on a monthly basis unless otherwise indicated.

(3) No blasting shall occur on Sunday, on a statutory holiday prescribed by the Province, or on any day between the hours of 1800 hours and 0800 hours.

(4) Every person responsible for the operation of a quarry shall have a technical blast design prepared by a qualified person which ensures the ground vibration and air concussion outlined in VIII (1) can be achieved.

(5) Every person responsible for the operation of a quarry shall conduct a preblast survey of all structures within 800 m of the point of blast. This survey should be conducted with Nova Scotia Environment and Labour's "Procedure For Conducting a Pre-Blast Survey".

(6) No blasting is to take place if a thermal inversion is anticipated at the time of the proposed blast.

9.0 BLASTING NOISE AND VIBRATION UNDERWATER IMPACT ASSESSMENT

While underwater blasting is not anticipated to be required by the Project, the location of the quarry adjacent to the ocean means that there is potential for quarry blasting noise and vibration to impact on the underwater environment and marine fauna.

Indicative offset distances between a blast and the ocean to meet the 13 mm/s underwater vibration limit in a spawning bed may be estimated using the same formula applied to terrestrial vibration impacts in Section 8.2 (Equation 2). The *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* indicates that the offset distance required to meet the underwater noise overpressure guideline level of 100 kPa is typically one third of the distance required to meet the vibration limit in spawning beds, for blasting in rock.

As with the terrestrial vibration assessment, the underwater vibration predictions are based on mean vibration levels. In practice, variations in ground conditions and other factors mean that vibration and the resulting underwater noise level can vary considerably. For the purpose of this assessment, the recommended offset distances between a blast point and ocean habitats are presented as a range. The range presented in Table 9-1 corresponds to the estimated mean or typical offset distance, and the estimated maximum offset distance (assuming a maximum vibration level four times higher than the mean or typical value). This factor of four has been included in the estimates because ground vibration levels in practice can vary from two-fifths to four times the estimated mean value (Angel 2006).

Table 9-1
Approximate Blasting Setback Distances to Ocean Habitats by Charge Mass

	Charge Mass per delay (kg)				
	50kg	100kg	200 kg	300 kg	400 kg
Setback distance for vibration impacts to spawning beds (m)	120-280	170-390	240-560	290-680	330-780
Setback distance for underwater noise impacts to fish (m)	40-90	60-130	80-190	100-230	110-260

It is recommended that these setback distances be refined following monitoring of initial test blasts at the site (using small charge weights). Depending on their proximity to ocean habitats, these initial blasts may need to take place outside of any identified spawning periods for marine fauna. These initial blasts would identify the site-specific vibration transmission characteristics, to enable design of blasts to comply with the underwater noise and vibration limits.

10.0CONCLUSION

The potential noise and vibration impacts of the Project have been assessed in accordance with the requirements of the Canadian Environmental Assessment Agency (CEA Agency) and Nova Scotia Environment (NSE). As required by the relevant guidelines for the EIS, the assessment identifies the current ambient noise and vibration levels within the local area, summarises the results of a baseline ambient noise survey, and provides information on typical sound sources, geographic extent and temporal variations. The noise and vibration impacts of the Project have also been identified, and recommendations made for mitigation of noise impacts during future aggregate production.

References

Angel, H.G. 2006. Australian Standard for Explosives 2187-2006.

11.0STATEMENT OF LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by SLR Consulting (Canada) Ltd. (SLR) for Vulcan Materials, hereafter referred to as the “Client”. It is intended for the sole and exclusive use of Vulcan Materials. The report has been prepared in accordance with the Scope of Work and agreement between SLR and the Client. Other than by the Client and as set out herein, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of SLR.

This report has been prepared in a manner generally accepted by professional consulting principles and practices for the same locality and under similar conditions. No other representations or warranties, expressed or implied, are made.

Opinions and recommendations contained in this report are based on conditions that existed at the time the services were performed and are intended only for the client, purposes, locations, time frames and project parameters as outlined in the Scope or Work and agreement between SLR and the Client. The data reported, findings, observations and conclusions expressed are limited by the Scope of Work. SLR is not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. SLR does not warrant the accuracy of information provided by third party sources.

