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REPORT

Environmental Assessment Registration Leitches Creek Quarry Expansion Project

Alva Construction Limited

PROJECT NO. 1005042.

PROJECT NO. 1005042.

TO

Alva Construction Limited
PO Box 1193
Antigonish, NS B2G 2L6

FOR

Environmental Assessment Registration
Leitches Creek Quarry Expansion Project

April 3, 2006

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EXECUTIVE SUMMARY

Alva Construction Ltd. proposes to expand the footprint of its existing quarry in Upper Leitches Creek, Cape Breton Regional Municipality, Nova Scotia. The proposal will allow continued aggregate production (blasting, crushing and stockpiling) to supply various construction and road building projects and activities. Quarry advancement and aggregate production at the quarry is limited by the need for additional quarry area beyond the existing permitted area. The proposed activities will take place over the next 20 years eventually expanding the quarry to a total of approximately 22 ha of land.

The quarry began operations under the current owners in June, 2005 and since then has produced approximately 200,000 tonnes of aggregate. The anticipated maximum production rate is 500,000 tonnes per year. A higher production rate is possible for limited periods of time should a large contract be awarded. The potential operating schedule is 24 hrs/day, 5 days/week, 40 weeks per year, or more, depending on weather and demand for aggregate. It should be noted that the quarry is not likely to be in production year round at that rate; but, the Proponent would like the flexibility to operate on a high production schedule should a large local contract be awarded to the quarry. Trucking operations will not begin before 7:00 AM. The estimated rock reserves in the proposed expansion area are in excess of five million tonnes.

Proposed Project activities will be consistent with current quarry operations approved by Nova Scotia Environment and Labour and in accordance with the Nova Scotia Pit and Quarry Guidelines (NSEL 1999). Aggregate production will begin with drilling and blasting, which will be conducted by a qualified blasting contractor. Blasting will take place approximately six to ten times per year, between April and December. Portable crushing equipment will be brought to the site to process the blasted rock as required. Aggregate will be stockpiled at the quarry site until sold and transported to local markets via tandem trucks or tractor trailer trucks.

Alva Construction Ltd is required to register this project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and Environmental Assessment Regulations. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from the NSEL for the quarry operation, and the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act* (2003). Provincial guidelines to be adhered to include the Nova Scotia Pit and Quarry Guidelines (NSEL 1999).

This environmental assessment registration evaluates the potential environmental effects of the Project and identifies appropriate mitigation and monitoring to minimize these effects. The document focuses on those aspects of the environment of most concern. Components evaluated include:

- fish and fish habitat;
- rare and sensitive flora;
- wetlands;
- wildlife;
- groundwater resources;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

Environmental effects of the quarry expansion will include the loss of terrestrial habitat within the proposed quarry expansion area. Field surveys conducted to date indicate that this area does not include unique habitat or rare or sensitive species; therefore, these effects are not anticipated to be significant. Assuming the mitigative measures specified in this report are implemented, and the quarry is operated according to existing provincial guidelines and approvals, no significant adverse residual environmental or socio-economic effects are likely. Continued operation of the quarry is likely to result in economic benefits, including employment and ongoing business opportunities.

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1.0 PROPONENT AND PROJECT IDENTIFICATION

1.1 Proponent Information

Alva Construction Limited (Alva Construction; the Proponent) is a Nova Scotia company conducting construction and materials related business since 1993. Alva Construction owns and/or operates five quarries in Nova Scotia that are permitted to supply aggregates to the general public and provincial highway projects. A copy of Registry of Joint Stocks is included in Appendix A.

Name of the Proponent:	Alva Construction Ltd.
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Tel.:	(902) 863-6445
Fax:	(902) 863-6446

Company President, Chief Executive Officer and/or Environmental Assessment Contact

Name:	A. G. MacDonald
Official Title:	Secretary – Treasurer
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Name:	Angela Swaine
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Address:	Jacques Whitford Environment Limited 3 Spectacle Lake Drive Dartmouth, NS B3B 1W8
Tel.:	(902) 468-7777
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March 28, 2006

Signature of Secretary – Treasurer **Date**

1.2 Project Information

Name of the Undertaking:	Leitches Creek Quarry Expansion Project
Location of the Undertaking:	Cape Breton Regional Municipality, Nova Scotia

2.0 PROJECT INFORMATION

2.1 Description of the Undertaking

Alva Construction owns and operates an existing quarry near Upper Leitches Creek, Cape Breton Regional Municipality, NS (Figure 2.1 and 2.2). An Industrial Approval (No. 2004-043800), pursuant to Part V of the Nova Scotia *Environment Act*, was issued by Nova Scotia Environment and Labour (NSEL) on December 20, 2004. This approval allows for construction and operation of the quarry, four hectares in area. A copy of the permit is appended to this report (Appendix B).

Alva Construction proposes to expand its quarry to allow for continued aggregate production (blasting, crushing, and stockpiling) and intends to supply various construction and road building projects and activities. The expansion includes 18 ha of land immediately adjacent to the existing quarry. Alva Construction owns the existing quarry lands as well as the surrounding lands, which will effectively allow for an expansion of its operation.

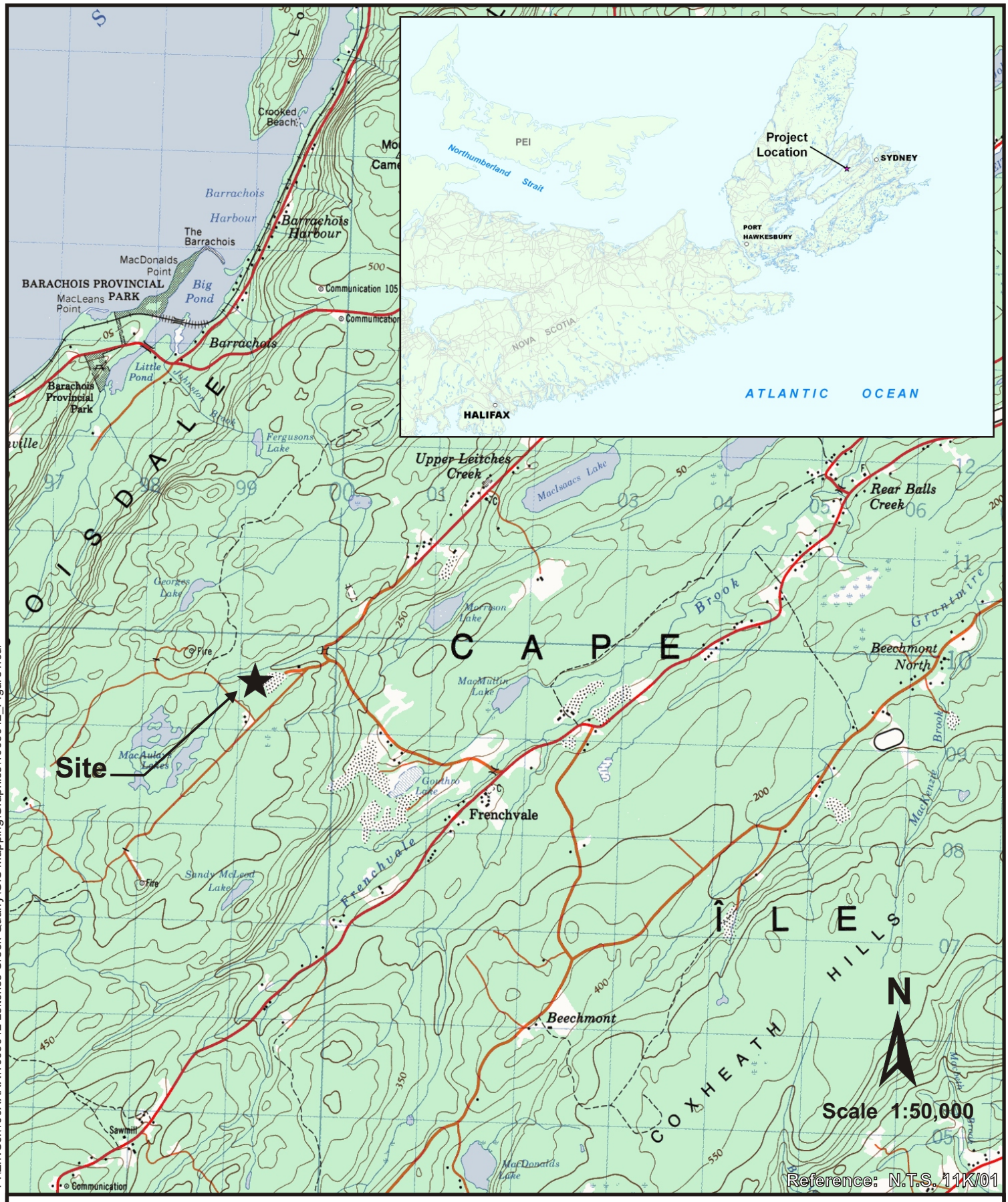
The quarry began operations under the current owners in June, 2005 and since then has produced approximately 200,000 tonnes of aggregate. Operations at the quarry began in 1985 by a different owner. The quarry operated sporadically up until Alva took over ownership and operations. The anticipated maximum production rate is 500,000 tonnes per year. A higher production rate is possible for limited periods of time should a large contract be awarded. The potential operating schedule is 24 hrs/day, 5 days/week, 40 weeks per year, or more, depending on weather and demand for aggregate. This is consistent with the present schedule at the quarry and the Proponent does not load trucks before 7:00 am. It should be noted that the quarry is not likely to be in production year round at that rate; but, the Proponent would like the flexibility to operate on a high production schedule should a large local contract be awarded to the quarry. Trucking operations will not begin before 7:00 AM. The estimated rock reserves in the proposed expansion area are in excess of five million tonnes.

The working face on average, is approximately 13 m in height and does not go below the natural water table (*i.e*., the quarry floor is not under water and has not flooded since the quarry opened). Alva Construction will continue to excavate from the working face and will not excavate deeper into the quarry floor. Quarry operations will continue to take place over the next 20 years, depending upon the demand for aggregate in the area.

2.2 Geographical Location

The quarry is located near Upper Leitches Creek at the corner of Upper Leitches Creek Road and Tower Road, Cape Breton County, NS. Entrance to the quarry is via an access road, approximately 50 metres (m) in length, from a publicly owned tertiary road. Entrance to the tertiary road is from the first exit along Highway 223 near Leitches Creek (Figure 2.1 and 2.2). The proposed quarry expansion area is bound to the west by Tower Road, to the south by Upper Leitches Creek Road, to the north and east by a small stream (unnamed tributary) and forested lands.

Residential development in the immediate vicinity of the Project is low (*i.e.,* two residences within a 800 m radius of the quarry). The nearest communities are Upper Leitches Creek, approximately 3 km to the northeast, Frenchvale, approximately 2.5 km to the southeast, and Barrachois, approximately 3.5 km to the north.

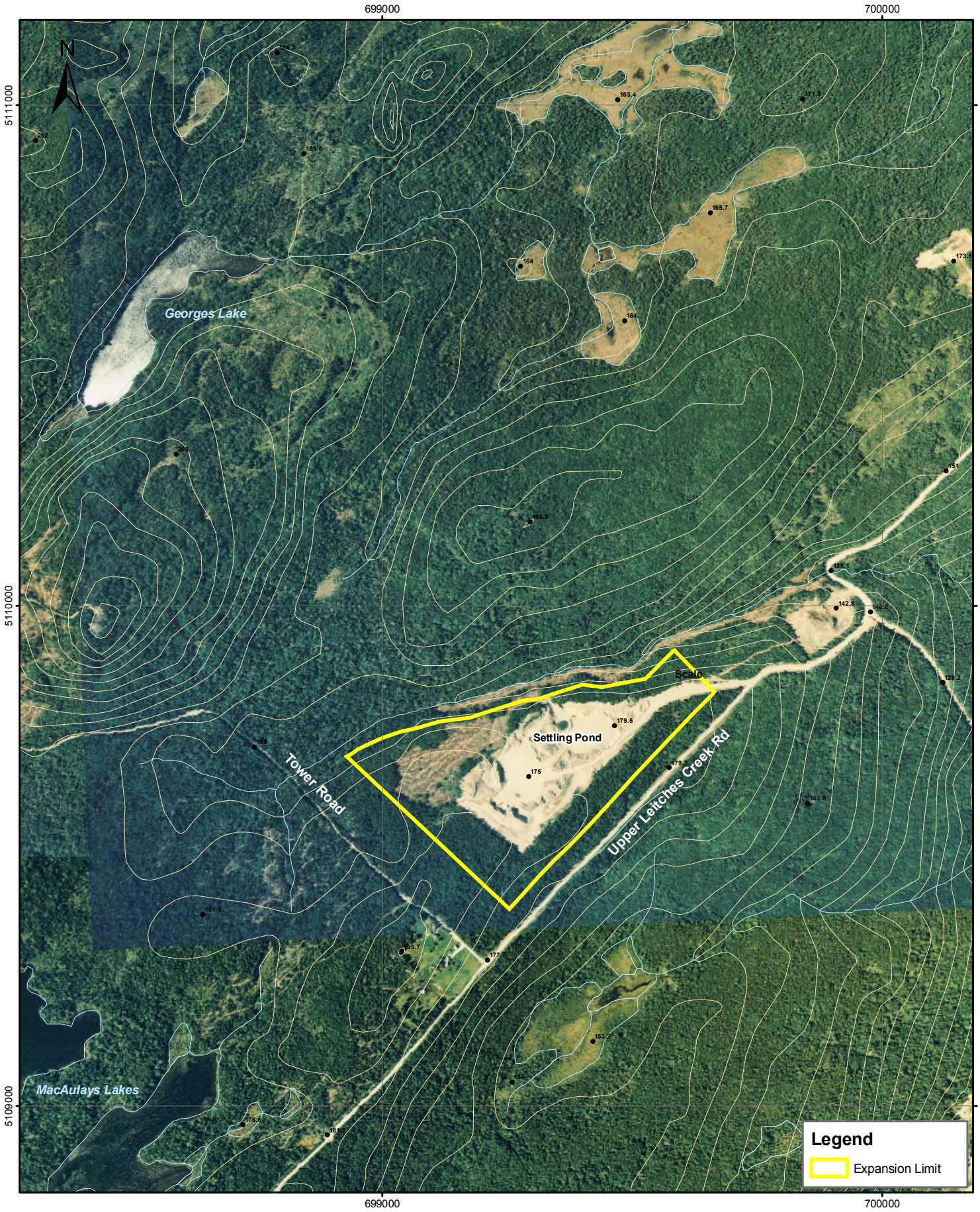


P:\EnvSci\100XXXX\1005042 Leitches Creek Quarry\GIS Mapping\Graphics\1005042_Figure1.cdr

FIGURE 2.1

Leitches Creek, Nova Scotia
General Site Location and Topography

Jacques Whitford



Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:10,000
Date: January 2006
Proposal No. 1005042

Figure 2.2
1999 Aerial Photography

Leitches Creek
Quarry Expansion Project

Jacques Whitford

A thin discontinuous surface of stony till plain overlying Hadrynian aged granodiorite and diorite bedrock covers the proposed quarry expansion area. Located in the Biosdale Hills region of the North Bras d'Or Uplands, the site is formed by undulating folding and minor faulting. Avalon crustal material is the primary component of the hills in the area, predominantly from the Precambrian period.

2.3 Physical Components

The existing quarry operation consists of a laydown area for the portable crushing equipment, various aggregate stockpiles, quarry floor and working face, settling pond, scale and scale house, and access road. There is no fuel storage, storage of dangerous goods, pipelines, port facilities or railways associated with the existing facility, and none are proposed for the quarry expansion.

Topsoil and overburden that have been stripped prior to drilling and blasting are stored on site for subsequent use during site reclamation. This practice will continue throughout the development and operation of the proposed expansion area.

The laydown area is located on the quarry floor. The surface area of the expanded quarry floor will be approximately 22 ha. The crushing equipment is transported to the site as required (*i.e.,* after blasting). Presently, aggregate stockpiles are located in various locations within the quarry limits, as space allows. As the quarry expands and additional space on the quarry floor is created, a dedicated stockpile area will be established. Surface runoff and quarry drainage are collected on the quarry floor, which has the capacity to hold a significant quantity of water. Overflow from the quarry floor drains to a settling pond located in the north corner of the existing operation (Figure 2.2). Overflow from the pond is directed in a northward direction into an unnamed stream.

The nearest residence is approximately 94 m from the boundary of the proposed quarry expansion limits. As shown in Figure 2.3, there is one residence/structure within 1 km of the quarry and three within 2 km. The general direction of quarry advancement will be south. Rock will be sampled and tested regularly to confirm the suitability of the aggregate and confirm that the acidic rock has/will not be encountered/disturbed. To date, quarry rock sampled and analyzed was not acid producing (refer to Section 5.6).

2.4 Site Preparation and Construction

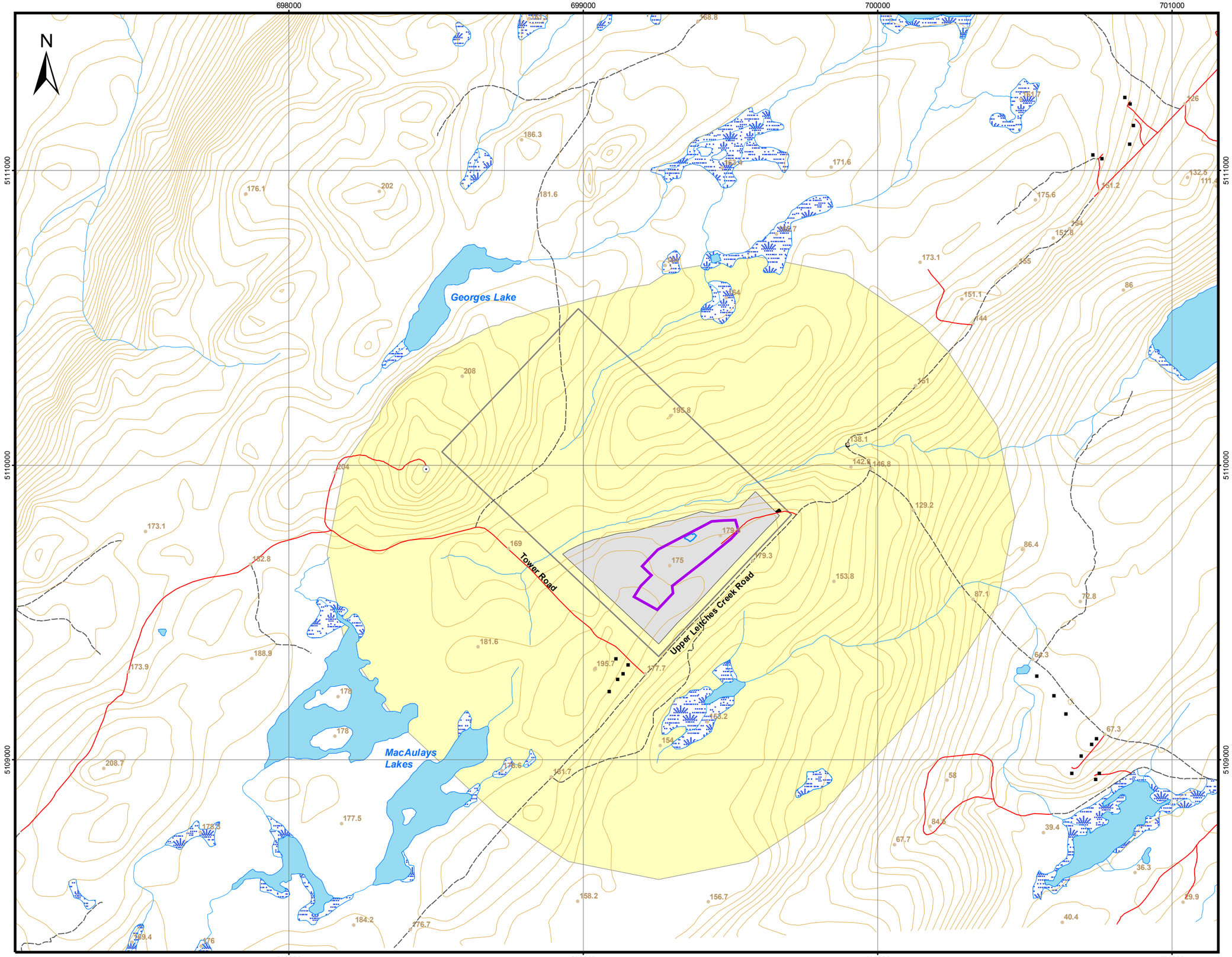
Alva Construction purchased the property in December, 2004. Timber had been previously harvested from the site. Access to the existing quarry development is along existing roads, likely constructed during earlier industrial activities. The quarry access road was upgraded in order to accommodate the truck traffic. Drainage ditches were installed along the access road to maintain drainage. Alva Construction has been actively encouraging the Nova Scotia Department of Transportation and Public Works to provide upgrades to the road in this area in support of quarry activities and community concerns.

To minimize the potential for erosion and sedimentation, grubbing and removal of overburden has been and will continue to be conducted on an as needed basis, to accommodate drilling and blasting activities. Topsoil, grubbed material and overburden are stockpiled on site and have been stabilized with hydroseed for subsequent use during rehabilitation. These stabilization procedures will continue throughout the operations of the proposed expansion.

Figure 2.3

Proposed Expansion Area

Leitches Creek Quarry Expansion Project



Map Features

- Buildings
- Bridge
- Major Highway
- Collector
- Paved Road
- Unpaved Road
- Rail
- Contour (5m)
- Watercourse
- Waterbody
- Wetland
- Current Permitted Area
- Expansion Limit
- Property Boundary
- Separation Distance (For Blasting)

0 125 250 500

Meters

Map Parameters
Projection: UTM/NAD83/Z20
Scale 1:12,000
Date: January 2006
Project No.: 1005042

Jacques Whitford

Quarry drainage and surface runoff collects on the quarry floor. Overflow from the quarry floor is directed to a settling pond located in the northwest corner of the existing developed area. Additional surface water management capacity will be created, as needed, as the quarry develops. At present, there is little overflow from the settling pond as the majority of the water collected on the quarry floor and in the settling pond infiltrates into the floor and/or evaporates. Overflow from the pond is directed toward the unnamed stream that drains in a northward direction, approximately 100 m from a watercourse.

A number of monitoring wells will be installed within the proposed quarry expansion area. Groundwater levels will be monitored regularly to assist with quarry development and water management as well as to identify effects on groundwater levels and potential effects to other groundwater users (refer to section 5.6).

2.5 Operation and Maintenance

2.5.1 Quarry Operation Activities

The proposed Project activities will be consistent with the current quarry operations approved by NSEL (Approval No.2004-043800) and future updates and will be in accordance with the Pit and Quarry Guidelines (NSEL 1999). These guidelines apply to all pit and quarry operations in the province of Nova Scotia and provide: separation distances for operations, including blasting; liquid effluent discharge level limits; suspended particulate matter limits; sound level limits; and requirements for a rehabilitation plan and security bond.

The Proponent intends to continue working along the present existing face of the quarry. Aggregate production begins with drilling and blasting. It is anticipated that blasting will occur 6 to 10 times per year between April and December which is consistent with current practice. A qualified blasting company will conduct this work. The blasting sub-contractor is responsible for blast designs and methods in accordance with the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act* (2003). Blasting activities will be conducted in accordance with the Pit and Quarry Guidelines.

The blasted rock will be processed by portable crushing equipment transported to the quarry site. The various aggregate products will be stockpiled in designated areas within the quarry. Piles will be built in layers to minimize segregation and prevent contamination by mixing of different piles. Material is hauled and moved within the quarry using loaders.

Products will be transported from the quarry via tandem and tractor trailer trucks along the Upper Leitches Creek Road, possibly along Highways 223 and 125 to the local markets. Since the quarry opened in 2005, the number of truck trips per day hauling aggregates has averaged between 100 and 150 (round trips). The volume of trucks per day depends on market demand. For example, if a large supply contract were awarded to the quarry (*i.e.,* a large highway construction project), it is anticipated that the volume of trucks per day would remain at 150 for short intervals (*i.e.,* up to four weeks) throughout the duration of the supply contract. There may be times (*e.g.,* winter) when there is no activity or trucking at the quarry.

The existing quarry currently employs five full time seasonal employees. The expansion may require up to ten seasonal employees. Drilling and blasting activities involve additional resources; these activities are sub-contracted to a professional blasting company. Hauling of materials from the quarry also involves additional resources.

2.5.2 Effluents and Emissions

In accordance with best practices and standard NSEL requirements, runoff controls will be in place to ensure that effluent generated during operations is managed appropriately. Surface runoff at the quarry collects on the quarry floor. The quarry floor has the capacity to contain/retain a significant volume of runoff (*i.e.*, greater than 3,000 m^3). Overflow from the quarry floor drains to a settling pond constructed in the north corner of the developed area. The majority of runoff collected evaporates or infiltrates. Overflow from the settling pond drains to the north, approximately 100 m from an unnamed stream. The existing containment/retention capacity is more than adequate for the existing facility. The containment/collection capacity of the quarry floor will increase as the quarry expands. Additional ponds will be installed, as required, in accordance with NSEL's Erosion and Sedimentation Control Handbook for Construction Sites (NSEL 1988) and the quarry's approval to operate (and future updates), and in consultation with NSEL's engineers/inspectors.

A hydrological review of the Leitches Creek Quarry and the proposed expansion was conducted by Hydro-Com Technologies Limited (refer to Appendix C). The report is based on criterion that are widely used throughout the Maritimes (6 hour duration, 25 year return period). As the majority of the sediment transport occurs during a large number of relatively low-return period events (*e.g.,* minor storm events), rather than the small (or infrequent) number of large return period events, the sediment trapping efficiency of the pond is based on a reasonable runoff volume (hence the 6 hour duration, 25 year return period criterion). It should however be noted that the hydraulic control infrastructure (spillways, freeboard and channels) is designed to accommodate a 100 year return period event. Although the pond will not be trapping sediment during a severe storm event, it will be able to pass the peak flows associated with this large event without taking structural damage of failing.

The report states that a reduction in evapotranspiration and a subsequent increase in the volume of surface runoff will occur as a result of the quarry development. It was determined that, based on the expansion area, the required capacity of the settling ponds should have a volume of no less than 4,700 m^3 in order to accommodate site runoff and drainage from the quarry at the proposed ultimate level of development (*i.e.*, assuming the entire proposed expansion is developed).

