Dexter Construction Co. Ltd.
Environmental Assessment Registration
Kemptown Road Quarry
Proposed Expansion Project

JW PROJECT # NSD17814

NOVEMBER 2004

Jacques Whitford

Dexter Construction Company Ltd.

PROJECT NO. NSD17814

REPORT TO

DEXTER CONSTRUCTION CO. LTD.

ON

ENVIRONMENTAL ASSESSMENT REGISTRATION
KEMPTOWN ROAD QUARRY EXPANSION
KEMPTOWN, NS

Jacques Whitford Limited
3 Spectacle Lake Drive
Dartmouth, NS B3B 1W8
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November 30, 2004

EXECUTIVE SUMMARY

Dexter Construction Co. Ltd. (Dexter) proposes to expand the area of its existing quarry at Kemptown, Colchester County, Nova Scotia. The proposal will allow continued aggregate production (blasting and crushing), stockpiling, and occasional asphalt production. During the past few years, the quarry has expanded to supply material for Nova Scotia Department of Transportation and Public Works (TPW) contracts. Dexter wishes to expand its market beyond TPW contracts and create more areas for stockpiling various types of aggregate. The proposed activities will take place over the next 10 years (varying depending on market demand) and will involve approximately 16 hectares (ha) of land, immediately adjacent to the existing quarry. The current and anticipated production rate is approximately 75,000 tonnes per year. The proposed operating schedule will be consistent with the existing schedule of 15 hrs/day, 7 days/week, and 4 weeks/year, weather permitting.

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 (NSDEL 1999). Aggregate production will begin with drilling and blasting, which will be conducted by a qualified blasting contractor. Blasting and crushing of aggregate will generally occur once a year between the months of May and November, but may occasionally occur more frequently. 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 sold and transported to local markets via tandem trucks or tractor trailer trucks. The primary market for the products will be TPW contracts. No additional facilities are needed to accommodate the expansion.

In order to expand the quarry boundary, expand its market beyond TPW contracts and create more area for stockpiling various types of aggregates, Dexter 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*. Provincial guidelines to be adhered to include the Nova Scotia Pit and Quarry Guidelines (NSDEL 1999). Relevant federal legislation includes the *Fisheries Act*, *Species at Risk Act* and the *Migratory Birds Convention Act*.

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:

- surface water resources and fish and fish habitat;
- groundwater resources;
- rare and sensitive flora;

- wildlife (including herpetiles and breeding birds);
- wetlands;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

Environmental effects from the quarry expansion will include the loss of terrestrial habitat within the quarry footprint. Field surveys indicate that this area does not include unique habitat or rare or sensitive species; therefore, these effects are not anticipated to be significant. Note that the area originally proposed for expansion has been modified to maintain a buffer around wetland habitat occurring in the northwest corner of the property.

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 to occur. Continued operation of the quarry will result in economic benefits, including employment and ongoing business opportunities.

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1.0 PROPONENT AND PROJECT IDENTIFICATION

1.1 Proponent Information

Dexter Construction Company Limited (Dexter; the Proponent) was incorporated as a New Brunswick company in 1961 where it carried out its construction and materials related business. Some years later, the company was purchased by Municipal Enterprises Limited and expanded its operations to Nova Scotia. Today, Dexter is one of the largest road contractors in the Province of Nova Scotia and owns several pits and quarries throughout the Province. A copy of a Certificate of Status and a copy of Registry of Joint Stocks are included in Appendix A.

Name of the Proponent:	Dexter Construction Co. Ltd
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	Truro, NS B2N 5V4
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Company President, Chief Executive Officer and/or Environmental Assessment Contact:

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Official Title:	Superintendent
Address, Tel, Fax:	Same as above

Environmental Consultant Contact:

Name:	Janice Comeau
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Cecil Cane — Nov 18/04

Signature of Signing Officer **Date**

1.2 Project Information

Name of the Undertaking:	Kemptown Road Proposed Quarry Expansion Project
Location of the Undertaking:	Kemptown, Colchester County, Nova Scotia

2.0 DESCRIPTION OF THE UNDERTAKING

Dexter owns and operates a quarry on Kemptown Road, Colchester County, NS (Figure 1). Dexter now proposes to expand its quarry to allow for continued aggregate production (*i.e.,* blasting, crushing, stockpiling, and occasional asphalt production) and to supply various construction and road building projects and activities. Dexter is required to register this Project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*. A detailed description of the proposed undertaking is provided in the following sections.

2.1 Project Background

In January 1994, Dexter (and Municipal Enterprises Limited) leased a parcel of land from Marshall and Jean Hutt for the development and operation of a rock quarry. At that time, Dexter made application to Nova Scotia Environment and Labour (NSEL) for an Industrial Waste Permit to allow for development and operation of a 4 ha quarry. An Industrial Waste Permit Approval (No. 94-003) was subsequently issued on March 11, 1994. A copy of the permit is appended to this report (Appendix B). Prior to Dexter's quarry operation, the land had been used for an unknown period of time by previous owners as a gravel pit.

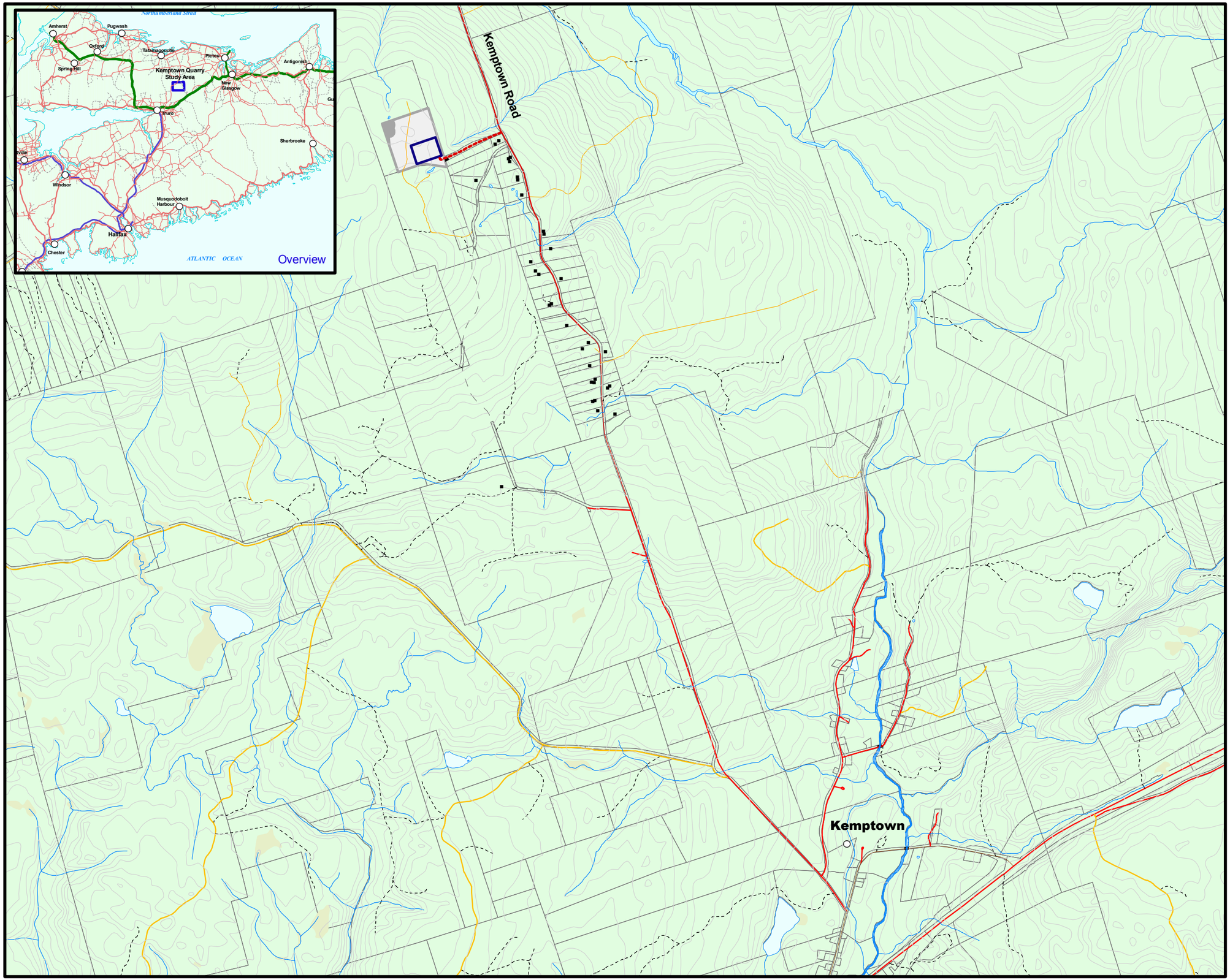
The quarry has operated on a seasonal basis (*i.e.*, from May through November) since it opened in July 1994. The quarry lands were subsequently purchased by Dexter in 1999. Over the past nine years of development and operation of the quarry, approximately 500,000 tonnes of material has been excavated. Generally, excavation has been in the direction of the working quarry face (west) (Figure 2).

In 2000, the quarry began to produce products solely for the Nova Scotia Department of Transportation and Public Works (TPW), which, in accordance with the *Environmental Assessment Regulations* and the Pit and Quarry Guidelines (NSDEL 1999), does not require an environmental assessment or Industrial Approval. At this time, the working area expanded beyond 4 ha (see Figure 2). Dexter has continued to operate the quarry in accordance with the *Pit and Quarry Guidelines*. On September 2, 2004, a representative of NSEL visited the quarry to review the status of the development. No significant concerns were raised.

In 2001, Dexter purchased land adjacent to the existing quarry to allow for an expansion of its operation to approximately 16.4 ha (40.6 acres) as shown in Figure 2. Note that the area originally proposed for expansion has been modified to maintain a buffer around wetland habitat occurring in the northwest corner of the property. It is Dexter's intent/desire to continue servicing TPW, while also extending its market to other customers and to provide more areas for stockpiling various types of aggregate. Quarry operations will continue to take place over the next 10 years; however, this may vary depending upon the demand for aggregate in the area. The annual production rate is not anticipated to increase as a result of the proposed expansion.

Figure 1

Kemptown Road Quarry Proposed Location Map



LEGEND

Kemptown Quarry
- Currently Permitted (NSEL) Area
- Proposed Expansion Area
- Area to be Avoided Due to Wetland
- Quarry Access Road

Roads
- Major Road
- Abandoned Road
- Loose Surface Road
- Trail / Track

Land Features
- Building/Structure
- Contour
- Watercourse
- Waterbody
- Wetland
- Landcover

- Property Boundaries

N

0 200 400 600 800

Metres

Data Source:
NSGC: Modifications Made
by Jacques Whitford Based
on Field Survey

Map Parameters
Projection: Modified Transverse Mercator (MTM)
Zone: 5
Datum: ATS 77
Scale: 1:20,000
Project Number: NSD17814
Date: November 2004

Jacques Whitford

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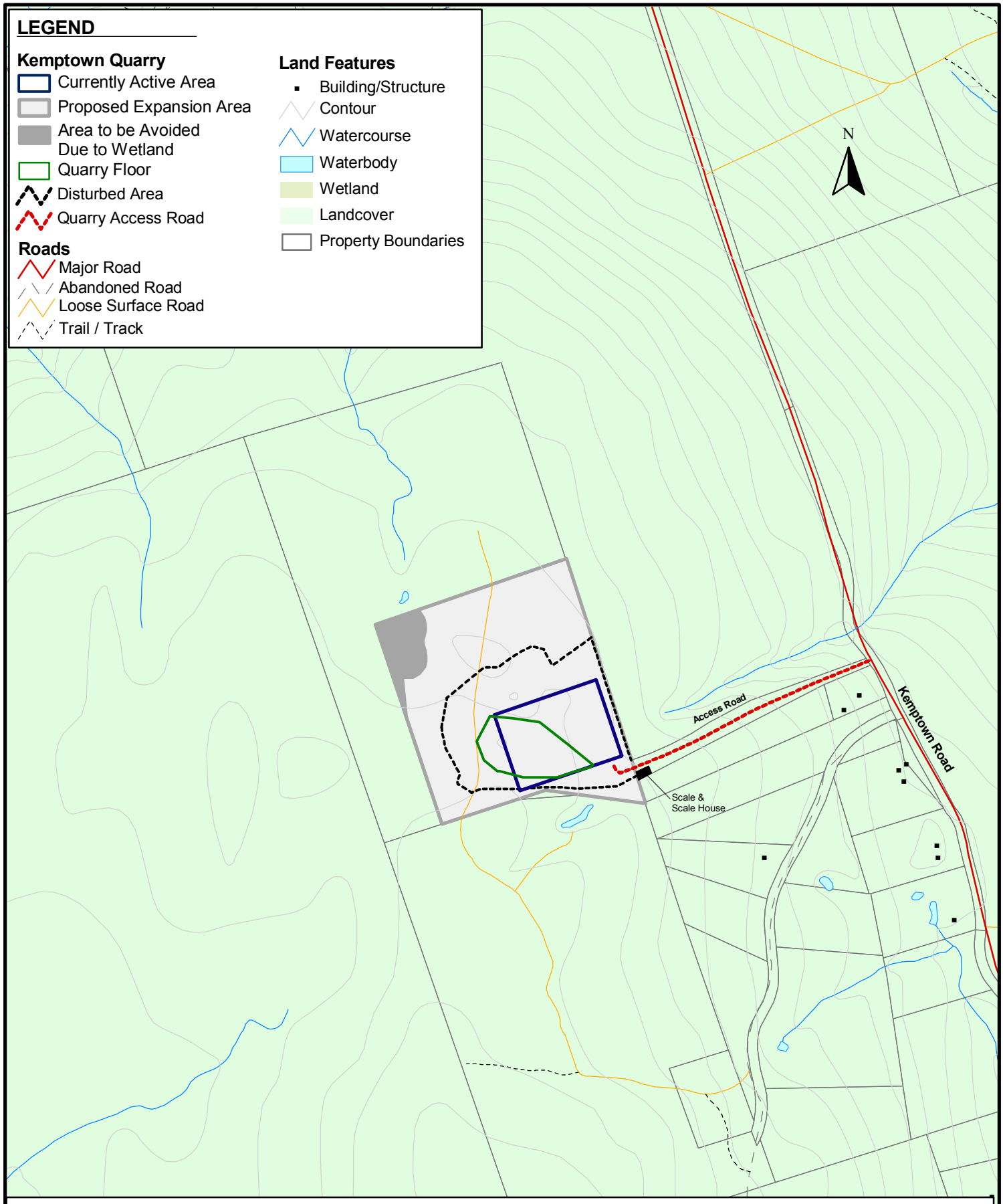

Data Source:
NSGC: Modifications Made by Jacques Whitford Based on Field Survey

Jacques Whitford

Figure 2

Kemptown Road Quarry Expansion Project Components

0 100 200 300 400 500

Metres

Map Parameters
Projection: Modified Transverse Mercator
Zone: 5
Datum: ATS 77
Scale: 1:10,000
Project Number: NSD17814
Date: November2004

x:\projects\novascotia\nsd17814

2.2 Geographical Location

The quarry is located on the west side of the Kemptown Road in Colchester County, NS. The entrance to the quarry is approximately 5.1 km northwest of the intersection of the Kemptown Road and Trunk 4 (Figure 2). The quarry, including the expanded area, is predominantly surrounded by forest (*i.e.,* pine, spruce and yellow birch with low shrubs scattered over barren areas). The density of residential development in the Project area is low (*i.e.*, 52 residences within a 5 km radius of the quarry). The nearest communities are Upper Kemptown and Kemptown, located approximately 3 and 6 km, respectively, to the south, and Earltown, approximately 7 km to the north.

The quarry is located on the Cobequid Mountains, which stand approximately 305 m (1000 feet) above sea level. The area is characterized by a thin layer of overburden (< 1 metre) of sandy glacial till overlying Devonian aged granite bedrock. The quarry area is relatively flat with drumlins scattered throughout the property. The actual rock face is part of a knoll with an elevation difference of approximately 15 m across the site.

The boundaries of the existing permitted area and the proposed quarry expansion area are shown on Figures 1 and 2. The nearest residence is approximately 325 m from the boundary of the proposed quarry expansion. As shown on the mapping, there are three residences within 500 m of the quarry boundary, 9 within 1 km, 18 within 1.5 km and 24 within 2 km. The general direction of quarry advancement is west-northwest, away from the majority of these residences.

2.3 Physical Components

The existing quarry operation consists of a laydown area for the portable crushing equipment, aggregate stockpile/storage area, quarry floor and working face, scale and scale house, and access road (Figure 2). 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.

The laydown area is a rock pad approximately 40 m by 15 m. The crushing equipment is transported to the site as required (*i.e.,* after blasting). The existing stockpile area is approximately 60 m by 25 m. Upon approval, Dexter will expand this area to approximately 90 m by 50 m to accommodate the additional aggregate storage (*i.e.,* presently there are five aggregate types stockpiled and an additional seven are proposed). The surface area of the quarry floor is approximately 1.83 ha. The quarry floor acts as a collection pond for quarry drainage and runoff (see Sections 2.4 and 2.5.2 for further details). The current elevation of the quarry floor is approximately 260 m above sea level, approximately 5 m below the lowest natural grade. Dexter will continue to excavate from the working face and does not anticipate excavating deeper into the quarry floor. Although it is not anticipated at this time, prior to any

excavation below the water table, Dexter will conduct a hydrological study, as required by the Pit and Quarry Guidelines, and will obtain approval from NSEL.

The scale and scale house are portable and brought to the site as needed. The access road is approximately 525 m in length. A portion of the quarry access road has been surfaced with asphalt to minimize the generation of dust, as well as to minimize maintenance (*i.e.,* grading) to the road. No additional access roads or modifications to the existing access road are required to support the planned expansion.

2.4 Site Preparation and Construction

During initial site preparation for the existing quarry, timber was harvested from the area prior to quarry development. Dexter developed the quarry in stages. The first stage involved an area of approximately four acres. To minimize the potential for erosion and sedimentation, grubbing and removal of overburden was conducted on an as needed basis, to accommodate drilling and blasting activities. Grubbed and overburden materials are stockpiled on site and stabilized with blasted rock for subsequent use during rehabilitation. Topsoil is also stockpiled on site and stabilized with hydroseed for subsequent use in rehabilitation. This practice will continue throughout the development and operation of the proposed expansion area.

During the initial quarry development phase, provision was made to collect surface runoff in a sedimentation pond with spillway. Once the quarry floor was established below the natural contours (*i.e.*, at an elevation of 260 m above sea level), it served as a surface runoff and drainage collection pond. A drainage culvert was installed at that time to convey any overflow from the quarry floor to a drainage channel along the quarry access road. There is little overflow from the quarry floor as the majority of the water collected infiltrates down into the quarry floor and/or evaporates. The capacity of the collection pond/quarry floor continues to grow as the quarry advances.

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. 94-003) and will be in accordance with the Pit and Quarry Guidelines (NSDEL 1999). These guidelines apply to all pit and quarry operations in the Province of Nova Scotia and provide separation distances for operations and guidance on activities including blasting, liquid effluent discharge level limits, suspended particulate matter limits, sound level limits, and requirements for a rehabilitation plan and security bond.

Aggregate production begins with drilling and blasting. Blasting and crushing of aggregate will generally occur once a year between the months of May and November, but may occasionally occur more frequently. 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* (1996). Blasting activity will be conducted in accordance with the Pit and Quarry Guidelines. A blast design has been prepared and submitted to NSEL. A pre-blast survey of all residences and wells within 800 m of the quarry was undertaken when the quarry was initially developed in 1994 and again in September 2003 to capture new residences.