SLR

global environmental solutions

Calgary, AB
134-12143 40 Street SE
Calgary, AB T2Z 4E6
Canada
Tel: (403) 266-2030
Fax: (403) 263-7906

Calgary, AB
1140-10201 Southport Rd SW
Calgary, AB T2W 4X9
Canada
Tel: (403) 259-6600
Fax: (403) 259-6611

Edmonton, AB
6940 Roper Road
Edmonton, AB T6B 3H9
Canada
Tel: (780) 490-7893
Fax: (780) 490-7819

Fort St. John, BC
9943 100 Avenue
Fort St. John, BC V1J 1Y4
Canada
Tel: (250) 785-0969
Fax: (250) 785-0928

Grande Prairie, AB
10015 102 Street
Grande Prairie, AB T8V 2V5
Canada
Tel: (780) 513-6819
Fax: (780) 513-6821

Halifax, NS
115 Joseph Zatzman Drive
Dartmouth, NS B3B 1N3
Canada
Tel: (902) 420-0040
Fax: (902) 420-9703

Kamloops, BC
8 West St. Paul Street
Kamloops, BC V2C 1G1
Canada
Tel: (250) 374-8749
Fax: (250) 374-8656

Kelowna, BC
200-1475 Ellis Street
Kelowna, BC V1Y 2A3
Canada
Tel: (250) 762-7202
Fax: (250) 763-7303

Markham, ON
101-260 Town Centre Blvd
Markham, ON L3R 8H8
Canada
Tel: (905) 415-7248
Fax: (905) 415-1019

Nanaimo, BC
9-6421 Applecross Road
Nanaimo, BC V9V 1N1
Canada
Tel: (250) 390-5050
Fax: (250) 390-5042

Prince George, BC
1586 Ogilvie Street
Prince George, BC V2N 1W9
Canada
Tel: (250) 562-4452
Fax: (250) 562-4458

Regina, SK
1048 Winnipeg Street
Regina, SK S4R 8P8
Canada
Tel: (306) 525-4690
Fax (306) 525-4691

Saskatoon, SK
620-3530 Millar Avenue
Saskatoon, SK S7P 0B6
Canada
Tel: (306) 374-6800
Fax: (306) 374-6077

Sydney, NS
PO Box 791, Station A
122-45 Wabana Court
Sydney, NS B1P 6J1
Canada
Tel: (902) 564-7911
Fax: (902) 564-7910

Vancouver, BC (Head Office)
200-1620 West 8 Avenue
Vancouver, BC V6J 1V4
Canada
Tel: (604) 738-2500
Fax: (604) 738-2508

Victoria, BC
6-40 Cadillac Avenue
Victoria, BC V8Z 1T2
Canada
Tel: (250) 475-9595
Fax: (250) 475-9596

Winnipeg, MB
Unit D, 1420 Clarence Avenue
Winnipeg, MB R3T 1T6
Canada
Tel: (204) 477-1848
Fax: (204) 475-1649

Whitehorse, YT
6131 6 Avenue
Whitehorse, YT Y1A 1N2
Canada
Tel: (867) 689-2021

Yellowknife, NT
Unit 44, 5022 49 Street
Yellowknife, NT X1A 3R8
Canada
Tel: (867) 765-5695

Energy | Waste Management | Planning & Development | Industry | Mining & Minerals | Infrastructure

ATTACHMENT A
Acoustic Terminology

Black Point Quarry Project
Guysborough County, NS
SLR Project No.: 210.05913.00000

1 Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(lin) or dB.

3 Sound Power Level

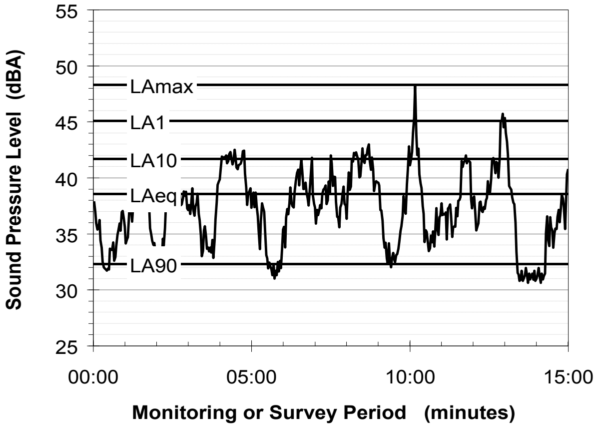
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_W, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with long term statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" L_{A90} noise level over the daytime, evening and night-time measurement periods. In addition the method produces mean or "average" levels representative of the other descriptors (L_{Aeq}, L_{A10}, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than "broad band" noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