The report concluded that the effects on the downstream flows (*i.e.*, an increase of approximately 4.0% at the culvert along the Upper Leitches Creek Road) and on water quality (*i.e.*, sediment loading) associated with the proposed ultimate level of quarry development can be fully mitigated using the placement of free-draining material (*i.e.*, rock/gravel) and properly sized flow retention structures (or holding areas along the quarry floor). Following the use of these mitigative measures, the remaining residual effects on downstream flows and water quality are expected to be minor.

Overflow from the settling pond(s), if any, will be monitored weekly (during overflow conditions) and sampled according to the terms and conditions of the existing approval (and future updates) and the Pit and Quarry Guidelines to ensure total suspended solids levels do not exceed the approved final effluent discharge limits. In the unlikely event that overflow exceeds final effluent discharge limits as determined through monitoring, contingency measures may include pumping of sediment laden water away from watercourses or through filter bags for additional filtration and/or use of additional filtration devices or structures.

Dust emissions will be controlled with the application of water, obtained from the water contained in the settling pond or water that is pooled on the quarry floor. To minimize generation of dust, the working

areas and laydown areas will be covered with blasted rock. Stockpiled topsoil and overburden material will be seeded and covered with hay. Monitoring of airbourne particulate emissions (dust) will be conducted at the request of NSEL and in accordance with the Pit and Quarry Guidelines and the Nova Scotia Air Quality Regulations.

Combustion emissions will be generated from the operation of vehicles and equipment. Given the scope of the planned operations, these emissions will be minimal and localized. Emissions will be reduced through proper equipment maintenance and inspection. Consideration will be given to methods to reduce idling, as feasible. Ambient air monitoring will be conducted at the request of NSEL.

As per the Pit and Quarry Guidelines, sound levels from quarry operations will be maintained at a level not to exceed the following sound levels (Leq) at the property boundaries:

Leq 65dBA 0700-1900 hours (Days)
60dBA 1900-2300 hours (Evenings)
55dBA 2300-0700 hours (Nights)

In September 2005, Alva Construction undertook a noise monitoring program to determine noise levels from quarry site activities detectable from the Project boundary and the nearest receptor of the quarry site (Appendix D). The noise monitoring program was undertaken by an independent consultant (Jacques Whitford) and concluded that site activity may be distinguishable from wind or other background noises by the human ear, dependent on the source frequency, however the overall levels measured can be considered low. There were a few one-minute events more than 10 dBA over the average which occurred at Tower Lane. These may have been due to activity on the property, or small animals or insects near the recording device. These are considered random events that generally do not affect the overall noise levels. Future sound monitoring will be conducted at the request of NSEL.

Solid waste generated on-site will be minimal (office and domestic refuse). All solid waste will be properly collected and stored until such time that it can be transported to a provincially approved waste disposal facility.

2.5.3 Hazardous Materials and Contingency Planning

There is no planned storage of hazardous materials or petroleum products at the quarry site. A qualified company will be contracted to conduct regular maintenance of equipment. Used oil and filters are presently and will continue to be removed from the site.

Refuelling of equipment will be conducted onsite on a regular basis, under contract by a tanker truck. Refuelling activities will not be conducted within 100 m of any surface water, and equipment operators will remain with the equipment at all times during refuelling in accordance with the Petroleum Management Regulations of the Nova Scotia *Environment Act*. Refuelling activities will take place only on a low permeability surface.

Spill response materials will be available on site for immediate clean up in the event of a spill during refueling. In the event of a leak or spill during refuelling, maintenance, or general equipment operation, immediate action will be taken to stop and contain the spilled material. All contaminated material will be collected and stored in an appropriate manner so as not to be re-released to the environment until such time as it will be transported to an approved treatment/disposal facility. All spills will be reported to the 24-hour environmental emergencies reporting system (1-800-565-1633) in accordance with the Emergency Spill Regulations of the Nova Scotia *Environment Act*.

2.6 Decommissioning and Reclamation

Alva Construction will undertake a progressive rehabilitation program at the quarry site. The rehabilitation process at the quarry began during initial site development with the preservation of topsoil for future revegetation of the quarry. As distinct areas within the quarry become inactive, the area will be graded to a stable slope (minimum of 2:1), covered with topsoil, and seeded. Using native species seed mixes if feasible. Care will be taken to ensure that plants used in revegtation are not known to be invasive. At the end of the quarry operation (within six months of abandonment), rehabilitation will consist of: grading and contouring of all slopes and exposed rock faces in consideration of rock falls, slope stability, and safety; spreading existing stockpiled topsoil; and hydroseeding. The laydown area and settling ponds within the quarry, which is covered with quarried materials, will be graded, as required, and levelled to allow for future commercial, industrial, recreational, or residential land use. Wetland creation during rehabilitation will be considered as an option for compensation for loss of wetland habitat during quarrying. A reclamation plan will be developed for the site and submitted to NSEL. The proponent plans to reclaim part of the existing quarried area this year and maintain a progressive schedule of reclaiming every second operational year.

3.0 SCOPE

3.1 Scope of the Undertaking

The proposed Project, as described in Section 2.0, consists of expansion of the existing quarry footprint to allow for continued quarry development and additional stockpiling. The following is a description of the spatial and temporal boundaries of the proposed Project to be considered in the assessment.

The facilities and infrastructure associated with the existing quarry includes: an access road with gate; various aggregate stockpiles; topsoil and overburden stockpiles; the quarry floor/laydown area (for portable crushing equipment); a scale and scale house; the working face and a settling pond. Additional facilities and infrastructure associated with the proposed expansion will likely include additional aggregate stockpile areas and additional flow retention structures, as required.

Expansion of the quarry will be initiated within two years following approval from NSEL, as the existing developed area becomes depleted of aggregates. The proposed expansion area will cover a total of approximately 18 ha. Setback distances described in the Pit and Quarry Guidelines will be adhered to.

Alva Construction will undertake progressive rehabilitation activities at the quarry. Refer to Section 2.6 for additional information related to decommissioning and abandonment activities.

3.1.1 Purpose and Need for the Undertaking

The purpose for the Project is to allow Alva Construction to expand the existing quarry footprint and continue operations at their quarry at Leitches Creek. The quarry is currently operating under Approval No. 2004-043800, issued by NSEL on December 20, 2004. This permit is for a quarry operation of up to four hectares. A copy of the NSEL Approval is included in Appendix B. The areas regulated by this approval are near depletion.

The aggregates produced at the quarry are an important requirement in municipal and residential construction projects in the region and are of an appropriate quality for highway construction and maintenance projects. Alva Construction anticipates the source material in the proposed expansion area to be of similar quality to the material currently extracted at the existing quarry.

The quarry under consideration as well as other quarries in Nova Scotia are an important component of the natural resource sector of the economy and provide essential raw materials to the province's construction industry. The quarry also provides direct and indirect employment for its workers and suppliers, as well as for the transportation and construction industries.

3.1.2 Project Alternatives

Other methods for carrying out the undertaking may include different methods of extraction of the resource and alternative facility locations. The current method of aggregate extraction at the Leitches Creek Quarry is drilling and blasting. Alternative methods for extraction of the rock (*i.e.* mechanical means) are not practical or feasible in this instance due to the nature and characteristics of the rock (*e.g.,* hard and dense). Therefore, there are no feasible alternatives to drilling and blasting as a means of extracting this material.

An alternative facility location is also not a feasible alternative. Expansion of the quarry will not require the construction of any new facilities (*i.e.*, roads or buildings), as the existing facilities are sufficient for the current and expanded operations. Additional flow retention structures will be installed/constructed as the quarry develops to accommodate the additional surface runoff and quarry drainage. Relocation of the quarry to another location may likely require development of a new site, construction of new facilities, and would potentially have greater effect on the surrounding biophysical and socio-economic environment.

3.2 Scope of the Environmental Assessment

The proposed Project involves expansion of a quarry footprint. The Project must therefore be registered for an Environmental Assessment under the Environmental Assessment Regulations of the Nova Scotia *Environment Act* as a Class I Undertaking. This report fulfils the primary requirements for project registration under this legislation.

Other relevant provincial regulations and guidelines include the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act* and the Nova Scotia Pit and Quarry Guidelines (NSEL 1999). Relevant federal legislation and policies include the *Species at Risk Act*, *Fisheries Act*, *Migratory Birds Convention Act*, Wildlife Policy for Canada, the Federal Water Policy, the Toxic Substances Management Policy, and the federal strategy for pollution prevention.

The scope of the environmental assessment in relation to the proposed Project has been determined by the Proponent and their consultant and is based upon: the proposed Project elements and activities; the professional judgement and expert knowledge of the study team; consultations with the public and regulatory authorities on this and similar projects; and the results of field studies conducted in support of this environmental assessment. The *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSEL 2002) was also used to determine/focus the scope of the assessment and organize the environmental assessment document. The Proponent and their consultant met with NSEL on October 19, 2005, to discuss the location of proposed expansion, and elements and activities associated with the proposed Project, in an effort to further focus the scope of the assessment. Landowners adjacent to the quarry were also contacted (see Section 4.0) for the purpose of issues identification.

This environmental assessment evaluates the potential environmental effects of the proposed Project elements and activities, for all Project phases, with regard to each Valued Environmental Component (VEC) and Valued Socio-economic Component (VSC). VECs and VSCs are components of the biophysical and socio-economic environment and are selected in consideration of their value to stakeholders and their potential interactions with the Project. By assessing potential impacts on VECs/VSCs within the study boundaries, a meaningful evaluation of project effects on relevant environmental parameters is achieved. Components evaluated include:

- surface water resources and fish and fish habitat;
- rare and sensitive flora;
- wetlands;
- wildlife;
- groundwater resources;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

4.0 PUBLIC INVOLVEMENT

4.1 Methods of Involvement

In December 2005, a Project Information Bulletin (Appendix E) was distributed to residences located in proximity to the quarry or along the proposed trucking route. In total, 75 bulletins were distributed along Gouthro Road and Upper Leitches Creek Road. The purpose of the bulletin was to advise local residents and businesses immediately adjacent to the quarry (*i.e.*, those who are potentially most affected) of the proposed expansion and provide them with an opportunity to comment on the proposed undertaking. A letter was also posted December 2, 2005, to the Union of Nova Scotia Indians (Appendix E) to encourage the submission of comments, concerns, and questions regarding the Project. The consultation effort assisted with issues scoping and development of appropriate mitigation for potential adverse effects.

4.2 Stakeholder Comments and Steps Taken to Address Issues

A number of letters and a petition were received in response to the Project information bulletin that was distributed. A representative from Alva had eight separate meetings in January 2006, with local residents, in their homes to discuss issues and Alva's response to those issues. Table 4.1 summarizes the issues and Alva's response/proposed resolution.

TABLE 4.1 Summary of Stakeholder Comments and Concerns

Stakeholder	Issue/Concern	Response/Proposed Resolution
Local Resident	How will the proposed expansion affect the local water table?	The proponent will install monitoring wells (refer to Section 5.6) and will monitor groundwater levels on a regular basis. Potential environmental effects on groundwater flows are also addressed in Section 5.6.
Local Resident	Concerned about the use of jake brakes, speed of trucks, hours of operation number of trucks and the integrity of the roads.	Transportation, safety and noise related issues area addressed in Sections 5.8 and 5.9. Alva has been meeting with NSTPW to actively advocate for the upgrading of Leitches Creek Road for the benefit of quarry activities and the community.
Local Resident	Concerned about local wildlife and habitat. Traffic level, hours of operation, condition of the road. Noise and dust issues Property value	Fish and Fish Habitat, Rare and Sensitive Flora, Wetlands and Wildlife issues are addressed in Section 5.2, 5.3, 5.4 and 5.5, respectively. A representative from Alva Construction met with the local resident to discuss the issues. He indicated that the company had a meeting with truckers at the existing operation on January 11, 2006. At that time truckers were informed that they are expected to abide by the 60 km/h speed limit and that anyone arriving before 7 am will be sent to the back of the line so there is no value in arriving at the quarry any earlier. Additional issues related to traffic and road conditions are discussed in Section 5.9. Dust and noise issues are discussed in Section 2.2.5, 5.8 and 5.9. Expansion of an existing quarry operation is not likely to affect existing property values.

TABLE 4.1 Summary of Stakeholder Comments and Concerns

Stakeholder	Issue/Concern	Response/Proposed Resolution
Local Resident	Concerned about speed of trucking and arrival of trucks before 7 am	A representative from Alva Construction met with the local resident to discuss the issues. See response on truck traffic above. Additional issues related to traffic and road conditions are discussed in Section 5.9.
Local Resident	Fed up with existing condition of the road. Concerned about water table Issues with dust Happy about local jobs	A representative from Alva Construction met with the local resident to discuss the issues. Additional issues related to traffic and road conditions are discussed in Section 5.9. See response on groundwater above. Dust issues are discussed in Section 2.2.5.
Local Resident	Concerned about speed of trucking and noise associated with trucks	A representative from Alva Construction met with the local resident to discuss the issues. See response on truck traffic above.
Local Resident	Noise and vibration issues	A representative from Alva Construction met with the local resident to discuss the issues. During the conversation he determined that the noise/vibration may result from other sources since the quarry was inactive for a period when the noise/vibration was still experienced.
Local Resident	Road conditions/trucking Water supply/quality issues	A representative from Alva Construction met with the local resident to discuss the issues. See response on truck traffic above. Additional issues related to traffic and road conditions are discussed in Section 5.9. See response on groundwater above.
Local Resident	Trucking	A representative from Alva Construction met with the local resident to discuss the issues. See response on truck traffic above.

Further opportunities for public input will be provided through the provincial registration process when the document is published by NSEL.

To date, no comments have been received from the Union of Nova Scotia Indians.

5.0 VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS (VEC/VSC) AND EFFECTS MANAGEMENT

5.1 Methodology

Preliminary field studies were conducted by Jacques Whitford (JW) in September and October, 2005 and vegetation studies will be further conducted in late May/early June, 2006, to investigate and establish the existing conditions and to determine appropriate mitigation, if necessary, to minimize environmental effects from the proposed expansion Project. These surveys consisted of: vegetation survey; wetland survey; breeding bird survey; mammal survey; herpetile survey; and fish and fish habitat survey. These surveys were undertaken by qualified terrestrial and aquatic ecologists employed by JW. An assessment of potential archaeological and heritage resources was undertaken by a qualified archaeologist. A reconnaissance survey of road conditions was also conducted by a qualified transportation engineer. Additional information, in support of the field studies and the assessment, was gathered through a review of: air photos; site mapping; and other information sources, such as the Nova Scotia Museum, Statistics Canada, the Nova Scotia Department of Transportation and Public Works, and the Nova Scotia Department of Natural Resources.

Temporal and spatial assessment boundaries encompass those periods and areas within which the VECs and VSCs are likely to interact with, or be influenced by, the Project. Both the temporal and spatial boundaries for the assessment vary according to the VEC. Temporal boundaries are generally limited to the duration of, and for a period of time after, the Project activities. Spatial boundaries are generally limited to the immediate Project area unless otherwise noted.

In order to accurately assess the potential environmental effects of a project and determine the significance of an effect, it is important to consider the magnitude, frequency, duration, geographical extent and reversibility of the potential effect. The study team has considered these elements for each VEC/VSC as well as the following:

- negative effects on the health of biota;
- loss of rare or endangered species;
- reductions in biological diversity;
- loss of critical/productive habitat;
- fragmentation of habitat or interruption of movement corridors and migration routes;
- transformation of natural landscapes;
- discharge of persistent and/or toxic chemicals;
- toxicity effects on human health;
- reductions in the capacity of renewable resources to meet the needs of present and future generations; and
- loss of current use of lands and resources for traditional purposes by Aboriginal persons.

5.2 Fish and Fish Habitat

5.2.1 Description of Existing Environment

During a review of 1:50,000 scale NTS mapping, the site location map and aerial photographs, waterbodies within and immediately adjacent to the quarry expansion site were identified. One stream, was identified and in keeping with the standard approach used in Nova Scotia, a habitat characterization of was carried out within the Proponent's property boundaries. Based on mapping, the stream does not appear to drain MacAuley's Lakes (Figure 2.3).

Fieldwork was carried out on October 6, 2005 by two qualified JW biologists who walked the length of the Stream and surveyed the physical and biological parameters of the watercourse. An assessment of aquatic habitat consisted of identifying physical units (*i.e.,* riffles, pools, and runs), instream cover, substrate composition, stream depth and width, overhead cover, water colouration, and presence of fish. Combinations of stream flow, water depth, and substrate are major determinants of the quality of fish habitat for rearing and spawning. Photographs were taken along the stream to document habitat.

Much of the discussion of fish habitat in Nova Scotia is focused on trout and salmon, which belong to the Salmonid family. Salmonids are valued by society for their role in recreational fisheries. Further, salmonids are sensitive to anthropogenic disturbance. Consequently, their presence can be used as an indicator of environmental health and the conservation of salmonid stream habitat ensures the ecological integrity of aquatic systems, including the protection of lesser known biota. A categorical system for rating salmonid habitat is commonly employed when assessing streams. There are five categories based on substrate, water flow, and stream morphology, and are as follows:

Type 1: Good salmonid spawning and rearing habitat;

Type 2: Good salmonid rearing habitat with limited spawning habitat;

Type 3: Good rearing habitat with no spawning capabilities, or used for migratory purposes;

Type 4: Poor juvenile salmonid rearing habitat with no spawning capability; may provide shelter for older salmonids; and

Type 5: No habitat for rearing or spawning.

The habitat summary for the stream is presented below, with the salmonid habitat rating.

At the downstream property boundary, the channel width is 3 m wide with a wet channel width of 0.9m. Substrate composition consists of 40% gravel, 50% cobble, and 10% boulder. Banks appeared stable with little to no undercutting. Water was clear and instream cover consisted of leaves and woody debris. The right bank consisted of sparse aspen and ash trees forming an open forest. Rocks were covered with mosses, and grasses and ferns were observed along the water's edge. The left bank consisted of sparse evergreens and grasses along the water's edge. Amphibian species were observed along the left bank. Canopy cover overall was 100% at this point.

Heading upstream, the stream reveals a series of riffles and runs with small intermittent pools. Embeddedness remains low and overhead cover varies from 30% to 90%. At 20 m upstream, large ferns and goldenrods line the right bank while young hardwoods form a thick forest along the left bank. Substrate composition consisted of rocks, cobble, and boulders. Average depth in pools was 30 cm and little to some bank undercutting was apparent. At 160 m upstream a change in overall stream morphology was observed. Bank undercutting was apparent on the left side but poorly defined on the right. Channel width was 2.5 m and was predominantly flat with a few small riffles. The stream was braided at 220 m upstream with a goldenrod community as the separation vegetation. Shallow riffles proceeded and were followed by small pools and flats.

At 250 m upstream, a blow over was observed with piled debris on both banks and over the channel. Sand and gravel formed the substrate composition as well as brush and organic debris. At 270 m upstream, a feeder stream was observed along the steep side of a hill adjacent to the stream. The stream widened to 3 m channel width with wet channel width at 2 m. The stream was shallow with low energy riffle areas. Ferns, herbs, mosses, and alders aligned the left bank while grasses, tamaracks, and mosses aligned the right side. A cutover was observed on the right side to 1 m from the edge of the stream. Instream cover was high with overhanging vegetation.

From 520 m to the stream's crossing with Tower Road, the area was significantly cut over with little buffer zone protection. Slash pile debris was high and young growth was observed throughout the area. The channel became swampy with flats and some riffles. At 750 m upstream, the channel appears as multiple braids with poorly defined banks and with woody debris instream cover. Grasses, mosses, herbs, goldenrods, and alders aligned both banks. Substrate composition consisted of organic debris and mud. At the crossing with Tower Road, a 50 cm metal culvert was found but the water was 40 cm above the road bed. This stream can be classified as Type 3 salmonid habitat with good rearing habitat but no spawning capabilities. The stream has a decreased potential as fish habitat due to past forestry operations apparent on the banks of the channel.

5.2.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Alva Construction will maintain at least a 30 m treed buffer between the watercourse and quarry activities, although previous activities in the area (conducted by the former land owner), did not maintain a vegetated buffer. This will minimize the potential for environmental effects of the quarry operation on fish and fish habitat.

Clearing, grubbing, and topsoil stripping activities can increase the potential for sediment erosion and deposition downgradient, particularly during periods of heavy rainfall or snow melt. These activities will also result in a reduction of evapotranspiration and a corresponding increase in surface runoff, which in turn increases potential for sediment erosion and deposition. Placement of free-draining material (*i.e.,* blasted rock) over the disturbed areas and the use of properly sized flow retention structures is expected to mitigate erosion and sedimentation effects. As the quarry develops, exposed soil capable of producing sediment laden-runoff will be stabilized with blasted rock and stockpiles of topsoil and overburden will be stabilized with hydroseed for future use during rehabilitation. Additional retention capacity on the quarry floor will be created as the quarry develops and additional settling pond(s) will be installed, as needed (see Section 2.5.2). Surface runoff will be directed to the settling pond(s). Overflow from the final settling pond will be monitored weekly (during overflow periods) and sampled in accordance with the terms and conditions of the existing Approval (and future updates) and the Pit and

Quarry Guidelines to ensure suspended solids levels do not exceed the approved final effluent discharge limits. Monitoring and inspection may be conducted more frequently immediately after a storm event.

Blasting in and adjacent to watercourses can cause direct deleterious effects on fish health, death or damage to fish eggs and larvae, excessive dust deposited in streams, disturbance to the habitat, and introduction of acidic drainage if the bedrock contains sulphide mineralization. The buffer zone that will be maintained between quarry activities and the watercourse will minimize the potential physical effects of blasting. Blasting shall be conducted in accordance with the Pit and Quarry Guidelines and the Guidelines for Use of Explosives in Canadian Fisheries Waters (Wright and Hopky 1998).

In addition, blasting may result in chemical impacts on fish (*e.g.*, release of ammonia). Although ammonia is a nutrient required for life, ammonia is toxic in its ionic form, which occurs in high pH environments. Excess ammonia may accumulate in fish and cause alteration of metabolism or increases in body pH. Experiments have shown that the lethal concentration for a variety of fish species ranges from 0.2 to 2.0 mg/l. At present, Environment Canada has not identified a buffer zone between an area in which ammonia-based explosive are used and a freshwater system (Danie Dube, pers. comm. May 2004). Most of the studies to date have looked at the effects of ammonia discharge from wastewater, fertilizer, and pulp and paper activities directly into a freshwater system.

The Proponent will consider the use of non-ammonium nitrate based explosives where feasible. Due to the significant distance between the settling pond discharge and the watercourse (*i.e.*, at least 100 m), the relative infrequent use of explosives at the quarry (*i.e.*, five to six times per year, rarely more), and the nature of ammonia uptake in neutral pH environments, chemical impacts on the fish as a result of blasting are not likely to occur.

Based on the results of the fish and fish habitat assessment and the vegetated buffer zone of at least 30 m that will be maintained between quarry activities and the watercourse, there is limited potential for quarry activities to interact with fish and fish habitat. The placement of free draining material over all disturbed areas and the use of properly sized flow retention/siltation structures (or holding areas along the quarry floor) is expected to fully mitigate the potential increase in downstream sediment loading. As the amount of freshly exposed rock within the quarry is likely to remain relatively constant, the effects of the quarry on downstream water quality are expected to be relatively minor (*i.e.,* within regulated limits) and the downstream water quality should return to background levels following the termination of active quarrying operations. With the implementation of this mitigation and compliance with the existing Approval and the Pit and Quarry Guidelines, effects on fish habitat will be negligible.

In summary, significant Project-related effects on fish and fish habitat are not likely to occur.

5.3 Rare and Sensitive Flora

5.3.1 Description of the Existing Environment

The site was visited by JW botanists on September 22, 2005. An inventory of vascular plants visible and identifiable at this time was compiled for the habitats in the existing quarry and in the proposed expansion area. Much of the once forest habitat lying between the quarry pit and Upper Leitches Creek Road, and the southern section of the area between the quarry pit and Tower Road has been recently clear-cut. Formerly clear-cut areas with varying levels of intolerant hardwood dominated regeneration

are present in much of the northern section of the study area northeast of Tower Road. Forest cutting operations are evident outside of the study area along, and north of the unnamed stream. Areas of uncut forest are present along the edges of both roads and along the entry area to the quarry. Extant forest habitat is also present along the steepest slope south of the stream in the eastern side of the study area. This area is composed of six distinct habitat types. These include: mature mixed wood forest; deciduous tree dominated slope forest; recent clear cut forest; several year regenerating clear cut forest; disturbed weedy regeneration; and verges and tall shrub/ treed swamp.

Mature mixed wood forest habitat is primarily of a secondary nature and only averaging 40 years or less in age. Since the 1999 aerial photo this habitat's extent has diminished due to extensive clear cutting that has continued up to very recently. This habitat is extant near the beginning entry road into the quarry and extends as a narrow remnant band along Leitches Creek Road and up along Tower Road. A mix of red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), birches (*Betula papyrifera, B. cordifolia, and B. alleghaniensis*), trembling aspen (*Populus tremuloides*) and some American beech (*Fagus grandifolia*) comprise the dominant trees. In the shrub layers blueberry (*Vaccinium myrtilloides*), Possum-haw viburnum (*Viburnum nudum*), striped maple (*Acer pensylvanicum*), American fly-honeysuckle (*Lonicera canadensis*) honeysuckle and even the occasional beaked hazelnut (*Corylus cornuta*) are present. The ground vegetation varies with wild sarsaparilla (*Aralia nudicaulis*), wild lily-of-the-valley (*Maianthemum canadense*), dwarf dogwood (*Cornus canadensis*), northern starflower (*Trientalis borealis*) and ferns like mountain wood-fern (*Dryopteris campyloptera*), northern beech fern (*Phegopteris connectilis*), and bracken (*Pteridium aquilinum*) being abundant.

Deciduous tree dominated slope forest is present along the area northeast of the existing quarry and along a relatively steep, rock studded slope that descends to the small stream valley below. Sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), and American beech are common here, with a bit of fir and spruce also present. A few alderleaf viburnum (*Viburnum lantanoides*) are present amid more common shrubs here and species like large-leaf goldenrod (*Solidago macrophylla*), some Christmas fern (*Polystichum acrostichoides*), very few false Soloman's seal (*Maianthemum racemosum*), and red baneberry (*Actaea rubra*) suggest a more calcium available surface soil development here. Despite this, no rare species were noted.