The blasted rock will be processed by portable crushing equipment transported to the quarry site for a period of approximately one month at a time. The various aggregate products will be stockpiled in designated areas within the quarry. Piles may be built in layers to minimize segregation and prevent contamination by mixing of different piles. Material is hauled and moved within the quarry with a loader. Other equipment may include a backhoe and/or front-end loader.

Products will be transported from the quarry via tandem and tractor trailer trucks to the local markets along the Kemptown Road, Loop of Old Trunk 4, Trunk 4 and Highway 104 (the Trans Canada Highway (TCH)). The TCH is a Schedule C provincial highway that allows for year-round triaxle trucking and can accommodate loads greater than 38,500 kg. Trunk 4, in the area of the quarry, is an all-weather road with no seasonal weight restrictions and can handle loads up to 38,500 kg. The Loop of Old Trunk 4 and the Kemptown Road can accommodate loads up to 38,500 kg; however, they are subject to spring weight restrictions. At full production, (*i.e.*, under TPW contracts), up to 100 truckloads per day for a period of one week may be transported from the facility. Dexter has and will continue to comply with all applicable seasonal and weight restrictions.

The operating schedule will be based on 15 hrs/day, 5 days/week and weekends as required, 4 weeks/year, weather permitting, which is consistent with the current operating schedules. The current and anticipated production rate is approximately 75,000 tonnes per year.

The existing quarry currently employs 4 to 7 individuals during production to operate crushing and mobile equipment and conduct general labour activities. Hauling of materials from the quarry involves additional resources, approximately 20% of which are hired directly by Dexter and the remaining 80% are hired through the local trucking association. Drilling and blasting activities involve additional resources; these activities are sub-contracted to a professional blasting company.

2.5.2 Effluents and Emissions

Erosion and Sediment Control

In accordance with best practices and standard NSEL requirements, erosion and sedimentation controls will be in place to ensure that effluent generated during operations is managed appropriately. This will include diversion of clean surface drainage away from disturbed areas and stabilization of all disturbed areas and potentially erodible soils with rock, hydroseed, or mulch. Dexter will coordinate quarry activities with seasonal constraints (*i.e.,* to the extent possible, avoid periods of heavy precipitation and snow melt) and will minimize the amount and duration of exposed soil at all times. Prior to temporary and winter shut down, Dexter will ensure the quarry site is left in a stable condition to minimize the potential for erosion and subsequent sedimentation during these non-operational periods.

Presently, surface runoff at the quarry is collected in low areas on the quarry floor where, for the most part, it evaporates or infiltrates into the ground. The quarry floor has the ability to hold/contain a significant volume of water. The existing containment/retention capacity of the quarry floor is more than adequate for the existing facility, as well as any future expansion. In a further effort to minimize generation of sediment laden water, trucks and equipment will refrain from traveling through ponded water on the quarry floor.

Overflow from the quarry floor, if any, is conveyed through a 30 m (100 ft) long culvert to a ditch/drainage channel along the quarry access road. Overflow will be monitored, sampled and reported 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 from the quarry exceeds final effluent discharge limits as determined through monitoring or is sediment laden (based on a visual inspection), contingency measures that may be employed include pumping of sediment laden water to vegetated areas (away from watercourses) or through filter bags for additional filtration and/or use of additional filtration devices or structures. More specific details related to erosion and sediment control, where required, will be identified in the amended Industrial Approval.

A hydrological review of the Kemptown Road quarry and the proposed expansion was conducted by Hydro-Com Technologies Limited (refer to Appendix C). It was determined that the required capacity of the quarry floor, allowing for water accumulation, should have a volume of no less than 4,700 m^3 in order to accommodate the site runoff from the quarry at the proposed ultimate level of development. At the present level of development, the capacity of the quarry floor is several times this minimum volume. The review concluded that the effects on the downstream flows and water quality 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/siltation treatment areas.

Following the use of these mitigative measures, the remaining residual effects on downstream flows and water quality are expected to be minor.

Acid Rock Generation

Acid rock drainage is not expected to occur as a result of the Project. Bedrock in the vicinity of the proposed development is granite.

Dust

Dust emissions will be controlled with the application of water, obtained from the water pooled/contained 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 is seeded and/or covered with rock or mulch to minimize erosion and dust generation. The quarry access road is partially surfaced with asphalt to minimize generation of dust. Monitoring of airbourne particulate emissions (dust) will be conducted at the request of NSEL and in accordance with the Pit and Quarry Guidelines.

Noise

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)

Sound monitoring will be conducted at the request of NSEL.

Combustion

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, and reduction of engine idling when not in use.

Solid Waste

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 recycling facility (where appropriate) or 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 will be removed from the site and disposed of in an appropriate manner.

Refuelling of equipment will be conducted on a regular basis, under contract by a tanker truck, onsite. Refuelling activities will not be conducted within 100 m of any watercourse, 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.*

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.*

As a requirement of the Industrial Approval application/amendment for this quarry, Dexter will prepare a contingency plan for accidental events for NSEL approval. The Canadian Standards Association publication, *Emergency Planning for Industry (CAN/CSA-Z731-95),* will be consulted as a reference in the preparation of the contingency plan.

2.6 Decommissioning and Reclamation

Dexter has and will continue to 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 is graded to a stable slope, covered with topsoil, and seeded. 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 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.

In August 2004, Dexter decommissioned and reclaimed a portion of the existing quarry along the southern boundary. This consisted of sloping/grading, spreading of topsoil, and seeding.

3.0 SCOPE

As it is Dexter's intent to expand its market and approved quarry area, the Project must be registered for Environmental Assessment under the *Environmental Assessment Regulations* of the Nova Scotia *Environment Act* as a Class I Undertaking. This report fulfills the primary requirements for Project registration under this legislation.

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 operations, additional stockpiling, and market expansion. 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; a laydown area for portable crushing equipment; a scale and scale house; the working face, which is currently sloped and stabilized at the end of each contract with TPW; and the quarry floor, which acts as a quarry drainage and runoff collection pond and associated drainage culvert. Additional facilities and infrastructure associated with the proposed expansion will likely include additional aggregate stockpile areas and additional erosion and sediment control structures, if required.

Access to the quarry site is via an access road from the Kemptown Road, approximately 525 m in length, specifically constructed for the operation of the quarry. From the quarry, products are transported via tandem and tractor trailer truck to local markets along the Kemptown Road and to Trunk 4 and Highway104. During active operation of the quarry (*i.e.*, during a typical TPW contract), up to 100 truck loads per day, for a period of one week, may be hauled from the facility.

Expansion of the quarry will be initiated immediately following necessary approvals from NSEL. The operating schedule will be based on 15 hrs/day, 5 days/week and weekends as required, 4 weeks/year, weather permitting, which is consistent with the current operating schedules. Blasting and crushing of aggregate is expected to occur once or twice a year and occasionally more frequently, between May and November, when demand for the product is present. The current and anticipated production rate is approximately 75,000 tonnes per year. The proposed expansion area will cover a total of approximately 16.4 hectares (see Figure 2).

Dexter will continue to 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 of the Project is to allow Dexter to expand its market and extend the life of its quarry at Kemptown. As such, Dexter will extend the boundaries of its current quarry operation. The quarry is currently operating under Approval No. 94-003, issued by NSEL on March 11, 1994. The areas regulated by this approval are either depleted or near depletion. The aggregates produced at the quarry are an important requirement in road construction and other construction projects. Dexter anticipates the source material to be of similar quality to adjacent material currently extracted at the existing quarry (*i.e.,* primarily Devonian aged granite).

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 extraction at the Kemptown 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. The expansion is occurring in an area that is already exposed to mining/quarrying activities. Expansion of the quarry will not require the construction of any new facilities, as the existing facilities are sufficient for the current and expanded operations. 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 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 and guidelines include the *General Blasting Regulations* made pursuant to the Nova Scotia *Occupational Health and Safety Act* (1996) and the Nova Scotia Pit and Quarry Guidelines (NSDEL 1999). Relevant federal legislation includes the *Species at Risk Act*, *Fisheries Act* and the *Migratory Birds Convention Act.*

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 at the site.

The *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSDEL 2002) was also used to determine/focus the scope of the assessment.

The proponent and their consultant met with provincial regulatory agencies (NSEL and NSDNR) on August 21, 2003 to discuss the location, proposed expansion area, and elements and activities associated with the proposed Project, in an effort to focus the scope of the assessment. Landowners within 5 km of the quarry were also contacted (see Section 4.0) for the purpose of issue identification.

This environmental assessment evaluates the potential environmental effects of the proposed Project elements and activities, for all Project phases, with regard to each of the identified Valued Environmental Component (VEC) and Valued Socio-economic Component (VSC). 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 (including herpetiles and breeding birds);
- groundwater resources;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

Based on professional judgement and existing information, and given the size, nature and location of the proposed Project, the Proponent and its consultants are confident that the zones of influence and subsequent boundaries of the assessment for this Project are limited. The physical footprint of quarry activities will only be expanding by 16.4 ha in total and the majority of emissions and discharges will likely be confined to the immediate vicinity of the quarry expansion area and Kemptown Road. Therefore, consideration of the above noted environmental components is focussed on their status in the general area of the Project and potential effects within the quarry expansion area and Kemptown Road.

As part of the scoping and assessment process, the Nova Scotia Government's Significant Species and Habitat database was consulted to determine the presence of high priority areas within the general area of the Project. This database is maintained by the Department of Natural Resources and contains information on sites within Nova Scotia that contain species at risk, species of special conservation concern, specialized habitats that could be jeopardized by human activities, sites of high biodiversity and sites of local natural historic interest. The results of this search are provided in Figure 3. Deer wintering areas are located 1.4 km from the site, species at risk habitat is located 2.9 km from the site (related to the potential presence of Inner Bay of Fundy salmon populations in the Salmon River) and species at risk habitat is located 6.1 km from the site (related to presence of mainland moose).

Figure 3

Kemptown Road Quarry Significant Species & Habitats

Kemptown Road Quarry Location

Truro

LEGEND

Significant Habitat

- Deer Wintering
- Of Concern
- Old Forest
- Other Habitat
- Saltmarsh
- Species at Risk
- Wetland

Project Location

N

0 2000 4000 6000

Metres

Map Parameters
Projection: Universal Transverse Mercator (UTM)
Zone: 20
Datum: NAD 83
Scale: 1:150,000
Project Number: NSD17814
Date: November2004

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4.0 PUBLIC INVOLVEMENT

4.1 Methods of Involvement

Dexter sent a letter to Chief Lawrence Paul of Millbrook First Nation in the fall of 2003, advising him of the proposed quarry expansion at Kemptown and seeking his comments and concerns relating to the proposed Project. Chief Lawrence Paul responded in December 2003 and stated the following: "Further to your 9 October 2003 letter, I advise there are no concerns regarding the proposed quarry operation. I advise we have no objection to the quarry expansion." A copy of the letter is included as Appendix D.

On October 13, 2003, a Project information bulletin was distributed to all landowners, and some local businesses, within 5 km of the quarry (Appendix E). A total of 52 bulletins were delivered to residents, and two copies were delivered to Murphy's General Store, located in Earltown, and Scott's Bakery and Variety, located in Kemptown.

4.2 Stakeholder Comments and Steps Taken to Address Issues

Table 4.1 summarizes the comments received and issues raised as a result of a meeting held with regulatory agencies (August 21, 2003), an information bulletin that was distributed to all landowners within 5 km of the quarry, and regulatory review of the draft environmental assessment. Also included in Table 4.1 are Dexter's response/proposed resolution to the issues raised.

Table 4.1 Summary of Comments and Concerns Raised by Stakeholders

Raised by:	Issue/Concern	Response/Proposed Resolution
NSDNR	Ownership of resources beneath water bodies.	Dexter and its consultant have evaluated all surface water bodies within the proposed expansion area and have determined whether dewatering is required to extract the resource (see Section 5.2).
NSDNR	Timing of field surveys.	Dexter and its consultant conducted a modelling exercise to determine potential presence of rare plants on site and to identify appropriate timing of surveys. Two surveys were subsequently conducted.
NSDNR	Monitoring of overflow for compliance with final effluent discharge limits.	Dexter will implement various erosion and sediment control measures to minimize production of sediment laden runoff. Monitoring of effluent will be conducted in accordance with NSEL requirements (see Section 2.5.2).
NSDNR, Environment Canada, and NSEL	Protection of wetland habitat.	Wetlands within and surrounding the Project area are described in Section 5.4, including a description of proposed mitigation. The proposed expansion area has been modified to avoid a wetland in the northwest corner of the Project area.
NSDNR	Impacts of sedimentation on Salmon River and its tributaries.	Section 2.5.2 describes the erosion and sediment control measures to be implemented to prevent/minimize the potential for sedimentation to streams surrounding the Project area.
NSDNR	Use of dated reference material for rare and at risk wildlife species.	Dexter and its consultant have conducted additional research and have obtained the recommended reference material (see Section 3.0 and Section 5.0).

Table 4.1 Summary of Comments and Concerns Raised by Stakeholders		
Raised by:	**Issue/Concern**	**Response/Proposed Resolution**
NSEL/NSDNR	Alterations in groundwater flow may affect adjacent wetlands, surface waters, and wells.	This environmental assessment registration considers potential environmental effects on groundwater resources (see Section 5.6) and interactions with surface water. A groundwater monitoring program, including installation of monitoring wells, will be developed and implemented.
NSEL	Provide description of watershed boundaries and names of rivers.	The Project site catchment basins have been delineated on Figure 4.
DFO	Protection of fish habitat.	There are no streams (or fish habitat) within the proposed expansion area or within approximately 100 m of the proposed expansion area. Section 2.5.2 and 5.2.2 provide a description of erosion and sediment control to be implemented to protect water quality and fish habitat downstream.
DFO	Potential for acid generating bedrock.	Acid rock drainage is not expected to occur as a result of the Project, as bedrock in the area of the development consists of granite.
Environment Canada	Protection of migratory birds, eggs, nests, and young.	Dexter will conduct clearing activities to avoid sensitive periods for most breeding birds and will implement other measures as required to ensure compliance with the *Migratory Birds Convention Act*. A spill contingency plan will be developed as part of the Industrial Approval Application.
Environment Canada	Pollution Prevention, Waste Management, and Accidents and Malfunctions.	Section 2.5.3 provides a discussion of hazardous waste, waste handling and management, and contingency planning. A spill contingency plan will be developed as part of the Industrial Approval Application.
Environment Canada	Erosion and Sedimentation Prevention and Control.	Section 2.5.2 provides a description of the erosion and sediment control measures to be implemented for the proposed Project.
Local Resident	Impacts to wells from blasting.	Proposed mitigation includes replacement of water supplies in the event of temporary or long-term/permanent effects on water quality or quantity (see Section 5.6.2).
Local Resident	Trucks travelling too fast along Kemptown Road.	As required by the Nova Scotia Trucking Association, 80% of the trucks hauling materials from the quarry are employed through the association and the remaining 20% are employed by Dexter. Dexter will work with their employees and with the trucking association to ensure that trucks travelling along the Kemptown Road are travelling at the posted speed limit. Furthermore, Dexter will also contact TPW regarding additional signage (*i.e.*, reduction of speed for truck traffic) along Kemptown Road.
Local Resident	Would like more direct, advance notice of blasting.	Dexter will ensure that blasting contractor provide direct and advance notice of blasting to all residences within 2 km of the quarry along the Kemptown Road.

5.0 VALUED ENVIRONMENTAL/SOCIOECONOMIC COMPONENTS (VEC/VSC) AND EFFECTS MANAGEMENT

5.1 Methodology

Field studies were conducted by Jacques Whitford between July 21, 2003 and June 4, 2004 to investigate and establish existing conditions and to determine appropriate mitigation, if necessary, to minimize environmental effects from the proposed expansion Project. These surveys consisted of: two vegetation surveys; breeding bird survey; mammal survey; herpetile survey; and surface water and fish and fish habitat survey. These surveys were undertaken by qualified terrestrial and fresh water ecologists employed by Jacques Whitford. An assessment of potential archaeological and heritage resources was undertaken by a qualified archaeologist. 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.

Temporal and spatial boundaries encompass those periods during, and areas within which, the VECs 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, but are generally limited to the duration of, and for a period of time after, the activities and the immediate Project area unless otherwise noted.

To 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 Surface Water Resources, Fish and Fish Habitat

5.2.1 Description of Existing Environment

The proposed quarry expansion is situated along the eastern limits of a local watershed divide (elev. 280 m) between tributaries of the Salmon River on the east and north, and the South Branch North River on the southwest. The local catchment basins have been delineated on Figure 4. Tributaries to the Salmon River are located approximately 90 m east and 100 m to the north of the quarry boundary (Figure 4). Information from federal and provincial government departments indicates that the Salmon River (*i.e.*, 2.9 km downstream from the site) supports a population of the Inner Bay of Fundy Atlantic salmon (*Salmo salar*). This species population is listed under Schedule 1 of the *Species at Risk Act* as an endangered species. It is therefore subject to the prohibitions under Section 32(1), Section 33 and Section 58 of the Act. Although the Project will not directly impact individuals of this species or the habitat of this species, the potential for indirect downstream effects on water quality and quantity have been addressed in this assessment as described below.

During a review of 1:50,000 scale NTS mapping, the site map provided by Dexter Construction Ltd., and aerial photographs (1994), a number of potential waterbodies were also identified within the proposed quarry expansion area (Figure 5). To verify the existence of these waterbodies, as well as the potential for fish habitat within both the water bodies and the Salmon River tributaries, the proposed quarry expansion area was assessed by a qualified aquatic biologist on August 26, 2003. Photos taken during the survey and referenced below are included in Appendix F.

Potential Water Bodies

Of the nine potential waterbodies identified in and near the proposed quarry expansion area (Figure 5), only one waterbody was encountered during the 2003 field survey (location 9). Five of the potential waterbodies identified on the mapping and aerial photography no longer exist (Figure 5, locations 1, 2, 3 (photo 1), 4 (photo 2), and 5 (photo 3)). Three of the remaining potential waterbodies were dry at the time of the field surveys and their basins were occupied by a heavy growth of grasses, sedges and bulrushes (Figure 5, location 6 (photo 4), 7 (photo 5), and 8 (photo 6)). Location 6 is located on the edge of the present quarry workings and is a small grassy clearing. The site was visited by a wetland ecologist on September 16, 2003. The area was dry and occupied by a sparse cover of grasses, sedges and ruderal herbs. It was not classified as wetland habitat. Location 7 has been identified as an anthropogenic wetland, likely formed as a result of forest harvesting activities, and is addressed further in Section 5.4. Location 8 is located outside of the proposed quarry expansion area. Location 9 (Photo 7), a small pond located outside of the quarry expansion area, had a water depth of approximately one metre at the time of the field survey. This water body does not have a defined inflow or outflow and there were many signs that water levels are usually higher. This pond does not offer quality fish habitat, as fish migration is not possible.