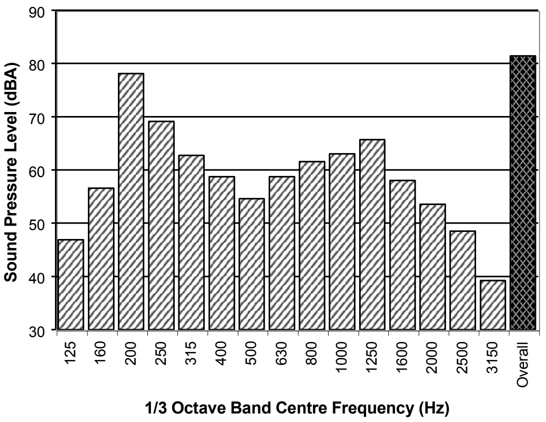
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as “peak particle velocity”, or PPV. The latter incorporates “root mean squared” averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/V_o), where V_o is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

10 Over-Pressure

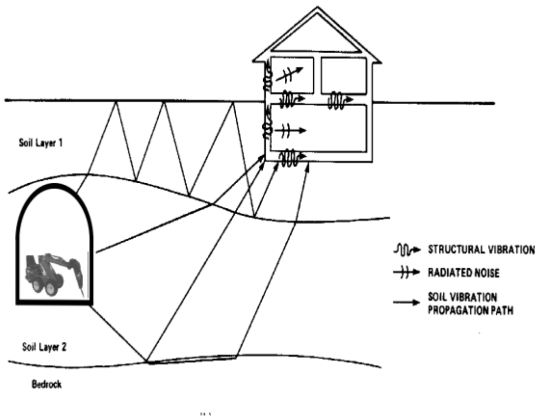
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed “structure-borne noise”, “ground-borne noise” or “regenerated noise”. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term “regenerated noise” is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

ATTACHMENT B
Noise Monitoring Data

Black Point Quarry Project
Guysborough County, NS
SLR Project No.: 210.05913.00000