Recently clear cut forest occupied much of the area north and west of Leitches Creek Road, beyond a narrow uncut edge along the road, to the south and southwest edge of the quarry and cleared ground along the margins. This area was formerly mixed forest habitat with scarce to no more than several years' regenerative growth. Remnants of the forest ground vegetation persist, as do some small shrub layer hardwood and softwood trees and shrubs. Birch and fire cherry (*Prunus pensylvanica*), red raspberry (*Rubus idaeus*) seedlings, and weedy species such as hawkweeds (*Hieracium caespitosum*, and *H. lachenalii*), bristly aralia (*Aralia hispida*) and grasses (*Agrostis capillaris*, *Anthoxanthum odoratum*) are also apparent. A small seepage streamlet evolves from patchy upslope seepage and supports various violets and other moisture loving plants more characteristic of wetlands like American bugleweed (*Lycopus americanus*) and Pennsylvania bitter-cress (*Cardamine pensylvanica*).

The regenerating clear-cut area within the Project area occurs east of Tower Road, over to roughly from the south corner of the quarry, and north to the slope crest, and down the slope descending to a small stream valley. This area was cut over mixed and perhaps deciduous dominated forest that has up to five or more years of regeneration. There is an abundance of birches (*B. papyrifera, B. cordifolia*) and fire cherry dominating the tall shrub, young tree layer, along with some maple sucker growth.

Considerable red raspberry and scattered late low bush blueberry (*Vaccinium angustifolium*) are also present. The ground vegetation is a mix of remnant woodland species and more recent colonizers. Patches of fireweed (*Epilobium angustifolium*) are present.

Disturbed weedy growth and verges are present along the access road edges, about the edges of the quarry and previous vegetation communities that have been largely obliterated and where the soil has been disturbed. Various young trees and shrubs are present along with herbaceous weed species like hawkweeds (*Hieracium murorum, H. pilosella*), sweet clover (*Melilotis officinalis*), various grasses and coltsfoot (*Tussilago farfara*).

A small tall shrub basin swamp of less than one hectare is present at the northwest corner of the existing quarry and its' cleared edge. This wetland is marginal and has little if any apparent aquatic habitat. Tree growth is primarily peripheral with some white pine (*Pinus strobus*) along the edge or inside on an elevated area of ground within the wetland, and some minor black spruce (*Picea mariana*) and red maple. The shrub layer dominants include black holly (*Ilex verticillata*), mountain fly-honeysuckle (*Lonicera villosa*/ syn. *L. caerulea*), possum-haw viburnum, young American larch (*Larix laricina*) and willows (*Salix sps*). The ground vegetation dominants consist of Cinnamon fern (*Osmunda cinnamomea*), sphagnum mosses (*Sphagnum sps*.), dwarf red raspberry (*Rubus pubescens*), blue-joint reedgrass (*Calamagrostis canadensis*), violets, some marsh fern (*Thelypteris palustris*) and bog goldenrod (*Solidago uliginosa*).

Rare Vascular Plants

A rare plant modeling exercise was performed to determine the likelihood of presence of rare or sensitive plants within the Project area. As part of the modelling exercise, all records of vascular plant species listed by Nova Scotia Department of Natural Resources (NSDNR) as at risk (Red listed) or sensitive to human activities or natural events (Yellow listed) (NSDNR 2002) within a radius of 100 km were compiled by means of an Atlantic Canada Conservation Data Center (ACCDC) data search. The habitat requirements of these species were compared to the habitat descriptions compiled for the Project Area to determine if suitable habitat was present for these species. In instances where appropriate habitat was present for a particular species, that species was considered to be potentially present and the suitable habitat in the Project Area was identified as a target for field surveys. The phenology and ease of identification of each of the species potentially present in the Project Area was also incorporated into the model in order to determine the best times to conduct the field surveys.

A total of 119 Red or Yellow-listed species have been recorded within 100 km of the Project Area. Based on the results of the habitat model, 12 Red or Yellow-listed species could potentially be present in the Project Area. Table 5.1 lists these species and the habitats present in the Project Area where they could potentially be found.

The rare plant modelling exercise indicated that an early vegetation survey conducted in spring and a late survey conducted in the fall would be sufficient to detect the 12 species identified by the model. As such, follow-up rare plant field surveys in the high priority sites will be conducted during early to mid-spring to supplement those already conducted in mid to late-fall in order to detect both early flowering and late flowering species.

TABLE 5.1 ACCDC Vascular Plants Potentially Found in Project Area

Binomial	Common Name	ACCDC Rank	NSDNR Rank	Preferred Habitat	Likely on site
Anemone quinquefolia	Wood Anemone	S2	Yellow	Fresh/moist hardwood and mixed-wood forest habitats	Possible
Botrychium lanceolatum var. angustisegmentum	Lance-Leaf Grape-Fern	S2	Yellow	Rich wooded hillsides.	Possible
Cardamine parviflora	Small-Flower Bitter-Cress	S2	Yellow	Dry woods, shaded or exposed ledges, sandy soils	Possible
Platanthera macrophylla	Large Round-Leaved Orchid	S2	Yellow	Damp woods in deep shade	Possible
Viburnum edule	Squashberry	S2	Yellow	In cold woods and along streams, coniferous forest	Possible
Viola nephrophylla	Northern Bog Violet	S2	Yellow	Cool mossy bogs, the borders of streams, and damp woods.	Possible
Botrychium simplex	Least Grape-Fern	S2S3	Yellow	Usually on lakeshores or the mossy edges of streams or waterfalls although it has been reported in a wide variety of habitats.	Possible
Floerkea proserpinacoides	False Mermaid-Weed	S2S3	Yellow	Deciduous ravine slopes, river margins, and intervale forests.	Possible
Polygala sanguinea	Field Milkwort	S2S3	Yellow	Poor or acidic fields, damp slopes, and open woods or bush.	Possible
Veronica serpyllifolia ssp. humifusa	Thyme-Leaved Speedwell	S2S3	Yellow	Moist soils, pastures, damp runs, creeping on the grass	Possible
Epilobium strictum	Downy Willow-Herb	S3	Yellow	Boggy areas and wet meadows	Possible
Fraxinus nigra	Black Ash	S3	Yellow	Low-lying areas that are very wet and marshy	Possible

Atlantic Canada Conservation Data Centre Species Rank Definitions	
S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant at some locations. (21 to 100 occurrences).
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species (*e.g.,* S1S2)
S#?	Inexact or uncertain ranking.
Nova Scotia Department of Natural Resources General Status Ranks	
Red	Known to be or thought to be at risk.
Yellow	Sensitive to human activities or natural events.
Source: ACCDC 2005; NSDNR 2005	

All species of vascular plant encountered during the surveys are identified and their population status in Nova Scotia are determined through a review of the species status reports prepared by NSDNR (NSDNR 2005), ACCDC (ACCDC 2005) and COSEWIC (2005). A list of the 152 vascular plant species found on the site during the field survey is presented in Appendix F.

The ACCDC listing of rare vascular flora and fauna, classed in the S1 and S2 rarity categories and in the provincial rarity classes of Blue, Red, and Yellow, known from within 100 km of the study site was evaluated. Knowledge of the habitats present on site was determined both by analysis of aerial

photography topographic, and geological mapping, as well as a late summer (September 22, 2005) site visit in which much of the evident flora, and some of the fauna was noted. Initially the various species from a 100 km radius were classed as unlikely, possible or likely given the aspects of the habitat.

Many of the species classed as unlikely would in fact be nearly impossible to be present on the site. For example as certain specific habitats like fresh water ponds, and coastal strands are absent on the site then rare species of pondweed (*Potamogeton sps*.), and various oraches (*Atriplex spp*.) particular to these habitats would not be expected to be present. Woodland habitats are present on site but many are variously disturbed or do not present with indications of sufficient calcium availability to host other rare species such as yellow lady's slipper (*Cypripedium parviflorum*) and they were also determined to be unlikely.

Among some of the plants believed to potentially occupy the site no specimens were encountered during the September survey despite the fact they should have been detectable at the time, while others like Northern bog violet (*Viola nephrophylla*) could not be reliably identified during the survey period. Therefore, a follow-up rare plant survey will be conducted at the site in early to mid spring 2006. Although much of the quarry expansion area has been previously disturbed by forestry activities, expansion activities will remove habitat that could potentially support some rare plant species. However, a late September field survey did not detect any rare species, therefore the likelihood of Project related effects on such species is low.

In summary, no S1, S2, Red or Yellow listed species were observed on site during the September survey.

5.3.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Standard mitigative measures to minimize the environmental effects of the Project on plant communities include the use of seed mixtures free of noxious weed during site reclamation. Wherever practical, native plants should be used for site reclamation. In lieu of native species, seed mixes containing naturalized species which are well established in Nova Scotia and which are not aggressive weeds in the barrens, wetland and forest plant communities which are present in the area should be used for reclamation.

In summary, significant Project-related effects on rare or uncommon flora are not likely to occur. A follow-up survey will be conducted in early to mid spring 2006 to confirm the presence or absence of rare plant species that can only be reliably identified at that time of year. The Proponent will not conduct quarry operations near the on-site wetland or the stream (areas where rare plant species could occur) until the surveys have been completed. Should a rare plant species be found during the follow-up survey in an area that could be affected by the expansion Project, NSDNR will be consulted to develop a mitigation plan for that species. It is assumed that an acceptable mitigation plan can be developed, if necessary, thus avoiding significant adverse effects on rare and sensitive flora.

5.4 Wetlands

5.4.1 Description of Existing Conditions

One small wetland is located in the proposed quarry expansion area. It is situated at the eastern corner of the existing 4 hectare limit and the proposed quarry expansion limit (see Figure 5.1). The wetland is approximately 0.146 ha in size. This small wetland occupies a small basin bordered on the east end by a

push off mound of soil at the edge of the existing quarry and fully cleared area. It apparently receives water from the surrounding upland slopes and an intermittent flow drainage channel enters from the west end. There is no apparent outlet. Little evidence of persistent surface water or pooling was apparent during the site visit, though the basin may hold some water over the winter and in early spring.

The dominant vegetation of the wetland was primarily peripheral with some white pine (*Pinus strobus*) on an elevated area within the wetland. White pine was approximately 2%, black spruce (*Picea mariana*) approximately 1%, and red maple (*Acer rubrum*) approximately 1%. Ground vegetation included Cinnamon fern (*Osmunda cinnamomea*) (40%), Sphagnum mosses (Sphagnum sps.) (30%), dwarf red raspberry (*Rubus pubescens*) (20%), blue-joint reedgrass (*Calamagrostis canadensis*) (15%), violets (*Viola macloskeyi, Viola sp*.) (5%), marsh fern (*Thelypteris palustris*) (3%) and bog goldenrod (*Solidago uliginosa*) (2%). The list of vascular plants in this study area is included in Appendix F.

At present this small basin wetland occurs along an edge of the quarry but does not appear to be anthropogenic in origin. Though moist to sodden in nature this wetland apparently holds little surface water and likely cannot support even wood frogs reproduction, among the ephemeral pond breeding amphibian contingent. It has no significant quantities of any edible plant material and while undoubtedly used by many of the areas fauna to some degree would support no waterfowl or be of significant value to area game animal populations. No rare vascular plant species were noted or expected from this wetland. Due to it's small size any peat in it is not of commercial interest. A 10-step wetland evaluation is presented in Appendix G.

5.4.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Quarry development could result in the loss of the small wetland located within the proposed expansion area. Generally, wetland habitat loss is of concern since wetlands are recognized as productive natural areas that are transitory between terrestrial and aquatic ecosystems. Wetlands often support a large diversity and abundance of organisms and are often threatened by development activities.

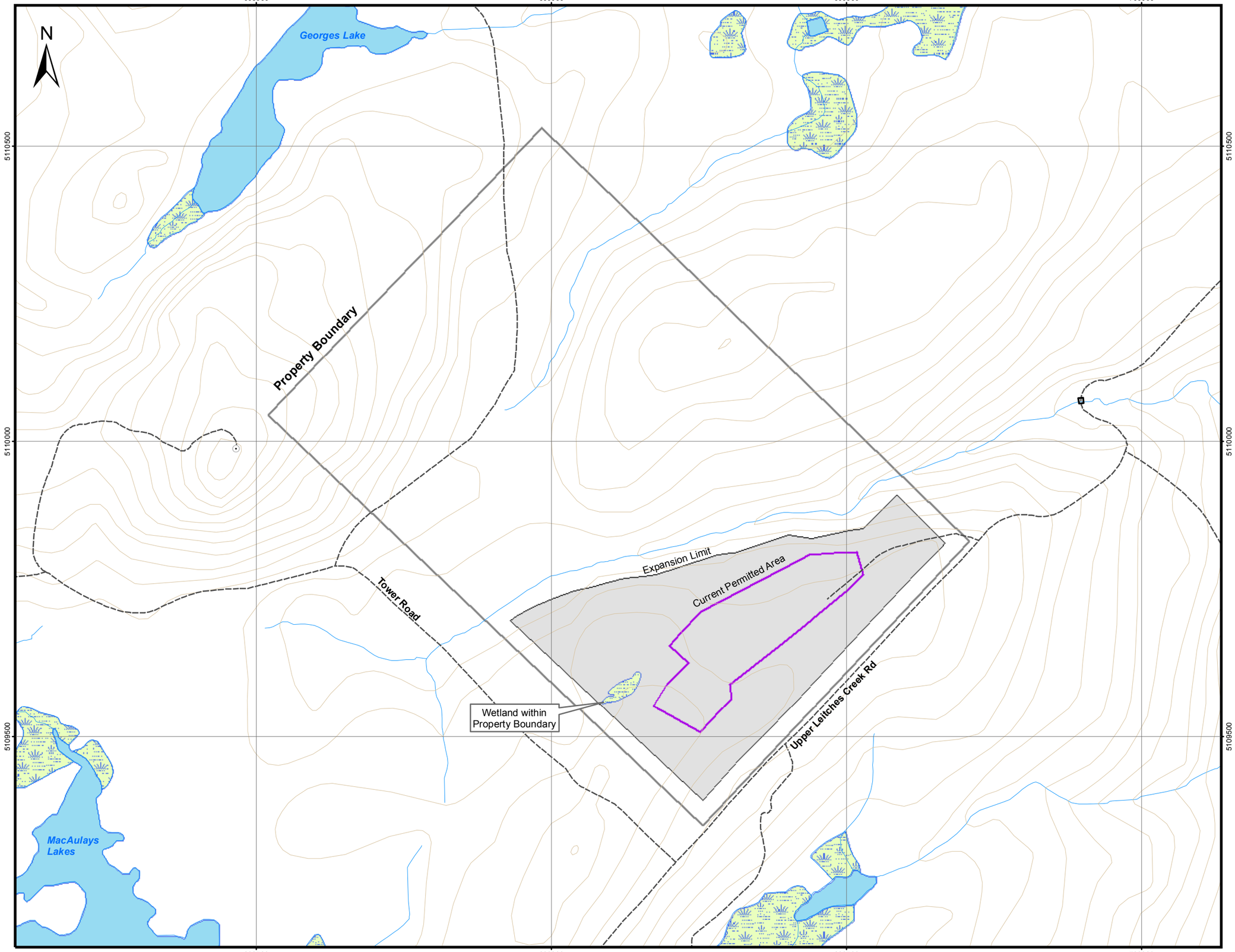
The wetland evaluation (Appendix G) demonstrates that no significant habitat loss for wildlife and plant species would occur. The effects of the Project on the wetland can be mitigated providing compensation for the overall loss of the habitat as changing the quarry boundaries to avoid the wetland is not a reasonable alternative given the topography of the area. Alva Construction will work with NSDNR to develop the mitigation measures including any required compensation. There are a number of options for wetland compensation. The preferred approach is for wetlands of similar type to that lost be re-created within the same watershed. This is not always feasible however, given the technical difficulty of creating certain types of wetlands (*e.g.,* bogs) and other constraints to development (*e.g.,* land ownership, local hydrology). Other options include wetland creation or enhancement outside the local watershed as well as sponsorship of relevant wetland protection or education programs. The Proponent will explore these options with NSEL and NSDNR including the potential for wetland creation as part of this quarry rehabilitation plan.

In summary, assuming the application of proposed mitigation measures, significant Project-related effects on wetland functional attributes are not likely to occur.

Figure 5.1

Surface Water & Wetlands

Leitches Creek Quarry Expansion Project



Map Features

- Bridge
- Major Highway
- Collector
- Rural Road
- Unpaved Road
- Rail
- Utility
- Contour (5m)
- Watercourse
- Waterbody
- Wetland
- Property Boundary

0 50 100 200
Meters

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:6,000
Date: January 2006
Project No.: 1005042

Jacques Whitford

5.5 Wildlife

5.5.1 Description of Existing Conditions

A rare species modeling exercise was performed to determine the likelihood of presence of rare or sensitive birds, mammals and herpetiles within the Project area. As part of the modelling exercise, all records of vertebrate species listed by Nova Scotia Department of Natural Resources (NSDNR) as at risk (Red listed) or sensitive to human activities or natural events (Yellow listed) (NSDNR 2002) within a radius of 100 km were compiled by means of an Atlantic Canada Conservation Data Center (ACCDC) data search. The habitat requirements of these species were compared to the habitat descriptions compiled for the Project Area to determine if suitable habitat was present for these species. In instances where appropriate habitat was present for a particular species, that species was considered to be potentially present and the suitable habitat in the Project Area was identified as a target for field surveys. In instances where species are known to be restricted to a particular geographic area, this information was taken into consideration in determining whether that species was likely to be present on the site.

A total of 16 Red or Yellow-listed vertebrate species have been recorded within 100 km of the Project Area. Table 5.2 lists these species and their preferred habitats.

TABLE 5.2 ACCDC Rare and Sensitive Wildlife Species Potentially Found in Project Area

Binomial	Common Name	ACCDC Rank	NSDNR Rank	Preferred Habitat	Likely on site
Charadrius melodus	Piping Plover	S1B	Red	Coastal sand and gravel beaches	Unlikely
Fratercula arctica	Atlantic Puffin	S1B	Yellow	Coastal grassy cliffs, but also amongst rocks and scree	Unlikely
Alca torda	Razorbill	S1B	Yellow	Coastal cliffs	Unlikely
Asio otus	Long-eared Owl	S1S2	Yellow	Various woodland habitats as well as open habitats	Possible
Asio flammeus	Short-eared Owl	S1S2B	Yellow	Open grassy habitats such as dyked wet meadows, marshes, coastal bogs, and grasslands	Unlikely
Accipiter gentilis	Northern Goshawk	S3B	Yellow	Mature coniferous and mixedwood forest generally remote from human habitation	Unlikely
Pooecetes gramineus	Vesper Sparrow	S253B	Yellow	Areas of low grass or shrubs such as pastures, blueberry fields and clearings. Most frequently found in blueberry fields in nova Scotia	Unlikely
Dolichonyx oryzivorus	Bobolink	S3B	Yellow	Fields with dense grass cover, particularly hay fields	Unlikely
Sterna hirundo	Common Tern	S3B	Yellow	Coastal and freshwater islands, coastal beaches and salt marshes	Unlikely
Sterna paradisaea	Arctic Tern	S3B	Yellow	Coastal islands, beaches and salt marshes. May occasionally nest on islands in lakes	Unlikely
Glyptemys insculpta	Wood Turtle	S3	Yellow	Streams and rivers having sand and gravel banks,	Unlikely

TABLE 5.2 ACCDC Rare and Sensitive Wildlife Species Potentially Found in Project Area

Binomial	Common Name	ACCDC Rank	NSDNR Rank	Preferred Habitat	Likely on site
				riparian woodlands	
Hemidactylium scutatum	Four-toed Salamander	S3	Yellow	Nests in Sphagnum moss hummocks around pools or sluggish streams in bogs or swamps. Forages in adjacent forest habitat	Unlikely
Alces alces ssp. Americana	Moose	S1	Red	Coniferous and mixedwood forest including a mixture of mature and immature stands. Bogs, swamps, lakes and ponds are also used	Unlikely
Lynx canadensis	Lynx	S1	Red	Mature forests with dense undergrowth but can also be found in more open forest and wooded swamps and bogs	Unlikely
Martes americana	American Marten	S1	Red	Mature coniferous or mixedwood forest	Unlikely
Sorex gaspensis	Gaspe Shrew	S2	Yellow	Rock outcrops and talus slopes in highlands where there are steep slopes	Unlikely

Atlantic Canada Conservation Data Centre Species Rank Definitions	
S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant at some locations. (21 to 100 occurrences).
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species (*e.g.,* S1S2)
S#?	Inexact or uncertain ranking.
Nova Scotia Department of Natural Resources General Status Ranks	
Red	Known to be or thought to be at risk.
Yellow	Sensitive to human activities or natural events.
Source: ACCDC 2005; NSDNR 2005	

Birds

The diversity and abundance of avian fauna is commonly associated with habitat structure rather than individual characteristics of territories such as tree species or temperature. Overall suitability of a site is determined by the complex set of interactions between atmospheric conditions, geological composition, hydrological influences, diversity and density of floral and other faunal species, *etc*.

Based on the results of the habitat model, one Yellow-listed species, Long-eared Owl, could potentially be present in the Project Area. This species may forage in the study area, however, given the facts that there is little remaining mature forest on the site and that most of this forest is found adjacent to roads, it is unlikely that Long-eared Owls nest on the property.

The Maritimes Breeding Bird Atlas (MBBA) database (Erskine 1992) contains a study of bird distribution and abundance across the maritime provinces of Canada. The breeding bird atlas data is of limited usefulness because that data is recorded in 10 km X 10 km census squares, making it impossible to establish whether a particular species has been observed in close proximity to the Project area. Nevertheless, it does provide an indication as to which species may be expected in the Project area. Information on the distribution and abundance of birds in the vicinity of the Project area was supplemented with a bird survey conducted in the fall of 2005. This information will be further

supplemented with a breeding bird survey that will be conducted in conjunction with a second vegetation survey during late May or early June, 2006.

Four MBBA squares were used to determine the approximate number of breeding birds that may be found around the Project area. The breeding status of each species was determined using the criteria used in the MBBA (Erskine 1992). “Possible” breeders are generally those birds that have been previously observed or heard singing in suitable nesting habitat. “Probable” breeders are those birds that have exhibited any of the following: courtship behaviour between a male and female; birds visiting a probable nest site; birds displaying agitated behaviour; and/or male and female observed together in suitable nesting habitat. “Confirmed” breeders are those birds that exhibited any of the following: nest building or adults carrying nesting materials; distraction display or injury feigning; recently fledged young; occupied nest located; and/or adult observed carrying food or fecal sac for young.

Appendix H lists all bird species from the breeding bird atlas squares within the surrounding area of the Project. Lists of provincially rare or sensitive birds were derived from the General Status of Wildlife in Nova Scotia (NSDNR 2005), Species at Risk in Nova Scotia (NSDNR 2005), and the ACCDC database (ACCDC 2005) while nationally rare species were derived from COSEWIC (2005) and *SARA*. Appendix H also lists NSDNR and COSEWIC rankings.

A total of 96 bird species have been recorded in the atlas squares. Seven species were observed during the field surveys: Black-capped Chickadee, Black-throated Blue Warbler, Common Raven, Common Yellowthroat, Ruffed Grouse, Song Sparrow, and Yellow-rumped Warbler. Four species are identified as species of conservation concern that have been reported in the vicinity of the Project area: Bobolink, Common Loon, Common Tern and Bicknell’s Thrush.

Bobolinks are uncommon in Nova Scotia and this species is considered to be sensitive to human activities and natural events (“Yellow” listed). Bobolinks generally nest in hay fields and pastures. The Bobolink population in Nova Scotia has decreased substantially in recent years. The causes of this decline are not well understood but may relate to changes in agricultural practices such as the use of insecticides, changes in management of hay fields, loss of hay fields to other uses, and the practice of spring burning and mowing. Hay fields and other agricultural lands are not present in the Project footprint so it is unlikely that the Project would adversely affect Bobolinks.

Common Loons are relatively common in Nova Scotia, but are sensitive to a variety of human activities, particularly around their breeding sites. As such, this species is “Yellow” listed by NSDNR. Loons are sensitive to disturbance at their nest sites and their nests, which are located close to the edge of the water, and can be swamped by the wakes of motor boats or by water level fluctuations in reservoirs. Common Loons are also susceptible to ingestion of lead in fishing sinkers, accumulation of mercury in freshwater fish and loss or reduction in food supplies as a result of acidification of freshwater bodies on which they live during the breeding season. Common Loons nest on lakes and occasionally large rivers, generally on small islands where their nests are safe from predators. Adult loons along with their fledged young move to the coast in mid-September and remain in ice-free coastal waters until the lakes are ice-free in the spring. Immature birds and a few nonbreeding adults remain in coastal waters throughout the year. The Project area is located well away from any suitable loon nesting habitat. Given the distribution of suitable loon nesting habitat relative to the Project area, it is unlikely that there will be a direct loss of Common Loon nesting habitat associated with the quarry expansion.

Common Terns are relatively uncommon and are considered to be sensitive to human activities and natural events by NSDNR (“Yellow” listed). Common Tern populations in Nova Scotia are adversely affected by disturbance of nesting colonies, predation of eggs and young by gulls and loss of prime nesting

sites to gulls which typically begin nesting earlier than terns. Common Terns nest on coastal islands, sand spits, beaches and occasionally in salt marshes. There is a low probability for Common Terns to nest in the vicinity of the Project area due to a lack of suitable nesting sites. Common Terns are not likely to travel near the Project area, and it is not critical habitat for this species.

Bicknell's Thrush are relatively uncommon in Nova Scotia, with the majority of the sightings occurring in Cape Breton. Bicknell's Thrush are considered to be sensitive to human activities and natural events by NSDNR ("Yellow" listed). Acid rain damage to conifer habitat is the main threat to this species, as well as forestry activities in remote mountain forests. Coastal habitats including dense low spruce are favored although some will also breed in upland areas. The species is not confirmed in the Project area and is listed as a "possible" breeder. The Project footprint does not contain suitable nesting habitat for Bicknell's Thrush and it is unlikely that expansion of the quarry will adversely affect this species.