Jacques Whitford

Figure 4

Kemptown Quarry Project

Project Site Catchment Areas

Salmon River

South Branch North River

- Catchment Areas
- Project Permitted Area
- Project Expansion Area
- Area to be Avoided Due to Wetland
- Contours
- Roads
- Watercourse
- Land Cover

N

0 500 1000 1500 2000

Metres

Data Source:
NSGC, Hydrocom

Map Parameters
Projection: Modified Transverse Mercator (MTM)
Zone: 5
Datum: ATS 77
Scale: 1:50,000
Project Number: NSD17814
Date: November 2004

x:\projects\novascotia\nsd17814

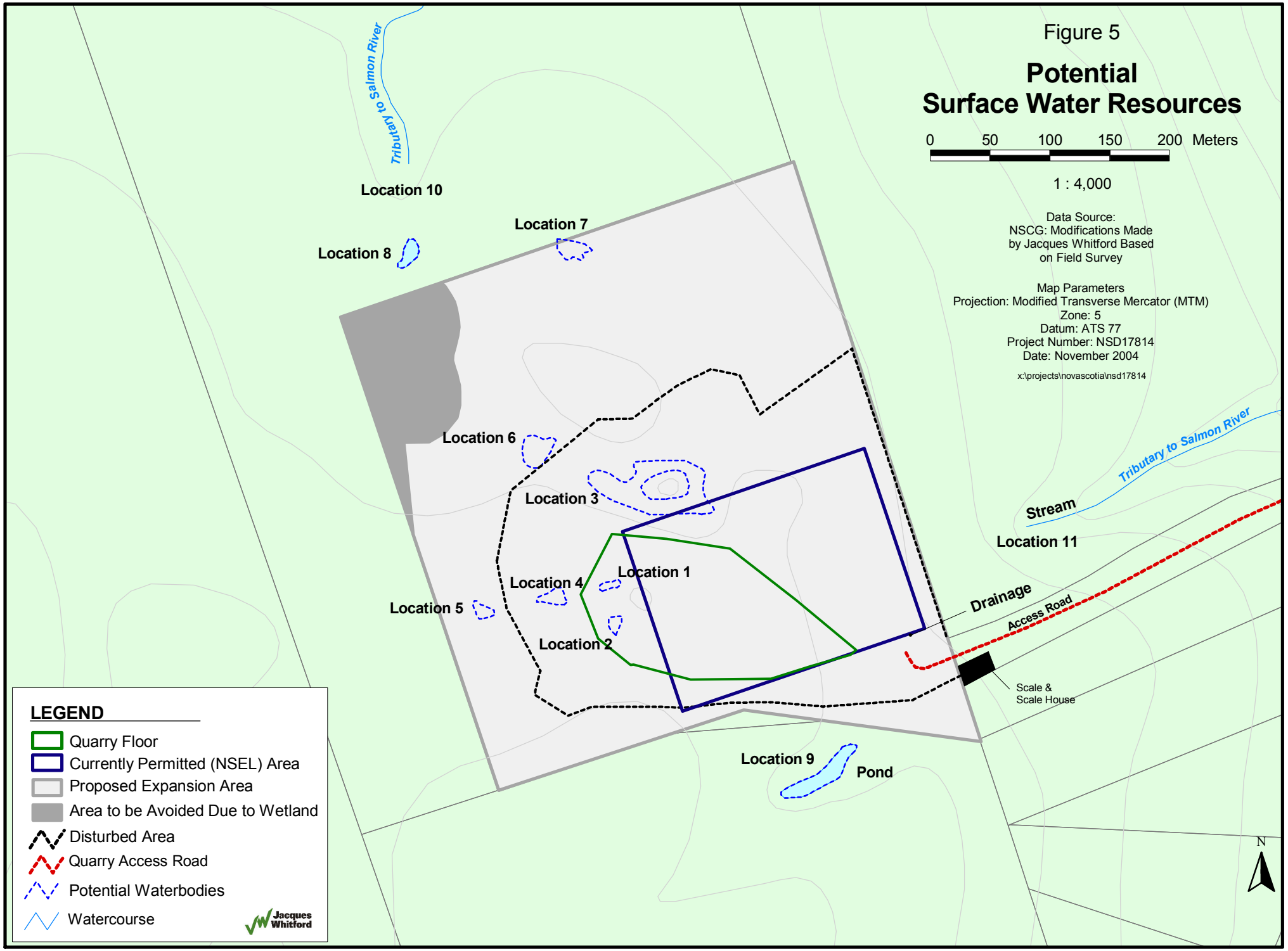


Figure 5
Potential
Surface Water Resources
0 50 100 150 200 Meters
1 : 4,000
Data Source:
NSCG: Modifications Made
by Jacques Whitford Based
on Field Survey
Map Parameters
Projection: Modified Transverse Mercator (MTM)
Zone: 5
Datum: ATS 77
Project Number: NSD17814
Date: November 2004
x:\projects\novascotia\nsd17814
Tributary to Salmon River
Location 10
Location 7
Location 8
Location 6
Location 3
Location 1
Location 4
Location 5
Location 2
Location 9
Pond
Stream
Tributary to Salmon River
Location 11
Drainage
Access Road
Scale &
Scale House
N
LEGEND
Quarry Floor
Currently Permitted (NSEL) Area
Proposed Expansion Area
Area to be Avoided Due to Wetland
Disturbed Area
Quarry Access Road
Potential Waterbodies
Watercourse
Jacques Whitford

The proposed expansion area, as well as the area surrounding it, has been clear-cut within approximately the past 15 years. It is believed that the potential water bodies identified on the 1994 aerial photography and 1:50,000 NTS mapping may have developed as a result of anthropogenic activities associated with the timber harvesting (*i.e.*, construction of fire ponds and impedance of local drainage by the movement of heavy equipment). To investigate this interpretation, 1985 aerial photography of the area, prior to timber harvesting and quarry development, were reviewed to ascertain whether the potential water bodies existed prior to disturbance. No open water is visible from the 1985 air photos; however, grassy areas are visible at the locations of four of the nine water bodies (Figure 5, locations 3, 4, 6, and 8). These grassy areas are believed to be small basin marshes dominated by wool grass (*Scirpus cyperinus*) and manna grass (*Glyceria* spp.). It appears that these basin marshes contained shallow open water in spring and possibly into early summer, but dried out in mid to late summer. The aerial photography from 1994 was taken on June 20, early in the growing season when standing water would be present. The aerial photos from 1985 were taken on August 5, after the shallow marshes had dried out. The remaining five potential water bodies cannot be distinguished from the forest cover, possibly due to their small size or possibly because they did not exist prior to forestry operations. Timber harvesting activities may have impeded surface water drainage at these sites resulting in the establishment of small basin marshes that are seasonally flooded.

Salmon River Tributaries

Location 10 (Figure 5) (*i.e.,* Salmon River tributary located to the north of the quarry) was also dry at the time of the survey. This portion of the stream does not offer quality fish habitat, as it becomes dry for some part of the year (Photo 8); however, the water in this section of the stream eventually flows into a larger watercourse capable of sustaining fish.

Overflow from the quarry floor flows through a 30 m long culvert (60 cm in diameter) that has been installed in the eastern portion of the quarry (Photo 9 and 10). The culvert conveys the overflow to a drainage channel along the quarry access road for approximately 50 m before it is directed to a vegetated area adjacent to (*i.e.*, within approximately 75 m of) the headwaters of a stream (Figure 5, Location 11). This stream, east of the quarry site, is intermittent in nature and contained little water at the time of the survey. The average width of the stream is 20 cm and water depth ranged from 0 to 14 cm (Photo 11). This stream crosses the Kemptown Road through a metal culvert. The downstream end of the 40 m long, 80 cm diameter culvert is perched approximately 100 cm above the streambed (Photo 12) (*i.e.,* a barrier to fish passage). The low flow and intermittent nature of this stream, and the barrier to fish passage at the Kemptown Road crossing, constitute a lack of fish habitat in this portion of the stream. Furthermore, due to the length of time that the stream crossing has likely been in place (*i.e.*, more that 20 years), it is highly unlikely that resident fish still inhabit this portion of the stream. At the time of the survey, pH of the water in the stream was 6.42, temperature was 17.1 and dissolved oxygen was 6 mg/L.

In November 2004, representatives of DFO conducted a habitat assessment of the stream at Location 11 (Figure 5). It is DFO's determination/opinion that there is potential for resident fish to inhabit this portion of the stream (V. Burdett-Coutts, pers. comm. 2004) and that "*...while there may be no fish habitat within the physical footprint of the quarry expansion, there is fish habitat of good quality surrounding and downstream of the quarry*" (Letter from DFO to Department of Environment and Labour dated November 24, 2004).

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

Water Quality

Clearing, grubbing, and topsoil stripping activities will 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 are expected to mitigate erosion and sedimentation effects. Stockpiled overburden and topsoil will be stabilized with mulch, hydroseed or rock. The quarry floor, which acts as a surface runoff and quarry drainage collection pond will accommodate the anticipated additional drainage and runoff from the proposed ultimate level of development. Additional erosion and sedimentation control measures are provided in Section 2.5.2.

Quarry drainage and surface runoff will continue to be directed to the quarry floor where it is allowed to collect and sediment is allowed to settle. Clean surface drainage will be directed away from disturbed areas. Overflow of the quarry floor collection pond (if any) will be monitored and sampled according to the existing Approval and the Pit and Quarry Guidelines to ensure total suspended solids levels do not exceed the final effluent discharge limits indicated. Potential overflow from the quarry floor is discharged approximately 75 m from the nearest watercourse.

The Pit and Quarry Guidelines also require a 30 m separation distance be maintained between active areas (*e.g.*, crushing equipment and stockpiles) and the bank of any watercourses or the ordinary high water mark. Given the results of the field survey (*i.e.*, no watercourses within the proposed expansion area or within 90 m of the boundary of the proposed expansion area), this is not a concern.

Fish and Fish Habitat

Section 35 of the *Fisheries Act* requires approval by Fisheries and Oceans Canada (DFO) for any alteration, disruption or destruction of fish habitat (*i.e.,* a HADD authorization) and also triggers the requirement for a federal environmental assessment under the *Canadian Environmental Assessment Act.*

As described in Section 5.2.1, there was no fish or fish habitat identified by the study team within the proposed quarry expansion area or within approximately 500 m downstream of the area, although DFO suggests that there is potential for resident fish in the stream north of the quarry access road (V. Burdett-Coutts, pers. comm. 2004) and has determined that there is fish habitat of good quality surrounding and downstream of the quarry. In the interest of protection of any fish habitat downstream, mitigation to minimize erosion and sedimentation, as described above and in Section 2.5.2, will be implemented. These mitigative measures will also protect resident fish and habitat that may exist in the watercourse upstream of the Kemptown Road.

The potential environmental effects of blasting in and adjacent to watercourses (*i.e.*, potential deleterious effects on fish, fish eggs and larvae) are not a concern. In any case, 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). As well, all blasting, physical works, equipment refuelling, stockpiles of aggregates *etc.* will not be undertaken/placed within at least 90 m of any watercourse. Due to the distance of physical quarry activities from the nearest watercourse and with implementation of effective spill response, it is not considered likely that any small spills of hydrocarbons that could occur onsite would have the potential of reaching or impacting any watercourses. As described in Section 2.5.3, all spills will be reported to the 24-hour environmental emergencies reporting system.

As described in Section 2.3, Dexter does not anticipate deepening the quarry floor below its current elevation. If this were deemed necessary in the future, Dexter would conduct a hydrological study as required by the Pit and Quarry Guidelines, and will obtain approval from NSEL. This study would consider the potential for excavation to dewater any watercourses, although this is considered unlikely as the closest watercourse is located 90 m from the quarry boundary.

Summary

Based on the results of the analysis, there is limited potential for quarry activities to interact with surface water resources or fish and fish habitat. With effective sediment and erosion control measures and compliance with the existing Approval and Guidelines, effects on fish habitat will be negligible. There is also no potential for activities at the quarry site to affect water quality/quantity downstream in the Salmon River, as supported by the above assessment. Therefore, no adverse effects on Inner Bay of Fundy Atlantic Salmon or the habitat of this species are likely to occur. DFO has also concluded that through implementation of appropriate methods of sediment and erosion control to contain silt and sediment on the site, the proposed works and undertakings will not likely result in the harmful alteration, disruption or destruction of fish habitat (Letter from DFO to Department of Environment and Labour dated November 24, 2004). In summary, significant Project-related effects on surface water resources and fish habitat are not likely to occur.

5.3 Rare and Sensitive Flora

5.3.1 Description of the Existing Environment

A vascular plant inventory was compiled for the site. The survey was focussed on natural habitats located in the area where quarry expansion is expected to occur. The study area is composed of six distinct habitat types. These include mature hygric mixedwood forest, immature mesic mixedwood forest, immature mesic softwood forest, tall shrub basin swamp, anthropogenic wetland, and disturbed areas. Although all habitat types were not specifically delineated and mapped, wetlands and other key habitat features are delineated on Figure 6.

All species of vascular plant encountered during the survey were identified and their population status in Nova Scotia were determined through a review of the species status reports prepared by the Nova Scotia Department of Natural Resources (NSDNR 2003; NSDNR 2004), Atlantic Canada Conservation Data Centre (ACCDC 2004) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2004). A list of the vascular plant species found on the site is presented in Appendix G. None of the species encountered during the field survey are considered to be uncommon or rare in Nova Scotia (ACCDC 2004; NSDNR 2004) or in Canada (COSEWIC 2004).

Mature Hygric Mixedwood Forest

Mature hygric mixedwood forest is found in an imperfectly drained basin at the southwest corner of the property (Figure 6). The tree canopy is composed largely of a mixture of red maple (*Acer rubrum*), black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*). The average age of trees in this stand is estimated to be approximately 60 years. The shrub understory is dominated by false holly (*Nemopanthus mucronata*), as well as seedlings and saplings of black spruce and red maple. The ground vegetation layer consists largely of a moss carpet composed mainly of Schreber's moss (*Pleurozium schreberi*) and sphagnum moss (*Sphagnum* spp.) which is punctuated by abundant shoots of cinnamon fern (*Osmunda cinnamomea*) and bunchberry (*Cornus canadensis*). NTS mapping identifies this habitat as wetland; however, the results of the site visit did not support this classification (Figure 6). The stand contains a plant community similar in species composition to mixedwood treed swamps found throughout Nova Scotia; however, swamps typically have vernal pools or stream channels associated with them. No evidence of extant or dry pools or channels was found in the stand and the surface of the forest floor was relatively dry.

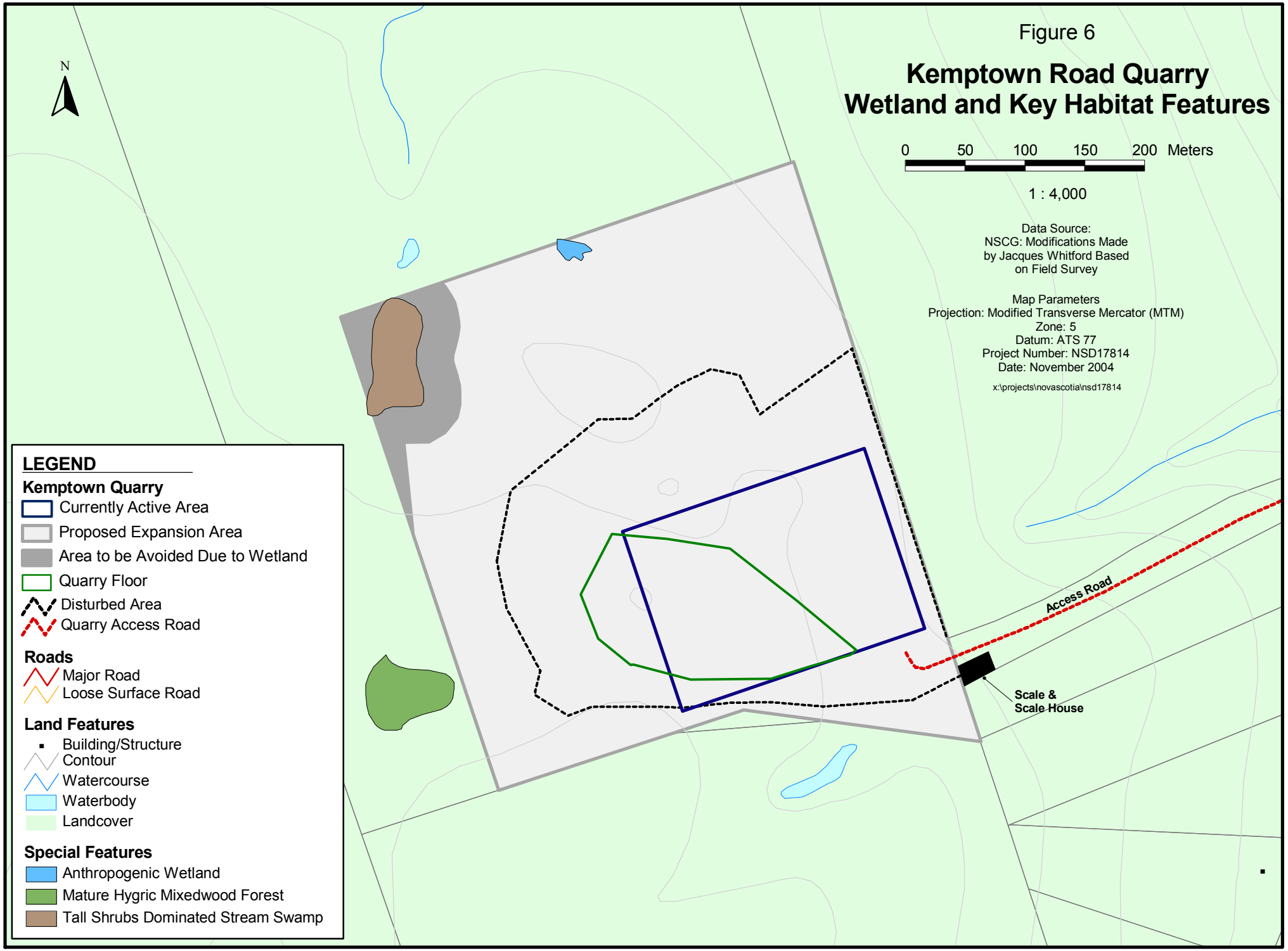


Figure 6
Kemptown Road Quarry
Wetland and Key Habitat Features
0 50 100 150 200 Meters
1 : 4,000
Data Source:
NSCG: Modifications Made
by Jacques Whitford Based
on Field Survey
Map Parameters
Projection: Modified Transverse Mercator (MTM)
Zone: 5
Datum: ATS 77
Project Number: NSD17814
Date: November 2004
x:\projects\novascotia\nsd17814
N
LEGEND
Kemptown Quarry
Currently Active Area
Proposed Expansion Area
Area to be Avoided Due to Wetland
Quarry Floor
Disturbed Area
Quarry Access Road
Roads
Major Road
Loose Surface Road
Land Features
Building/Structure
Contour
Watercourse
Waterbody
Landcover
Special Features
Anthropogenic Wetland
Mature Hygric Mixedwood Forest
Tall Shrubs Dominated Stream Swamp
Access Road
Scale &
Scale House

The stand is underlain by approximately two metres of woody peat suggesting that it was wetland habitat in the past. Deposition of organic matter has resulted in the infilling of the basin in which the stand is located, resulting in conversion of the wetland to forest habitat. It is likely that past anthropogenic activities in the vicinity of this wetland have also influenced its conversion to forest habitat. It is difficult to determine the exact timing and nature of these influences, as the site was used for gravel extraction prior to Dexter's operation of the quarry in July 1994. The area of disturbance by the previous owner is roughly equivalent to Dexter's currently permitted area of 4 ha. In addition, an access road was developed between the quarry and the former wetland, likely to facilitate timber harvesting. All of these activities were on-going prior to Dexter taking ownership of the land and quarry site.