Location 1 Half Island Cove Rd							
Weather Station Name		HART ISLAND (AUT)					
Province		NOVA SCOTIA					
Latitude		45.35					
Longitude		-60.98					
Elevation		8.2					
Climate Identifier		8202318					
WMO Identifier		71419					
TC Identifier		WRN					
All times are specified in Local Standard Time (LST).							
A-Weighted Noise Levels							
Date	Time	Leq	Lmax	Lpk	L10	L90	Wind speed km/h
8-Nov-11	9:32:22	59.5	80.3	103.7	61.3	42.2	26
8-Nov-11	10:32:22	45.9	64	82.8	45.8	40.4	30
8-Nov-11	11:32:22	39.4	57.8	80	41.3	35.3	28
8-Nov-11	12:32:22	36.1	46.8	76.7	37.7	34	20
8-Nov-11	13:32:22	41.3	62.3	82.5	42.6	38.6	15
8-Nov-11	14:32:22	45.2	52	81.9	47.3	41.2	17
8-Nov-11	15:32:22	44	54.3	81.4	45.9	41.7	13
8-Nov-11	16:32:22	41.2	56.3	79.2	43.4	37	15
8-Nov-11	17:32:22	36.5	52.5	69.2	36.8	34.7	19
8-Nov-11	18:32:22	34	38.8	69.3	35.7	32.5	19
8-Nov-11	19:32:22	32.1	35.8	69.2	33.3	30.5	9
8-Nov-11	20:32:22	29.8	36.4	70.1	30.8	28.8	13
8-Nov-11	21:32:24	30	37.9	72.3	30.8	29	11
8-Nov-11	22:32:24	34	46.1	76.3	35.8	29.7	4
8-Nov-11	23:32:24	35.1	39.1	75.3	36.4	33.8	13
9-Nov-11	0:32:24	35.7	40.3	77.7	37.1	33.6	11
9-Nov-11	1:32:24	34.5	38.7	74.7	36.1	32.7	9
9-Nov-11	2:32:24	34.8	39.3	74.5	36.8	32.2	6
9-Nov-11	3:32:24	34.7	39.2	75	35.9	33.4	6
9-Nov-11	4:32:24	32.8	36.7	73.4	34.3	31.1	6
9-Nov-11	5:32:24	36.2	41.8	74.2	37.4	34.2	6
9-Nov-11	6:32:24	36	47	76.6	36.7	35.1	15
9-Nov-11	7:32:24	37.4	62.1	80.4	37.5	33.4	11
9-Nov-11	8:32:24	37.3	54.9	75.8	37.9	33.8	7
9-Nov-11	9:32:26	40.3	69.8	88.9	37.5	32.6	6
9-Nov-11	10:32:26	35.8	60.2	77.5	35.9	30.7	11
9-Nov-11	11:32:26	36.7	59.9	79.1	35.3	31.3	13
9-Nov-11	12:32:26	36.8	63.7	82.7	34.8	30.9	4
9-Nov-11	13:32:26	31.6	59.3	76.4	30.7	26.7	9
9-Nov-11	14:32:26	37.9	68.6	84.9	36.1	26.9	13
9-Nov-11	15:32:26	34.4	57.5	73.8	31.7	27.6	13
9-Nov-11	16:32:26	35.1	58.5	76.2	34.9	29.3	13
9-Nov-11	17:32:26	33.5	54.9	74	34.1	30.6	7
9-Nov-11	18:32:26	31.9	38.1	72.8	33.2	30.7	11
9-Nov-11	19:32:26	30.4	34.9	72.2	31.1	29.7	9
9-Nov-11	20:32:26	32.6	39.3	72.8	33.8	30.7	4
9-Nov-11	21:32:27	31.8	47.3	71.6	32.7	30.7	2
9-Nov-11	22:32:27	30.9	44.9	69.7	31.3	29.5	7
9-Nov-11	23:32:27	30.6	43	75.7	31.3	29.3	0
10-Nov-11	0:32:27	30.3	32.9	70.2	31.3	29.3	2
10-Nov-11	1:32:27	29.7	40.6	76.9	30.6	28.7	4
10-Nov-11	2:32:27	29.1	32.4	69.2	30.1	28.3	7
10-Nov-11	3:32:27	28.4	31.3	63.8	29.1	28	2
10-Nov-11	4:32:27	28.3	39.1	61.5	28.5	28	6
10-Nov-11	5:32:27	28.8	32.6	73.8	29.3	28.3	7
10-Nov-11	6:32:27	29.6	40.5	70.4	31	28.5	7
10-Nov-11	7:32:27	32.2	55.5	72.9	31.8	28.6	11
10-Nov-11	8:32:27	34.8	58.9	76.5	31.7	28.1	11
10-Nov-11	9:32:29	32.1	58.6	75.3	30.5	27.6	15
10-Nov-11	10:32:29	34	63.6	81.6	29.7	27	17