Mammals

Four "Yellow" or "Red" listed mammal species have been recorded within a 100 m radius of the Project area (Table 5.2) including moose, lynx, American marten and Gaspe shrew. Moose, lynx and American martens are listed as endangered species under the Nova Scotia *Endangered Species Act*. The property contains suitable foraging habitat for moose, however, the *Americana* subspecies of moose which is listed as an endangered species is restricted to mainland Nova Scotia. Moose in Cape Breton belong to the *Andersoni* subspecies which was introduced onto the island in 1947 and 1948 from stock imported from Alberta. The Cape Breton population is in good condition and supports aboriginal subsistence hunting and a limited sport hunt. No suitable habitat is present for the other endangered mammal species recorded.

Information regarding the presence of rare mammals and sensitive mammal habitat within the study area was derived from field surveys and a review of Nova Scotia significant habitat mapping data base (NSDNR 2005b). Field surveys were conducted concurrently with vegetation and fish and fish habitat in the fall of 2005, and will also occur during the future vegetation and bird surveys during late May / early June 2006. The field surveys provide a good indication of the presence of large mammal species in the study area. Knowledge of the distribution of small mammals in the study area is limited by their secretive nature. Fortunately, many small, rare mammals have very specific habitat requirements, which can be used to predict areas where they are likely to be found.

The study area is characterized by moderate habitat diversity. Most of the area has been harvested within the past five years. Remnants of mature softwood forest and mature mixedwood forest are found in the Project area. Small patches of immature softwood and mixedwood forest are found scattered around the property. One small wetland is present within the Project area.

The species recorded in the study area are generally typical of woodland habitats. Evidence of species recorded during the field surveys included black bear (*Ursus americanus*), American Red Squirrel (*Tamiasciurus hudsonicus)*, varying hare (*Lepus americanus*), and White-tailed Deer (*Odocoileus virginianus*).

A review of the NSDNR significant habitat mapping database (NSDNR 2005) did not reveal the presence of any rare or sensitive mammal species in the vicinity of the study area or critical habitat such as deer wintering areas. All of the habitats present in the study area are commonly encountered throughout the province and are unlikely to provide habitat for rare small mammal species.

Herpetiles

Two “Yellow” or “Red” listed herpetile species, four-toed salamander and wood turtle have been recorded within a 100 m radius of the Project area. Wood turtle is also listed as vulnerable under both the Nova Scotia *Endangered Species Act* and the Canadian *Species at Risk Act*. No suitable habitat is present for either of these species in the Project area.

Information regarding amphibians and reptiles and their habitat within the study area was also derived during the field surveys. Field surveys were conducted concurrently with vegetation and fish and fish habitat in the fall of 2005, and will also occur during the future vegetation and bird surveys during late May / early June 2006. No reptile species were encountered during the surveys. Three amphibian species were encountered during the surveys including: Red-backed Salamander (*Plethodon cinerus*), Green Frog (*Rana clamitans*) and Northern Leopard Frog (*Rana pipiens*). None of the herpetile species are listed as rare, endangered, or of conservation concern.

5.5.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

None of the bird species potentially found in the Project area are listed under the NS *Endangered Species Act*. The habitat would suggest that the Project area may provide suitable foraging habitat for long-eared owl, a “Yellow” listed species (NSDNR, 2003a). However, it is unlikely that this species nests in the Project area and expansion of the quarry is not expected to have an adverse effect on this species if it is present. Migratory birds are protected under the *Migratory Birds Convention Act*. It is illegal to kill migratory bird species not listed as game birds or destroy their eggs or young. Other bird species not protected under the federal act such as raptors are protected under the provincial *Wildlife Act*. In order to avoid contravening these regulations clearing of areas to be used as quarry sites will be conducted outside of the breeding season for most bird species (April 1 to August 1) so that the eggs and flightless young of birds are not inadvertently destroyed. A breeding bird survey will be conducted in 2006 to identify any other species that may be breeding in the area. Should rare birds be found to be breeding in an area potentially affected by Project expansion activities during the breeding bird survey, NSDNR and/or the Canadian Wildlife Service will be consulted to develop an appropriate mitigation plan for the species. Such mitigation will reduce the potential for significant adverse effects on bird species.

No critical areas for mammals such as deer wintering areas are known to exist in the study area. The species recorded in the study area are generally typical of woodland habitats. The field survey and a review of existing records (NSDNR 2005) did not reveal the presence of any rare mammal species in the vicinity of the study area. The habitats present in the study area are commonly encountered throughout the province and are unlikely to provide habitat for rare small mammal species.

In summary, assuming recommended mitigative measures are applied (*i.e.*, clearing outside bird breeding season), significant Project-related effects on wildlife are not likely to occur.

5.6 Groundwater Resources and Hydrogeology

The following discussion of the local groundwater resources and hydrogeology is based on a desktop study and does not include any site-specific water well or groundwater sampling and analysis, or groundwater depth measurements. A site reconnaissance survey was conducted to assess the quarry conditions and to locate nearby homes that are suspected to be serviced with private water wells.

5.6.1 Description of Existing Environment

The proposed quarry expansion area is characterized by a thin discontinuous veneer (< 1 m) of stony till plain overlying Hadrynian aged granodiorite and diorite bedrock (Figures 5.2 and 5.3). The community of Upper Leitches Creek, located approximately 3 km northeast, is underlain by a thin veneer of stony ground morraine over the paragneiss and schist formations of the George River Group (Proterozic age). The community of Frenchvale, located 3 km to the southeast, is underlain by silty ground moraine over undivided Windsor Group composed of strata of siltstone, mudstone, sandstone, shale, conglomerate, and evaporates (Early-Carboniferous).

The Project is located in the Boisdale Hills region of the North Bras d'Or Uplands. The area is characterized by gentle undulating folding and minor faulting. The hills are a series of elongated northeast-southwest oriented fault blocks composed of Avalon crustal material, predominantly Precambrian in age, which has risen relative to the surrounding landscape. Movement along faults, such as the Georges River fault that passes through the area on northeast strike, has tilted and domed the surrounding Carboniferous Strata.

The topography in the area is complex, making an inference of groundwater flow directions difficult. The Project is located on the northern slope of a series of irregular northeast to southwest trending hills. The highest point in the Boisdale Hills (elev. 235 m) is located at the northwestern boundary of the property. Based on topography, it is expected that deep groundwater flow on the west side of the Boisdale Hills is westward towards St. Andrews Channel, with groundwater discharging to the Bras d'Or Lakes. Deep flow on the east side of the divide is eastward to the Northwest Arm of Sydney Harbour, or southward to the East Bay of the Bras d'Or Lakes.

Shallow groundwater flow near the quarry is inferred to be primarily towards the southeast and to the northeast roughly following the predicted surface water drainage patterns (see Appendix C, Figure 1).

The domestic potable water supply in this area is predominantly derived from drilled water wells. Several residents with shallow spring-fed wells are known to be present in the community of Upper Leitches Creek to the northeast. Based on site observations during a reconnaissance survey, there are two nearby rural residential properties that likely have drilled water wells. These wells are located at the corner of Tower Road and Upper Leitches Creek Road, approximately 100 m to the south of the proposed quarry expansion. Based on local topography, these wells may be hydrologically upgradient of the quarry. Several other residential properties that may have dug or drilled wells are located on Gouthro Lake Road, greater than 800 m downgradient of the proposed quarry expansion, and on the opposite side of Frenchvale Brook. The nearest residences to the northeast on Upper Leitches Creek Road are over 1.8 km from the site, and on the opposite side of a tributary of Frenchvale Brook.

Details of the water wells servicing the residential homes located nearest to the quarry were not available for this desktop study. However, a review of available NSEL well records provides information for three wells that are located within 2 km of the quarry; two located east of the site in Upper Leitches Creek, and one located south of the site near Frenchvale. One of the wells in Upper Leitches Creek is drilled in a sand and gravel aquifer, whereas the remaining wells are drilled in granite and dolomite.

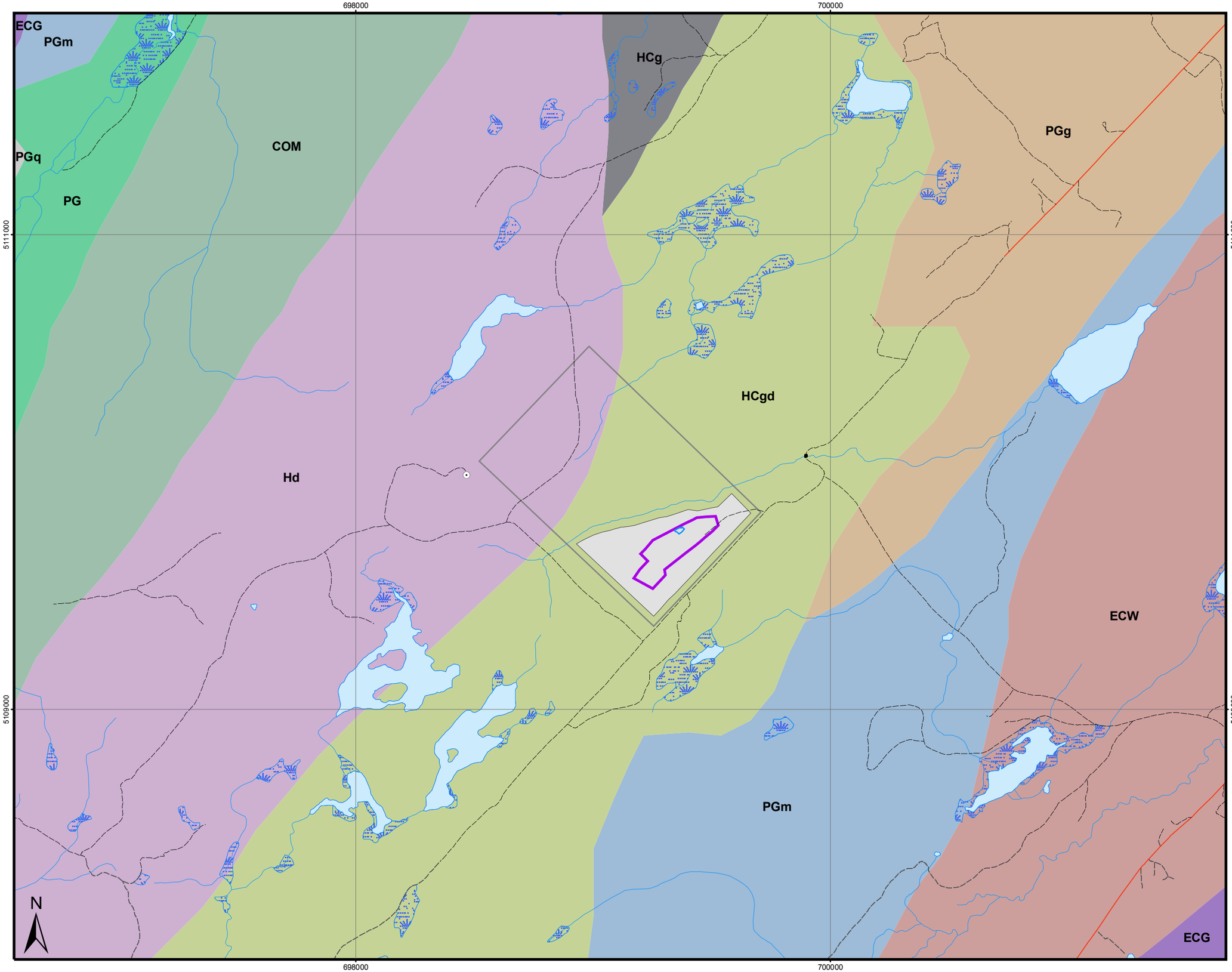


Figure 5.2

Bedrock Geology

Leitches Creek Quarry Expansion Project

Map Features

- Tower
- Settling Pond
- Utility
- Current Permitted Area
- Property Boundary
- Expansion Limit

Water Features

- Waterbody
- Wetland

Bedrock Geology

McLeod Brook & MacNeil Formations - Cambro-Ordovician
COM conglomerate, sandstone, siltstone, shale

Grantmine Formation - Early Carboniferous
ECG conglomerate, sandstone, siltstone, shale

Undivided Windsor Group - Windsor Group - Early Carboniferous
ECW res siltstone, mudstone, sandstone, shale, conglomerate, gypsum, anhydrite, halite

Hadrynian - Cambrian
HCg granite/rhyolite
HCgd granodiorite

Hadrynian
Hd diorite

Undivided George River Group - Proterozoic
PG

George River Group - Proterozoic
PGg paragniess and schist
PGm includes marble and calc-silicate rocks
PGq mainly quartzite

Note: Bedrock Geology mapping obtained from "NSDNR - Mineral Resources Branch Digital Products" - DP ME D00-01, Version 1, 2000. Digital version of Nova Scotia Department of Natural Resources Map ME 2000-1, Geological Map of the Province of Nova Scotia, scale 1:500 000, 2000.
- http://www.gov.ns.ca/natr/meb/pubs/pubs3.htm

0 75 150 300 450 600
Meters

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:15,000
Date: January 2006
Project No.: 1005042

Jacques Whitford

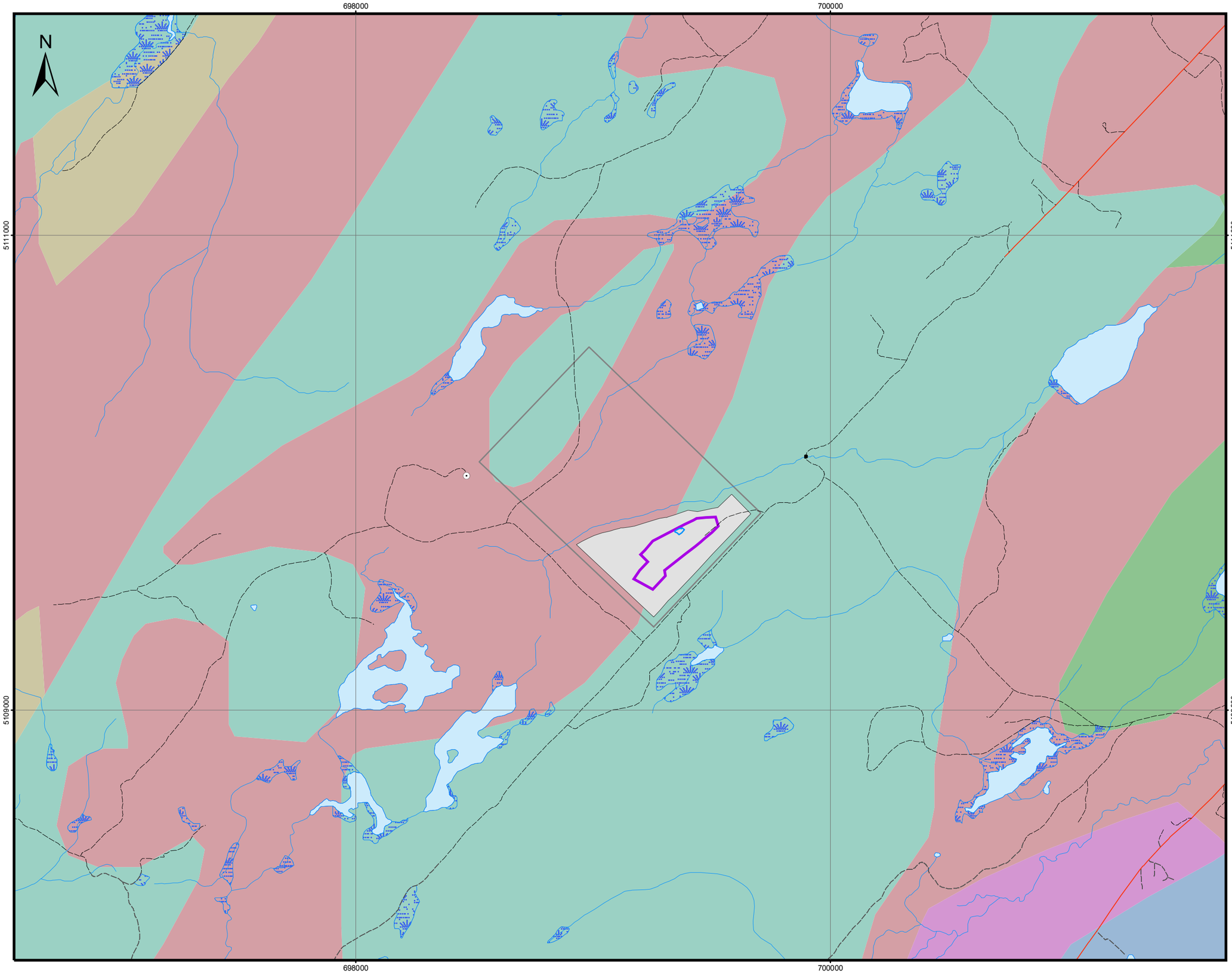


Figure 5.3

Surficial Geology

Leitches Creek Quarry Expansion Project

Map Features

- Tower
- Settling Pond
- Utility
- Current Permitted Area
- Property Boundary
- Expansion Limit

Water Features

- Waterbody
- Wetland

Surficial Geology

Post Last Glaciation (Holocene)

Colluvial Deposits

A complex mixture of glacial deposits, weathered and frost shattered rock and soils

Alluvial Deposits

Gravel, sand, mud; bedded, coarse at base, finer at top, stream channels generally sand, floodplains sand

Last Glaciation (Wisconsinian)

Glaciofluvial Deposits

Outwash Fans, Deltas, and Valley Train Deposits - Gravel and sand; massive to horizontally stratified, coarse to fine gradation within sections and deposits

Ground Morraine and Streamlined Drift

Stony Till Plain - Stony, sandy matrix, material derived from both local and distant sources

Ground Morraine and Streamlined Drift

Silty Till Plain - Silty, compact, material derived from both local and distant sources

Pre Last Glaciation

Bedrock - Bedrock of various types and ages; glacially scoured basins and knobs, overlain by thin, discontinuous veneer of till

Note: Surficial Geology mapping obtained from "NSDNR - Mineral Resources Branch Digital Products" - DP ME D92-03, Version 1, 1997. Digital version of Nova Scotia Department of Natural Resources Map ME 1992-3, Surficial Geology Map of the Province of Nova Scotia, 1:500 000, 1992. - http://www.gov.ns.ca/natr/meb/pubs/pubs3.htm

0 75 150 300 450 600

Meters

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:15,000
Date: January 2006
Project No.: 1005042

Jacques Whitford

The quarry and surrounding area are underlain by Hadrynian diorite, granodiorite and granite, as well as paragniess and marble of the George River Group. The two wells drilled in granite are considered the most representative of water wells drilled in the vicinity of the proposed quarry expansion area. The well records indicate that these wells service single-dwelling residential homes. The well construction details for these two granite bedrock wells are summarized in Table 5.3. The depth and water levels in these wells differ greatly, most likely due to topographical variability.

TABLE 5.3 Summary of Local Domestic Water Wells Completed in Granite

Well Location	Well Depth (m)	Casing Length (m)	Well Diameter (mm)	Estimated Yield (igpm)	Water Level (m)	Overburden Thickness (m)
Frenchvale	17.4	6.1	152.4	8	9	1.22
Upper Leitches Creek	64	5.2	152.4	2	1.22	1.22
Source: NSEL well records						

Although no specific information is available on the water table in the immediate vicinity of the quarry, it is likely that the water table elevation is close to the elevation of the tributary draining MacAulays Lake, located just east of the quarry. If the excavation does alter shallow flow in the immediate vicinity of the quarry, it is expected to be limited in area, and will occur primarily during the wetter months of the year. Alva Construction Limited does not anticipate excavating below the water table, however if required, a hydrological study will be conducted as per the Pit and Quarry Guidelines and approval will be sought from NSEL.

Any drainage that may presently occur from rainwater within the quarry flows northwest to a small settling pond on site (Chisholm, 2005).

The water quality from wells constructed in the granite bedrock is expected to be good, with most parameters meeting the Canadian Drinking Water Guidelines (Health Canada 2003). Groundwater quality problems due to acid drainage are not expected to occur in granite bedrock; rock will be sampled and tested regularly to confirm that acid rock has not been encountered.

5.6.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

The possible dug or drilled wells or spring-fed wells located on Gouthro Road, greater than 800 m downgradient of the proposed quarry expansion may be at risk of negative effects of the quarry expansion. The wells located at the corner of Tower Road and Upper Leitches Creek Road, approximately 100 meters to the south of the proposed quarry expansion are located upgradient of the proposed expansion and may be at risk from water table decline. The wells identified in the NSEL Well Drillers Records, located approximately 2 to 3 km downgradient in Upper Leitches Creek and Frenchvale, are not likely to be affected due to the distance from the quarry, and intervening streams.

The potential impacts from this operation include: temporary siltation of nearby wells due to intermittent blasting, possible reduced water levels (temporary or permanent) and decrease in well yield in wells hydraulically up-gradient of the quarry, and possible water quality deterioration of down-gradient wells from accidental releases of deleterious substances, such as blasting agents or fuel oil within the quarry area. Potential impacts to residential water wells will be a function of distance, location of a well with respect to groundwater flow directions, intensity and frequency of blasting, and individual well construction methods.

Since the existing quarry lies in a groundwater recharge area and no significant topographic relief is present upgradient of the quarry (about 20 m), the water table depth is expected to be deep (greater than 10 m below surface). The headwaters of surrounding streams likely represent spring-fed shallow water table levels or perched water tables from precipitation runoff from surrounding relief. The stream east of the quarry appears to be about 12 to 15 m lower than the quarry floor.

The magnitude of water level decline in a dug well or spring is likely to be greater up-gradient of an excavation due to drainage into the excavation. The water levels in wells located at the corner of Leitches Creek Road and Tower Road approximately 100 m up-gradient of the site could be lowered if the water table is intercepted and dewatering in the quarry was undertaken. Due to the fact that it is unlikely that dewatering will be required and the inferred moderate yields of local drilled wells in granite (*i.e.,* 2 - 8 igpm) and in-well storage capacity, significant loss of yield from the residential wells is not anticipated.

The nearest potential down-gradient wells are located approximately 800 m from the quarry and across local streams. With continuing regional recharge from the hills to the west, and possible enhanced recharge through the floor of the quarry itself, the existing water tables should be maintained along Gouthro Road east of the quarry area. The degree of water level effect should decrease with distance from the quarry. Since excavation elevation (and water levels) in the proposed expanded quarry will not decline below the existing portion (*i.e.,* an excavation of 13 m), no further water level effects are anticipated at the residential wells.

Changes in water quality may occur due to excavations in the recharge area of wells. Wells located down-gradient of the quarry are more likely to be affected in this manner than wells to the south, due to the location of the groundwater and surface water divide. Potential impacts include: temporary siltation from blasting; oil and nitrate from blasting operations; and lubricant compounds, and other chemical releases within the quarry area. Due to distance to the wells, significant impacts are not anticipated due to natural attenuation through dilution and dispersion of any contaminants along the groundwater pathways.

In the unlikely event of well water deterioration, mitigation of short-term turbidity impacts caused by blasting vibration would likely involve temporary provision of bottled water to affected residents, or provision of an in-line dirt filter. In the unlikely event of persisting long-term water quality or reduced yield, the proponent will provide suitable treatment, replace or repair any water supply well found to be adversely affected by this quarry operation to the satisfaction of the owner.

In summary, significant Project-related effects on groundwater resources are not likely to occur. However, a groundwater monitoring program will be developed and implemented to allow collection of site specific groundwater data (*i.e.,* depth and chemistry) at the southeast and northeast corners of the quarry. The monitoring plan will include predevelopment and baseline monitoring and effects monitoring during quarry expansion. Contingency plans will be developed to initiate mitigative action if monitoring results indicate unacceptable impacts to groundwater resources. Details of the monitoring program (*i.e.,* monitoring parameters and frequency) will be developed in consultation with NSEL.

There have been suggestions that quarrying by an unrelated quarry operator in the Upper Leitches Creek area, about 4 to 5 km northeast of this site, has led to the loss of yield to shallow residential spring-fed wells that are located on the flanks of the hills. This was likely a consequence of reduction of piezometric head in the mountainous areas that form the recharge area for the wells. While the deep

drilled wells are unlikely to be affected due to both long saturated thickness, and recharge from the regional flow system, shallow dug wells or springs situated directly on bedrock in groundwater discharge zones and along the dominant NE-SW bedrock strike could suffer significant decline in yield due to even a few metres of depressurization of the recharge area, especially in the dry summer months. This situation has also happened in steep valley wall areas of the Annapolis Valley. The monitoring program should therefore attempt to identify the presence of any spring-fed wells within the capture area of the quarry that are set on or in bedrock, as these could be at risk if the quarry is excavated into the water table. This assessment indicates that none are present within the likely capture area (*e.g.,* hill SW and West of the quarry).

In addition, the location of the stream east of the quarry suggests that the water table should be 10 m or so below the floor. The monitoring program should also confirm this.

5.7 Archaeological and Heritage Resources

5.7.1 Description of the Existing Environment

For the purposes of this assessment, archaeological and heritage resources are defined as physical remains that inform us of the human use of and interaction with the physical environment. These resources may be above or below the surface of the ground and cover the earliest Pre-Contact times to the relatively recent past.

Heritage resources are generally considered to include historic period sites such as cemeteries, heritage buildings and sites, monuments, and areas of significance to First Nations or other groups. Pre-Contact refers to the time before the arrival of non-Aboriginal peoples.

The assessment of heritage resource potential within the study area incorporated sources that included archaeological site records at the Nova Scotia Museum and archival resources. There are no recorded archaeological sites within or adjacent to the study area (Nova Scotia Museum Archaeological Sites Database; Stephen Powell, pers comm., 2005).

Background research was conducted by a qualified archaeologist (Mr. Laird Niven) using the records at the Public Archives of Nova Scotia as well as those available on the Internet. Maps consulted included those by A.F. Church (1877) and Fletcher and Robb (1899). The historical aerial photographs in the NSDNR library were also examined.