Immature Mesic Mixedwood Forest

This forest type is found on the southern side of the western half of the study area. The canopy of this habitat type consists of a moderately dense cover of balsam fir, sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*). A mixture of fly-honeysuckle (*Lonicera canadensis*) and red raspberry (*Rubus ideaus*) dominates the shrub understory. Hay-scented fern (*Dennstaedtia punctilobula*), wood aster (*Aster acuminatus*), bracken fern (*Pteridium aquilinum*), and running clubmoss (*Lycopodium clavatum*) are the most abundant species of the ground vegetation layer. This habitat type has developed following timber harvesting on the property approximately 15 years ago.

Immature Mesic Softwood Forest

This habitat type is found mainly on the eastern side of the proposed quarry expansion area. It appears to have developed following timber harvesting approximately 15 years ago. The presence of dead stems of hardwoods and red raspberry, as well as the fact that this habitat type has developed under similar soil and drainage conditions present in the immature mixedwood forest habitat suggests that tree species composition in this habitat type had been altered through application of herbicide. This habitat type was characterized by lower species richness than encountered in the immature mixedwood forest habitat. The canopy of this stand was characterized by a dense cover of balsam fir and red spruce (*Picea rubens*). The shrub understory was extremely sparse and consisted almost entirely of red raspberry. The ground vegetation layer consisted mainly of a carpet of Schreber's moss and bunchberry along with a few evergreen wood fern (*Dryopteris intermedia*) and wild sarsaparilla (*Aralia nudicaulis*).

Tall Shrub Basin Swamp

This habitat type is found at the northwest corner of the proposed quarry expansion area (Figure 6). It has developed along a narrow intermittent channel and it likely forms part of the headwaters for the Salmon River tributary located north of the quarry expansion area. Tree cover consists of a few

scattered balsam firs. A patchy cover of tall shrubs is present which is dominated by speckled alder (*Alnus incana*). Advanced regeneration of balsam fir, black spruce and red maple is also present in the shrub layer. Open patches are present in this wetland, particularly along the edge of the intermittent channel. These areas are typically dominated by a mixture of sedge (*Carex echinata*), bog goldenrod (*Solidago uliginosa*), wool grass (*Scirpus cyperinus*), sphagnum moss, Joe-Pye weed (*Eupatorium maculatum*), and violets (*Viola* sp.). Other species typical of the ground vegetation layer include rough goldenrod (*Solidago rugosa*), tawny cotton-grass (*Eriophorum virginicum*) and rattlesnake grass (*Glyceria canadensis*).

Anthropogenic Wetland

This habitat is found at the northern end of the proposed quarry expansion area (Figure 6). This wetland has developed as a result of forest harvesting operations approximately 15 years ago. Heavy ground disturbance associated with skidding of logs to a landing site resulted in the impedance of drainage at the junction of two woods roads, which appears to retain surface water during the early part of the growing season. This basin supports a heavy cover of wool grass, sensitive fern (*Onoclea sensibilis*), violets and water smartweed (*Polygonum punctatum*). A few scattered shrubs are present including pussy willow (*Salix discolor*) and black alder (*Ilex verticillata*).

Disturbed Areas

Heavily disturbed areas are present in the working areas of the quarry in the southern half of the proposed quarry expansion area. These areas are characterized by a sparse ground cover composed mainly of introduced weeds and forage grasses. Some species present in this habitat type include field horsetail (*Equisetum arvense*), evening primrose (*Oenothera biennis*), brown top (*Agrostis capillaris*), and tickle-grass (*Agrostis hyemalis*).

Rare Vascular Plants

Prior to conducting the vascular plant survey of the site in September 2003, the Atlas of Rare Vascular Plants in Nova Scotia (Pronych and Wilson 1993) was reviewed to determine if any rare vascular plant species had been recorded in the vicinity of the study area. Data was compiled for the 10 km X 10 km atlas square within which the study area is situated, as well as all of the atlas squares adjacent to that atlas square. Following completion of the field surveys, an ACCDC data request was made for the area surrounding the quarry site to verify whether the timing of the field surveys was appropriate. Table 5.1 lists the 22 rare species which have been recorded within the 900 km^2 area encompassed by the nine atlas squares surrounding the study area, as well as the area encompassed in the ACCDC data request (*i.e.,* within 20 km of the Project). Note that the size of the area investigated in the literature review was based on professional judgement and considered the following factors:

- Focus on ecozones representative of the area in which the Project is located (*i.e.*, expanding the area considered would introduce habitats not present in the study area, such as coastal areas);
- The limited zone of influence of the Project (*i.e.*, there is limited opportunity for impacts on rare plants to expand beyond the quarry footprint); and
- The size of the quarry footprint and subsequent field methodology (*i.e.*, the small size of the footprint allowed field biologists to inventory the full site and identify all rare plants present. If the site were larger, field biologists may have been required to conduct directed surveys in which only the rare plants identified in the literature review were investigated).

Table 5.1 Phenology and Habitat Preferences of Rare Vascular Plant Species Recorded in the Vicinity of the Kemptown Quarry

Binomial	Flowering Period/ Ease of Identification	Preferred Habitat	NSDNR Status
Allium tricoccum (Wild Leek)	Late July. Leaves identifiable from early spring to mid June at least. Fruiting stalks identifiable until October	Sugar maple woods, intervales, rich woods, deciduous forest	Red
Alopecurus aequalis (Short-awn Foxtail)	Flowers in summer. From mid summer into autumn	Muddy riparian edges and margins of shallow ponds where there is little competition	Yellow
Botrychium lanceolatum (Lance-leaved Grapefern)	July and August. Sporangia persist until fall.	Rich woods on hillsides, open grassy areas	Yellow
Campanula aparinoides (Marsh Bellflower)	Flowers in August, which is when most noticeable. Less detectable from late spring to September	Relatively rich soil areas in moist meadows, ditches and river banks	Yellow
Carex hirtifolia (Pubescent Sedge)	Fruit matures in May and June	Rich calcareous meadows, thickets, flood plains and forest slopes	Yellow
Carex garberi (Elk Sedge)	Flowers June to August. Would be most identifiable in September	Moist shores and meadows on calcareous soils	Red
Carex plantaginea (Plantain-leaved Sedge)	Flowers in spring. Highly distinctive foliage and virtually evergreen and can be detected year round if not snow covered	Rich calcareous hardwoods in vaguely seepy, moist areas	Red
Caulophyllum thalictroides (Blue Cohosh)	Early April to early June. Distinctive berries persist until September. Foliage easily identified.	Rich woods, intervales, alluvial soil, ash thickets along rivers, high brook embankments	Red
Dryopteris fragrans (Fragrant Cliff Wood-fern)	Best identified May to October. The evergreen tendency and persistent dead leaves at base can extend detectability to a greater extent.	Dry exposed ledges and overhanging cliffs and in cliff crevices along streams and waterfalls	Yellow
Floerkea proserpinacoides (False Mermaid-weed)	Flowers late May to late June. Plants should be observable in early spring to at least mid summer.	Relatively rich deciduous forest slopes, along riparian edges and in intervale forests	Yellow
Hieracium robinsoni (Robinson's Hawkweed)	Flowers July and August. Superficially like *H. lachenalii,* but without basal rosette	Crevices in rock outcrops and cliffs and along cobble of shores and streams.	Yellow

Table 5.1 Phenology and Habitat Preferences of Rare Vascular Plant Species Recorded in the Vicinity of the Kemptown Quarry			
Lilium canadense (Canada Lily)	Flowers in July. Plant is readily detectable from at least early spring to early October	Relatively rich riparian intervales and meadows	Yellow
Platanthera flava (Southern Rein-Orchid)	Flowers May to August. Most visible when in flower, but should remain identifiable from persistent flower parts into September	Lacustrine or riparian edges on sandy or gravel beaches, wet peat, bogs swamps or meadows	Yellow
Platanthera macrophylla (Large Round-leaved Orchid)	Flowers in August. Distinctive large leaves would be suggestive from at least June to September	Rich deciduous woods or occasionally mixed woods	Yellow
Polygala sanguinea (Blood Milkwort)	Flowers late June to October. Best identified in September when most plants are in flower.	Woods, near beaches, sand barrens, sandy soil, poor/acid fields, damp slopes, open woods/bush	Yellow
Ranunculus flammula var. flammula (Greater Creeping Spearwort)	Flowers July to September. Most noticeable during flowering but detectable at least from mid June to mid October	Cold bogs and streams, a semi-aquatic species	Yellow
Rudbeckia laciniata (Cut-leaved Coneflower)	Flowers in August, when most detectable. This large, distinctive plant can be identified from mid spring on to autumn	Relatively rich swales and intervales, swamp or riparian edges, when not associated with human habitations in plantings	Yellow
Sphenopholis intermedia (Slender Wedge Grass)	Flowers June to August. Spikelets should remain identifiable into September	Cliff faces in pockets where the rots are in contact with alkaline rock types like limestone, gypsum or basalt, also this or similar form can occur on calcareous shores	Yellow
Tiarella cordifolia (Foamflower)	Mid-May to mid-June. Fruit and evergreen foliage distinctive. Easily identified until autumn	Rich hardwoods, intervales, hardwood slopes above brooks	Yellow
Triosteum aurantiacum (Horse-gentian)	July. Easily identified by vegetative features. Distinctive orange berries present until late September.	Intervale soils, rich alluvial soils, hillsides, banks under woods, rich open woods, meadows	Red
Zizia aurea (Common Alexanders)	May to June. While the flowering period is peak detection period, this plant can be identified from mid spring to early autumn	Relatively rich calcareous areas in meadows, riparian shores and damp thickets and woods	Yellow
Viola nephrophylla (Northern Bog Violet)	May to July. Flowers required for positive identification.	Roadsides, mossy brooksides, damp/wet woods, borders of streams, cool mossy beds	Yellow

The habitats present in the study area are judged to support a likely potential for only four of the twenty-two species identified above including lance-leaved grapefern, blood milkwort, southern rein-orchid and northern bog violet. The till soils overlaying the study area can be relatively rich as displayed in uncut sugar maple dominated hardwoods that occur outside the quarry footprint along the right side of the access road. Here species such as the occasional Dutchman's breetches (*Dicentra cucullaria*), yellow trout lily (*Erythronium americanum*), and nodding trillium (*Trillium cernuum*) are present. Nevertheless, this mature deciduous wood and the much more modified and less rich appearing habitats

on the survey site do not appear to be sufficiently fertile enough to support many of the rare species on the above list. Examples of species from the list above, which would tend to be excluded due to the lack of very rich calcareous soils, include wild leek, blue cohosh, grove meadow grass, plantain-leaved sedge, pubescent sedge foamflower, slender wedge grass, horse-gentian, large round-leaved orchid and false mermaid-weed.

Similarly, there were no significant riparian or lacustrine shore habitats, wet meadows, or alluvial habitats on site, and the wetland areas were not situated on highly calcareous substrates in the Project area. The lack of these habitats tends to exclude species like marsh bellflower, Canada lily, elk sedge, common Alexanders, cut-leaved coneflower, short-awn foxtail, and greater spearwort.

The Project imprint lacked natural large rock outcrops cliffs, or rocky habitats along streams and so habitat was not present for species such as Fragrant Cliff Wood-fern, or slender wedge grass, and Robinson's hawkweed.

Nineteen of the twenty-two rare species recorded in the general vicinity of the study area could be readily identified in mid-September when the initial rare plant survey was conducted. The possible presence of northern bog violet, as well as other species more detectable earlier in the season, justified a late spring survey as well. Violets are difficult to identify without flowers. The best time to identify violets and other spring blooming species, of variably spring ephemeral class aspect, is in June when the greatest number of species and individuals are in flower. Violets are typically in flower and even the highly spring ephemeral species finished flowering are still apparent and identifiable. Given the fact that there was some potential for northern bog violet to occur on the site, a second rare plant survey was conducted on June 4, 2004 to determine if this species was present and to identify any spring ephemeral species which may be present on the site.

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

No uncommon or rare vascular plant species or uncommon habitat types were encountered in the area designated for quarry expansion during the two rare plant surveys (Appendix G). As such, no mitigation is required to address these potential issues.

Generic mitigative measures that help to minimize the effects of the Project on plant communities include the use of seed mixtures free of noxious weed during site reclamation. Wherever practical, native plants will be used for site reclamation.

In summary, significant Project-related effects on rare flora are not likely to occur.

5.4 Wetlands

5.4.1 Description of Existing Conditions

Two small wetlands were found in the area proposed for quarry expansion. This included a tall shrub dominated basin swamp and an anthropogenic basin marsh (Figure 6). The tall shrub dominated basin swamp is found at the northwest corner of the proposed quarry expansion area. It has developed along a narrow intermittent channel and is 0.357 ha in size. Tree cover consists of a few scattered balsam firs. A patchy cover of tall shrubs is present which is dominated by speckled alder. Advanced regeneration of balsam fir, black spruce and red maple is also present in the shrub layer. Open patches are present in this wetland, particularly along the edge of the intermittent stream. These areas are typically dominated by a mixture of sedge (*Carex echinata*), bog goldenrod, wool grass, sphagnum moss, Joe-Pye weed, and violets. Other species characteristics of the ground vegetation layer include rough goldenrod, tawny cotton-grass and rattlesnake grass. Appendix H lists the vascular plant species found in this wetland. Animals recorded in the wetland include varying hare (*Lepus americanus*), white-tailed deer (*Odocoileus virginianus*), red squirrel (*Tamiasciurus hudsonicus*), Common Yellowthroat (*Geothlypis trichas*), Cedar Waxwing (*Bombycilla cedrorum*), White-throated Sparrow (*Zonotrichia albicollis*), northern spring peeper (*Pseudacris crucifer*), pickerel frog (*Rana palustris*), and green frog (*Rana clamitans*). None of the plant or animal species recorded in the wetland is considered to be uncommon or rare in Nova Scotia (ACCDC 2004; NSDNR 2003) or Canada (COSEWIC 2004).

A wetland evaluation was conducted to assess the functional attributes of the wetland. The results of the wetland evaluation are presented in Appendix H. The wetland contains little open water habitat and has little value as waterfowl habitat. Ephemeral pools located near the outflow of the wetland provide marginal breeding habitat for amphibian species such as wood frog (*Rana sylvatica*), pickerel frog and yellow spotted salamander (*Ambystoma maculatum*). The wetland does not provide habitat for any uncommon, rare or endangered species of plant or animal. Tall shrub dominated swamps are one of the most abundant wetland types in Nova Scotia. The wetland appears to be a groundwater discharge site. It may help to regulate the local flow of surface waters; however, given the small size of the wetland, its effect on local hydrology is probably not significant. The wetland currently plays no role in maintenance of surface water quality. There is no evidence to indicate that the wetland is used for recreational purposes. It has no potential for either agricultural production or peat harvesting. Overall, the wetland is not considered to be particularly valuable.

The anthropogenic basin marsh is found at the northern end of the proposed quarry expansion area (Figure 6). It is approximately 0.033 ha in size and has developed as a result of forest harvesting operations approximately 15 years ago. Heavy ground disturbance associated with skidding of logs to a landing site resulted in the impedance of drainage at the junction of two woods roads, which appears to retain surface water during the early part of the growing season. This basin supports a heavy cover of

wool grass, sensitive fern, violets and water smartweed. A few scattered shrubs are present including pussy willow and black alder. A list of vascular plants found in this wetland is presented in Appendix H. No birds were observed in the wetland at the time of the site visit. 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. The only herpetile noted from the wetland was northern spring peepers, which were heard calling from woodlands surrounding the wetland. The wetland consists of a shallow pool that probably dries out early in the summer. Wood frog is the only amphibian species likely to successfully breed there. Wetland evaluations are not required for wetlands of anthropogenic origin provided they do not support rare species. No rare plants or animals were found in this wetland; therefore, no wetland evaluation is required.

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

The results of the tall shrub dominated basin swamp wetland evaluation indicate that the wetland has little value relative to other wetlands, and loss of this wetland is not considered to be significant. Nevertheless, the wetland does perform a variety of functions. For this reason, Dexter is proposing to avoid this wetland, maintaining a 30 m buffer between the edge of the wetland and proposed quarry activities (Figure 6), including activities such as refuelling. Therefore, the functional attributes of the wetland will be maintained. The anthropogenic basin marsh is not considered particularly valuable as wetland habitat; therefore no mitigative measures are proposed.

In summary, significant Project-related effects on wetlands are not likely to occur.

5.5 Wildlife

5.5.1 Description of the Existing Environment

Birds

Bird surveys were conducted at the site on July 18, 2003 and June 4, 2004. Additional bird observations were recorded during the vegetation survey conducted on September 17, 2003. The survey area included the proposed quarry expansion, as well as the existing access road to the quarry site. Birds heard or observed within several hundred metres of the footprint of the Project were recorded. The July 18, 2003 survey began at 3:00 AM and ended at 8:00 AM. The June 4, 2004 survey began at 5:30 AM and ended at 7:55 AM. All birds heard or observed within the survey area were recorded. Additional information regarding use of the area by birds was derived from a review of the Atlas of Breeding Birds of the Maritime Provinces (Erskine 1992). The breeding bird data for the atlas square (10 km X 10 km) within which the study area is located was reviewed, and a list of all birds found there along with their breeding status (possible breeder, probable breeder, or confirmed breeder) in the atlas square or study area was compiled.

The population status of each species was determined from existing literature. Lists of provincially uncommon, rare or sensitive birds were derived from the Atlantic Canada Conservation Data Centre (ACCDC 2004), Endangered Species and Status of Wildlife in Nova Scotia (NSDNR 2004) and Species at Risk in Nova Scotia (NSDNR 2003) while nationally rare species were derived from COSEWIC (2004).

Appendix I contains a list the bird species recorded in the atlas square and during the field survey. Eighty-three species have been recorded in the general vicinity of the quarry expansion area (atlas data and field data combined). Seventy-seven species have been recorded in the atlas square and 44 species were recorded within the quarry expansion area and along the access road. A total of 160 birds representing 25 species were recorded in this area in 2003. A total of 155 birds of 28 species were recorded in the quarry expansion area in 2004. Fifty-five birds of 19 species were recorded along the access road during the 2003 survey, and 22 birds of 11 species were recorded in this area during the 2004 survey.

The quarry expansion area contains a mixture of immature softwood and mixedwood forest. The most abundant species in descending order were Magnolia Warbler (*Dendroica magnolia*) (17.5% of all birds recorded), Common Yellowthroat (15.2%), American Robin (*Turdus migratorius*) (12.7%), White-throated Sparrow (8.6%), Hermit Thrush (*Catharus guttatus*) (5.1%), Black-throated Green Warbler (*Dendroica virens)* (5.1%), Black-and-white Warbler (*Mniotilta varia*) (3.8%), Yellow-bellied Flycatcher (*Empidonax flaviventris*) (3.5%), and Alder Flycatcher (*Empidonax alnorum*) (3.2%). Together these species accounted for 54% of the total number of birds recorded in the quarry expansion area.

The access road runs through mature hardwood forest, as well as immature mixedwood forest. The most abundant species in descending order of abundance in this area were American Robin (16.0%), Red-eyed Vireo (*Vireo olivaceus*) (13.3%), Black-and-white Warbler (*Mniotilta varia*) (8.0%), American Redstart (*Setophaga ruticilla*) (8.0%), Black-throated Green Warbler (*Dendroica virens*) (6.7%), and Magnolia Warbler (*Dendroica magnolia*) (6.7%). Together these species accounted for 59% of the total number of birds observed adjacent to the access road.