Location 2 Eagle Valley Rd							
Weather Station Name		HART ISLAND (AUT)					
Province		NOVA SCOTIA					
Latitude		45.35					
Longitude		-60.98					
Elevation		8.2					
Climate Identifier		8202318					
WMO Identifier		71419					
TC Identifier		WRN					
All times are specified in Local Standard Time (LST).							
A-Weighted Noise Levels							
Date	Time	Leq	Lmax	Lpk	L10	L90	Wind speed km/h
8-Nov-11	10:34:57	54.8	78.3	102.9	58.2	31.9	30
8-Nov-11	11:34:57	50.4	67.3	94	54.5	30.1	28
8-Nov-11	12:34:57	51	68.9	89.4	55.1	31.3	20
8-Nov-11	13:34:57	49.9	67.3	97	53.8	33.6	15
8-Nov-11	14:34:57	50.5	70.9	98.4	54.2	35.1	17
8-Nov-11	15:34:57	51.2	69.3	94.8	55.9	29.3	13
8-Nov-11	16:34:57	51.7	70	87.4	55.8	27.9	15
8-Nov-11	17:34:57	52.5	69.7	82.9	56.9	24.3	19
8-Nov-11	18:34:57	49.9	69	84.2	51.9	25.1	19
8-Nov-11	19:34:57	48.9	66.6	83.1	51.1	25.9	9
8-Nov-11	20:34:57	48.6	68.6	83	49.2	26.5	13
8-Nov-11	21:34:57	48.5	68.3	82.3	46.9	27.1	11
8-Nov-11	22:34:59	42.4	65	79.2	30.9	27.8	4
8-Nov-11	23:34:59	36.1	64	79.4	28.8	26.9	13
9-Nov-11	0:34:59	31.4	34.1	63.4	32.4	29.2	11
9-Nov-11	1:34:59	30.7	34.2	62.6	32.6	28.5	9
9-Nov-11	2:34:59	30.9	32.6	62.8	32	29.8	6
9-Nov-11	3:34:59	38.5	65	78.7	30.4	28.5	6
9-Nov-11	4:34:59	46.7	68.5	83	37.1	28.3	6
9-Nov-11	5:34:59	46	69.3	83.7	33.3	26	6
9-Nov-11	6:34:59	45.6	66.4	80.1	38.9	25.5	15
9-Nov-11	7:34:59	53.1	71.2	86.7	55.9	24.7	11
9-Nov-11	8:34:59	54.5	71.3	87.5	59.5	26.1	7
9-Nov-11	9:34:59	50.9	66.9	86.1	55.5	28.9	6
9-Nov-11	10:35:01	48.6	67.5	85.4	50.6	24.1	11
9-Nov-11	11:35:01	49.7	67.5	89	53.9	24.1	13
9-Nov-11	12:35:01	49.8	70.2	86.6	53.4	24.2	4
9-Nov-11	13:35:01	49.1	71.4	89.2	52	24.5	9
9-Nov-11	14:35:01	49.2	66.2	85.1	53.9	24.9	13
9-Nov-11	15:35:01	48.2	66.1	85	50.9	24.7	13
9-Nov-11	16:35:01	50.5	68	82.4	54.6	26.7	13
9-Nov-11	17:35:01	51.9	69.8	89.6	56.3	26.4	7
9-Nov-11	18:35:01	52.2	70.7	92.7	55.8	27.4	11
9-Nov-11	19:35:01	52.2	67.3	80	55.8	26.9	9
9-Nov-11	20:35:01	51.1	69.6	84.7	53.1	27.2	4
9-Nov-11	21:35:01	45.6	68.6	82.7	33.4	26.3	2
9-Nov-11	22:35:03	46.9	68.1	83.1	41.8	25.6	7
9-Nov-11	23:35:03	38.3	62.1	76.6	27.5	25.2	0
10-Nov-11	0:35:03	39.1	64.1	77	26.9	25.5	2
10-Nov-11	1:35:03	37.9	65	81.8	26	24.7	4
10-Nov-11	2:35:03	24.5	29.6	61	24.7	24.3	7
10-Nov-11	3:35:03	24.5	26.5	65.4	24.9	24.2	2
10-Nov-11	4:35:03	43.7	66.3	80.4	31.6	24.1	6
10-Nov-11	5:35:03	46.5	69	82.9	30.3	24.4	7
10-Nov-11	6:35:03	44.9	67.5	82.4	34.5	25.1	7
10-Nov-11	7:35:03	49.6	68.9	84.7	49.2	24.2	11
10-Nov-11	8:35:03	50.5	67.2	84.6	55	24.4	11
10-Nov-11	9:35:03	51.2	67.2	83.4	56.1	25.9	15

ATTACHMENT C
Equipment and Site Layouts

Black Point Quarry Project
Guysborough County, NS
SLR Project No.: 210.05913.00000

PRELIMINARY EQUIPMENT LIST

Crusher Plant	Model Number	Description	Crusher Model	Power
CR1	LT160	Track Mounted Crushing Plant	C160	Diesel
CR2	LT120	Track Mounted Crushing Plant	C120	Diesel