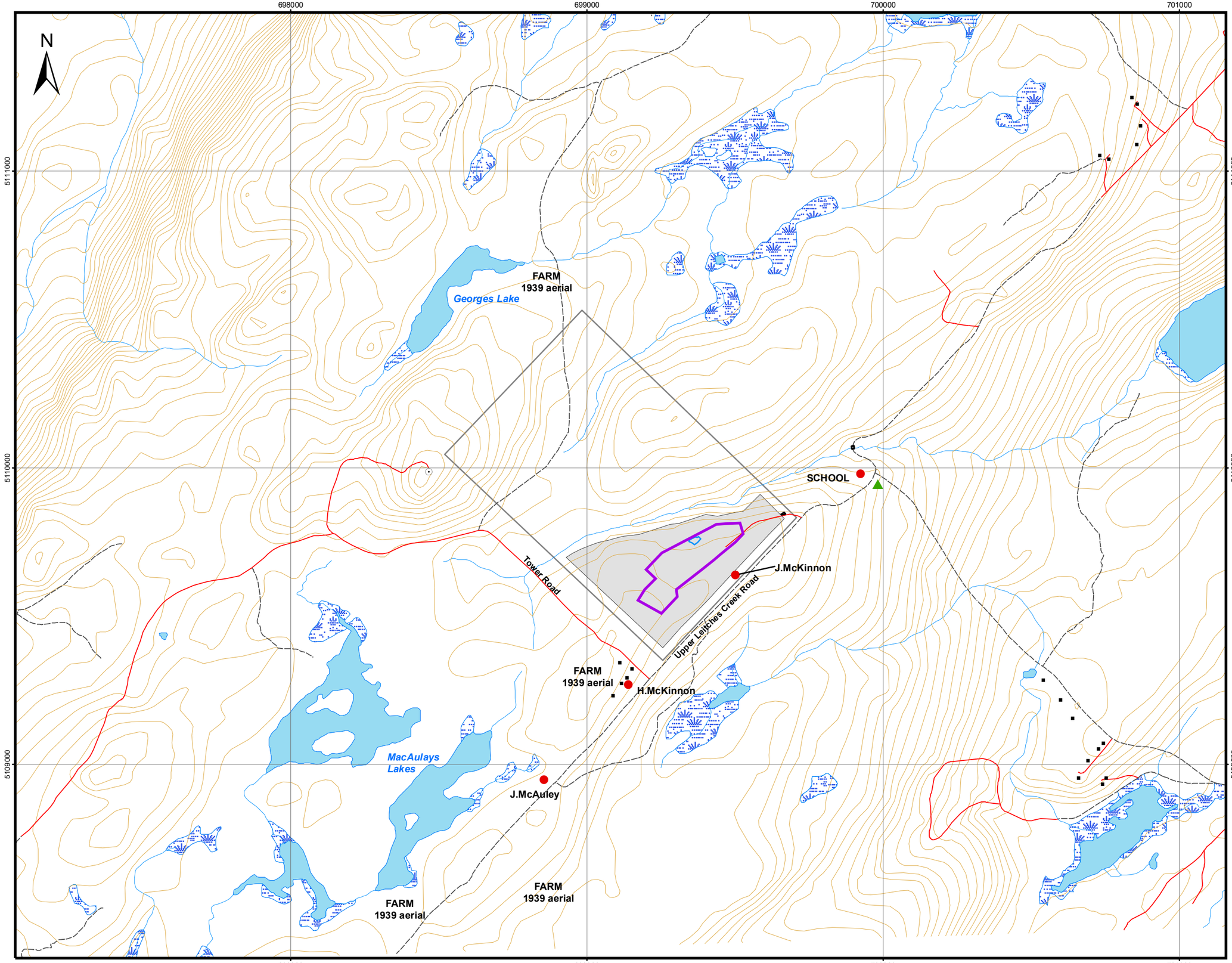
The area around Upper Leitches Creek and Boisdale was settled by Scottish immigrants, predominantly MacDonald's and McKinnon's from South Uist, who came to Nova Scotia in the early nineteenth century. It is evident from the archival research that this area was never densely settled.

The A.F. Church maps can be very useful, although their accuracy is often called into question. These old maps indicate three houses and one school (Figure 5.4). The houses are identified as belonging to J. McKinnon, H. McKinnon, and, J. McAulay. Of those houses shown on the Church map only the J. McKinnon house appears to be within the study area and it is just on the north side of the Upper Leitches Creek Road. This house is not located within the expansion limit area. This house does not currently exist.

Figure 5.4

Old Settlement Locations

Leitches Creek Quarry Expansion Project



Map Features

- Building
- Old Farms Noted on A. F. Church Map
- Old Farms Noted on GSC, 1988
- Bridge
- Major Highway
- Collector
- Paved Road
- Unpaved Road
- Rail
- Contour (5m)
- Watercourse
- Waterbody
- Wetland
- Current Permitted Area
- Property Boundary
- Expansion Limit

0 125 250 500

Meters

Map Parameters
Projection: UTM/NAD83/Z20
Scale 1:12,000
Date: January 2006
Project No.: 1005042

Jacques Whitford

The 1899 Geological Survey of Canada map is more geographically detailed and accurate than the Church map, but it shows less detail of use to archaeologists. The only identified building on this map is the school, located on the opposite side of the road (south) of the one shown by the Church (Figure 5.4). This may be the result of an inaccuracy on the early map or it may be an indication that the route of the road has changed slightly. A second unidentified building is shown further to the south west, but well outside of the study area. These structures also do not currently exist.

The black and white historical aerial photos are very useful as they often show houses, roads, and other settlement features that are no longer visible on modern aerials. A 1939 aerial was examined (A6554-19) and several farms were noted in the area, but none within the study area (Figure 5.4).

Based on the background research, there appears to be low potential for the study area to contain archaeological resources dating to the historic period. Settlement in this area was sparse at best and the offspring of the original settlers were most likely leaving for Sydney rather than carrying on the tradition of their parents. One potential feature, the J. McKinnon house shown on the Church map, is outside of the expansion area and has most likely already been adversely impacted.

The study area is deemed to have a low potential for containing archaeological or heritage resources pertaining to First Nations peoples. There are no apparent resources within the area that would have attracted settlement during the pre-Contact period (400 to 500 years ago). Any First Nation's resources within the general area would likely be found along the Sydney River system 9 km to the southeast, the north west arm of Sydney Harbour 10 km to the northeast, and, along the shores of St. Andrews Channel of the Bras d'Or Lakes to the north, particularly around Barrachois.

5.7.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Certain activities associated with the Project (*i.e.,* grubbing, grading), could affect archaeological or heritage sites if they were present within the zone of surficial and subsurface disturbance. These disturbances, if unmitigated, could result in the loss of resources and the potential knowledge to be gained from its interpretation.

The study area has only low potential for identifiable human use in the pre-Contact and historic periods. No archaeological/heritage resources or areas of elevated heritage potential were identified in the study area. It is assumed that no areas beyond the study area will be disturbed during the development and operation of the proposed quarry expansion. As such, development and operation of the proposed quarry expansion are not expected to have any adverse environmental effects on heritage resources.

If archeological or heritage resources are discovered during development and operation of the Project, the find will be immediately reported to the Curator of Archaeology and the Manager Special Places at the Nova Scotia Museum. If the resources are thought to belong to First Nations, the Chief of the nearest Mi'kmaq band will also be contacted. In the case of suspected human remains, the RCMP will be called. The appropriate authorities will determine further actions to be undertaken which could include avoidance and further assessment.

In summary, assuming appropriate measures are undertaken in the event that archaeological or heritage resources are discovered, significant Project-related effects on these resources are not likely to occur.

5.8 Air Quality

5.8.1 Description of the Existing Environment

NSEL monitors air quality at ten stations across Nova Scotia susceptible to air quality problems. Common air pollutants monitored regularly are sulphur dioxide (SO_2), particulate matter (PM), carbon monoxide (CO), ground level ozone (O_3), nitrogen dioxide (N_2O), and hydrogen sulphide (H_2S). Exceedances for these contaminants are generally small and infrequent in Nova Scotia. The closest NSEL monitoring site to Leitches Creek Quarry is located in Sydney, more than 30 km from the quarry site. Since 1997, the province began continuous reporting of an air quality index for the Sydney region. Since reporting began, air quality has been predominantly in the "Good" category (NSEL 2004).

The Leitches Creek Quarry is located in a rural setting with little or no industry within a radius of 10 km. It is not anticipated that the common air pollutants are exceeded at the quarry location due to the separation distance of more than 30 km from the urban centre of Sydney. Regional sources of air pollution include the coal fired generation plan at Lingan.

5.8.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Quarrying activities can generate dust (*i.e.*, particulate emissions) which has the potential to be transported offsite. As per the conditions of the existing Leitches Creek Quarry Industrial Approval and the Pit and Quarry Guidelines, particulate emissions will not exceed the following limits at the site property boundaries:

- Annual Geometric Mean 70 $\mu g/m^3$
- Daily Average (24 hrs) 120 $\mu g/m^3$

Efforts to minimize the generation of dust at the site have been made by covering laydown and work areas with blasted materials, and covering stockpiled topsoil with seed and hay. Fugitive dust emissions will be controlled with the application of water obtained from the settling pond and/or sump as per current practice. Since the Proponent began operations, the existing settling pond has not gone dry. Water would be applied with the use of a water truck if necessary. Monitoring of particulate emissions (dust) will be conducted at the request of NSEL. Additional mitigative measures (*e.g.,* vehicle washing) will be considered in the event of persistent concerns.

In summary, assuming appropriate dust suppression measures are undertaken, significant Project-related effects on air quality are not likely to occur.

5.9 Socio-economic Environment

5.9.1 Description of the Existing Environment

Population and Employment

The quarry is located in Cape Breton Regional Municipality (CBRM), northwest of the community of Frenchvale and south of the community of Barachois. The quarry is located in a rural setting with approximately two residences/structures within 800 m of the quarry site. Based on the latest census

data for 2001, the population of the CBRM was 105,968, an 11% decline from 1996 level (Statistics Canada 2002).

The majority of the aggregates from the quarry, to date, have been sold to customers in CBRM, predominantly for municipal water and sewer projects and residential and commercial developments.

The existing quarry currently employs five full time seasonal employees. Drilling and blasting activities require additional resources; these activities are sub-contracted to a professional blasting company. Hauling of materials from the quarry also involves additional resources; hauling (or trucking) is typically arranged through the customers. The expansion of the quarry may result in an additional five full time seasonal positions.

Land Use

Mining

The Municipal Planning Strategy of the CBRM recognizes the area around Frenchvale as having major gravel deposits fit for extraction. Frenchvale and its surrounding communities are considered developing areas of CBRM and the Strategy adopts a pro-development approach. The province of Nova Scotia also recognizes the importance of aggregate mining and has retained the regulatory authority for regulating the extraction process. While CBRM is not inclined to delay industrial development, the municipality has expressed their intent through the Strategy of ensuring proper procedures are adhered to at all times. The CBRM will adopt a rehabilitation by-law that industries, including aggregate mining, will be required to follow. Also, the CBRM wishes to share the information regarding known aggregate deposits in areas where extraction is feasible. The CBRM adopts a land use policy that establishes zones for areas in the vicinity of known aggregate deposits (*i.e.,* the Frenchvale Rural Gravel Deposit Zone). Although the Leitches Creek site is not located in the Gravel Deposit Zone, this industrial activity is consistent with the overall land use policy for a Rural CBRM Zone, in which the site is located (CBRM 2005). The land use policy includes on-site permits for the temporary use of secondary manufacturing equipment such as those used by Alva Construction Limited (*i.e.,* portable crushing units) in unserviced areas setback from residential development and outside public water supply watersheds. (CBRM 2005).

Agriculture

The Canada Land Inventory classified soil for agricultural use into seven different classes with Class 1 being the best and Class 7 being the worst. Class 1 to 3 soils are of adequate quality for successful cultivation with minimum to moderate improvements. Nova Scotia is predominantly comprised of Class 2 and Class 3 soils, although 2% of the land mass of CBRM is estimated to contain Class 2 while 23% is considered to be Class 3.

The Strategy maintains that the majority of Class 2 and 3 soils are to maintain their availability for cultivation. However, the Strategy also maintains that development projects will not be specially regulated so as to afford equal opportunity for all industries. The Leitches Creek area is not located in a region where conflict with current and future agricultural practices is anticipated due to the distribution of Class 2 and 3 soils.

Forestry

Specialized or intensive forestry activities have not been identified in the region within and surrounding the Project area. It is noted that much of the area intended for quarry expansion has been clear cut within the past five years.

Transportation

A transportation assessment and discussion of potential impacts of the quarry expansion operation was conducted by Atlantic Road and Traffic Ltd. in support of this environmental registration. A description of the existing conditions in the area is included in the following paragraphs.

Road Descriptions

The Alva Construction Limited Quarry is located in Upper Leitches Creek adjacent to the Upper Leitches Creek Road approximately 5.2 km south of Route 223. Trucks traveling between the Quarry and Highway 125 have two route options:

- Option 1 - Upper Leitches Creek Road to Route 223 (5.2 km) and Route 223 to access Highway 125 at Exit 3 (5.5 km), a total distance of approximately 10.7 km. The first 1.7 km of road from the quarry has a gravel surface and unimproved geometry, including an intersection with Gouthro Road and a 'hair pin' turn with a one lane bridge. There are no traffic control signs at the intersection of Upper Leitches Creek Road and Gouthro Road, and no warning signs for the one lane bridge, the curve, or at the end of pavement. The 3.5 km section of Upper Leitches Creek Road from the end of pavement to Route 223 has a very poor paved surface with considerable cracking and wheel track rutting. The Upper Leitches Creek Road meets Route 223 at a Stop sign controlled intersection that was reconstructed during 2005 and has adequate available sight distance. The section of Route 223 from the intersection to Highway 125 was repaved during 2005. In summary, this route has 1.7 km of gravel surfaced, unimproved road, and 9.0 km of paved road.
- Option 2 – Upper Leitches Creek Road to Gouthro Road (0.3 km), Gouthro Road to Frenchvale Road (2.6 km), and Frenchvale Road to access Highway 125 at Exit 4 (8.5 km), a total distance of about 11.4 km. The first 2.9 km of road from the quarry, which includes the short section of Upper Leitches Creek Road and all of Gouthro Road, has a gravel surface and unimproved geometry, including the Upper Leitches Creek Road / Gouthro Road intersection, extremely steep grades, and a one lane bridge. There are no traffic control signs at the intersection of Upper Leitches Creek Road and Gouthro Road, and no warning signs for the one lane bridge. The Gouthro Road approach to Frenchvale Road is on an up-grade and meets Frenchvale Road at a badly skewed intersection with poor sight distance to the west. The 8.5 km section of Frenchvale Road to the Highway 125 Exit 4 interchange has a paved surface and curve warning signs where required. In summary, this route has 2.9 km of gravel surfaced, unimproved road, and 8.5 km of paved road.

Traffic Volumes

Available traffic volume data have been obtained from the Nova Scotia Department of Transportation and Public Works. Traffic volumes are reported as Annual Average Daily Traffic (AADT) volumes and provide an estimate of the average daily volume at a location that would be obtained by counting all traffic for an entire year and dividing by 365. The following are the most recent available traffic volumes:

- Route 223, 3.0 km west of Highway 125 - 2005 AADT 820 vpd. Average weekday volume in mid-August 2005 was about 1100 vehicles per day (vpd).

- Upper Leitches Creek Road just south of Route 223 - 2000 AADT 290 vpd. Average weekday volume in early September 2000 was about 400 vpd.
- Frenchvale Road just west of Beechmont Road – 2004 AADT 730 vpd. Average weekday volume in late July / early August 2004 was about 900 to 1000 vpd.
- Frenchvale Road just west of Campbell Road – 2004 AADT 990 vpd. Average weekday volume in late July / early August 2004 was about 1500 to 1600 vpd.

Collision Data

The following collision rate and frequency information was obtained from the collision data base maintained by the Nova Scotia Department of Transportation and Public Works:

- The relative 'safety' of a section of roadway is evaluated by comparing Study Area collision rates to the average collisions rates for all similar roadways in the Province. The 5.5 km section of Route 223 in the Study Area is part of a much longer (about 23 km) section for which collision rates are maintained. The average collision rate for this section of Route 223 during the five year period 1999 to 2003 was 23.5 collisions per hundred million vehicle kilometers (HMVK) which is considerably lower than the average rate of 92.8 collisions per HMVK for all similar routes in Nova Scotia.
- No collisions were reported at the intersection of Route 223 and Upper Leitches Creek Road during the five years 2000 to 2004.
- There was one reported collision on the Upper Leitches Creek Road during the five years 2000 to 2004. A single vehicle went off the road on a curve and struck a building or a wall.
- No collisions were reported on the Gouthro Road during the five years 2000 to 2004.
- No collisions were reported at the intersection of Frenchvale Road and Gouthro Road during the five years 2000 to 2004.
- While there were 13 reported collisions on Frenchvale Road during the five year period 2000 to 2004, none involved heavy trucks. Since most collision locations were not clearly indicated, some collisions probably occurred beyond the 8.5 km Study Area section of Frenchvale Road. Eight of the collisions occurred during winter driving conditions when the road was covered with snow or ice.

Quarry Traffic

The projected maximum production rate for the Quarry is approximately 500,000 tonnes per year. Assuming an average of 25 tonnes per load, and Quarry operation five days per week for 40 weeks (April to December) per year, the proposed production rate is equivalent to an average of about 100 truck loads per day. Since it has been reported that an average of 100 to 150 truck loads per day have been generated by the existing Quarry during operating periods since 2004, the average daily truck traffic volume is not expected to be affected by the proposed quarry land area expansion.

Recreation and Tourism

Recreational fishing and hunting are permitted in the region surrounding the Project area. Recreational fishing records were not available and the lakes surrounding the Project area are not included in the provincial recreational fish stocking program. While moose hunting is not permitted in the region surrounding the Project area, deer hunting is allowed. Leitches Creek is situated in Deer Management Zone 6 although stamps have not been allocated in the past three years. (NSDNR 2005)

There are no designated parks within or surrounding the Project area.

Human Health

Human health related aspects and potential effects on environmental health include potential impacts on air quality (*i.e.*, particulate emissions) and safety of commuters along the transportation route. Air quality is addressed in Section 5.8, and Sections 5.9.1 and 5.9.2 includes a discussion of the safety of travellers along the transportation route.

5.9.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Population and Employment

The direct and indirect employment associated with operation of the Leitches Creek Quarry may be considered a benefit, or positive effect, to the regional economy. In addition, the quarry produces valuable products that support development and infrastructure, and the growth of the region's economy.

Expansion of the Leitches Creek Quarry to allow for continued operation will result in an overall positive effect on the regional economy. The availability of continued supply to the market place should encourage a more stable price for aggregate. In some cases (*i.e*., markets in close proximity to quarries) the overall price for aggregates will be lower, since cost of aggregate largely reflects the distance it has to be hauled. This, in turn, can significantly reduce costs of construction, which, in the case of public infrastructure such as highways, communities, public works agencies, and taxpayers should result in financial benefits (NSDNR 2004). In particular, the Leitches Creek quarry is the only quarry in the region to provide an asphalt grade source of aggregate.

Another interpretation of Project-related employment effects is that they may be considered neutral. This is because the market that Leitches Creek Quarry is supplying is not new, the products are not new, and the demand for aggregate in Cape Breton Regional Municipality is currently being met by existing quarries, including the existing Leitches Creek Quarry. Any increase in employment associated with the Project could be offset by reductions elsewhere (*i.e*., at other quarries).

Land Use

Quarrying activities will produce noise from equipment operation and blasting. The quarry is sheltered from the road by a treed buffer, left in place during timber harvesting activities. The potential for noise from the quarry site to have a significant effect on residents is minimal.

Blasting operations associated with the proposed expansion will be conducted in accordance with current operations at the quarry as permitted by NSEL (Approval No. 2004-043800, issued December 20, 2004) and in accordance with the Pit and Quarry Guidelines (NSEL 1999). Blasting will be conducted in accordance with the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act* (2003). It is understood that additional blast monitoring activities and/or reporting may be required by NSEL.

As per the requirements of the current operating Industrial Approval and Pit and Quarry Guidelines, sound levels from the operation in the expansion area will be maintained at a level not to exceed the following sound levels (Leq) from the property boundaries:

Leq 65dBA 0700-1900 hours (Days)
60dBA 1900-2300 hours (Evenings)
55dBA 2300-0700 hours (Nights)

As indicated in Section 2.5.2, sound levels at the existing operation are within existing guidelines (see also Appendix D). Future sound monitoring will be conducted at the request of NSEL.

A treed buffer will be maintained along the Upper Leitches Creek Road. No new aesthetic impacts are anticipated due to the expansion. The existing quarry is not visible from Upper Leitches Creek Road or Tower Road.

Due to the existing industrial activity onsite (*i.e.*, quarry) and the distance from residences, impacts on existing and future adjacent land uses are not expected. Quarry activities will be conducted in accordance with the Pit and Quarry Guidelines and all setback distances specified in the Guidelines will be maintained.

Transportation

In general, truck traffic associated with this Project is not anticipated to increase above that of the existing operation (considering normal variability of activities), unless a significant aggregate supply contract were awarded (*i.e.*, a local highway construction project).

The transportation impacts of the proposed quarry expansion can be summarized by the following:

- The two quarry access routes both have warning sign deficiencies on the gravel sections.
- The Gouthro Road approach to Frenchvale Road is on an up-grade and meets Frenchvale Road at a badly skewed intersection with poor sight distance to the west.
- Volumes on all approach roads in the Study Area are low to moderate.
- Review of collision data does not indicate any history of collisions involving heavy trucks.
- The average daily truck traffic volume generated by the quarry expansion is not expected to be increased beyond the existing average of 100 to 150 truck loads per day.

In summary, the number of loaded trucks per day to Tower Road and Upper Leitches Creek Road from the quarry is not anticipated to increase substantially over current volumes (and considering normal variability of activities) and should not affect the level of performance or safety of the road from present conditions. It should be noted that the Proponent has been actively lobbying provincial government officials to upgrade the road in order to ensure safe trucking operations from the quarry continue as well as to address concerns expressed by local residents regarding the existing poor quality of the road. The Proponent continues to work with the local truckers to ensure safe trucking practices are implemented by asking the truckers to not show up at the quarry to commence loading operations before 7:00 AM and by reminding the truckers to abide by the posted speed limit of 60 km/h.

Recreation and Tourism

The existing quarry and proposed expansion of the operation are not likely to have an impact on hunting and recreational fishing in the general area. The quarry is situated in a hunting management zone that is not at present allocating stamps. It is unlikely that recreational fishing would take place in the tributary to the adjacent stream along the proposed expansion area. Fishing may occur further downstream and near MacAulay's Lake or Georges Lakes. Expansion and operation of the quarry are not expected to have an impact due to the distance from these potential recreation fishing locations.

Human Health

Human health related issues are discussed in Section 5.8 Air Quality and Sections 5.9.1.3 and 5.9.2.3 Transportation. The health and safety of nearby residences is not expected to be affected by the Project.

Summary

In summary, assuming effective application of mitigative measures (*e.g.*, Pit and Quarry Guidelines, dust suppression) significant adverse Project-related effects on the socio-economic environment are not likely to occur. Continued operation of the quarry will likely result in economic benefits, including employment and ongoing business opportunities.

6.0 EFFECTS OF THE PROJECT ON THE ENVIRONMENT

Activities associated with the proposed quarry expansion and operation will be conducted in accordance with terms and conditions of the existing Industrial Approval for Alva Construction's existing quarry operation in Upper Leitches Creek, as well as future amendments to the Approval, adherence to the Pit and Quarry Guidelines (NSEL 1999) and specific mitigative measures described in this assessment. Environmental effects of the quarry expansion will include the loss of terrestrial habitat within the proposed revised quarry expansion area. Field surveys conducted to date indicate that this area does not include unique habitat or rare or sensitive species; therefore, these effects are not anticipated to be significant.

Groundwater monitoring wells will be constructed at various locations within the proposed revised expansion area. Depth to groundwater will be monitored on a regular basis, in consideration of seasonal variations and blasting activities (*i.e.*, before and after blasting). This data will be used to monitor groundwater elevations across the site and monitor changes in the groundwater table as the quarry develops. The data could also be used to identify any hydraulic connection between the quarry area and the adjacent watercourse as well as monitor groundwater inflow to the quarry and any identifying potential water management issues.

Assuming the mitigative measures specified in this report are implemented, and the quarry is operated according to existing provincial guidelines and approvals, no significant adverse residual environmental or socio-economic effects are likely. Continued operation of the quarry is likely to result in economic benefits, including employment and ongoing business opportunities.

7.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The definition of an environmental effect often includes any change to the project that may be caused by the environment. In the case of a quarry operation, potential effects of the environment on the Project are limited to climate and meteorological conditions, specifically precipitation. Precipitation and runoff may cause temporary delays in quarry construction, operation, and rehabilitation activities. Wet weather or snow may also affect hauling of material from the site.

On a national basis, Canada shows a warming and cooling pattern with a higher overall warming trend of approximately 1.1 ºC since 1895. The Atlantic Region, however, shows a warming trend from 1895 which peaked in the mid 1950s followed by a cooling trend in the 1990s. The overall warming trend of 0.4 ºC in Atlantic Canada since 1895 is not statistically significant. With respect to precipitation, the Atlantic Region shows an overall increasing trend in precipitation since 1948, with an increasing trend in the number of daily precipitation events above 20 mm and a very slightly increasing trend in the number of daily snowfall events above 15 cm (Lewis 1997).

There are a number of planning, design and construction strategies intended to minimize the potential effects of the environment on the Project so that the risk of damage to the Project or interruption of service can be reduced to acceptable levels. Mitigation measures include, but are not limited to, designing and installing erosion and sediment control structures to accommodate appropriate levels of precipitation, and consideration of weather conditions when scheduling activities. All Project activities will be taking place out-of-doors and thus weather has been and will be factored into all Project phases and activities. Alva Construction proposes that the quarry remain open year round, depending on demand and weather, and will consider severe winter weather conditions when planning activities. Heavy snowfalls and significant snow accumulation will have an impact on the quarry's ability to remain open.

In summary, climate and meteorological conditions, including climate change, are not anticipated to significantly effect the operation of the quarry over its proposed lifetime.

8.0 OTHER APPROVALS REQUIRED

As stated in Section 2.0, the Proponent is required to register this project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and Environmental Assessment Regulations. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from the NSDEL for operation of the Project, and the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act* (2003). Provincial guidelines to be adhered to include the *Pit and Quarry Guidelines* (NSDOE 1999). Examples of other relevant federal legislation include the *Fisheries Act, Migratory Birds Convention Act* and the *Species at Risk Act.*

9.0 FUNDING

The proposed expansion will be 100 percent privately funded.