Three of the species recorded in the atlas square are considered by ACCDC (2004) to be uncommon or rare breeding species in Nova Scotia. These include Boreal Chickadee (*Parus hudsonicus*) (uncommon), Wood Thrush (*Hylocichla mustelina*) (rare) and Vesper Sparrow (*Pooecetes gramineus*) (rare). NSDNR considers the Vesper Sparrow to be sensitive to anthropogenic activities (Yellow listed), while Boreal Chickadee and Wood Thrush populations in Nova Scotia are considered to be secure (Green listed). None of these species was recorded during the field survey. Suitable breeding habitat is present for Wood Thrush in mature hardwood forest adjacent to the access road; however, none were recorded during either survey. Boreal Chickadees may forage in the immature softwood forest in the

quarry expansion area, but are unlikely to breed there in any numbers due to a lack of snags and mature trees with cavities suitable for nesting. In Nova Scotia, Vesper Sparrows typically nest in sparsely vegetated agricultural fields, most commonly blueberry fields. No agricultural land is present in or near the quarry expansion area, so this species is not expected to be present. One uncommon breeding species, the Rusty Blackbird (*Euphagus carolinus*), was observed during the June 4, 2004 survey. A pair was observed at a small fire pond (Figure 5, location 9) just outside of the quarry expansion area (approximately 30 m from the limits of the existing disturbed area). The Project will not affect this habitat and the birds were using the habitat adjacent to the quarry in spite of the ongoing quarrying activities. The proposed expansion of quarry activities is away from the small fire pond, and therefore it is not anticipated that future activities will be any closer than current activities.

Mammals

Information regarding the presence of rare mammals and sensitive mammal habitat within the study area was derived from field surveys and a review of data compiled by NSDNR. A review of the records for the Nova Scotia Museum and the ACCDC did not reveal the presence of any rare mammal species in the immediate vicinity of the study area. As stated in Section 3.2, deer wintering areas have been identified 1.4 km from the site and habitat known to support mainland moose is located 6.1 km from the site (Figure 3).

The field survey was conducted concurrently with the vegetation survey of September 16, 2003. The field survey provides a good indication of the presence of large mammal species in the study area. Obtaining site specific knowledge of the distribution of small mammals in the study area is limited by their secretive nature and the undesirable requirement to conduct intensive small mammal trapping programs to determine their presence in the area. Fortunately, many small, rare mammals have very specific habitat requirements, which can be used to predict areas where they are likely to be found.

Habitat in the study area is relatively uniform and is largely composed of immature softwood forest approximately 15 years of age. Some areas occupied by immature mixedwood forest of the same age are also present, as well as a small remnant of mature hygric mixedwood forest. Non-forested habitats present in the quarry expansion area include wood roads, two small wetlands and the largely barren surface of the existing quarry. No areas of natural talus slope, large expanses of mature forest or other habitat features associated with rare mammal species in Nova Scotia are present in the Project area.

The species recorded in the study area are generally typical of woodland habitats, and are widespread and common in Nova Scotia. Species recorded during the field survey included white-tailed deer, varying hare, red squirrel, coyote (*Canis latrans*), and red fox (*Vulpes vulpes*). There was no evidence that moose were present in the study area. Furthermore the nature of the general habitat in the Project area offers little in the way of important core habitat for large mammals or for deer wintering.

Herpetiles

Information regarding amphibians and reptiles and their habitat within the study area was derived from a review of existing literature, as well as the September 16, 2003 field survey. The number of amphibian species recorded in the proposed quarry expansion site and adjacent areas was low. Within the quarry expansion area there were no permanent ponds, only marginal ephemeral pools. This habitat is suitable for ephemeral pool breeding amphibians such as wood frog, northern spring peeper, pickerel frog, and yellow-spotted salamander. This marginal ephemeral pool habitat, which was dry at the time of the survey, was associated with the two small wetland areas on site (refer to Section 5.4). Much of the quarry expansion area was young, largely conifer dominated regenerated stands, as well as young mixedwood stands. The conifer stands appear to have developed in response to herbicide treatments. Judging from adjacent uncut stands, the previous forest cover on site had a significantly higher component of tolerant deciduous hardwood tree species.

A red-back salamander (*Plethodon cinereus*) was found in the quarry area; however, this species is likely to be less abundant on the site than in the adjacent uncut tolerant hardwood forest near the access road. A brief search in the latter area revealed two red-back salamanders. The rare and localized erythristic morph of the red-back salamander is typically associated with tolerant hardwood forests at high elevations. It is possible that this colour morph is present in the general vicinity of the quarry expansion area; however, none were noted in the tolerant hardwood forest adjacent to the access road. Since the forest habitat in the expansion area is largely composed of young coniferous forest, which is typically not used by this colour morph, it is unlikely that a sustainable population of this rare species is present in the area to be disturbed.

No potential breeding habitat for the four-toed salamander (*Hemidactylium scutatum*) was noted on or adjacent to the quarry expansion area; and it is unlikely that this species is present in the Project area. The only amphibian species detected in the quarry expansion area were a red-back salamander, a pickerel frog, several northern spring peepers, and a juvenile green frog. The pond at Location 9 (Figure 5) hosted many adult, juvenile, and larval green frogs. Yellow spotted salamander larvae were abundant in this pond. One of the larva examined had the appearance of a blue-spotted salamander (*A. laterale*), suggesting that this species was also breeding in the pond. While blue-spotted salamanders and their associated complex are perhaps the salamander species with the most restricted range in Nova Scotia, they are nevertheless relatively common and not a species of particular concern (NSDNR 2003). A juvenile pickerel frog was also noted at this location. Other species which may be expected to breed in this pond include wood frogs, northern spring peeper and possibly American toad (*Bufo americanus*). As this pond habitat was close to the quarry area, it is likely that species found in this pond would be present in similar habitats in the nearby quarry expansion area (*i.e.,* in marginal ephemeral pools).

No reptile species were noted in the area during the survey period. Snake species that are expected to be present in this area include the Maritime garter snake (*Thamnophis sirtalis*), northern redbelly snake (*Storeria occipitomaculata),* and eastern smooth green snake (*Liochlorophis vernalis*). Northern ring-neck snake (*Diadophis vernalis*) may also be present. Northern ribbon snake (*Thamnophis sauritis*) and Blanding's turtle (*Emydoidea blandingii*) populations in the Province are located far to the south and these species would not be expected to be present. Potential core habitat for aquatic turtles was limited to the pond found off site (Location 9, Figure 5). Neither eastern painted turtle (*Chrysemys pictiventris*), nor common snapping turtle (*Chelydra serpentina*), was noted there or expected to have any significant population at this pond. It is unlikely that any wood turtles (*Clemmys insculpta*) (listed as vulnerable under the Nova Scotia Endangered Species Act and by COSEWIC) would be present in the Project area, as it is distant from any core water course and riparian habitat for this species. In any event, the proposed quarry expansion site would not represent good movement corridor habitat for wood turtles.

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

None of the three uncommon or rare bird species recorded in the atlas square within which the quarry expansion area is located are expected to nest in the quarry expansion area. One uncommon bird species was encountered during the field surveys. The Rusty Blackbirds recorded during the survey were found just outside of the proposed quarry expansion area and were present in spite of ongoing quarrying activity. Further development of the quarry is not expected to adversely affect Rusty Blackbirds.

Migratory birds, their eggs and young are protected under the *Migratory Birds Convention Act*. In order to avoid violating the Act, clearing will be conducted outside of the breeding season for most species of migratory birds in order to prevent the destruction of eggs and unfledged young. In Nova Scotia, most species nest between mid-April and early August, although it is acknowledged that some species breed at other times of the year (*i.e.,* White-winged Crossbills and Red Crossbills). Dexter proposes to conduct clearing activities outside of the nesting period for the majority of species (*i.e.,* outside of the mid-April to early August period) and will implement additional measures as required to ensure compliance with the Act. No significant impacts on birds are likely as a result of the proposed Project.

Deer wintering habitat and habitat supporting mainland moose are known to occur 1.4 and 6.1 km from the site, respectively. A review of the records for the Nova Scotia Museum and the ACCDC did not reveal the presence of any other rare mammal species in the vicinity of the study area. The results of the field survey support this existing knowledge. The habitats present in the study area are commonly encountered throughout the province and are unlikely to provide habitat for rare small or large mammal species. The species recorded in the study area are generally typical of woodland habitats. As described above, Project activities will not result in any alterations in habitat (*i.e.,* terrestrial or freshwater) beyond the quarry boundaries and quarry activities (*i.e.,* noise disturbance and truck traffic) will be limited to the immediate vicinity of the quarry and Kemptown Road. Activities at the quarry and prior gravel pit have been on-going for more than ten years, and the level of activity is not expected to increase as a

result of the proposed expansion. In addition, the activities at the quarry during the winter months are anticipated to be limited. For the above reasons, the proposed expansion is not anticipated to interact with or adversely affect deer wintering areas or moose habitat. No evidence of use of the study area by moose was found on any of the three field surveys conducted. Given this paucity of evidence of moose usage of the area, it is unlikely that the site provides important moose habitat.

None of the species of amphibians or reptiles present or expected to be present at this site are considered to be rare or of particular concern in the Province of Nova Scotia (ACCDC 2004; NSDNR 2004) or in Canada (COSEWIC 2004). The Project area does not provide unique or particularly valuable or productive herpetile habitat. Expansion of the quarry is not likely to have any significant adverse effects on local herpetile populations.

In summary, assuming recommended mitigative measures are applied (*i.e.*, clearing outside the 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 mantle (< 1 m) of sandy glacial till overlying Devonian aged granite bedrock (Figure 7). The communities of Upper Kemptown and Kemptown, located 3 and 6 km to the south, are underlain by wacke, siltstone, conglomerate and shale formations of the undivided Canso Group, while the community of Earltown, located 7 km to the north, is underlain by basalt, siltstone and wacke of the Devonian aged Diamond Brook Formation.

An inference of groundwater flow directions has been made based on topography. The site is located on the Cobequid Mountains near a major topographic divide. Deep groundwater flow on the north side of the mountain is northward towards Northumberland Strait, with groundwater discharge occurring in Tatamagouche Bay or into the regional river system (*i.e.*, Waugh River), while deep flow on the south side of the mountain is southward towards the Salmon River system. The quarry site is situated along the eastern limits of a local watershed divide (elev. 280 m) between tributaries of the Salmon River on the east and north, and the South Branch North River on the southwest. Shallow groundwater flow near the quarry is inferred to be primarily towards the north and northeast. It is possible that shallow groundwater could move radially outwards from the quarry, and discharge into the Salmon River tributaries located to the north and east of the proposed quarry site (refer to Figure 5).

Water supply in this area is derived from individual dug or drilled water wells. Based on site observations during a site reconnaissance survey, nearby rural residential properties with possible drilled or dug water wells are situated primarily in a small subdivision located southeast of the quarry, and along Kemptown Road to the south and north of the proposed quarry expansion area (Figure 7). The subdivision includes several wilderness camp facilities and two residential homes. With the exception of one wilderness camp located approximately 700 m south-southeast of the quarry, it is understood that the other camps do not have drilled water wells, but have either shallow dug wells or no water wells. The closest residential home is located approximately 325 m southeast of the quarry site, which is inferred to be located cross-gradient from the quarry. Several other residential properties are located along Kemptown Road approximately 500 m east and cross-gradient of the quarry. Other rural residences are located further to the north and south along Kemptown Road. The nearest down-gradient wells are located along Kemptown Road, approximately 1.5 km north of the quarry. With the potential exception of the one drilled wilderness camp well located approximately 700 m southeast of the quarry, there are no known residences located within 1 km up-gradient of the quarry.

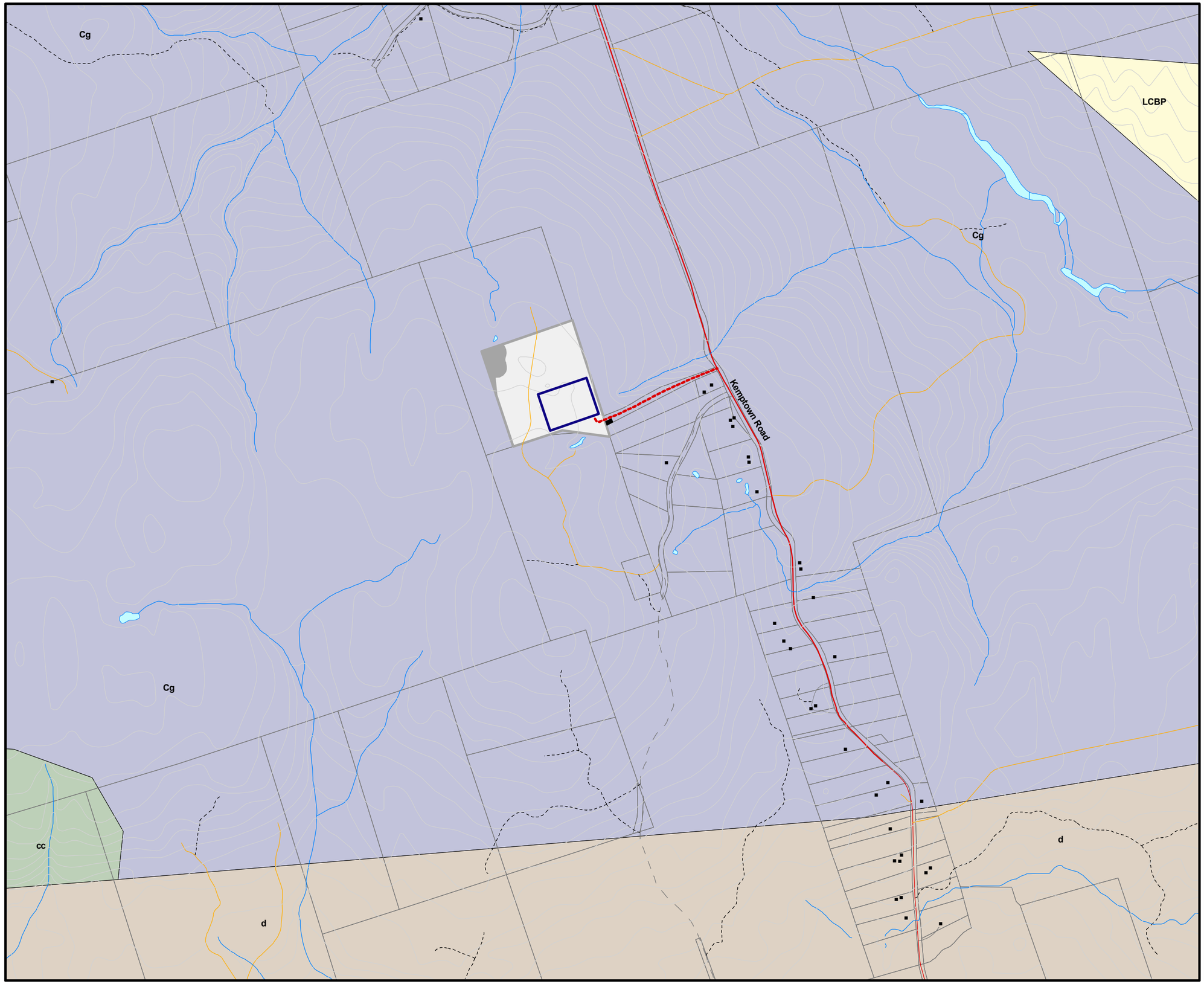
Details of the water wells servicing the residential homes located nearest the quarry were not available for this desktop study. However, a review of available NSEL well records provides information for 85 driller well logs that are located in the three nearest communities, Upper Kemptown and Kemptown to the south, and Earltown to the north. Of these eighty five well records, only nine (two in Upper Kemptown, four in Earltown, and three in Kemptown) are reported to be constructed in granite bedrock. Since the quarry and an area extending at least 1 km in radius from the quarry is reportedly underlain by granite, these nine records are considered the most representative of water wells drilled in the vicinity of the proposed quarry expansion area. These records service single residential homes or light commercial facilities. The well construction details for these nine granite bedrock wells are summarized in Table 5.2. The wells average 54 m in depth, have an average 7.8 m of casing, and yield in the range of 0.5 to 9 igpm, averaging 2.9 igpm. Depth to the water table averages 13.4 m below grade, consistent with an upland groundwater recharge area. The present quarry does not reach the water table (Sears 1995).

Table 5.2 Summary of Local Domestic Water Wells Completed in Granite

	Well Depth (m)	Casing Length (m)	Well Diameter (mm)	Estimated Yield (gpm)	Water Level (m)	Overburden Thickness (m)
Minimum	18.3	6.1	129	0.5	3.4	3.7
Maximum	91.5	10.7	155	6	56.7	9.1
Average	54.0	7.8	149	2.9	13.4	6.7
Median	56.7	7.9	155	3	7.6	7.0
Number	9	9	9	9	9	9

Figure 7

Kemptown Road Quarry
Bedrock Geology



LEGEND

Bedrock Geology

- LCBP — Boss Point Formation: arenite, siltstone, shale, congolomerite, mudstone
- Cg — granite, minor porphyry
- d — Undivided Canso Group: wacke, sildstone, conglomerate, shale
- cc — diorite or dioritoid

Kemptown Quarry

- Currently Permitted (NSEL) Area
- Proposed Expansion Area
- Area to be Avoided Due to Wetland
- Quarry Access Road

Roads

- Major Road
- Abandoned Road
- Loose Surface Road
- Trail / Track

Land Features

- Building/Structure
- Contour
- Watercourse
- Waterbody

- Property Boundaries

N

0 200 400 600 800

Metres

Data Source:
NSGC: Modifications Made by Jacques Whitford Based on Field Survey;
NSDNR

Map Parameters
Projection: Modified Transverse Mercator
Zone: 5
Datum: ATS 77
Scale: 1:15,000
Project Number: NSD17814
Date: November 2004

Jacques Whitford

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A site inspection found that the existing quarry floor is relatively flat. Minor groundwater seepage observed along the exposed excavation face to the west and north was not inferred to be associated with the groundwater table, but was associated with either shallow infiltration recharging the deeper groundwater table at depth or a small perched groundwater condition. Although no specific information is available on the water table in the immediate vicinity of the quarry, the local average water table depth is approximately 13.9 m, based on the data in Table 5.2. Therefore, it is expected that the water table is below or near the floor of the existing 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. As previously indicated, Dexter does not anticipate excavating deeper into the quarry floor; however, prior to any excavation below the water table, Dexter will conduct a hydrological study, as required by the Pit and Quarry Guidelines, and will obtain approval from NSEL.

Any drainage that may presently occur from rainwater within the quarry flows to the southeast, and thence eastward to a wet area and into the Salmon River (Sears 1995).

Water Quality

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). Arsenic and uranium in excess of the drinking water guidelines are possible naturally occurring water quality issues. Groundwater quality problems due to acid drainage are not expected to occur in granite bedrock.

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

The wells at potential risk include those located in the adjacent subdivision and wells located along Kemptown Road near the proposed quarry expansion. Wells located further north are less likely to be affected due to the distance from the quarry.

The potential impacts from this operation include temporary siltation of nearby wells due to intermittent blasting, possible reduced water levels (temporary or permanent) in wells hydraulically up-gradient of the quarry, decrease in well yield, and possible water quality deterioration of down-gradient wells from accidental releases of deleterious substances, such as 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 site lies in a groundwater recharge area, the water table depth is expected to be deep (*e.g.*, 13 m indicated in local well logs). In consideration of the low level relief (< 10 m), lowering of water levels or dewatering of the rock west and north of the quarry is not anticipated. Perched water levels may be encountered. The headwaters of surrounding streams likely represent shallow water table levels.