Conveyors	
Conveyor Number	Description
C1	CR1 to CR2
C2	Product Stacker

	DATE	REVISION	BY
D			
C			
B			
A			
–		INITIAL RELEASE	

TOLERANCES–UNLESS NOTED
FRACTIONAL: ± 1/16"
DECIMAL: ± 0.010"
ANGLE: ± 0.1°

Vulcan Materials Company

PLANT LAYOUT
PHASE #1

STATE: NOVA SCOTIA	PLANT: BLACK POINT
DRAWN BY: CB	CHECKED BY:
DATE: 8/15/14	DATE:
PROJ. NO.:	FILE SERVER:
SCALE: 1 : 33 1/3	SHEET 1 OF 1
DWG. NO.: 100-PLT-0001	REV.:

PRELIMINARY EQUIPMENT LIST

Crusher Plant	Model Number	Description	Crusher Model	Power
CR1	LT160	Track Mounted Crushing Plant	C160	Diesel
CR2	LT120	Track Mounted Crushing Plant	C120	Diesel
CR3	LT300HP	Track Mounted Crushing Plant	HP300	Diesel
CR4	LT300HP	Track Mounted Crushing Plant	HP300	Diesel

Conveyors	
Conveyor Number	Description
C1	CR1 to CR2
C2	CR2 to CR3
C3	CR3 to CR4
C4	Product Stacker

	DATE	REVISION	BY
D			
C			
B			
A			
–		INITIAL RELEASE	

TOLERANCES–UNLESS NOTED
FRACTIONAL: ± 1/16"
DECIMAL: ± 0.010"
ANGLE: ± 0.1°

THIS DRAWING IN DESIGN AND DETAIL IS THE PROPERTY OF VULCAN MATERIALS COMPANY AND MUST BE RETURNED UPON DEMAND. THIS DRAWING MUST NOT BE COPIED, REPRODUCED, OR USED WITHOUT PERMISSION.

Vulcan Materials Company

PLANT LAYOUT
PHASE #2

STATE: NOVA SCOTIA
PLANT: BLACK POINT
DRAWN BY: CB
DRAWN DATE: 8/15/14
CHECKED BY:
CHECKED DATE:
PROJ. NO.:
FILE SERVER:
SCALE: 1 : 33 1/3
SHEET 1 OF 1
DWG. NO.: 100-PLT-0002
REV.:

PRELIMINARY EQUIPMENT LIST

Crusher Plant	Model Number	Description	Crusher Model	Power
CR1	LT160	Track Mounted Crushing Plant	C160	Diesel
CR2	LT120	Track Mounted Crushing Plant	C120	Diesel
CR3	LT300HP	Track Mounted Crushing Plant	HP300	Diesel
CR4	LT300HP	Track Mounted Crushing Plant	HP300	Diesel
CR5	LT300HP	Track Mounted Crushing Plant	HP300	Diesel
SCREEN PLANT	MODEL NUMBER	DESCRIPTION	SCREEN SIZE	POWER
SC1	ST620	TRACK MOUNTED SCREENING PLANT	6' X 20'	DIESEL
SC2	ST620	TRACK MOUNTED SCREENING PLANT	6' X 20'	DIESEL

Conveyors	
Conveyor Number	Description
C1	CR1 to CR2
C2	CR2 to CR3
C3	CR2 to CR3
C4 & C12	SC2 to CR4
C5	SC! To C9
C6 & C7	Product Stackers
C8, C9 & C10	SC1 to CR4
C11	CR4 to SC2
C13	CR4 to C11
C14 & C15	Product Stackers

PROPOSED PLANT LAYOUT
(LAYOUT MAY CHANGE TO SUIT FIELD CONDITIONS, FINAL EQUIPMENT SELECTION, ETC.)