10.0 ADDITIONAL INFORMATION

No additional information is provided in support of this document.

11.0 REFERENCES

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APPENDIX A

Registry of Joint Stocks

Jacques Whitford

NOVA SCOTIA
Service Nova Scotia and Municipal Relations
Registry of Joint Stock Companies

Print | Close Window

PROFILE - ALVA CONSTRUCTION LIMITED - as of 2006-01-25 10p.m.

Company/Society Name:	ALVA CONSTRUCTION LIMITED
Registry ID:	2244933
Type:	N.S. Limited Company
Nature Of Business:	
Status:	Active
Jurisdiction:	Nova Scotia
Registered Office:	5600 LOCHABER ROAD ANTIGONISH NS B2G 2L6
Mailing Address:	P.O. BOX 1193 ANTIGONISH NS B2G 2L6

PEOPLE

Name	Position	Civic Address	Mailing Address
A.G. MACDONALD	Director	15 HERITAGE DRIVE ANTIGONISH NS B2G 2T6	
ALLISTER N. MACDONALD	Director	12 NICHOLSON COURT ANTIGONISH NS B2G2V4	
ALLAN MACDONALD	Director	38 PONDEROSA DRIVE ANTIGONISH NS B2G 2R5	
ALLISTER MACDONALD	PRESIDENT		
A.G. MACDONALD	SECRETARY		

ALLAN MACDONALD	VICE-PRESIDENT		
A.G. MACDONALD	Recognized Agent	15 HERITAGE DRIVE ANTIGONISH NS B2G 2T6	PO BOX 1193 ANTIGONISH NS B2G 2L6

ACTIVITIES

Activity	Date
Registered	1993-02-22
Incorporated	1993-02-22
Registered Office Change	1993-02-23
Agent Filed	1993-02-23
Special Resolution	1996-01-30
Annual Report Filed	1996-02-09
Change of Directors	1996-02-09
Filed Debenture	1996-11-07
Annual Statement Filed	1997-03-19
Annual Renewal	1997-03-20
Annual Renewal	1998-02-26
Annual Renewal	1999-01-25
Address Change	1999-02-26
Annual Statement Filed	1999-02-26
Annual Renewal	2000-02-08
Annual Renewal	2001-02-26
Annual Renewal	2002-01-24
Annual Renewal	2003-01-20
Annual Statement Filed	2003-01-20
Annual Renewal	2004-02-27

Annual Renewal	2005-02-22
Special Resolution	2005-07-29
Annual Renewal	2005-12-22

RELATED REGISTRATIONS

This Company ...
Registered COLIN R. MACDONALD CONSTRUCTION

APPENDIX B

Industrial Approval

Jacques Whitford

NOVA SCOTIA
Department of Environment and Labour
Environmental Monitoring and Compliance Division

PO Box 714
295 Charlotte Street
Sydney, NS B1P 6H7

Tel: (902) 563-2100
Fax: (902) 563-2387

File Number: 92100-30SYD-043800
Approval Number: 2004-043800

December 20, 2004

Mr. Brock Chisholm
Alva Construction Limited
PO Box 1193
Antigonish, NS
B2G 2L6

Dear Mr. Chisholm:

RE: Approval to Construct and Operate - Quarry
1000 Upper Leitches Creek Road
Approval No. 2004-043800, PID # 15313653

Enclosed please find Approval # 2004-043800 to construct and operate the Quarry at 1000 Upper Leitches Creek Road, Upper Leitches Creek, Cape Breton Regional Municipality, Nova Scotia.

Strict adherence to the attached terms and conditions is imperative in order to validate this approval.

Despite the issuance of this Approval, the Approval Holder is still responsible for obtaining any other authorization which may be required to carry out the activity, including those which may be necessary under provincial, federal or municipal law.

Should you have any questions, please contact Michael Florian, Eastern Region, Sydney Office at (902) 563-2100.

Yours Truly

Michael Florian, CPHI (C)
Inspector Specialist

cc Mark Farrell
Peter Weaver

Enclosure

NOVA SCOTIA Department of Environment and Labour

APPROVAL

Province of Nova Scotia
Environment Act, **S.N.S. 1994-95, c.1**

APPROVAL HOLDER: **Alva Construction Limited**

APPROVAL NO: **2004-043800**

EFFECTIVE DATE: **December 20, 2004**

EXPIRY DATE: **December 20, 2014**

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Construction and operation of a Quarry, and associated works, at or near 1000 Upper Leitches Creek Road, Upper Leitches Creek, Cape Breton Regional Municipality in the Province of Nova Scotia.

Administrator

Date Signed December 20, 2004

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Department of Environment and Labour

Project:	Alva Construction Limited Quarry - Lands of Alva Construction 1000 Upper Leitches Creek Road Upper Leitches Creek, Cape Breton Regional Municipality
Approval No:	2004-043800
File No:	92100-30SYD-043800
Map Series:	11 K 01
Grid Reference:	E699310 N5109674
PID # :	15313653

Reference Documents:

- Application dated November 5, 2004 and attachments.
- Correspondence dated November 1, 2004, addressing the scope of activities and operations at the site.
- Site plan identified as Drawing # 2004-1104. Dated November 4, 2004.

1. **Definitions**

a) "Abandonment" means cessation of production of aggregate for a period of twelve (12) months.

b) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act.

c) "Active Area" means the area required to operate a quarry and includes the working face and associated works.

d) "Associated works" means any building, structure, processing facility, pollution abatement system or stockpiles of aggregate.

e) "Department" means the Eastern Region, Sydney Office, of the Nova Scotia Department of Environment and Labour located at the following address:

Nova Scotia Department of Environment and Labour
Environmental Monitoring and Compliance Division
Eastern Region, Sydney Office,
PO Box 714
295 Charlotte Street,
Sydney, Nova Scotia, B1P 6H7.

Phone: (902) 563-2100
Fax: (902) 563-2387

f) "Disturbed Area" means any area on a quarry site that has been stripped of vegetation and is susceptible to erosion.

g) "Facility" means the Quarry at 1000 Upper Leitches Creek Road and associated works.

h) "Minister" means the Minister of the Nova Scotia Department of Environment and Labour.

i) "Rehabilitation" means restorative work performed or to be performed in accordance with the rehabilitation plan.

j) "Structure" includes but is not limited to a private home, a cottage, an apartment building, a school, a church, a commercial building or a treatment facility associated with the treatment of municipal sewage, industrial or landfill effluent, an industrial building, infrastructure or construction, a hospital, and a nursing home, etc.

2. Scope of Approval

a) This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to construct and operate the Facility, situated at or near 1000 Upper Leitches Creek Road Upper Leitches Creek, Cape Breton Regional Municipality (the "Site").

b) The Facility shall be constructed and operated as outlined in the application for industrial approval dated November 5, 2004 and supporting documentation.

c) The Site shall not exceed the area as outlined in the application and supporting documentation.

3. **General Terms and Conditions**

a) The Approval Holder shall construct, operate and reclaim its Facility in accordance with provisions of the:

i) *Environment Act* S.N.S. 1994-1995, c.1;
ii) Regulations pursuant to the above Act;
iii) Any future amendments to the Act and regulations

b) No authority is granted by this Approval to enable the Approval Holder to construct the Facility on lands which are not in the control or ownership of the Approval Holder. It is the responsibility of the Approval Holder to ensure that such a contravention does not occur. The Approval Holder shall provide, to the Department, proof of such control or ownership upon expiry of any relevant lease or agreement. Failure to retain said authorization will result in this Approval being null and void.

c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.

d) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.

e) This Approval is not transferable without the consent of the Minister or Administrator.

f) (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.

(ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.

g) The Approval Holder shall notify the Department and follow up in writing, prior to any proposed extensions or modifications of the Facility, including the active area, process changes or waste disposal practices which are not granted under this Approval. An amendment to this Approval will be required before implementing any change. Extensions or modifications to the Facility may be subject to the Environmental Assessment Regulations.

h) Pursuant to Section 60 of the *Act*, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.

i) The Approval Holder shall immediately notify the Department and follow up in writing, of any incidents of non-compliance with this Approval.

j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.

k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.

l) All samples required by this Approval shall be analysed by a laboratory that is:

   i) Accredited by the Standards Council of Canada; or

   ii) Accredited by another agency recognized by the Nova Scotia Department of Environment and Labour to be equivalent to the Standards Council of Canada; or

   iii) Maintaining an acceptable standard in a proficiency testing program conducted by the Canadian Association for Environmental Analytical Laboratories for all parameters being reported; or

   iv) Maintaining an acceptable standard in a proficiency or performance testing in another program considered acceptable to the Nova Scotia Department of Environment and Labour for all parameters being reported

m) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, All monitoring results shall be submitted within 30 days following the month of monitoring.

n) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.

o) The Approval Holder will be required to register their project under Part IV of the *Environment Act* should the Facility and associated works including access roads exceed an area of four (4) hectares.

4. **Particulate Emissions (Dust)**

a) Particulate emissions shall not exceed the following limits at or beyond the Site property boundaries:

Annual Geometric Mean 70 $\mu g/m^3$

Daily Average (24 hr.) 120 $\mu g/m^3$

b) The generation of fugitive dust from the Site will be suppressed by the application of water sprays, or the application of other suitable dust suppressants approved by the Department.

c) Site access road(s) shall be maintained to minimize dust generation. The use of used oil is <u>not</u> permitted.

d) Monitoring of particulate emissions shall be conducted at the request of the Department. The location of the monitoring station(s) for particulate will be established by the Administrator and may include point(s) beyond the property boundary of the quarry.

e) When requested, suspended particulate matter shall be measured by the high volume method as described in report No. E.P.S. 1-AP-73-2.

5. **Sound Levels**

a) Sound levels measured at the Site property boundaries shall not exceed the following equivalent sound levels (Leq):

Leq 65 dBA 0700-1900 hours (Days)
60 dBA 1900-2300 hours (Evenings)
55 dBA 2300-0700 hours (Nights)

b) Monitoring of sound levels shall be conducted at the request of the Department. The location of the monitoring station(s) for sound will be established by the Administrator and may include point(s) beyond the property boundary of the quarry.

6. **Surface Water**

a) The Site shall be developed and maintained to prevent siltation of the surface water which is discharged from the property boundaries into the nearest watercourse or beyond the property boundary. The Nova Scotia Department of the Environment "Erosion and Sedimentation Control Handbook For Construction Sites" shall serve as the reference document for all erosion

control measures. These measures are minimum requirements and additional controls shall be implemented if Site runoff exceeds the discharge limits contained herein.

b) No authority is granted by this Approval to enable the Approval Holder to discharge surface water beyond the property boundary and onto adjoining lands without the authorization of the affected landowner(s). It is the responsibility of the Approval Holder to ensure that the authorization of said landowner(s) is current and valid. Failure to retain said authorization will result in this Approval being null and void. The Approval Holder shall provide, to the Department, proof of the continued authorization of the adjoining landowner(s) when the current agreement has expired.

c) All erosion and sedimentation control devices shall be installed prior to any excavation of material.

d) The Approval Holder shall ensure the liquid effluent levels in Table 1 are met and that the effluent is monitoring at the frequency and locations indicated.

Table 1

Final Effluent Discharge Limits

Parameters	Maximum in a Grab Sample	Monthly Arithmetic Mean	Monitoring Frequency	Monitoring Station
Total Suspended Solids	50 mg/l	25 mg/l	At NSEL Request	Siltation Pond Discharge
pH	5 - 9	6 - 9	At NSEL Request	Siltation Pond Discharge

e) If it becomes necessary to drain the Site, the wastewater shall be drained to settling ponds for appropriate treatment to meet the suspended solids limits outlined in Table 1.

f) All wash water systems shall be arranged in closed circuit.

g) Additional monitoring stations for liquid effluent may be specified as required by the Department.

h) Results of monitoring shall be submitted at the request of the Department.

7. Groundwater

a) The Approval Holder shall replace at their expense any water supply which has been lost or damaged as a result of extracting aggregate.

b) The Approval Holder shall secure from the Administrator an approval amendment prior to excavating below the watertable.

c) The Approval Holder shall at the request of the Department and in consultation with the Department determine the average mean high water table and employ a method to monitor these levels.

d) The monitoring of the water table level shall be conducted at the request of the Department. The location of the monitoring points will be established through consultation with the Administrator/Department and may include point(s) beyond the property boundary of the quarry. All monitoring results are to be reported in writing within 30 days to the Department.

8. Separation Distances

a) The Approval Holder shall not locate the Active Area of the quarry within:

i) 30 m of the boundary of a public or common highway.

ii) 30 m of the bank of any watercourse or ordinary high water mark.

iii) 30 m of the boundary of the quarry property.

b) The Approval Holder shall not blast within:

i) 30 m of the boundary of a public or common highway.

ii) 30 m of the bank of any watercourse or ordinary high water mark.

iii) 800 m of the foundation or base of a structure located off site unless written permission is obtained and submitted to the Department.

iv) 15 m of the property boundary when a structure on the abutting property is not involved.

9. Blasting

a) The Approval Holder shall have a technical blast design prepared by a qualified person which ensures the ground vibration and air concussion limits in this Approval can be achieved.

b) The Approval Holder shall conduct a pre-blast survey including a water quality analysis of all structures within 800 metres of the Facility. The survey shall be conducted in accordance with the Department's "Procedure For Conducting a Pre-Blast Survey" and the results of this survey sent to the Department prior to any blasting on the Site. Water quality parameters will be determined by NSDEL staff.

c) The Approval Holder shall call the nearest weather office, to assess the climatic conditions prior to conducting any blasting. No blasting will be permitted if a thermal inversion is anticipated at the time of the proposed blast.

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

e) The Approval Holder shall ensure that all blasts are monitored for concussion and ground vibration to ensure that the limits in Table 2 are not exceeded:

Table 2

Blasting Limits

Parameters	Maximum	Monitoring Frequency	Monitoring Station
Concussion (Air Blast)	128 dBL	Every Blast	Within 7 m of the nearest structure not located on the Site
Ground Vibration	0.5 in/sec (12.5 mm/s)	Every Blast	Below grade or less than 1 m above grade in any part of the nearest structure not located on the Site

f) The monitoring station for blasting shall be as indicated in Table 2. Additional monitoring stations for blasting may be specified as required by the Department.

g) Results of monitoring shall be submitted to the Department per each event.

10. **Rehabilitation**

a) The Approval Holder shall post security in a form acceptable to the Department in the amount of $24,500 by December 31, 2004.

b) The Approval Holder shall submit a rehabilitation plan to the Department for review by June 1, 2005. The rehabilitation plan shall be revised and updated every three year thereafter and submitted for review. The rehabilitation plan shall include the estimated total cost for labour, equipment, supplies and services of a third party contractor to undertake the following activities:

i) surface contouring
ii) establishing proper drainage
iii) revegetation work
iv) any work necessary to reclaim the quarry

c) The final security shall be revised every three years in accordance with the revised rehabilitation plan.

d) The Approval Holder shall rehabilitate the Site within twelve (12) months of abandonment and in accordance with the rehabilitation plan submitted by the Approval Holder in 10 (b) or other terms as specified by the Department

e) The Nova Scotia Department of Environment and Labour shall release the security to the Approval Holder after final rehabilitation of the Site has been completed to the satisfaction of the Minister or Administrator. The Approval Holder shall notify the Department and follow up in writing, when rehabilitation has been completed.

f) The Approval Holder may request return of the security deposited on behalf of the company as per 10 (a) once the site has been inspected and the Department has deemed the site in compliance.

11. Site Specific Conditions

a) The boundaries of the Site will be cut out and kept reasonably clear of new growth and the corner boundaries shall be clearly marked with permanent markers no less than four feet high, painted red.

b) The Approval Holder must comply with the Department request as per correspondence dated November 29, 2004, either, before any earth work or quarry activity begins, or, by June 1, 2005, whichever occurs first.

c) The Approval holder must notify the Department and follow up in writing, in a timely manner and follow up in writing of any non compliance issues with this Approval.

d) Appropriate signage including the hours of operation, emergency telephone numbers and contacts are to be posted at the entrance to the Facility.

Report

Application For Approval

Alva Construction Limited
Quarry
Upper Leitches Creek, Cape Breton Regional Municipality

Application Number: 2004-043800

File Number: 92100-30SYD-043800

Eastern Region

Ian Campbell
Hydro Geologist

Date

Michael Florian
Inspector Specialist

Dec 20/04
Date

Peter Weaver
Engineer

Dec 21/04
Date

3452
Dec 20, 04

Report

File No: **92100-30SYD-043800**

Application No: **2004-043800**

Project: **Alva Construction Limited**
Quarry - 1000 Upper Leitches Creek Road
Upper Leitches Creek, Cape Breton Regional Municipality

Introduction: To evaluate the potential environmental effects associated with the operation by Alva Construction Limited of a quarry (Formally Municipal Ready Mix Limited) at Upper Leitches Creek, Cape Breton Regional Municipality. The Quarry is located on map series 11 K 01, grid reference E699310 N5109674, PID # 15313653.

Discussion:

The Approval Holder, Alva Construction Limited, intends to utilize the area on an as needed basis to meet their requirements. The disturbed area will be approximately 9.8 acres. There will be no permanent structures on site but there will be the normal dynamic stockpiling of processed material and the normal processing associated with a quarry operation (ie crushing and screening).

This Facility will be operated on lands owned by the Approval Holder.

The quarry area is less than four hectares and therefore is not subject to registration under the Environmental Assessment Regulations. A term and condition has been included in the Approval requiring registration if the area exceeds the four hectare limit.

The quarry does not meet the minimum separation distance of 800 metres from a structure. Correspondence from the two home owners within this area is on file. There is a watercourse in the immediate vicinity of the quarry but greater than 30 meters of separation is attainable. The remainder of the proposed area of operation covered by this approval will meet/exceed the 15 metre separation distance from other adjoining properties.

The proposed area of operation covered by this approval will meet all of the separation distances as specified in the pit and quarry guidelines.

Environmental Impact:

The main environmental impacts associated with the proposed operation are noise, dust, surface runoff, blasting, and rehabilitation.

Air Emissions (Dust) & Noise: Environmental impact from noise and dust are expected to be minimal as the proposed area meets the required minimum separation distances from the nearest residential dwelling and is surrounded by undeveloped lands. Noise and dust will be further restricted to the limits set forth in the Department of Environment and Labour pit and quarry guidelines and shall be monitored at the Department's request.

Surface Runoff: Environmental impact from surface runoff will be controlled via quarry grading and siltation ponds so that surface runoff is retained prior to discharge.

Surface water runoff from the quarry operation will be restricted to the limits in the Department of Environment and Labour pit and quarry guidelines. Surface runoff will be monitored by the Approval Holder regularly with periodic reports being submitted to the Department.

Blasting: The site of the proposed quarry meets the departments guideline for separation from the nearest residence of 800 metres with signoff from the two affected residences. Blasting operations will be restricted to the limits in the Department of Environment and Labour pit and quarry guidelines. Each Blast will be monitored by the proponent with periodic reports being submitted to the Department.

Rehabilitation: The Approval Holder plans to immediately restore all disturbed areas via grading and vegetation once extraction is completed.

Recommendation: The proposed Quarry meets all of the conditions of the pit and quarry guidelines.

It is therefore recommended that Alva Construction Limited application for the operation of a Quarry at Upper Leitches Creek, Cape Breton Regional Municipality, be approved subject to the appended terms and conditions.

Michael Florian, CPHI (C)
Inspector Specialist

APPENDIX C

Leitches Creek Hydrology

Jacques Whitford

Hydro-Com Technologies
a division of R.V. Anderson Associates Limited

445 Urquhart Crescent
Fredericton New Brunswick E3B 8K4 Canada
Tel 506 455 2888 Fax 506 455 0193
Web www.hydro-com.com

December 7, 2005 Project # 05-6611

Jacques Whitford Environment Limited
3 Spectacle Lake Drive
Dartmouth, NS
B3B 1W8

Attention: Ms. Angela Swaine

Dear : Ms. Swaine

Re: Leitches Creek Quarry Hydrology

Dear Ms. Swaine:

Hydro-Com Technologies, acting at your request, has performed a review of the proposed *Leitches Creek Quarry* expansion project. The objective of the review was to determine the hydrologic effects of this quarry expansion. This report has been prepared solely for the project described above and contains a description of our methodologies and our findings.

Site Description

The plan view of the existing quarry and proposed quarry expansion area is presented in Figure 1. The existing and proposed developments are located near Upper Leitches Creek in the Boisdale Hills within the Cape Breton Regional Municipality along Upper Leitches Creek Road. The proposed expansion area is bordered by the Upper Leitches Creek Road to the east, Tower Road to the west and an unnamed stream to the north. The delimination is assumed to establish appropriate buffer distances from the watercourse and roadways.

The existing quarry (delimited in purple in Figure 1) is approximately 4 ha in size. The proposed expansion area (highlighted in grey in Figure 1) is approximately 18 ha in size and includes the existing quarry. The proposed expansion area is located on the eastern face of a gently sloping knoll. The site is bisected by a hydrologic divide (as indicated in Figure 1), and flow from the area drains in both northern and southern directions. Approximately 15.0 ha of the proposed expansion area currently drains north into the unnamed stream. This area includes the existing 4 ha quarry, which currently discharges from a settling pond into the unnamed stream. Approximately 3.4 ha of the southern corner of the proposed expansion area currently drains south toward Upper Leitches Creek Road. As Jacques Whitford field crews did not identify any culverts along the Upper Leitches Creek Road directly adjacent to the proposed expansion area, this flow is assumed to be intercepted by ditching along the Upper Leitches Creek Road and assumed to discharge into the same unnamed stream at the Upper Leitches Creek Road crossing approximately 300 m east of the site. The unnamed stream flows east into Morrison Lake approximately 1.5 km east of the site. Morrison Lake ultimately drains toward Forresters Lake before discharging into the North West Arm of the Sydney Harbour.

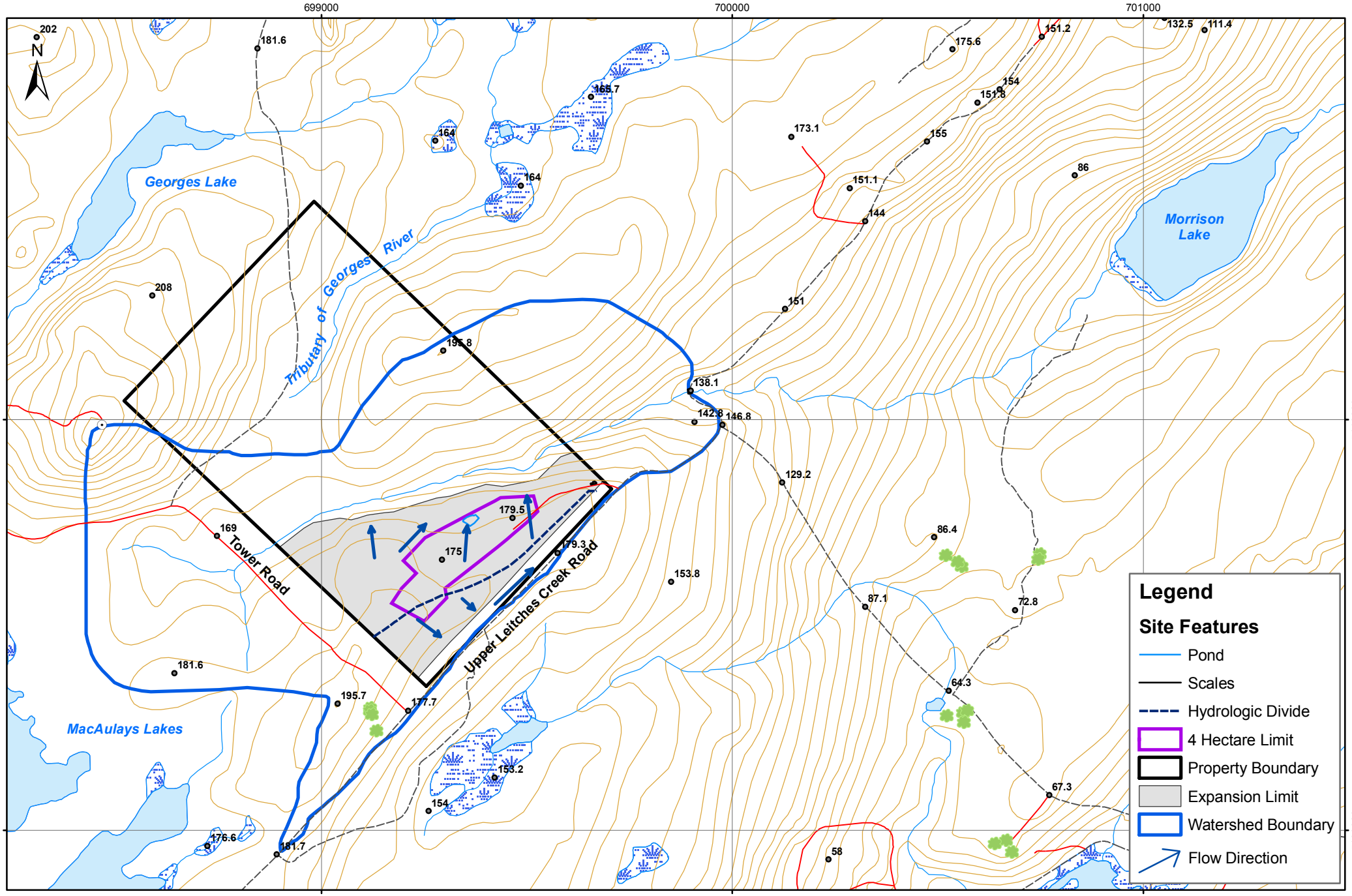

Figure 1

UPPER LEITCHES CREEK,
CAPE BRETON REGIONAL MUNICIPALITY, NS

ALVA CONSTRUCTION LIMITED, QUARRY EXPANSION

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:12,000
Date: November 2005
Project No. 1005042

Jacques Whitford

It is our understanding that quarry development will progress from the edges of the existing 4 ha quarry. Runoff from the impacted quarry areas following excavation and landforming will be collected at a central location for treatment before being discharged into the unnamed stream north of the site. In addition, the recommendations of this study are based on the assumption that off-site runoff will be diverted around the proposed quarry expansion area.