It is not anticipated that surface and groundwater flowing into the quarry will collect or pool on the quarry floor in a manner that will require dewatering. In consideration of the distance of the quarry to nearest existing residential wells (*i.e.*, at least 400 m), the fact that the quarry will be extended to the west and north away from the nearest residential wells, and the inferred moderate yields of local drilled wells in granite (*i.e.*, 2.9 igpm), significant loss of yield from the residential wells is not anticipated. It should be noted that landowner consent was obtained from all landowners within an 800 m radius of the blast area (at the time of quarry development) during the Industrial Approval process in 1994 and again in September 2003 to capture new residences.

In the unlikely event that the water levels were to be lowered by deeper quarry excavation, for example, the degree of water level decline at a domestic well would be proportional to distance from the edge of the quarry, decreasing exponentially with distance. Based on topography, the nearest potential up-gradient well is at the wilderness camp located 700 m to the south-southeast. This well, along with the other nearby residential wells in the subdivision and along Kemptown Road are not expected to experience significant water level declines since they are locally recharged primarily from hills located west and southwest, with limited to no recharge from the proposed quarry site.

The nearest potential down-gradient wells are located over a kilometre from the quarry. With continuing regional recharge from the hills to the south and west, and possible enhanced recharge through the floor of the quarry itself, the existing water tables should be maintained along Kemptown Road north 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 (*e.g.*, approximately 5 m at previously excavated area), 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 the wells. Wells located down-gradient (north and northeast) of the quarry are more likely to be affected in this manner than wells to the east and 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. Again, due to distance, significant impacts are not anticipated due to natural attenuation primarily by dilution and dispersion along the groundwater pathways.

In the event of 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 well yield loss event, the proponent will 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 for the collection of site specific groundwater data (*i.e.*, depth and chemistry) at the southeast and northeast corners of the quarry. Details of the monitoring program (*i.e.*, monitoring parameters and frequency) will be developed in consultation with NSEL.

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 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.).

Background research was conducted using the records at the Public Archives of Nova Scotia. Maps consulted included those by A.F. Church (1874) and Faribault. These maps cover the period from the middle of the nineteenth century to the beginning of the twentieth century. There were no potential archaeological features shown on either map that fell within or adjacent to the study area.

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).

Based on the background research, there appears to be low potential for the study area to contain archaeological resources dating to the historic period. While it is on a major road, there are no historic settlements located within the immediate area.

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 limited 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 during the visual reconnaissance. It is assumed that no areas beyond the study area will be disturbed during the development and operation of the proposed quarry expansion area. As such, development and operation of the proposed quarry are not expected to have any adverse environmental effects on heritage resources.

If heritage resources are discovered during development and operation of the Project, the find will be immediately reported to the Curator of Archaeology and the Curator of Special Places at the Nova Scotia Museum. If the resources are thought to be 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 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 Kemptown is located at Pictou, approximately 45 km from the quarry site.

Emissions (not quarry related) noted at the Pictou monitoring station have included periodic air quality exceedances, particularly with respect to SO_2. These exceedances are attributed to the industrialized nature of the Pictou area (NSDEL 1998). It is not likely that particulate emissions have significantly changed since NSEL published the State of the Nova Scotia Environment report in 1998. It is not

anticipated that the common air pollutants are exceeded at the quarry location due to the separation distance of approximately 45 km from the industrial area at Pictou.

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

As per the existing Kemptown Road Quarry Industrial Approval conditions 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 paving a portion of the quarry access road, covering laydown and work areas with blasted materials, and covering stockpiled topsoil with seed, mulch and/or rock. Fugitive dust emissions will be controlled with the application of water obtained from the quarry floor/collection pond, as per current practice. Monitoring of particulate emissions (dust) will be conducted at the request of NSEL. In addition, Dexter will contact TPW and will work with them to minimize and control the generation of dust along the Kemptown Road.

5.9 Socioeconomic Environment

5.9.1 Description of the Existing Environment

Population and Employment

The quarry is located north of the communities of Kemptown and Upper Kemptown and south of the community of Earltown, Colchester County. The area's general population, including Kemptown and Earltown, is approximately 18,607 (Statistics Canada 2001). The population of Colchester County has increased by only 0.1% from 1996 to 2001, with a population increase in the area of the quarry of approximately 1.1% in the same period. The nearest town is the Town of Truro, approximately 30 km southwest, with a population of approximately 11,457 (Statistics Canada 2001).

The employment rate in Colchester County is 56.5% while the unemployment rate is 9.9% (Statistics Canada 2001). Approximately half of the experienced labour force consists of manufacturing and construction, wholesale and retail sales and service occupations and trades, and health and education related occupations.

The existing quarry currently employs 4 to 7 individuals during production to operate crushing and mobile equipment and conduct general labour activities. Hauling of materials from the quarry involves additional resources, approximately 20% of which are hired directly by Dexter and the remaining 80% are hired through the local trucking association. Drilling and blasting activities involve additional resources; these activities are sub-contracted to a professional blasting company.

Land Use

The proposed quarry expansion area is located on lands that have been clear-cut within the past 15 years. Timber harvesting was conducted by the previous owners of the property. Residential development in the area of the quarry is limited (*i.e.*, 52 residences within a 5 km radius of the quarry). There are no other industrial or commercial developments within a 5 km radius.

The Municipality of the County of Colchester has indicated that the area in which the quarry is located is unzoned. Furthermore, there are no land-use by-laws for the area. Figure 8 indicates the ownership of the lands immediately adjacent to the quarry. As indicated, the proponent owns the land immediately to the north and west of the site. Other lands in the vicinity are privately owned.

Transportation

As indicated in Section 2.5.1, products will be transported from the quarry via tandem and tractor trailer trucks to the local markets along the Kemptown Road, Loop of Old Trunk 4, Trunk 4 and Highway 104 (the Trans Canada Highway (TCH)). The Kemptown Road is a gravel road with no posted speed limit. The Loop of Old Trunk 4 has a paved surface and a posted speed limit of 80 km/hr. These roads can accommodate loads up to 38,500 kg; however they are subject to spring weight restrictions.

Trunk 4 in the area of the quarry is an all-weather road with no seasonal weight restrictions. It can accommodate loads up to 38,500 kg year-round. The TCH is a Schedule C provincial highway that allows for year-round triaxle trucking and can accommodate loads greater that 38,500 kg. The TCH, in the area of the quarry, is a four-lane, divided, controlled access highway, with a posted speed limit of 110 km/h.

Recreation and Tourism

Anecdotal information from a resident/landowner in the general area of the quarry included historical use of lands for hunting. There are no parks in the vicinity of the quarry, and there are no streams in the immediate area that are likely to support recreational fishing.

Figure 8

Adjacent Property Ownership

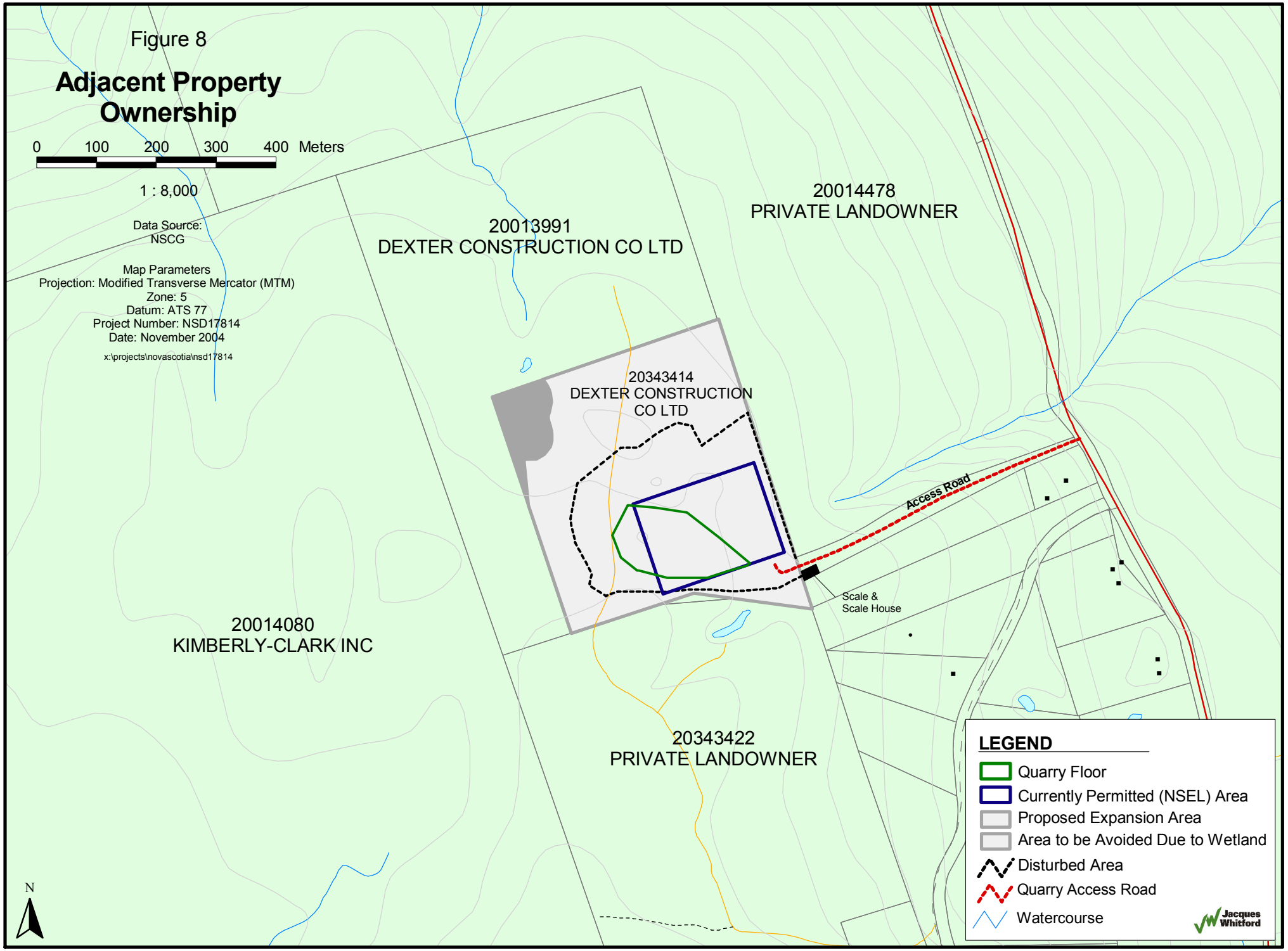
0 100 200 300 400 Meters

1 : 8,000

Data Source:
NSCG

Map Parameters
Projection: Modified Transverse Mercator (MTM)
Zone: 5
Datum: ATS 77
Project Number: NSD17814
Date: November 2004

x:\projects\novascotia\nsd17814



Human Health

Human health related aspects and potential effects on environmental health include potential impacts on well water quality, air quality (*i.e.*, particulate emissions) and safety of commuters along the Kemptown Road. Well water quality is addressed in Section 5.6, air quality is addressed in Section 5.8, and Section 5.9 includes a discussion of the transportation along the Kemptown Road.

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

Population and Employment

Quarrying activities will produce noise from equipment operation and blasting. The area surrounding the quarry is relatively undeveloped. The majority of residences near the quarry are located along the Kemptown Road. There are three residences within 500 m of the boundary of the proposed quarry expansion area. Prior to opening the quarry in 1994, Dexter sought and received consent from all owners of residences within 800 m of the quarry, a requirement of the Pit and Quarry Guidelines. 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. 94-003, issued in March, 1994) and in accordance with the Pit and Quarry Guidelines (NSDEL 1999). Blasting will be conducted in accordance with the General Blasting Regulations made pursuant to the Nova Scotia *Occupational Health and Safety Act*. It is understood that additional blast monitoring activities and/or reporting may be required by NSEL. Dexter has committed to advanced notification of blasting for residents within 2 km of the quarry.

As per the requirements of the current operating Industrial Approval and standard provincial 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)

Sound monitoring will be conducted at the request of NSEL.

No new aesthetic impacts are anticipated due to the expansion. The existing quarry is not visible from the Kemptown Road due to the relatively small difference in elevation across the site.

Economic benefits from the continued operation of the quarry will accrue to the regional and provincial economies. With continued quarry operation, Dexter will be able to continue to supply provincial highway construction and maintenance projects, as well as other industrial and construction-related projects. The quarry will continue to generate employment, the majority of which is sourced locally.

Land Use

Due to the existing industrial activity onsite (*i.e.*, quarry) and the lack of zoning and land use planning in the area, the proposed Project is not inconsistent with existing and future adjacent land uses. Quarry activities will be conducted in accordance with the Pit and Quarry Guidelines and all setback distances specified in the Guidelines will be maintained, to the extent practical (*i.e.*, consent from landowners within 800 m). The quarry is located on private property, 100% owned by Dexter. As described in Section 2, Dexter has and will continue a progressive rehabilitation program that will eventually allow for future land use at the site.

Transportation

Traffic associated with this Project is not anticipated to increase above that of the existing operation. The proposed expansion will allow operation of the quarry to continue at its current production rate. At full production (*e.g.*, for TPW projects), up to 100 truck loads per day for a period of one week can be expected. Dexter will work with the local trucking association, which employs approximately 80% of the truck drivers to and from the quarry, regarding truck traffic along the Kemptown Road and will contact TPW regarding posted speed limits and signage. Dexter will ensure that trucks hauling from the quarry respect weight restrictions when they are in force.

A portion of the quarry access road has been surfaced with asphalt to minimize the generation of dust as well as to minimize maintenance (*i.e.*, grading) to the road. Section 5.8.2 describes the existing and proposed dust mitigation measures. No new access roads are required for this Project.

Recreation and Tourism

The existing quarry and proposed expansion of the operation are not likely to have an impact on hunting in the general area. The quarry is situated on cleared lands adjacent to a road, which are not considered suitable conditions for hunting.

Human Health

Human health related issues are discussed in Section 5.6 Groundwater Resources, Section 5.8 Air Quality and Sections 5.9.1 and 5.9.2 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.

5.10 Other Undertakings in the Area

There are no other quarry operations licensed to operate in a 10 km radius of the Kemptown Road Quarry. There are two hard rock quarries operating within approximately 20 km of the quarry, in the area of Mt. Thom. These other quarries should not add to the traffic flow along the Kemptown Road, Loop of Old Trunk 4, and Trunk 4 in the area of the proposed Project. It is likely that these quarries haul along the TCH.

6.0 EFFECTS OF THE PROJECT ON THE ENVIRONMENT

Activities associated with this proposed Project will be conducted in accordance with the terms and conditions of the existing Industrial Approval for Dexter's existing quarry operation in Kemptown, as well as future amendments to the Approval, and the Pit and Quarry Guidelines (NSDEL 1999). Environmental effects of the quarry expansion will include the loss of terrestrial habitat within the quarry footprint. 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. Note that the area originally proposed for expansion has been modified to maintain a buffer around wetland habitat occurring in the northwest corner of the property.

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 will 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, particularly 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 °C 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 °C 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 slightly increasing trend in the number of daily snowfall events above 15 cm (Lewis 1997).

There is a number of planning, design and construction strategies directed at minimizing 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, and scheduling of activities to accommodate weather interruptions. All Project activities will be taking place out-of-doors and thus weather has been and will be factored into all Project phases. Generally, the quarry operates from May to November and, therefore, activities are often not affected by severe winter weather conditions.

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*. In addition to the *Environment Assessment Regulations*, other relevant provincial regulations include the *Activities Designation Regulations*, which requires an industrial approval from the NSEL for operation of the Project, 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 *Pit and Quarry Guidelines* (NSDOE 1999). Examples of other relevant federal legislation include the *Species at Risk Act*, the *Fisheries Act* and the *Migratory Birds Convention Act*. It is not anticipated that any federal permits or approvals will be required for this Project.

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

11.1 Literature Cited

Atlantic Canada Conservation Data Centre (ACCDC). 2004. Species Lists and Rare Species. Internet Publication: http://www.accdc.com/products/lists/.

COSEWIC. 2004. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON.

Church, A.F. 1874. Colchester County.

Erskine, A. J. 1992. Atlas of Breeding Birds of the Maritime Provinces. Nimbus Publishing and the Nova Scotia Museum, Halifax, 270 pp.

Faribault, E.F. Province of Nova Scotia, Colchester County, Map Sheet #57.

Gilhen, J. 1984. Amphibians and Reptiles of Nova Scotia. Nova Scotia Museum, Halifax, NS.

Health Canada. 2003. Guidelines for Drinking Water Quality.

Keppie, J. D. 2000. Geological Map of the Province of Nova Scotia. N.S. Department of Natural Resources. Minerals and Energy Branch. Map ME2000-1. Scale 1: 500,000.

Lewis, P. J. 1997. Trends. In: Shaw, R.W. (ed.). Climate Variability and Climate Change in Atlantic Canada. Proceedings of a Workshop Halifax, Nova Scotia, 3-6 December 1996. Prepared for Environment Canada.

Nova Scotia Department of Environment and Labour (NSDEL). 1999. Pit and Quarry Guidelines. Revised May 1999.

NSDEL. 1998. The State of the Nova Scotia Environment.1998. Halifax, NS.

NSEL. 2002. Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia. Nova Scotia Environment and Labour, December 2002.

NSDEL. Water Well Records. Annual Publications 1965-1978; Database Inventory 1978-2001.

Nova Scotia Department of Natural Resources (NSDNR). 2004. Endangered Species and Status of Wildlife. Internet Publication: http://www.gov.ns.ca/natr/WILDLIFE/genstatus/specieslist.asp.

NSDNR 2003. Species at Risk in Nova Scotia. Wildlife Species Protected under the Endangered Species Act in Nova Scotia. http://www.gov.ns.ca/natr/wildlife/endngrd/specieslist.htm.

Pronych, G. and A. Wilson. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum of Natural History, Halifax, NS, Curatorial Report No. 78, 331 pp.

Sears, Trevor. 1995. Preliminary Rehabilitation Plan. Kemptown Quarry, Colchester County, Nova Scotia.

Statistics Canada. 2001. Community Profiles, Nova Scotia, Statistics Canada, 1996 and 2001. Internet Publication: www.statscan.ca.

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

11.2 Personal Communications

Burdett-Coutts, Victoria. Habitat Assessment Biologist, Habitat Management Division, Fisheries and Oceans. November 2004.

Powell, Stephen. Assistant Curator Archaeology, Nova Scotia Museum. Nova Scotia Museum, Maritime Archaeological Resource Inventory. October 2003.

APPENDIX A

CERTIFICATE OF STATUS AND REGISTRY OF JOINT STOCKS

Nova Scotia

CERTIFICATE OF STATUS

I hereby certify that according to the records of this office

DEXTER CONSTRUCTION COMPANY LIMITED

was registered under the Corporations Registration Act of Nova Scotia on November 18, 1977 and the certificate is still in force.

Registrar of Joint Stock Companies

October 28, 2003

Date of Issue

CANADA
PROVINCE OF NEW BRUNSWICK
BUSINESS CORPORATIONS ACT
CERTIFICATE

New Nouveau Brunswick

CANADA
PROVINCE DU NOUVEAU-BRUNSWICK
LOI SUR LES CORPORATIONS COMMERCIALES
CERTIFICAT

I HEREBY CERTIFY that according to the records under the Companies Act,

JE CERTIFIE par la présente que d'après les livres en vertu de la Loi sur les compagnies,

DEXTER CONSTRUCTION COMPANY LIMITED
(#004978)

was incorporated by Letters Patent dated the **22nd day of December, 1961.**

a été constitué(e) par lettres patentes datées le **22ième jour de décembre 1961.**

I CERTIFY FURTHER that according to the said records, the company continued as a corporation under the Business Corporations Act by Articles of Continuance filed the **23rd day of October, 1986.**

JE CERTIFIE de plus que d'après lesdits livres, la compagnie a été prorogée à titre de corporation sous le régime de la Loi sur les corporations commerciales par ses statuts de prorogation déposés le **23ième jour d'octobre 1986.**

I CERTIFY FURTHER that according to the said records the Articles above referred to have not been dissolved.