	DATE	REVISION	BY
D			
C			
B			
A			
–		INITIAL RELEASE	

TOLERANCES–UNLESS NOTED
FRACTIONAL: ± 1/16"
DECIMAL: ± 0.010"
ANGLE: ± 0.1°

Vulcan Materials Company

PLANT LAYOUT
PHASE #3

STATE: NOVA SCOTIA
PLANT: BLACK POINT
DRAWN BY: CB
DATE: 8/15/14
CHECKED BY:
DATE:
PROJ. NO.:
FILE SERVER:
SCALE: 1 : 33 1/3
SHEET 1 OF 1
DWG. NO.: 100-PLT-0003
REV.:

PRELIMINARY EQUIPMENT LIST

Screen Towers

Tower No.	Item No.	Description	Size	TPH	Total HP
ST1	SCR001	Scalping Screen	8x24 TD	2800	80
ST2W	SCR02B	Sizing Screen (West)	8x24 TD	1400	80
ST3W	SCR03C	Sizing Screen (West)	8x24 TD	903	80
	SCR03D	Sizing Screen (West)	8x24 TD	903	80
ST4W	SCR04D	Sizing Screen (West)	8x20 TD	361	50
	SCR04E	Sizing Screen (West)	8x20 TD	355	50
	SCR04F	Sizing Screen (West)	8x20 TD	361	50
ST5	SCR05A	Wash Screen (South)	10x20 TD	1500	100
	SCR05B	Wash Screen (North)	10x20 TD	1500	100

Crushers

Dwg. Label	Item No.	Description	Size	TPH	Total HP
C1	CRS001	Gyratory	54x74	2800	500
C2	CRS002	Secondary Standard	MP1000	2259	1000
C3A	CRS03A	Tertiary Short Head (West)	H8800	590	1000
C4A	CRS04A	Tertiary Short Head (West)	H6800	269	450
C5A	CRS05A	Tertiary Short Head (West)	H6800	269	450

Conveyors:

Name	Description
CNV001	Primary Crusher to Transfer 1
CNV002	Transfer 1 to Primary Surge
CNV003	Primary Reclaim to Scalping Tower
CNV004	Scapling Tower to Secondary Surge
CNV005	Base Stacker
CNV006	Secondary Surge Reclaim
CNV007	Tower 2 to CNV008 Stacker, 1 1/2x1
CNV008	Stacker, 1 1/2x1
CNV09A	Tertiary Discharge Belt To Transfer 1
CNV10A & B	Transfer 1 To Tower 3
CNV11A & CNV12A	Tower 3 to H6800 Crushers
CNV013, CNV014	Tower 3 to 1x3/4 Pile
CNV015, CNV016	Tower 3 to 3/4x1/2 Pile
CNV17A & B, CNV18A, B & C	Tower 3 to Tower 4
CNV019, CNV020	Tower 4 to CNV020 to 1/2x3/8 Pile
CNV021, CNV022	Tower 4 to CNV022 to 3/8x#8 Pile
CNV23A	Tower 4 to CNV011A & B
CNV024, CNV025	Tower 4 to Screenings Pile
CNV026	Base/Screengs Reclaim
CNV027	Fraction Reclaim
CNV028, CNV29A & B	Fraction Reclaim to Wash Tower
CNV030	Sand Screws to Reclaim
CNV031	Wash Tower Bypass Belt
CNV032	Wash Tower to Tripper
CNV033, CNV034, CNV035	Tripper and Stackers
CNV036, CNV037, CNV038	Reclaim to Ship Loader
CNV039A & B	Ship Loader

PROPOSED PLANT LAYOUT
(LAYOUT MAY CHANGE TO SUIT FIELD CONDITIONS, FINAL EQUIPMENT SELECTION, ETC.)

100 GRAPHIC SCALE – METERS 0 100 200

GRAPHIC SCALE – FEET 100 0 100 200 300 400 500 600

	DATE	REVISION	BY
D			
C			
B			
A			
–		INITIAL RELEASE	

TOLERANCES–UNLESS NOTED
FRACTIONAL: ± 1/16"
DECIMAL: ± 0.010"
ANGLE: ± 0.1°

Vulcan Materials Company

PLANT LAYOUT
PHASE #4

STATE: NOVA SCOTIA
PLANT: BLACK POINT
DRAWN BY: CB
DRAWN DATE: 6/27/14
CHECKED BY:
CHECKED DATE:
PROJ. NO.:
FILE SERVER:
SCALE: 1:33 1/3
SHEET 1 OF 1
DWG. NO.: 100-PLT001-0004
REV.: REV