It is also our understanding that no significant wetlands were identified within the proposed quarry expansion area during site inspections conducted by Jacques Whitford Ltd personnel.

Objectives

The objectives for this assignment are as follows:

- estimate quantities of surface runoff from the proposed quarry expansion area for the currently proposed ultimate level of quarry development,
- estimate the size and design discharge capacity of the flow retention/siltation structures required for the currently proposed ultimate level of quarry development, and
- assess potential effects of the quarry on downstream flows and water quality for the currently proposed ultimate level of quarry development.

Methodology

The methodologies that were used to satisfy the above objectives were as follows:

- the annual volume of runoff from the proposed quarry expansion area was estimated using proration of mean annual flows from a nearby hydrometric station and using values from the MacLaren Atlantic Limited (1980)[1] study;
- the size and design discharge capacity of the required flow retention/siltation structures were determined using a HEC-1 runoff model and the Rational Method, and physiographic parameters of the proposed quarry expansion area; and
- the effects on downstream flows and water quality were assessed based on experience with similar developments.

The following physiographic parameters were obtained from the available project mapping:

- drainage area within the proposed quarry expansion area: 18.4 ha;
- drainage slope within the proposed quarry expansion area: 1.7%;
- time of concentration of flow from the proposed quarry expansion area: 0.49 hrs (29 min);
- coefficient of runoff of the proposed quarry expansion area: 0.65;
- Soil Conservation Service (SCS) land use curve number of the proposed development areas at the ultimate development condition for average antecedent moisture conditions (AMC II): 76; and
- drainage area upstream of the culvert along Upper Leitches Creek Road (as delimited in Figure 1): 91.4 ha.

[1] MacLaren Atlantic Limited. 1980. *Regional Flood Frequency Analysis for Mainland Nova Scotia Streams*. Canadan-Nova Scotia Flood Reduction Program. Figure 3.1.

Mean Annual Site Runoff

The mean annual site runoff for the proposed quarry expansion area was estimated using a number of different approaches for comparison purposes as shown in Table 1. The upper bound of the mean annual runoff volume was first calculated assuming that all precipitation contributes to runoff (using local climatic data). The lower bounds were obtained using area-based proration from a nearby hydrometric station and using mean annual runoff values for the area as reported by MacLaren Atlantic Ltd (1980). Because both of the estimation methods for the lower bounds derive mean annual runoff volumes from larger watersheds containing undeveloped areas (which help reduce overland runoff volumes), the expected mean annual runoff volume from the proposed expansion area at ultimate development conditions was estimated by increasing the lower bound value by a reasonable amount to reflect the expected hydrological conditions. The results of this analysis are presented in Table 1.

Table 1. Estimated mean annual runoff from the site based on different assessment methods.

Description	Method	Annual Flow Volume (m^3)	Mean Annual Flow (L/s)
Upper Bound	Annual Precipitation	277,000	8.8
Lower Bound	Hydrometric Station Proration	215,000	6.8
Lower Bound	MacLaren et al.	202,000	6.4
Expected Mean	Adjustment of lower bounds[a]	250,000	7.9

[a]Average of both lower bound estimates + expected increase in annual runoff.

Based on historical climatic data at the Sydney Airport climate station (approximately 20 km from the project site) (1971-2000), the average annual precipitation at the site is 1504.9 mm. If all of this precipitation is converted into surface runoff (which would represent an upper bound of expected average annual runoff), the annual volume of runoff from the proposed quarry expansion area was estimated to be 277,000 m^3, which corresponds to a mean annual flow of 8.8 L/s.

A lower bound for the expected annual volume of site runoff was established by a drainage area based proration of flows from a nearby hydrometric station. The hydrometric station 01FJ002 (1978-2003), Macaskills Brook near Birch Grove with a drainage area of 17.2 km^2, was chosen as most representative for proration purposes as its drainage area and hydrological characteristics were most similar to those at the proposed quarry site. By prorating flows from the hydrometric station, a mean annual runoff volume for the proposed quarry expansion was estimated to be 215,000 m^3, which corresponds to a mean annual flow of 6.8 L/s.

A second approach was used to estimate the lower bound of the expected annual runoff at the site for comparison purposes. Based on the MacLaren Atlantic study, which presents a spatial distribution of runoff volumes throughout Nova Scotia, a mean annual runoff depth of 1,100 mm was determined as the mean annual runoff depth for the region. Using this approach, the mean annual runoff volume for the proposed quarry expansion area was computed to be 202,000 m^3 (which corresponds to a mean annual runoff flow of 6.4 L/s).

Development of the quarry will involve the removal of vegetative cover and topsoil. Clearing the land of vegetative cover will reduce interception and temporary storage of precipitation. This hydrologic change will result in less evapotranspiration and more direct runoff from the site. The average *potential* evapotranspiration rate at the Sydney Airport is approximately 462 mm (Dzikowski et al, 1984)[2]. Assuming that the *actual* evapotranspiration rate is reduced by 225 mm and that the annual runoff volume is increased by the same amount, the annual runoff volume is computed to be approximately 250,000 m^3 (which corresponds to a mean annual flow of 7.9 L/s) following ultimate development of the quarry expansion area.

Flow Retention/Siltation Treatment Structures

Peak design flows from the quarry expansion area at the currently proposed ultimate level of development and the retention volumes associated with the required flow retention/siltation structures were also determined. These calculations are based solely on the drainage areas associated with the quarry expansion, and assume that the surface runoff upstream of the development areas will be diverted around the quarry development. The peak design flow for the structures represent the peak flow resulting from a 100 year return period storm event, while the minimum pond volume was to be equal to the runoff volume of a 6 hour duration storm event with a 25 year return period. Note that the low lying areas of the quarry floor can provide adequate retention/siltation treatment, provided it meets the runoff volume retention standards.

Based on the Rational Method and HEC-1 modelling, and using a time of concentration of 29 minutes, the peak flow resulting from a 100 year return period storm event was estimated to have a magnitude of 2.49 m^3/s for the proposed quarry expansion area. All of the hydraulic control structures at the currently proposed ultimate level of development should thus be designed for a peak flow magnitude of no less than 2.49 m^3/s for the proposed quarry expansion area.

Using HEC-1 modelling, the runoff volume resulting from a 6 hour duration storm event with a 25 year return period was estimated to be approximately 4,700 m^3 for the proposed quarry expansion area. The flow retention/siltation structure(s) (or capacity of quarry floor allowing for water accumulation between the interstices of porous media) of the proposed quarry expansion area should have a volume of no less than 4,700 m^3 to accommodate for site runoff at the currently proposed ultimate level of development.

Effects on Downstream Flows and Water Quality

The currently proposed ultimate level of quarry development is expected to reduce the amount of evapotranspiration from the quarry site and increase the volume of mean annual surface runoff. The magnitude of the above change is estimated to be approximately 41,400 m^3/year, which represents an approximate 20% increase of the mean annual flows from the proposed quarry expansion area following ultimate development. Based on a 0.184 km^2 drainage area associated with the proposed quarry expansion area, and the 0.914 km^2 drainage area of the watershed within which the quarry is located, the above change in the volume of mean annual

[2] Dzikowski, P.A, G. Kirby, G. Read, W.G. Richards. 1984. *The Climate for Agriculture in Atlantic Canada.* Publication No. ACA 84-2-500. Agdex. No. 070. 19 pp.

surface runoff from the quarry would result in an increase in the mean annual flows at the culvert location along the Upper Leitches Creek Road of approximately 4.0%.

Although the quarry development will result in an increase in the peak rates of surface runoff and a reduction of the low flows (i.e. water will run off more quickly following additional quarry development) from the proposed quarry area, the placement of free-draining material over the disturbed areas and the use of properly sized flow retention structures (or holding areas along the quarry floor) is expected to greatly mitigate these changes in temporal flow patterns downstream of the culvert along the Upper Leitches Creek Road.

The potential effects of the quarry development on downstream water quality include an increase in the total sediment loading and an increase in chemical parameters associated with the rock being quarried. The placement of free-draining material over all disturbed areas and the use of properly sized flow retention/siltation structures (or holding areas along the quarry floor) is expected to fully mitigate the potential increase in downstream sediment loading. As the amount of freshly exposed rock within the quarry is likely to remain relatively constant (it should be a function of the production rate, rather than the overall quarry size), the effects of the quarry on downstream water quality are expected to be relatively minor and the downstream water quality should return to background levels following the termination of active quarrying operations.

In summary, we believe that the effects on the downstream flows and water quality associated with the currently proposed ultimate level of quarry development can be greatly mitigated using the placement of free-draining material and properly sized flow retention/siltation structures. Following the use of these mitigative measures, the remaining residual effects on downstream flows and water quality are expected to be minor.

Closure

We trust that this satisfies your current requirements. If you have any questions or require additional information, please contact us at your convenience.

Yours truly,

Hydro-Com Technologies

Neil McLaughlin, M.Sc.E., P.Eng. Hans Arisz, M.Sc.E., P.Eng.

APPENDIX D

2005 Noise Survey

Jacques Whitford

Jacques Whitford

Engineering, Scientific, Planning and Management Consultants

3 Spectacle Lake Drive
Dartmouth NS
Canada B3B 1W8

Bus 902 468 7777
Fax 902 468 9009

www.jacqueswhitford.com

File No. 1005065

September 29, 2005

Mr. Brock Chisholm
Alva Construction
PO Box 1193
Antigonish, NS B2G 2L6

Dear Mr Chisholm:

Re: Noise Survey, Upper Leitches Creek Quarry

We are pleased to report the results of noise monitoring conducted at Upper Leitches Creek Quarry in September 2005. The objective of the survey was to monitor the noise levels from the quarry site activity detectable from project boundary and the nearest receptor of the quarry site.

Both locations were monitored for 24 hours using a Quest 2900 Sound Level Meter. The data was downloaded to a computer and graphed. All units reported are A-weighted decibels (dBA), where the A weighting accounts for the spectral sensitivity of human beings. Hourly Leq values (energy-weighted averages) were then calculated and reported for each data set for comparison with the Nova Scotia Department of Environment and Labour (NSDEL) Guideline for Noise Measurement and Assessment (1989).

To conduct the monitoring for the project boundary, the sound level meter was placed at 1148 Tower Lane at the edge of the property closest to the quarry. Figure 1 illustrates the results of the 1-minute monitoring over the 24 hour period. Table 1 shows that one hourly Leq value exceeded the NSDEL Guideline limits occurring at 23:00 on September 21, 2005. During this time it was noted that a heavy rainfall began at approximately 23:00 on the 21st and subsided at about 00:30 on the 22nd, and we conclude that the higher noise reading was due to rain, and not to quarry activities.

To conduct the monitoring at the nearest residential receptor to the east, the noise meter was placed at 668 Upper Leitches Creek next to the garage on the property. Figure 2 illustrates the results of the 1-minute monitoring over the 24 hour period. Table 2 shows that none of the calculated hourly Leq values exceeded to the NSDEL Guideline limits.

At both locations, site activity may still be distinguishable from wind or other background noises by the human ear, depending on the source frequency, however the overall levels measured can be considered low. There are a few “spikes”, or one-minute events more than 10 dBA over the average, which occurred at the Tower Lane location. These may be due to activity on the property, small animals, or insects near the meter. These are random events that generally do not affect the overall noise levels.

If you have any questions or concerns regarding the above, please do not hesitate to contact our office. We would like to thank you for the opportunity to provide this service for you, and look forward to working with you again.

Yours truly,

JACQUES WHITFORD ENVIRONMENT LIMITED

Kari MacDonald
Environmental Technologist

Figure 1 - 1148 Tower Lane
Upper Leitches Creek Quarry Noise Monitoring
September 21 - 22, 2005

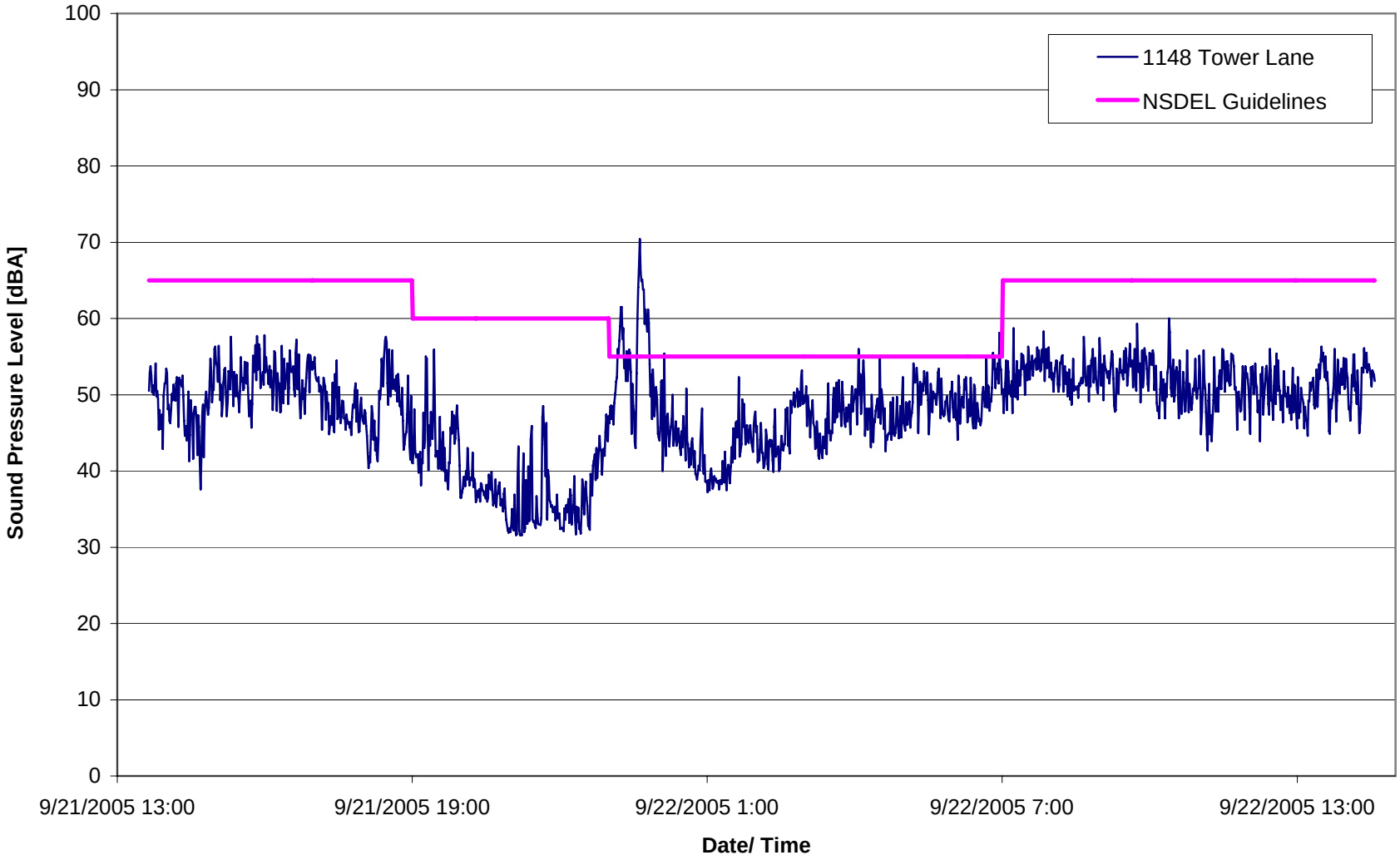

Table 1: Noise Monitoring, 1148 Tower Lane Hourly Noise levels in dBA September 21 - 22, 2005				
Date / Time	**Leq**	**Guideline**	**L10 (Highest)[a]**	**L90 (Lowest)[b]**
9/21/2005 14:00	49.7	65	51.4	43.4
9/21/2005 15:00	52.8	65	55.2	47.2
9/21/2005 16:00	52.8	65	55.0	47.5
9/21/2005 17:00	49.4	65	51.1	44.7
9/21/2005 18:00	50.6	65	51.0	44.6
9/21/2005 19:00	46.2	60	46.4	39.7
9/21/2005 20:00	37.7	60	39.1	35.0
9/21/2005 21:00	39.1	60	37.8	32.9
9/21/2005 22:00	39.9	60	40.0	34.4
9/21/2005 23:00	59.4	55	57.6	46.9
9/22/2005 0:00	45.6	55	46.2	39.3
9/22/2005 1:00	43.8	55	44.7	38.9
9/22/2005 2:00	46.7	55	48.1	41.6
9/22/2005 3:00	47.7	55	49.5	43.1
9/22/2005 4:00	48.9	55	50.6	43.8
9/22/2005 5:00	50.1	55	52.4	45.5
9/22/2005 6:00	50.8	55	52.5	45.8
9/22/2005 7:00	53.8	65	56.0	48.8
9/22/2005 8:00	52.9	65	55.0	48.5
9/22/2005 9:00	53.7	65	56.1	49.0
9/22/2005 10:00	52.4	65	54.1	47.4
9/22/2005 11:00	51.8	65	53.5	46.8
9/22/2005 12:00	51.0	65	53.3	45.1
9/22/2005 13:00	51.6	65	53.6	46.8

Figure 2 - 668 Upper Leitches Creek
Upper Leitches Creek Quarry - Noise Monitoring
September 19 - 20, 2005

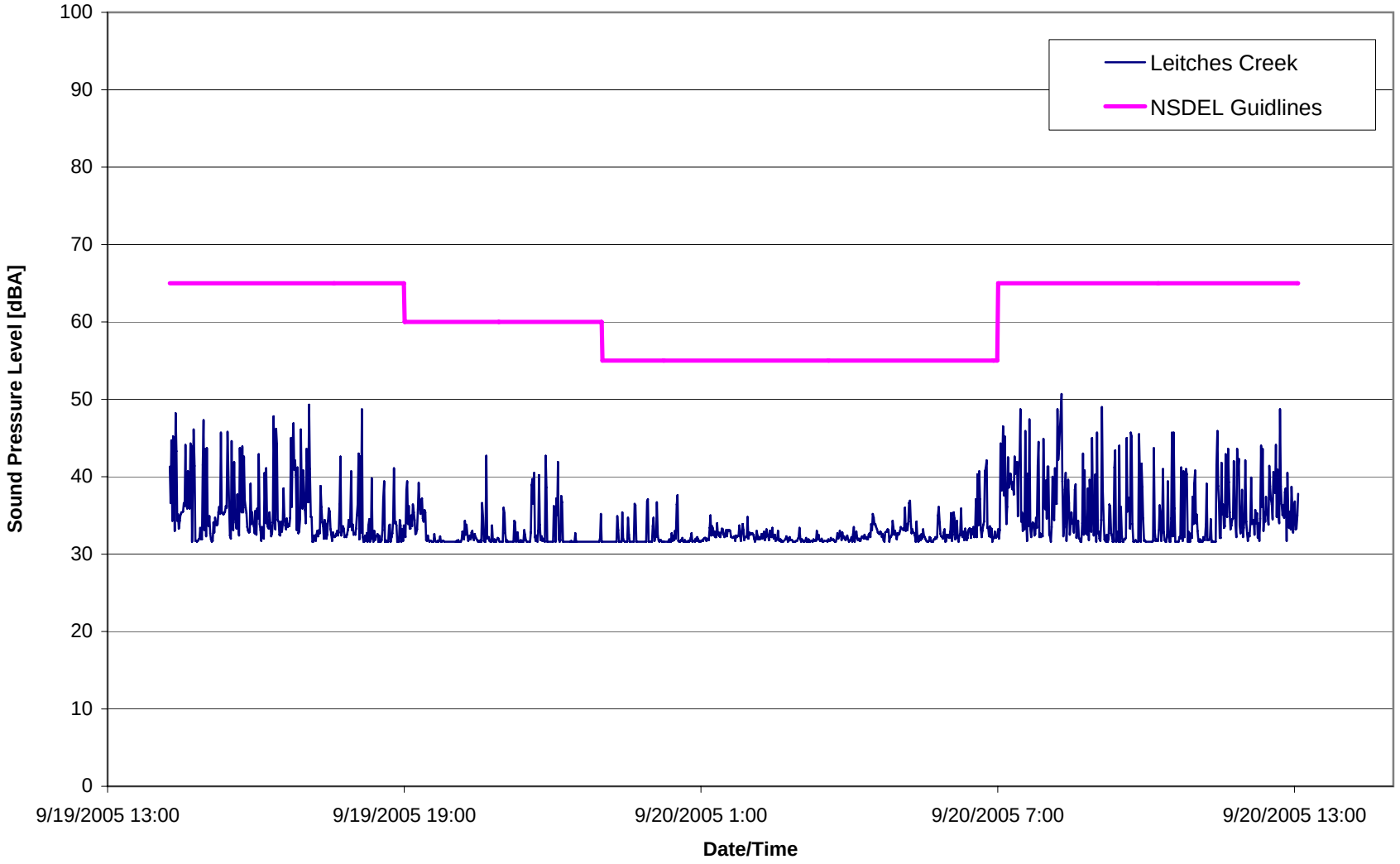

Table 2: Noise Monitoring, 668 Upper Leitches Creek Hourly Noise levels in dBA September 19 - 20, 2005				
Date / Time	**Leq**	**Guideline**	**L10 (Highest)[a]**	**L90 (Lowest)[b]**
9/19/2005 14:00	40.5	65	39.7	33.0
9/19/2005 15:00	38.0	65	37.6	33.2
9/19/2005 16:00	39.3	65	38.8	33.1
9/19/2005 17:00	36.8	65	35.7	32.4
9/19/2005 18:00	36.2	65	34.5	31.8
9/19/2005 19:00	33.8	60	34.0	31.8
9/19/2005 20:00	32.9	60	33.1	31.7
9/19/2005 21:00	34.2	60	34.0	31.8
9/19/2005 22:00	33.0	60	32.8	31.7
9/19/2005 23:00	32.5	55	32.5	31.6
9/20/2005 0:00	32.4	55	32.7	31.7
9/20/2005 1:00	32.6	55	34.1	31.6
9/20/2005 2:00	32.2	55	33.1	31.6
9/20/2005 3:00	31.9	55	32.4	31.6
9/20/2005 4:00	32.7	55	34.1	31.6
9/20/2005 5:00	33.0	55	34.3	31.6
9/20/2005 6:00	34.7	55	35.5	31.9
9/20/2005 7:00	40.3	65	40.3	32.9
9/20/2005 8:00	40.2	65	39.4	32.0
9/20/2005 9:00	38.7	65	36.9	31.9
9/20/2005 10:00	36.8	65	35.6	31.9
9/20/2005 11:00	37.2	65	36.4	32.4
9/20/2005 12:00	38.8	65	39.0	32.1

APPENDIX E

Project Information Bulletin and Letter to First Nations

Jacques Whitford

Alva Construction Limited
Quarry Expansion Project
Project Information Sheet

Project Overview

Alva Construction Limited proposes to expand the quarry footprint and continue quarry activities at its existing facility at Upper Leitches Creek, Cape Breton Regional Municipality, Nova Scotia (refer to Figure 1 on reverse). The proposal will allow continued aggregate production (blasting and crushing), and additional stockpiling. The quarried material of different sized aggregates is used for local construction projects such as road building. The primary markets for the products are within Cape Breton Regional Municipality. The proposed activities involve approximately an additional 23 ha of land immediately adjacent to the existing quarry.

Proposed project activities will be consistent with current quarry operations approved by Nova Scotia Environment and Labour (NSEL) and in accordance with the Nova Scotia Pit and Quarry Guidelines (NSEL 1999). Aggregate production begins with drilling and blasting, which will be conducted by a licensed blasting contractor. Blasting will take place approximately six to ten times per year, between April and December. After blasting, portable crushing equipment will be brought to the site to process the blasted rock. Various products (*i.e.*, various aggregate sizes) will be stockpiled at the quarry site until they are transported to local markets via tandem trucks or tractor trailer trucks. The average number of trucks hauling aggregates from the quarry is 15 per day, depending on market demand. This could increase, for a short period, if a large aggregate supply contract were awarded (*i.e.*, provincial highway construction project).

The anticipated average production rate is potentially as much as 500,000 tonnes or more per year if a significant contract were awarded. The operating schedule will be based on 24 hrs/day, 5 days/week, and 40 weeks/year, weather permitting, which is consistent with the current operating schedule.

Environmental Assessment Process

Alva Construction Limited is required to register this project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*. The environmental assessment registration is currently being prepared by environmental consultants Jacques Whitford Limited, on behalf of Alva Construction Limited, to fulfill these regulatory requirements. Other relevant provincial regulations include *the Activities Designation Regulations*, which requires an Industrial Approval from the Nova Scotia Department of Environment and Labour for the quarry operation, and the *General Blasting Regulations* made pursuant to the Nova Scotia *Occupational Health and Safety Act* (1996). Provincial guidelines to be adhered to include the Nova Scotia *Pit and Quarry Guidelines* (NSEL 1999).

The environmental assessment registration will evaluate potential environmental effects of the project and identify appropriate mitigation and monitoring to minimize these effects. The environmental assessment registration document will be available for public review and comment once it is filed with NSEL.

Environmental Document Components

The environmental registration document focuses on those aspects of the environment of most concern. Components to be evaluated include:

- rare and sensitive flora;
- wildlife;
- surface water resources
- groundwater resources;
- wetlands;
- archaeological and heritage resources;
- atmospheric environment (includes dust and noise); and
- socio-economic environment.

Potential effects of quarry activities on these components will be addressed in the registration document. Preliminary results from an environmental evaluation identified no rare or sensitive species, critical habitat, or cultural resources onsite. While further evaluations may identify critical areas or species, Alva Construction Limited will modify existing plans to avoid any sensitive features identified. Assuming the implementation of standard mitigative measures and government guidelines and approvals, no significant adverse environmental or socio-economic effects are considered likely.