JE CERTIFIE de plus que d'après lesdits livres, les statuts mentionnés ci-dessus n'ont pas été annulés.

I CERTIFY FURTHER that according to the said records the above corporation has filed Annual Returns and paid filing fees up to the end of **January 2004.**

JE CERTIFIE de plus que d'après lesdits livres, la corporation ci-dessus a déposé le rapport annuel et payé les droits de dépôt jusqu'à la fin de **janvier 2004.**

CERTIFIED under my hand at Fredericton, New Brunswick,
CERTIFIÉ sous mon seing à Fredericton, Nouveau-Brunswick,

2003 10 28

Year/Annee – Month/Mois – Day/Jour

Director
Directeur

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

[redacted]

PROFILE - DEXTER CONSTRUCTION COMPANY LIMITED - as of 2003-10-25 10p.m.

Company/Society Name:	DEXTER CONSTRUCTION COMPANY LIMITED
Registry ID:	1109762
Type:	Extra-Provincial Corporation
Nature Of Business:	
Status:	Active
Jurisdiction:	New Brunswick
Registered Office:	1800-1801 HOLLIS ST HALIFAX NS B3J 3N4
Mailing Address:	P O BOX 548 HALIFAX NS B3J 2R7

PEOPLE

Name	Position	Civic Address	Mailing Address
CARL B. POTTER	Director	111 SHORE DR. BEDFORD NS B4A2E2	
RAPHAEL M. POTTER	Director	111 SHORE DR. BEDFORD NS B4A2E2	
CECIL G. VANCE	Director	67 JAMES STREET FALL RIVER NS B2T 1H7	
CARL B. POTTER	PRESIDENT		
RAPHAEL M. POTTER	SECRETARY		
ALAN G. HAYMAN	Recognized Agent	1800-1801 HOLLIS ST BOX 36 HALIFAX NS B3J 3N4	BOX 548 HALIFAX NS B3J 2R7
CECIL G.	GENERAL	67 JAMES STREET	

VANCE	MANAGER	FALL RIVER NS B2T 1H7	
HUGH SMITH	VP	135 EAGLEWOOD DRIVE BEDFORD NS B4A 3B6	
MERLIN A. FOWNES	VP, FINANCE	9 SIME COURT HAMMONDS PLAINS NS B4B 1K1	
DAVID A. WOOD	COMPTROLLER	71 HALFWAY DRIVE HAMMONDS PLAINS NS B4B 1M8	

ACTIVITIES

Activity	**Date**
Incorporated in Other Jurisdiction	1961-12-22
Registered	1977-11-18
In Business Since	1977-11-18
Change of Directors	1981-03-09
Agent Filed	1983-04-28
Revoked for Non-Payment	1988-12-30
Reinstated	1989-03-07
Registered Office Change	1994-12-29
Annual Report Filed	1995-12-27
Annual Renewal	1997-01-30
Annual Statement Filed	1997-01-30
Annual Renewal	1997-12-03
Annual Statement Filed	1997-12-03
Annual Renewal	1998-11-16
Annual Statement Filed	1998-11-16
Annual Renewal	1999-11-29
Annual Statement Filed	1999-11-29
Annual Renewal	2000-11-27

Annual Statement Filed	2000-11-27
Annual Renewal	2002-01-21
Annual Statement Filed	2002-01-21
Change of Directors	2002-04-03
Annual Renewal	2002-12-17
Annual Statement Filed	2002-12-17

RELATED REGISTRATIONS

This Company ...
Registered DEXTER PAVING
Registered NOVA SCOTIAN UTILITY CONSTRUCTION CORP.

APPENDIX B

INDUSTRIAL WASTE PERMIT APPROVAL

Nova Scotia

Department of the Environment

PO Box 2107
Halifax, Nova Scotia
B3J 3B7

Our file no:

11-94-0007

March 11, 1994

David Shupe
Dexter Construction Co. Ltd.
P. O. Box 48100, Bedford
Nova Scotia B4A 3Z2

Dear Mr. Shupe:

Re: Industrial Waste Permit Approval #94-003

Enclosed please find your approved Industrial Permit #94-003 for the operation of an Aggregate Quarry at Kemptown, Colchester County.

Strict adherence to the attached stipulations is imperative in order to validate your permit.

Should you have any questions please contact the Northern Regional Office in Truro at 893-5880, or in writing.

Yours truly,

D. E. Hiltz, P. Eng.,
Manager
Industrial Pollution Control

/lk

cc: G. MacLellan
A. Beckett

Enclosure

NOVA SCOTIA

DEPARTMENT OF THE ENVIRONMENT

Industrial Waste Permit

Pursuant to the Environmental Protection Act, the Water Act and Regulations made pursuant thereto, and subject to the terms and conditions contained in the permit, this permit is granted to Dexter Construction Company Limited to construct and/or operate a Rock Quarry at or near Kemptown, in the County of Colchester, in the Province of Nova Scotia.

Granted at Halifax, in the County of Halifax, Province of Nova Scotia, this 10th *day of* March, *A.D. 1994.*

94-003
PERMIT NUMBER

MINISTER OR PERSON DESIGNATED BY THE MINISTER

STIPULATIONS SHEET

Nova Scotia Department of the Environment

Project: Dexter Construction Company Limited
Rock Quarry
Kemptown, Colchester County

Approval No: 94-003

File No: 11-94-0007

Grid Reference: 910 415

Map Series: 11 E/11

Stipulations:

This application is recommended for approval subject to the following stipulations:

1. **Scope of Approval**

This approval relates to Dexter Construction Company Limited hereafter called the "proponent" and their application to operate a ten (10) acre rock quarry as outlined on plan SK-1 stamped by professional engineer John Franklin P.Eng. dated February 4, 1994.

2. **General Stipulations**

a) The proponent shall conduct its' rock quarry in accordance with provisions of the:

i) Environmental Protection Act, RSNS 1989, C.150;
ii) Water Act, RSNS 1989, C.500;
iii) Dangerous Goods and Hazardous Waste Management Act, RSNS 1989, C.118;
iv) Regulations pursuant to the above Acts, and
v) Local municipal environmental bylaws, and zoning restrictions.

b) The Minister reserves the right to modify, amend, or add stipulations to this Industrial Permit at any time.

c) This Industrial Permit is not transferrable without the written permission of the Minister.

d) If the Minister determines that there has been non-compliance with any or all of the stipulations provided in this Permit issued pursuant to Section 23 of the Environmental Protection Act, the Minister may cancel or suspend the permit until such time as the Minister is satisfied that all stipulations have been met.

e) The proponent shall notify the Nova Scotia Department of the Environment prior to any process changes or waste disposal practices which are not approved under authorization of this permit.

f) The proponent shall bear all expenses incurred in carrying out the environmental monitoring required under stipulations of this permit.

g) The proponent has provided a legal property boundary survey outlining the 25 acres they have leased as well as the 10 acres they propose to quarry. The 10 acre quarry site must be staked off so that upon an inspection the quarry boundaries are easily identifiable.

h) The proponent shall develop the site in such a manner as to expose only the areas that are being actively used/excavated.

i) The proponent shall ensure that this permit or a copy is kept on-site or at their head office at all times and that personnel directly involved in the project are made fully aware of the conditions which pertain to this approval.

j) The proponent will be required to register their project under the Environmental Assessment Act should the area exceed 4 hectares.

k) The proponent shall notify the Regional Office prior to operating the site so that a final inspection can be conducted.

3. **Particulate Emissions (Dust)**

a) Particulate emissions shall not exceed the following limits at 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.

c) Site access road(s) shall be maintained to minimize dust generation. The use of waste oil is not permitted.

Note: Monitoring of Particulate Emissions shall be at the request of the Nova Scotia Department of the Environment.

4. **Sound Levels**

Sound levels measured at the 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)

Note: Monitoring shall be conducted at the request of the Nova Scotia Department of the Environment.

5. **Surface Water**

a) The site shall be maintained to prevent siltation of the surface water which is discharged from the property boundaries into the nearest watercourse. This includes the installation of soil erosion and sedimentation control designed to meet the specification of this Department.

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

c) If it becomes necessary to drain the pit/quarry workings, the wastewater shall be drained to settling ponds for appropriate treatment to meet the suspended solids limits.

d) The proponent shall sample and ensure the following liquid effluent levels are met:

Final Effluent Discharge Limits

Parameters	Maximum in a Grab Sample	Monthly Arithmetic Mean	Monitoring Frequency
Total Suspended Solids	70 mg/l	35 mg/l	upon request
pH	5 - 9	6 - 9	upon request

e) Non-compliance of the above final effluent discharge limits shall be immediately reported to the Regional Office of the Nova Scotia Department of the Environment*.

f) Monitoring stations for liquid effluent shall be determined by the Regional Office of the Nova Scotia Department of the Environment* following a final inspection of the site. Monitoring shall be at the request of the Nova Scotia Department of the Environment.

g) A monthly summary of results of monitoring shall be submitted to the Regional Office of the Nova Scotia Department of the Environment*.

h) The proponent shall secure from this Department a Permit Amendment approved by the Minister prior to washing any aggregate.

6. **Groundwater**

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

7. **Blasting**

a) The proponent shall have a blast design prepared by a qualified consultant and the design sent to the Nova Scotia Department of the Environment for review prior to any blasting. The proponent is limited to 20,000 tonnes of material removed per blast unless the technical blast design proves that more or less material can be removed without causing an environmental impact.

b) The proponent shall conduct a pre-blast survey including a water quality analysis of all structures within 800 metres of a quarry. The survey shall be conducted by a qualified professional and the results sent to the Regional Office of the Nova Scotia Department of the Environment* prior to blasting at the site. Water quality parameters will be determined by NSDOE staff.

c) The proponent 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) The proponent shall ensure that all blasts are monitored at the nearest structure (residential, commercial, institutional) and a second monitor to be placed 800

metres downwind of the quarry site. The following limits for blasting shall not be exceeded:

Air blast	128 dBL
Ground Vibration	0.5 inches/second
	12.5 mm/second

* Nova Scotia Department of the Environment
Northern Regional Office
P. O. Box 824,
Truro, N. S.
B2N 5G6
(902) 893-5880

Note: All blasts are to be monitored by a qualified professional and the results sent to the Regional Office of the Nova Scotia Department of the Environment on a monthly basis.

8. **Reclamation**

a) The site shall be progressively reclaimed and rehabilitated where possible by grading, contouring, and revegetating the disturbed land.

b) The proponent shall submit a rehabilitation plan to the Nova Scotia Department of the Environment for approval by December 31,1994.

c) The proponent shall rehabilitate the site within six months of abandonment and in accordance with the approved rehabilitation plan or other terms as specified by the department.

d) The proponent shall post a security in a form acceptable to the Nova Scotia Department of the Environment in the amount of $20,000 on or before April 15, 1994.

e) The Nova Scotia Department of the Environment shall release the security to the proponent after rehabilitation of the active area has been completed to the satisfaction of the Minister of the Environment.

f) The proponent shall ensure that any security posted for rehabilitation be kept valid for the term of the permit.

DSF/lk

APPENDIX C

KEMPTOWN ROAD QUARRY HYDROLOGY

HYDRO-COM TECHNOLOGIES LTD

445 Urquhart Crescent
Fredericton, NB
E3B 8K4

e-mail: hydrocom@nbnet.nb.ca
Fax: (506)-455-0193
Tel: (506)-455-2888
www.hydro-com.com

September 30, 2003 Project 03030

Ms. Katherine Fleet,
Jacques Whitford Environment Limited
3 Spectacle Lake Drive
Dartmouth, NS
B3B 1W8

Re: Kemptown Road Quarry Hydrology

Dear Ms. Fleet:

Hydro-Com Technologies Limited, acting at the request of Ms. Katherine Fleet of Jacques Whitford Environment Limited, has performed a hydrologic review of the Kemptown Road Quarry. The objectives of the hydrologic review was to determine the effects of the proposed quarry site expansion. This report has been prepared solely for the project described above and contains a description of our methodologies, and our findings.

Site Description

A plan view of the quarry site and proposed extension are presented in Figure 3. The existing quarry area is presented with blue outline while the proposed extension is presented with gray outline. The quarry is located on a knoll; therefore, there is relatively little drainage area upstream contributing runoff to the quarry site. The natural drainage paths of the site currently direct water from the north-west side of the knoll towards the stream located north of the site, and from its south-east side toward the stream to the east. Both streams discharge into a larger watercourse to the east. Waters currently collecting within the existing quarry site will accumulate on its bowl-shaped floor, which has been covered with a layer of crushed rock to retain water while allowing trafficability. When the water level in the quarry rises, excess water enters the culvert located on the eastern part of the pit and is evacuated toward the eastern stream. In this report, it is our understanding that as quarry development progresses, runoff from the site will continue to drain in the same direction due to associated landforming. Ultimately, the entire proposed quarry extension will contribute runoff water to the eastern stream.

Objectives

Based on our discussions, the objectives for this assignment are as follows:

- estimate quantities of surface runoff from the site for the currently proposed ultimate level of quarry development,

- estimate the size and design discharge capacity of the required flow retention/siltation treatment structures 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 was estimated using a proration of mean annual flows from nearby hydrometric stations and from previous studies,
- the size and design discharge capacity of the required flow retention/siltation treatment structures were determined using the HEC-1 runoff model and the Rational Method, 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 of the watershed containing the quarry at the currently proposed ultimate level of development is 0.237 km^2,
- working slope of the watershed containing the quarry is 1.3 %,
- time of concentration of the watershed containing the quarry is 43 minutes,
- coefficient of runoff at the quarry site is equal to 0.55,
- Soil Conservation Service (SCS) land use curve number at the quarry site for average antecedent moisture conditions (AMC II) is equal to 76, and
- drainage area of the watershed within which the quarry is located at the confluence of the eastern stream and the larger watercourse approximately 1.7 km east of the quarry is 2.23 km^2.

Mean Annual Site Runoff

The mean annual runoff at the quarry site was estimated using a number of different approaches for comparison purposes. The upper bounds of the mean annual runoff volume was first calculated considering 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 previously estimated mean annual runoff values for the area (MacLaren Atlantic Ltd, 1980). Because both of these estimation methods derive mean annual runoff volumes from larger watersheds containing undeveloped and buffer zones, and therefore dampening overland runoff, the expected volumes were increased from the lower bounds by a reasonable amount to reflect hydrological conditions in the quarry.

Based on historical climatic data at the Truro climatic station (approximately 23 km away) (1960-2000), the average annual precipitation at the site is 1184.5 mm. If all of this precipitation is converted into surface runoff (which would represent an upper bound on the expected average annual runoff), the annual volume of runoff from the quarry site at the currently proposed ultimate level of development would be 195,000 m^3, which corresponds to a mean annual flow of 6.2 L/s.

A lower bound for the expected annual volume of site runoff was established by drainage area based proration of flows from a nearby hydrometric station. The hydrometric station 01DH003 (1965-1991), Fraser Brook near Archibald, whose drainage area is 10.1 km^2, was chosen as most representative for proration purposes as its drainage area and hydrological characteristics were most similar to those at the quarry site. By prorating flows at the hydrometric station, a mean annual flow of 3.9 L/s was calculated for the quarry site at the currently proposed ultimate level of development. This mean annual flow corresponds to an annual runoff volume of 124,000 m^3.

A second approach was used to estimate the lower bound of the expected annual runoff at the site for comparison purposes. MacLaren Atlantic Ltd. (1980) has compiled a figure presenting the spatial distribution of runoff volumes throughout Nova Scotia based on findings from a number of sources. A mean annual runoff depth of 800 mm was selected from this figure to determine the runoff at the site. Based on this approach, the mean annual runoff flow of 4.2 L/s was computed for the quarry site at the currently proposed ultimate level of development. This mean annual flow corresponds to an annual runoff volume of 132,000 m^3.

Development of the quarry will involve the removal of tree cover and topsoil from the section of watershed containing the quarry. Clearing the land of vegetative cover will reduce interception and temporary storage of precipitation. This hydrologic change will drive more direct runoff at the site, and result in less evapotranspiration (which encompasses both evaporation and transpiration from the soil-plant matrix). Average potential evapotranspiration rates in the area are approximately 500 to 600 mm(Dzikowski et al, 1984). By assuming a reduction in actual evapotranspiration rates of 250 mm, a direct increase to runoff to reflect the currently proposed ultimate level of development was computed. Adjustment of the lower bounds of average annual runoff as presented earlier resulted in expected annual runoff volumes of 165,000 m^3 and 173,000 m^3 based on the proration method and MacLaren Atlantic study method, respectively. These annual volumes correspond to mean annual flows of 5.2 L/s and 5.5 L/s respectively.

Flow Retention/Siltation Treatment Structures

The criteria that were used to determine the peak design flow and the retention volume associated with the flow retention/siltation treatment structures for the quarry at the currently proposed ultimate level of development are as follows. The peak design flow for the pond consisted of the peak flow resulting from a 10 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 existing water holding area along the quarry floor will 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 43 minutes, the peak flow resulting from a 10 year return period storm event was estimated to have a magnitude of 1.35 m^3/s. All of the hydraulic control structures associated with the quarry at the currently proposed ultimate level of development should thus be designed for a peak flow magnitude of no less than 1.35 m^3/s.

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. The flow retention/siltation treatment structures (or capacity of quarry floor allowing for water accumulation between the interstices of porous media) should thus have a volume of no less than 4,700 m^3 in order to accommodate the site runoff from the quarry at the currently proposed ultimate level of development. An appropriate collection system will prevent waters from the site from running off directly without first being directed to the retention area of the quarry site.

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 20% of the mean annual volume of precipitation over the quarry site, or approximately 41,000 m^3/year. This increase in runoff can be evaluated in terms of the runoff of the basin which includes the quarry site. The drainage area associated with the currently proposed ultimate level of quarry development is 0.165 km^2. The drainage area of the watershed encompassing the eastern stream, which receives flows from the quarry, up to the confluence with the larger watercourse to the east of Kemptown Road is 2.23 km^2. Considering, the relative size of both drainage areas, the above change in the volume of mean annual surface runoff from the quarry would result in an increase in the mean annual flows at the outlet of the eastern stream of approximately 7%.

Although the quarry development will result in an increase in the peak rates of surface runoff at the outlet of the quarry site and a reduction of the low flows (i.e. water will run off more quickly following additional quarry development), 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 fully mitigate the above re-distribution of flows.

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 treatment 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 fully mitigated using the placement of free-draining material and properly sized flow retention/siltation treatment areas. Following the use of these mitigative measures, the remaining residual effects on downstream flows and water quality are expected to be minor.

References

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.

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

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 Limited

Neil McLaughlin, M.Sc.E., EIT

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

APPENDIX D

CORRESPONDENCE FROM CHIEF LAWRENCE PAUL

P.O. Box 634, Truro, N.S.
B2N 5B6

MILLBROOK BAND COUNCIL

Tel: (902) 897-9100
Fax: (902) 895-0120

JOSEPH JULIAN SERVED AS CHIEF 1917-1957

To: Danny Clifton
Manager of Quarry Operations
Dexter

Dear Mr. Clifton:

RE: Kemptown Quarry, Colchester County

Further to your 9 October 2003 letter, I advise there are no concerns regarding the proposed quarry operation. I advise we have no objection to the quarry expansion.