PRELIMINARY EQUIPMENT LIST

Screen Towers

Tower No.	Item No.	Description	Size	TPH	Total HP
ST1	SCR001	Scalping Screen	8x24 TD	2800	80
ST2E	SCR02A	Sizing Screen (East)	8x24 TD	1400	80
ST3E	SCR03A	Sizing Screen (East)	8x24 TD	903	80
	SCR03B	Sizing Screen (East)	8x24 TD	903	80
ST4E	SCR04A	Sizing Screen (East)	8x20 TD	361	50
	SCR04B	Sizing Screen (East)	8x20 TD	355	50
	SCR04C	Sizing Screen (East)	8x20 TD	361	50
ST2W	SCR02B	Sizing Screen (West)	8x24 TD	1400	80
ST3W	SCR03C	Sizing Screen (West)	8x24 TD	903	80
	SCR03D	Sizing Screen (West)	8x24 TD	903	80
ST4W	SCR04D	Sizing Screen (West)	8x20 TD	361	50
	SCR04E	Sizing Screen (West)	8x20 TD	355	50
	SCR04F	Sizing Screen (West)	8x20 TD	361	50
ST5	SCR05A	Wash Screen (South)	10x20 TD	1500	100
	SCR05B	Wash Screen (North)	10x20 TD	1500	100

Crushers

Dwg. Label	Item No.	Description	Size	TPH	Total HP
C1	CRS001	Gyratory	54x74	2800	500
C2	CRS002	Secondary Standard	MP1000	2259	1000
C3A	CRS03A	Tertiary Short Head (West)	H8800	590	1000
C4A	CRS04A	Tertiary Short Head (West)	H6800	269	450
C5A	CRS05A	Tertiary Short Head (West)	H6800	269	450
C3B	CRS03B	Tertiary Short Head (East)	H8800	590	1000
C4B	CRS04B	Tertiary Short Head (East)	H6800	269	450
C5B	CRS05B	Tertiary Short Head (East)	H6800	269	450

Conveyors:

Name	Description
CNV001	Primary Crusher to Transfer 1
CNV002	Transfer 1 to Primary Surge
CNV003	Primary Reclaim to Scalping Tower
CNV004	Scapling Tower to Secondary Surge
CNV005	Base Stacker
CNV006	Secondary Surge Reclaim
CNV007	Tower 2 to CNV008 Stacker, 1 1/2x1
CNV008	Stacker, 1 1/2x1
CNV09A & B	Tertiary Discharge Belt To Transfer 1
CNV10A, B, C & D	Transfer 1 To Tower 3
CNV11A & B, CNV12A &B	Tower 3 to H6800 Crushers
CNV013, CNV014	Tower 3 to 1x3/4 Pile
CNV015, CNV016	Tower 3 to 3/4x1/2 Pile
CNV17A thru D, CNV18A thru F	Tower 3 to Tower 4
CNV019, CNV020	Tower 4 to CNV020 to 1/2x3/8 Pile
CNV021, CNV022	Tower 4 to CNV022 to 3/8x#8 Pile
CNV23A & B	Tower 4 to CNV011A & B
CNV024, CNV025	Tower 4 to Screenings Pile
CNV026	Base/Screengs Reclaim
CNV027	Fraction Reclaim
CNV028, CNV29A & B	Fraction Reclaim to Wash Tower
CNV030	Sand Screws to Reclaim
CNV031	Wash Tower Bypass Belt
CNV032	Wash Tower to Tripper
CNV033, CNV034, CNV035	Tripper and Stackers
CNV036, CNV037, CNV038	Reclaim to Ship Loader
CNV039A & B	Ship Loader

	DATE	REVISION	BY
D			
C			
B			
A			
–		INITIAL RELEASE	

TOLERANCES–UNLESS NOTED
FRACTIONAL: ± 1/16"
DECIMAL: ± 0.010"
ANGLE: ± 0.1°

Vulcan Materials Company

PLANT LAYOUT
PHASE #5

STATE: NOVA SCOTIA
PLANT: BLACK POINT
DRAWN BY: CB
DATE: 6/27/14
CHECKED BY:
DATE:
PROJ. NO.:
FILE SERVER:
SCALE: 1:33 1/3
SHEET 1 OF 1
DWG. NO.: 100-PLT001-0005
REV.: REV