Contacts

If you have any questions or concerns about this project please contact:

Brock Chisholm
Alva Construction Limited
(902) 454-5438

A.G. MacDonald, Director
Alva Construction Limited
(902) 863-6445

Angela Swaine, Project Manager
Jacques Whitford Environment Limited
3 Spectacle Lake Drive, Dartmouth, NS B3B 1W8
(902) 468-7777 ext. 210 (tel.)
(902) 468-9009 (fax)

ALVA CONSTRUCTION LIMITED, QUARRY EXPANSION
UPPER LEITCHES CREEK,
CAPE BRETON REGIONAL MUNICIPALITY, NS

Legend

- 4 Hectare Limit
- Expansion Limit
- Property Boundary
- 800 Metre Buffer

Jacques Whitford

0 50 100 200 300 400 500
Meters

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:6,000
Date: October 14, 2005
Proposal No. 1005024

Georges Lake

MacAulays Lakes

Tower Road

Upper Leitches Creek Rd

Pond

Scales

Project Location

PEI

Northumberland Strait

SYDNEY

PORT HAWKESBURY

NOVA SCOTIA

ATLANTIC OCEAN

HALIFAX

697000 698000 699000 700000 701000

5110000 5109000

Jacques Whitford

Engineering, Scientific, Planning and Management Consultants

3 Spectacle Lake Drive
Dartmouth NS
Canada B3B 1W8

Bus 902 468 7777
Fax 902 468 9009

www.jacqueswhitford.com

Project No. 1005042

December 2, 2005

Mr. Joe B. Marshall
Union of Nova Scotia Indians
47 Maillard Street
Membertou, Nova Scotia
B15 2P5

Dear Mr. Marshall:

Re: Leitches Creek Quarry Expansion

This letter is to inform you of a project that may be located close to your area of interest.

The project consists of an expansion of quarry activities at the existing facility near Upper Leitches Creek, Cape Breton Regional Municipality, Nova Scotia. The developer, Alva Construction Limited, is proposing to expand the area of the existing quarry while maintaining approximately the same level of production. Alva Construction is currently preparing the documentation required to register this project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act*.

Please find enclosed the Project Information Sheet and the corresponding Figure, which provide more details regarding the Project and the site location.

Please contact the undersigned or the contacts listed on the Project Information Sheet with any comments, concerns, or questions you may have regarding the project.

Yours very truly,

JACQUES WHITFORD LIMITED

Original Signed By

Angela Swaine
Project Manager

AS/vy
Enclosure

P:\EnvSci\100XXXX\1005042 Leitches Creek Quarry\LetterToFirstNations.doc

APPENDIX F

Vascular Plants Recorded in Study Area

Jacques Whitford

Table of Vascular Plants Recorded in the Study Area during the Fall Survey

Common Name	Binomial	S-Rank
a Hybrid Wood-fern	*Dryopteris x boottii*	HYB
A St. John's-Wort	*Hypericum perforatum*	SE
Alderleaf Viburnum	*Viburnum alnifolium*	S5
American Beech	*Fagus grandifolia*	S5
American Bugleweed	*Lycopus americanus*	S5
American Fly-Honeysuckle	*Lonicera canadensis*	S5
American Larch	*Larix laricina*	S5
American Mountain-Ash	*Sorbus americana*	S5
American Wintergreen	*Pyrola rotundifolia var. americana americana*	S5
Arrow-Leaved Tearthumb	*Polygonum sagittatum*	S5
Balsam Fir	*Abies balsamea*	S5
Beaked Hazelnut	*Corylus cornuta*	S5
Bearded Short-Husk	*Brachyelytrum erectum*	S4S5
Bebb's Willow	*Salix bebbiana*	S5
Beechdrops	*Epifagus virginiana*	S4S5
Black Holly	*Ilex verticillata*	S5
Black Sedge	*Carex arctata*	S5
Black Spruce	*Picea mariana*	S5
Black Starthistle	*Centaurea nigra*	SE
Bladder Sedge	*Carex intumescens*	S5
Blue-Joint Reedgrass	*Calamagrostis canadensis*	S5
Bog Aster	*Aster nemoralis*	S5
Bog Goldenrod	*Solidago uliginosa*	S5
Bracken Fern	*Pteridium aquilinum*	S5
Bristly Sarsaparilla	*Aralia hispida*	S5
Brittle-Stem Hempnettle	*Galeopsis tetrahit*	SE
Canada Goldenrod	*Solidago canadensis*	S5
Canadian St. John's-Wort	*Hypericum canadense*	S5
Choke Cherry	*Prunus virginiana*	S5
Christmas Fern	*Polystichum acrostichoides*	S5
Cinnamon Fern	*Osmunda cinnamomea*	S5
Clinton Lily	*Clintonia borealis*	S5
Colonial Bentgrass	*Agrostis capillaris*	SE
Colt's Foot	*Tussilago farfara*	SE
Common Boneset	*Eupatorium perfoliatum*	S5
Common Dandelion	*Taraxacum officinale*	SE
Common Hawkweed	*Hieracium lachenalii*	SE
Common Woodrush	*Luzula multiflora*	S5
Corn Mint	*Mentha arvensis*	S5
Cottongrass Bulrush	*Scirpus cyperinus*	S5
Crested Shield-Fern	*Dryopteris cristata*	S5
Dotted Smartweed	*Polygonum punctatum*	S5
Downy Goldenrod	*Solidago puberula*	S5
Dwarf Dogwood	*Cornus canadensis*	S5
Dwarf Red Raspberry	*Rubus pubescens*	S5
Eastern Hay-Scented Fern	*Dennstaedtia punctilobula*	S5

Table of Vascular Plants Recorded in the Study Area during the Fall Survey

Common Name	Binomial	S-Rank
Eastern White Pine	*Pinus strobus*	S5
European Mountain-Ash	*Sorbus aucuparia*	SE
Evergreen Woodfern	*Dryopteris intermedia*	S5
Fan Club-Moss	*Diphasiastrum digitatum*	S5
Farewell-Summer	*Aster lateriflorus*	S5
Fire Cherry	*Prunus pensylvanica*	S5
Fireweed	*Epilobium angustifolium*	S5
Flat-Top Fragrant-Golden-Rod	*Euthamia graminifolia*	S5
Fowl Manna-Grass	*Glyceria striata*	S5
Fringed Sedge	*Carex crinita*	S4S5
Goldthread	*Coptis trifolia*	S5
Graceful Sedge	*Carex gracillima*	S4S5
Green-Fringe Orchis	*Platanthera lacera*	S4S5
Gypsy-Weed	*Veronica officinalis*	S5SE
Hair Fescue	*Festuca filiformis*	SE
Hairy Willow-Herb	*Epilobium ciliatum*	S5
Heart-Leaved Paper Birch	*Betula cordifolia*	S5
Hoary Sedge	*Carex canescens*	S5
Interrupted Fern	*Osmunda claytoniana*	S5
Kentucky Bluegrass	*Poa pratensis*	S5
Lady-Fern	*Athyrium filix-femina*	S5
Lady's Thumb	*Polygonum persicaria*	SE
Large-Leaf Goldenrod	*Solidago macrophylla*	S4
Large-Tooth Aspen	*Populus grandidentata*	S5
Low Hop Clover	*Trifolium campestre*	SE
Marsh Bedstraw	*Galium palustre*	S5
Marsh Fern	*Thelypteris palustris*	S5
Marsh St. John's-Wort	*Triadenum fraseri*	S5
Meadow Hawkweed	*Hieracium caespitosum*	SE
Michaux Sedge	*Carex michauxiana*	S4
Mountain Fly-Honeysuckle	*Lonicera caerulea*	S4S4
Mountain Holly	*Nemopanthus mucronata*	S5
Mountain Wood-Fern	*Dryopteris campyloptera*	S5
Mouseear	*Hieracium pilosella*	SE
Narrow-Leaved Meadow-Sweet	*Spiraea alba*	S5
Narrow-Panicled Rush	*Juncus brevicaudatus*	S5
New Belgium American-Aster	*Aster novi-belgii*	S5
New England Sedge	*Carex novae-angliae*	S5
New York Fern	*Thelypteris noveboracensis*	S5
Northern Beech Fern	*Phegopteris connectilis*	S5
Northern Bugleweed	*Lycopus uniflorus*	S5
Northern Bush-Honeysuckle	*Diervilla lonicera*	S5
Northern Oak Fern	*Gymnocarpium dryopteris*	S5
Northern Starflower	*Trientalis borealis*	S5
Northern Witchgrass	*Panicum boreale*	S5
Norwegian Cinquefoil	*Potentilla norvegica*	S5

Table of Vascular Plants Recorded in the Study Area during the Fall Survey

Common Name	Binomial	S-Rank
One-Side Wintergreen	*Pyrola secunda*	S5
Orange Hawkweed	*Hieracium aurantiacum*	SE
Oxeye Daisy	*Chrysanthemum leucanthemum*	SE
Paper Birch	*Betula papyrifera*	S5
Pearly Everlasting	*Anaphalis margaritacea*	S5
Pennsylvania Bitter-Cress	*Cardamine pensylvanica*	S5
Pointed Broom Sedge	*Carex scoparia*	S5
Possum-Haw Viburnum	*Viburnum nudum*	S5
Poverty Oat-Grass	*Danthonia spicata*	S5
Prairie Willow	*Salix humilis*	S5
Pussy Willow	*Salix discolor*	S5
Quaking Aspen	*Populus tremuloides*	S5
Red Baneberry	*Actaea rubra*	S5
Red Elderberry	*Sambucus racemosa*	S5
Red Maple	*Acer rubrum*	S5
Red Raspberry	*Rubus idaeus*	S5
Rosy Twistedstalk	*Streptopus roseus*	S5
Rough Bentgrass	*Agrostis hyemalis*	S5
Rough Sedge	*Carex scabrata*	S5
Rough-Leaf Goldenrod	*Solidago rugosa*	S5
Royal Fern	*Osmunda regalis*	S5
Running Pine	*Lycopodium clavatum*	S5
Self-Heal	*Prunella vulgaris*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Sheep Sorrel	*Rumex acetosella*	SE
Sheep-Laurel	*Kalmia angustifolia*	S5
Shining Rose	*Rosa nitida*	S4
Shinleaf	*Pyrola elliptica*	S5
Small Bedstraw	*Galium trifidum*	S5
Small Bristleberry	*Rubus setosus*	S4?
Small Enchanter's Nightshade	*Circaea alpina*	S5
Smooth White Violet	*Viola blanda*	S5
Soft Rush	*Juncus effusus*	S5
Spinulose Shield Fern	*Dryopteris carthusiana*	S5
Spotted Joe-Pye Weed	*Eupatorium maculatum*	S5
Spreading Bentgrass	*Agrostis stolonifera*	S5SE
Spreading Dogbane	*Apocynum androsaemifolium*	S5
Stiff Clubmoss	*Lycopodium annotinum*	S5
Striped Maple	*Acer pensylvanicum*	S5
Sugar Maple	*Acer saccharum*	S5
Sweet Vernal Grass	*Anthoxanthum odoratum*	SE
Tall Meadow-Rue	*Thalictrum pubescens*	S5
Tall Rattlesnake-root	*Prenanthes altissima*	S4S5
Tawny Cotton-Grass	*Eriophorum virginicum*	S5
Three-Leaved Rattlesnake-root	*Prenanthes trifoliolata*	S5
Trailing Arbutus	*Epigaea repens*	S5

Table of Vascular Plants Recorded in the Study Area during the Fall Survey

Common Name	Binomial	S-Rank
Tree Clubmoss	*Lycopodium obscurum*	S5
Twinflower	*Linnaea borealis*	S5
Velvetleaf Blueberry	*Vaccinium myrtilloides*	S5
Virginia Rose	*Rosa virginiana*	S5
Virginia Strawberry	*Fragaria virginiana*	S5
Wall Hawkweed	*Hieracium murorum*	SE
White Spruce	*Picea glauca*	S5
White Wood-Sorrel	*Oxalis acetosella*	S5
Wild Lily-of-The-Valley	*Maianthemum canadense*	S5
Wild Sarsaparilla	*Aralia nudicaulis*	S5
Woolly Blue Violet	*Viola sororia*	S5
Yellow Birch	*Betula alleghaniensis*	S5
Yellow Sweetclover	*Melilotus officinalis*	SE

APPENDIX G

Wetland Evaluation

Jacques Whitford

This wetland is approximately 0.146 ha in size and is located near Upper Leitches Creek in the eastern portion of the area slated for expansion of the Leitches Creek Quarry.

The amount of wetland habitat potentially disturbed by the Project is less than 2 ha and thus is subjected to the ten-step wetland evaluation process described in the Nova Scotia Department of Environment Wetland Directive (NSDNR 1995). In the following text each of the questions associated with the ten steps is addressed.

Step 1. Evaluate Wildlife Habitat Potential.

This wetland does not appear on wetland atlas mapping due to its small size and no Golet Score (a wetland evaluation system used to determine the value of wetlands as wildlife habitat) has been assigned to it. During the initial field surveys, all species of bird, mammal, reptile and amphibian detected within and immediately adjacent to the wetland were recorded. Wildlife species were detected on the basis of visual sightings, vocalizations, tracks, feces, skeletal remains, and distinctive signs such as claw marks or dens.

The wetland was surveyed for birds, mammals and herpetiles in September 2005 and additional wildlife information will be collected during a second visit in late May or early June, 2006. Birds observed in the wetland included the Common Yellowthroat. Tracks and feces of varying hare and white-tailed deer were observed in the wetland suggesting that these mammals use the wetland or travel through it. Herpetile species noted from the wetland included the leopard frog. The wetland does not contain any pools which suggests that it does not provide valuable habitat for waterfowl or semi-aquatic mammals such as muskrat (*Ondatra zibethicus*) and beaver (*Castor canadensis*), or breeding habitat for amphibians. Additionally, the wetland does not provide suitable habitat for fish. Overall, the wetland is considered to have relatively low value as wildlife habitat due to its small size and lack of diverse habitats.

Step 2. Evaluate for Rare and Endangered Species

A vegetation survey was conducted in the fall of 2005 to determine if any rare vascular plant species were present. A second vegetation survey will occur in 2006 to further determine the diversity and abundance of any rare species.

A total of 152 species of vascular plant were encountered during the survey (Appendix E), 45 of which are found in the wetland (Table below X.X). None of these species is considered to be rare in Nova Scotia (ACCDC 2005; NSDNR 2005), or Canada (COSEWIC 2005). None of the wildlife species recorded are considered to be rare nationally (COSEWIC 2005) or provincially (ACCDC 2005, NSDNR 2005).

Table G.1 Vascular Plants Found in Wetland

Common Name	Binomial	S-Rank
American Bugleweed	*Lycopus americanus*	S5
American Fly-Honeysuckle	*Lonicera canadensis*	S5
American Larch	*Larix laricina*	S5
Balsam Fir	*Abies balsamea*	S5
Bebb's Willow	*Salix bebbiana*	S5
Black Holly	*Ilex verticillata*	S5
Blue-Joint Reedgrass	*Calamagrostis canadensis*	S5
Bog Goldenrod	*Solidago uliginosa*	S5
Cinnamon Fern	*Osmunda cinnamomea*	S5
Colonial Bentgrass	*Agrostis capillaris*	SE
Common Boneset	*Eupatorium perfoliatum*	S5
Cottongrass Bulrush	*Scirpus cyperinus*	S5
Crested Shield-Fern	*Dryopteris cristata*	S5
Dwarf Dogwood	*Cornus canadensis*	S5
Dwarf Red Raspberry	*Rubus pubescens*	S5
Eastern White Pine	*Pinus strobus*	S5
Flat-Top Fragrant-Golden-Rod	*Euthamia graminifolia*	S5
Heart-Leaved Paper Birch	*Betula cordifolia*	S5
Hoary Sedge	*Carex canescens*	S5
Marsh Fern	*Thelypteris palustris*	S5
Marsh St. John's-Wort	*Triadenum fraseri*	S5
Michaux Sedge	*Carex michauxiana*	S4
Mountain Fly-Honeysuckle	*Lonicera caerulea*	S4S4
Mountain Holly	*Nemopanthus mucronata*	S5
Narrow-Leaved Meadow-Sweet	*Spiraea alba*	S5
Narrow-Panicled Rush	*Juncus brevicaudatus*	S5
New Belgium American-Aster	*Aster novi-belgii*	S5
New York Fern	*Thelypteris noveboracensis*	S5
Possum-Haw Viburnum	*Viburnum nudum*	S5
Prairie Willow	*Salix humilis*	S5
Pussy Willow	*Salix discolor*	S5
Red Maple	*Acer rubrum*	S5
Red Raspberry	*Rubus idaeus*	S5
Rough Bentgrass	*Agrostis hyemalis*	S5
Royal Fern	*Osmunda regalis*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Sheep-Laurel	*Kalmia angustifolia*	S5
Shining Rose	*Rosa nitida*	S4
Small Bristleberry	*Rubus setosus*	S4?
Smooth White Violet	*Viola macloskeyi*	S5
Tawny Cotton-Grass	*Eriophorum virginicum*	S5
Virginia Rose	*Rosa virginiana*	S5

Table G.1 Vascular Plants Found in Wetland

Common Name	Binomial	S-Rank
Virginia Strawberry	*Fragaria virginiana*	S5
White Spruce	*Picea glauca*	S5
Yellow Birch	*Betula alleghaniensis*	S5

Step 3. Evaluate Groundwater Recharge Potential

The wetland may function as a groundwater recharge site. It receives both surface water and groundwater inputs from a portion of the watershed approximately 0.184 km^2 in size; however, there is no evident surface water outflow suggesting that water is lost from the wetland through evapotranspiration and groundwater flow. No wells are located within approximately 2 km. Given the size of the wetland and its location relative to inhabited areas it is not expected to play a significant role in the replenishment of local water supplies.

Step 4. Evaluate the Role of the Wetland in Surface Flow Regulation

The wetland may play a minute role in surface water flow regulation by capturing flood surface waters from the surrounding watershed and temporarily storing it or diverting some into groundwater flow. The wetland currently has no visible outflow, and thus the wetland likely does not play a significant role in general surface flow regulation.

Step 5. Evaluate the Agricultural use of the Wetland

The wetland is not used for agricultural production nor does it have any agricultural potential due to its small size.

Step 6. Evaluate the Potential Role of the Wetland in Water Treatment

The wetland is not an obvious source or sink of water treatment for the surrounding areas. The direction of surface flow is away from the wetland area suggesting the water may arrive from rainfall and dissipate through either percolation or evaporation (Appendix H, Figure 1). There does not appear to be any effluent source or other artificial or natural input into the wetland.

Step 7. Evaluate the Potential for Peat Development

The wetland is too small to provide potential for commercial peat extraction and the peat present in the wetland would have a high wood content reducing its value as horticultural peat.

Step 8. Have You Addressed All Potential Issues With the Wetland Proposal?

All issues have been addressed.

Step 9. Address Additional Concerns

There are no additional concerns.

Step 10. Summary of Wetland Evaluation

This wetland provides minimal wetland functions including the probable ground water infiltration site and surface water flow control. Expansion of the quarry will result in the loss of wetland habitat. Incorporating mitigative compensation measures as per NSEL's guidance will minimize adverse changes to overall wetland diversity and abundance in Nova Scotia.

APPENDIX H

Bird Species Potentially Found in Study Area

Jacques Whitford

Table H1 MBBA Birds Within the Vicinity of Leitches Creek Quarry, Cape Breton, Nova Scotia

MBBA Possible	MBBA Probable	MBBA Confirmed	Species	Binomial Nomenclature	NSDNR Rank	COSEWIC Rank	ACCDC Rank	Observed (Field Survey
		x	Alder Flycatcher	*Empidonax alnorum*	Green			
		x	American Black Duck	*Anas rubripes*	Green			
		x	American Crow	*Corvus brachyrhynchos*	Green			
		x	American Goldfinch	*Carduelis tristis*	Green			
		x	American Kestrel	*Falco sparverius*	Green			
		x	American Redstart	*Setophaga ruticilla*	Green			
		x	American Robin	*Turdus migratorius*	Green			
		x	Bald Eagle	*Haliaeetus leucocephalus*	Green	Not at risk		
		x	Barn Swallow	*Hirundo rustica*	Green			
x			Barred Owl	*Strix varia*	Green			
		x	Belted Kingfisher	*Ceryle alcyon*	Green			
		x	Black-and-white Warbler	*Mniotilta varia*	Green			
		x	Black-backed Woodpecker	*Picoides arcticus*	Green			
x			Blackburnian Warbler	*Dendroica fusca*	Green			
		x	Black-capped Chickadee	*Parus atricapillus*	Green			x
		x	Blackpoll Warbler	*Dendroica striata*	Green			
		x	Black-throated Blue Warbler	*Dendroica caerulescens*	Green			x
		x	Black-throated Green Warbler	*Dendroica virens*	Green			
		x	Blue Jay	*Cyanocitta cristata*	Green			
		x	Blue-winged Teal	*Anas discors*	Green			
	x		Bobolink Goglu	*Dolichonyx oryzivorus*	Yellow		S3B	
		x	Boreal Chickadee	*Parus hudsonicus*	Green		S3S4	
	x		Brown-headed Cowbird	*Molothrus ater*	Green			
		x	Cedar Waxwing	*Bombycilla cedrorum*	Green			
		x	Chimney Swift	*Chaetura pelagica*	Green			
		x	Chipping Sparrow	*Spizella passerina*	Green			
		x	Common Grackle	*Quiscalus quiscula*	Green			
		x	Common Loon	*Gavia immer*	Yellow	Not at risk		
	x		Common Raven	*Corvus corax*	Green			x
		x	Common Snipe	*Gallinago gallinago*	Green			
		x	Common Tern	*Sterna hirundo*	Yellow	Not at risk	S3B	
		x	Common Yellowthroat	*Geothlypis trichas*	Green			x

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MBBA Possible	MBBA Probable	MBBA Confirmed	Species	Binomial Nomenclature	NSDNR Rank	COSEWIC Rank	ACCDC Rank	Observed (Field Survey
		x	Dark-eyed Junco	*Junco hyemalis*	Green			
	x		Downy Woodpecker	*Picoides pubescens*	Green			
		x	Eastern Wood-Pewee	*Contopus virens*	Green			
		x	European Starling	*Sturnus vulgaris*	Intro			
		x	Evening Grosbeak	*Coccothraustes vespertinus*	Green			
		x	Golden-crowned Kinglet	*Regulus satrapa*	Green			
x			Gray Catbird	*Dumetella carolinensis*	Green			
x			Gray-cheeked Thrush	*Catharus minimus*	Yellow			
x			Great Black-backed Gull	*Larus marinus*	Green			
		x	Green-Winged Teal	*Anas crecca*	Green			
x			Hairy Woodpecker	*Picoides villosus*	Green			
		x	Hermit Thrush	*Catharus guttatus*	Green			
x			Herring Gull	*Larus argentatus*	Green			
		x	Hooded Merganser	*Lophodytes cucullatus*	Green			
		x	House Sparrow	*Passer domesticus*	Intro			
		x	Least Flycatcher	*Empidonax minimus*	Green			
		x	Lincoln's Sparrow	*Melospiza lincolnii*	N/A			
		x	Magnolia Warbler	*Dendroica magnolia*	Green			
x			Merlin	*Falco columbarius*	Green	Not at risk	S3S4B	
		x	Mourning Warbler	*Oporornis philadelphia*	Green			
		x	Northern Flicker	*Colaptes auratus*	Green			
		x	Northern Parula Warbler	*Parula americana*	Green			
x			Northern Waterthrush	*Seiurus noveboracensis*	Green			
	x		Olive-sided Flycatcher	*Contopus borealis*	Green			
		x	Osprey	*Pandion haliaetus*	Green			
		x	Ovenbird	*Seiurus aurocapillus*	Green			
	x		Palm Warbler	*Dendroica palmarum*	Green			
	x		Philadelphia Vireo	*Vireo philadelphicus*	Green		S2B	
x			Pied-billed Grebe	*Podilymbus podiceps*	Green			
x			Pileated Woodpecker	*Dryocopus pileatus*	Green			
	x		Pine Grosbeak	*Pinicola enucleator*	Green			
		x	Pine Siskin	*Carduelis pinus*	Green			
	x		Purple Finch	*Carpodacus purpureus*	Green			

Table H1 MBBA Birds Within the Vicinity of Leitches Creek Quarry, Cape Breton, Nova Scotia

MBBA Possible	MBBA Probable	MBBA Confirmed	Species	Binomial Nomenclature	NSDNR Rank	COSEWIC Rank	ACCDC Rank	Observed (Field Survey
		x	Red Crossbill	*Loxia curvirostra*	Green		S3S4	
		x	Red-breasted Merganser	*Mergus serrator*	Green		S2S3B	
		x	Red-breasted Nuthatch	*Sitta canadensis*	Green			
		x	Red-eyed Vireo	*Vireo olivaceus*	Green			
x			Red-tailed Hawk	*Buteo jamaicensis*	Green	Not at risk		
		x	Red-winged Blackbird	*Agelaius phoeniceus*	Green			
		x	Ring-necked Duck	*Aythya collaris*	Green			
		x	Ruby-crowned Kinglet	*Regulus calendula*	Green			
	x		Ruby-throated Hummingbird	*Archilochus colubris*	Green			
		x	Ruffed Grouse	*Bonasa umbellus*	Green			x
	x		Rusty Blackbird	*Euphagus carolinus*	Green		S3S4B	
		x	Savannah Sparrow	*Passerculus sandwichensis*	Green			
x			Sharp-shinned Hawk	*Accipiter striatus*	Green	Not at risk		
		x	Solitary Vireo	*Vireo solitarius*	Green			
		x	Song Sparrow	*Melospiza melodia*	Green			x
		x	Spotted Sandpiper	*Actitis macularia*	Green			
x			Spruce Grouse	*Dendragapus canadensis*	Green			
	x		Swainson's Thrush	*Catharus ustulatus*	N/A			
		x	Swamp Sparrow	*Melospiza georgiana*	Green			
		x	Tennessee Warbler	*Vermivora peregrina*	Green			
		x	Tree Swallow	*Tachycineta bicolor*	Green			
x			Veery	*Catharus fuscescens*	Green			
		x	White-throated Sparrow	*Zonotrichia albicollis*	Green			
	x		White-winged Crossbill	*Loxia leucoptera*	Green			
		x	Wilson's Warbler	*Wilsonia pusilla*	N/A			
		x	Winter Wren	*Troglodytes troglodytes*	Green			
x			Wood Duck	*Aix sponsa*	Green			
		x	Yellow Warbler	*Dendroica petechia*	Green			
		x	Yellow-bellied Flycatcher	*Empidonax flaviventris*	Green			
		x	Yellow-bellied Sapsucker	*Sphyrapicus varius*	Green			
		x	Yellow-rumped Warbler	*Dendroica coronata*	Green			x