Yours truly,

Chief Lawrence Paul

Chief Lawrence Paul

APPENDIX E

PROJECT INFORMATION BULLETIN

NOTICE TO RESIDENTS

Proposed Expansion of Dexter Quarry at Kemptown

Dexter Construction have been operating a rock quarry at Kemptown, Colchester County for several years and have been using the aggregate on Department of Transportation and Public Works projects. We are now applying to the Nova Scotia Department of Environment and Labour for a Permit to operate a quarry in excess of four hectares that will also allow Dexter to supply aggregate to non-Department of Transportation and Public Works projects and to stockpile more types of aggregate at the Kemptown site.

This will involve a moderate expansion of the quarry. We do not anticipate any substantial increase in the frequency of our blasting, truck traffic or production. In order for Dexter to expand its quarry it must register this project as a Class I Undertaking pursuant to the Nova Scotia Environment Act and Environmental Assessment Regulations.

If you have any questions or concerns regarding the registration of this project you should correspond with our representative Alan Hayman at Burchell Hayman Parish, Suite 1800, 1801 Hollis Street, Halifax, Nova Scotia, B3J 3N4 or by contacting him by e-mail at ahayman@burchells.ca; telephone 423-6361 or fax 420-9326 by October 31st, 2003.

Dated this 10th day of October, 2003.

Dexter Construction Company Limited
Danny Clifton, General Superintendent

APPENDIX F

PHOTOS TAKEN DURING FIELD SURVEY

Photo 1 **Location 3 looking east, June 2004**

Photo 2 **Location 4 looking north, June 2004**

Jacques Whitford

Photo 3 **Location 5 looking east, June 2004**

Photo 4 **Location 6 looking east, June 2004**

Photo 5 **Location 7 looking north, August 2003**

Photo 6 **Location 8 looking east, August 2003**

Photo 7 **Location 9 looking east, August 2003**

Photo 8 **Location 10 looking north, August 2003**

Photo 9 **Drainage culvert inlet, August 2003**

Photo 10 **Drainage channel along quarry access road, August 2003**

Photo 11 Stream east of quarry, August 2003

Photo 12 Stream crossing at Kemptown Road (downstream), August 2003

APPENDIX G

VASCULAR PLANTS RECORDED IN STUDY AREA

Table G1 Vascular Plant Species found in the Study Area.	
Trees	
Binomial	**Common Name**
Abies balsamea	balsam fir
Acer rubrum	red maple
Acer saccharum	sugar maple
Acer spicatum	mountain maple
Betula allegheniensis	yellow birch
Betula cordifolia	mountain white birch
Betula populifolia	wire birch
Fagus grandifolia	American beech
Picea glauca	white spruce
Picea mariana	black spruce
Picea rubens	red spruce
Populus grandidentata	large-tooth aspen
Populus tremuloides	trembling aspen
Sorbus americana	mountain-ash
Shrubs	
Binomial	**Common Name**
Alnus incana	speckled alder
Corylus cornuta	beaked hazelnut
Ilex verticillata	black alder
Kalmia angustifolia	lambkill
Ledum groenlandicum	Labrador tea
Lonicera canadesis	American fly-honeysuckle
Nemopanthus mucronata	false holly
Prunus pensylvanica	pin-cherry
Rosa nitida	swamp-rose
Rubus canadensis	smooth blackberry
Rubus idaeus	wild raspberry
Rubus recurvicaulis	blackberry
Salix alba	white willow
Salix bebbiana	beaked willow
Salix discolor	pussy-willow
Salix eriocephala	willow
Salix humilis	small pussy-willow
Salix pyrifolia	bog willow
Sambucus racemosa	red-berried elder
Taxus canadensis	yew
Vaccinium angustifolium	late lowbush blueberry
Vaccinium myrtilloides	Canada blueberry
Viburnum alnifolium	hobblebush

Table G1 Vascular Plant Species found in the Study Area.	
Viburnum nudum	witherod
Viburnum opulus	highbush-cranberry
Ground Vegetation	
Binomial	**Common Name**
Actaea alba	white baneberry
Agrostis capillaris	bent-grass
Agrostis hyemalis	tickle-grass
Agrostis perennans	bent-grass
Anaphalis margaratacea	pearly everlasting
Aralia hispida	bristly aralia
Aralia nudicaulis	wild sarsaparilla
Aster acuminatus	wood aster
Aster lateriflorus	calico aster
Aster umbellatus	tall white aster
Athyrium filix-femina	lady fern
Calamagrostis canadensis	blue-joint
Carex arctata	sedge
Carex debilis	sedge
Carex echinata	sedge
Carex intumescens	sedge
Carex lurida	sedge
Carex scoparia	sedge
Carex stipata	sedge
Carex trisperma	sedge
Carex crinita	sedge
Chelone glabra	turtlehead
Clintonia borealis	yellow clintonia
Coptis trifolia	goldthread
Cornus canadensis	bunchberry
Cypripedium acaule	common lady's-slipper
Danthonia spicata	poverty grass
Dennstaedtia punctilobula	hay-scented fern
Drosera intermedia	narrow-leaved sundew
Dryopteris campyloptera	eastern spreading wood fern
Dryopteris cristata	crested wood fern
Dryopteris intermedia	evergreen wood fern
Eleocharis acicularis	spike rush
Epilobium angustifolium	fireweed
Epilobium leptophyllum	bog willow-herb
Equisetum arvense	field horsetail
Equisetum sylvaticum	wood horsetail

Table G1 Vascular Plant Species found in the Study Area.	
Erectites hieracifolia	fireweed
Eriophorum tenellum	cotton-grass
Eriophorum virginicum	cotton-grass
Eupatorium maculatum	Joe-Pye-weed
Eupatorium perfoliatum	boneset
Euthamia graminifolia	narrow-leaved goldenrod
Festuca ovina	sheep fescue
Fragaria virginiana	wild strawberry
Galium trifidum	bedstraw
Galium triflorum	sweet-scented bedstraw
Gaultheria hispidula	snowberry
Glyceria canadensis var. laxa	rattlesnake grass
Glyceria striata var. stricta	fowl manna-grass
Hieracium pillosella	mouse-ear hawkweed
Hypericum canadense	St. John's-wort
Impatiens capensis	spotted touch-me-not
Juncus conglomeratus	rush
Juncus effusus	soft rush
Lactuca biennis	blue wild lettuce
Linnaea borealis	twin-flower
Lobelia inflata	Indian-tobacco
Lycopodium annotinum	bristly club-moss
Lycopodium clavatum	club-moss
Lycopodium obscurum	ground pine
Lycopus uniflorus	bugle weed
Maianthemum canadense	wild lily-of-the valley
Medeola virginiana	Indian cucumber-root
Monotropa uniflora	Indian pipe
Oenothera biennis	evening primrose
Onoclea sensibilis	sensitive fern
Osmunda cinnamomea	cinnamon fern
Osmunda claytoniana	interrupted fern
Osmunda regalis	royal fern
Oxalis acetosella	wood sorrel
Panicum villosissium	panic grass
Phegopteris connectilis	northern beech fern
Platanthera dilatata	white bog-orchid
Platanthera lacera	ragged-fringed orchid
Polygonum punctatum	water-smartweed
Prenanthes trifoliolata	gall-of-the-earth
Prunella vulgaris	heal-all

Table G1 Vascular Plant Species found in the Study Area.	
Pteridium aquilinum	bracken fern
Rubus pubescens	dewberry
Saturjea vulgaris	basil
Scirpus cyperinus	bulrush
Scutellaria lateriflora	skullcap
Solidago canadensis	Canada goldenrod
Solidago puberula	rough goldenrod
Solidago rugosa	rough goldenrod
Solidago uliginosa	bog-goldenrod
Stellaria graminea	stitchwort
Streptopus roseus	rose twisted-stalk
Thelypteris noveboracensis	New York fern
Triadenum fraseri	marsh St. John's-wort
Trientalis borealis	star flower
Trillium undulatum	painted trillium
Typha angustifolia	narrow-leaved cat-tail
Typha latifolia	broad-leaved cat-tail
Veronica officinalis	common speedwell
Veronica scutellata	marsh-speedwell
Viola cucullata	blue violet
Viola macloskeyi	small white violet
Viola sp.	violet

APPENDIX H

WETLAND EVALUATION

WETLAND EVALUATION

This wetland is 0.36 ha in size and is located in Upper Kemptown in the northwestern corner of the area slated for expansion of the Dexter quarry. The wetland occupies a small basin at the headwaters of a small intermittent stream course, which is bounded by immature softwood forest. The wetland is classed as a tall shrub dominated basin swamp. Tree cover consists of a few scattered balsam fir (*Abies balsamea*). A patchy cover of tall shrubs is present which speckled alder (*Alnus incana*) dominates. Advanced regeneration of balsam fir, black spruce (*Picea mariana*) and red maple (*Acer rubrum*) is also present in the shrub layer. Open patches are present in this wetland, particularly along the western edge of the wetland. These areas are typically dominated by a mixture of sedge (*Carex echinata*), bog goldenrod (*Solidago uliginosa*), wool grass (*Scirpus cyperinus*), sphagnum moss (*Sphagnum* spp.), Joe-Pye weed (*Eupatorium maculatum*), and violets (*Viola* sp.). Other species typical of the ground vegetation layer include rough goldenrod (*Solidago rugosa*), tawny cotton-grass (*Eriophorum virginicum*) and rattlesnake grass (*Glyceria canadensis*).

The amount of wetland habitat potentially disturbed by the project is less than two hectares, therefore, the wetland evaluation uses the ten-step process described in the Nova Scotia Department of the Environment Wetland Directive. In the following text each of the questions associated with each of 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 field survey, 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.

During the September 16, 2003 field survey, three species of birds were recorded in or adjacent to the wetland. The lateness of the season precluded identification of local breeders, or likelihood of spotting many summer resident birds. The species observed included Cedar Waxwing (*Bombycilla cedrorum*), Common Yellowthroat (*Geothlypis trichas*) and White-throated Sparrow (*Zonotrichia albicollis*). All of these species can be expected to breed in the habitat provided by the wetland. Other species expected to breed in the wetland include Alder Flycatcher (*Empidonax alnorum*), American Robin (*Turdus migratorius*) and Swamp Sparrow (*Melospiza georgiana*). Mammals detected in the wetland included red squirrel (*Tamiasciurus hudsonicus*), varying hare (*Lepus americanus*), white-tailed deer (*Odocoileus virginianus*), and coyote (*Canis latrans*). The wetland contains only a few ephemeral pools and this combined with its small size would suggest that it does not provide valuable habitat for waterfowl or semi-aquatic mammals such as muskrat (*Ondatra zibethicus*) and beaver (*Castor canadensis*).

At the time of the survey no reptiles were observed and the only amphibian species in evidence were green frog (*Rana clamitans*), pickerel frog (*Rana palustris*) and northern spring peeper (*Pseudacris crucifer*). Other reptiles and amphibians which may be expected in the wetland include maritime garter snake (*Thamnophis sirtalis*), eastern smooth green snake (*Liochlorophis vernalis*), yellow-spotted salamander (*Ambystoma maculatum*) and wood frog (*Rana sylvatica*). The only open water in the wetland is a few ephemeral pools at the northern end of the wetland and the small intermittent stream which originates at the outflow of the wetland. These provide only marginal amphibian breeding habitat.

Given the small size and intermittent nature of the stream that originates at the outflow of the wetland, it is unlikely that fish are present in the wetland. Overall, the wetland is considered to have relatively low value as wildlife habitat due to its small size and lack of diverse habitats. Two other small wetlands are known to be present downstream of the wetland. These wetlands in conjunction with the wetland under evaluation may serve as a conduit for the movement of wetland species along the drainage course.

Step 2. Evaluate for Rare and Endangered Species

A vegetation survey was conducted to determine if any rare vascular plant species were present. A total of 45 species of vascular plant were encountered during the survey (Table x). None of these species is considered to be rare in Nova Scotia (Atlantic Canada Conservation Data Centre (ACCDC) 2003; Nova Scotia Department of Natural Resources (NSDNR) 2003), or Canada (Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2003). None of the bird, mammal, or herpetile species recorded in the wetland or expected to be found in the wetland are considered to be rare nationally

(COSEWIC 2003) or provincially (ACCDC 2003, NSDNR 2003). As such, the wetland does not function and is not expected to function as habitat for rare or endangered species.

Step 3. Evaluate Groundwater Recharge Potential

The wetland appears to be a groundwater discharge site. No wells occur within or near the area occupied by the wetland under evaluation. The wetland 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 is small (0.36 ha) and is located near the top of a small hill. It is situated at the headwaters of a small intermittent stream. The wetland can be expected to help to regulate stream flow by acting as a small reservoir and slowly releasing surface water and groundwater following precipitation events and snow melt. Given the small size of the wetland and its position near the top of a hill, this function is not expected to play a significant role in stream flow regulation. At the time of the field survey in mid-September there was no water flowing from the wetland.

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

This small wetland could be utilized as a storm water-settling pond. This use of the wetland would depend upon the depth of the quarry relative to the elevation of the wetland. If the quarry is deeper than the wetland it will not be possible to direct storm water into the wetland without pumping.

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 small tall shrub dominated basin swamp is not an uncommon or unique habitat type and does not provide valuable wildlife habitat or habitat for rare or endangered species. It is a groundwater discharge site and may help to moderate surface water flow in an adjacent intermittent stream although this function is not expected to be significant given the size and topographic position of the wetland. The wetland has some potential as a settling pond provided it is down slope of the quarry floor. The wetland has no potential for agricultural production or peat harvesting.

Table H1 Vascular Plant Species found in the Wetland.	
Trees	
Binomial	**Common Name**
Abies balsamea	balsam fir
Acer rubrum	red maple
Acer saccharum	sugar maple
Betula populifolia	wire birch
Picea glauca	white spruce
Picea mariana	black spruce
Shrubs	
Binomial	**Common Name**
Alnus incana	speckled alder
Ilex verticillata	black alder
Rosa nitida	swamp-rose
Rubus idaeus	wild raspberry
Taxus canadensis	yew
Ground Vegetation	
Binomial	**Common Name**
Agrostis hyemalis	tickle-grass
Agrostis perennans	bent-grass
Aster umbellatus	tall white aster
Calamagrostis canadensis	blue-joint
Carex echinata	sedge
Carex lurida	sedge
Carex stipata	sedge
Chelone glabra	turtlehead
Cornus canadensis	bunchberry
Dryopteris cristata	crested wood fern
Equisetum sylvaticum	wood horsetail
Eriophorum tenellum	cotton-grass
Eriophorum virginicum	cotton-grass
Eupatorium maculatum	Joe-Pye-weed
Eupatorium perfoliatum	boneset
Euthamia graminifolia	narrow-leaved goldenrod
Galium trifidum	bedstraw
Gaultheria hispidula	snowberry
Glyceria canadensis var. laxa	rattlesnake grass
Hypericum canadense	St. John's-wort
Impatiens capensis	spotted touch-me-not
Juncus conglomeratus	rush
Lycopus uniflorus	bugle weed

Table H1 Vascular Plant Species found in the Wetland.	
Osmunda cinnamomea	cinnamon fern
Platanthera dilatata	white bog-orchid
Platanthera lacera	ragged-fringed orchid
Rubus pubescens	dewberry
Scirpus cyperinus	bulrush
Scutellaria lateriflora	skullcap
Solidago rugosa	rough goldenrod
Solidago uliginosa	bog-goldenrod
Triadenum fraseri	marsh St. John's-wort
Typha angustifolia	narrow-leaved cat-tail
Viola cucullata	blue violet

APPENDIX I

BIRD SPECIES RECORDED IN STUDY AREA

Table I1	Bird Species Recorded in the Study Area					
Common Name	**Scientific Name**	**Breeding Status**	**Number Recorded in Expansion Area (June/04)**	**Number Recorded in Expansion Area (July/03)**	**Number Recorded along Access Road (June/04)**	**Number Recorded along Access Road (July/03)**
Ruffed Grouse	*Bonasa umbellus*	Possible	1		1	
Spotted sandpiper	*Actitis macularia*	Possible	1			
Northern Saw-whet Owl	*Aegolius acadicus*	Probable		1		
Northern Flicker	*Colaptes aureus*	Confirmed	1	2		
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Possible	1			
Hairy Woodpecker	*Picoides villosus*	Possible			2	
Eastern Wood Pewee	*Contopus borealis*	No Evidence				2
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Confirmed	1	10		
Least Flycatcher	*Empidonax minimus*	Probable				1
Alder Flycatcher	*Empidonax alnorum*	Probable		10		
Blue Jay	*Cyanocitta cristata*	Possible				2
Common Raven	*Corvus corax*	Confirmed		1		
American Crow	*Corvus brachyrhynchos*	Possible	3	2		
Black-capped Chickadee	*Parus atricapillus*	Probable	1			1
White-breasted Nuthatch	*Sitta carolinensis*	No Evidence				1
Winter Wren	*Troglodytes troglodytes*	Probable	3			
Golden-crowned Kinglet	*Regulus satrapa*	Confirmed		1		
Ruby-crowned Kinglet	*Regulus calendula*	Probable		1		
American Robin	*Turdus migratorius*	Confirmed	20	20	2	10
Hermit Thrush	*Catharus guttatus*	Confirmed	1	15		
Swainson's Thrush	*Catharus ustulatus*	Probable	3	7		4
Blue-headed Vireo	*Vireo solitarius*	Probable	1		2	
Red-eyed Vireo	*Vireo olivaceus*	Confirmed		5	2	8
Black-and-white Warbler	*Mniotilta varia*	Confirmed	10	2		6
Magnolia Warbler	*Dendroica magnolia*	Confirmed	35	20	3	2
Black-throated Blue Warbler	*Dendroica caerulescens*	Probable				1
Yellow-rumped Warbler	*Dendroica coronata*	Confirmed	3	2		

Table I1	Bird Species Recorded in the Study Area					
Common Name	**Scientific Name**	**Breeding Status**	**Number Recorded in Expansion Area (June/04)**	**Number Recorded in Expansion Area (July/03)**	**Number Recorded along Access Road (June/04)**	**Number Recorded along Access Road (July/03)**
Black-throated Green Warbler	*Dendroica virens*	Confirmed	14	2	1	4
Blackburnian Warbler	*Dendroica fusca*	Possible	6			1
Chestnut-sided Warbler	*Dendroica pensylvanica*	Probable			1	2
Palm Warbler	*Dendroica palmarum*	No Evidence		3		
Wilson's Warbler	*Wilsonia pusilla*	Probable	1			
Ovenbird	*Seiurus aurocapillus*	Probable	1		1	1
Common Yellowthroat	*Geothlypis trichas*	Confirmed	23	25		
Mourning Warbler	*Oporornis philadelphia*	Confirmed		1	1	2
American Redstart	*Setophaga ruticilla*	Confirmed			6	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Probable	1			
Fox Sparrow	*Passerella iliaca*	Possible	2	2		
Song Sparrow	*Melospiza melodia*	Confirmed	1	2		
Lincoln Sparrow	*Melospiza lincolnii*	Confirmed	5	5		1
White-throated Sparrow	*Zonotrichia albicollis*	Confirmed	12	15		4
Dark-eyed Junco	*Junco hyemalis*	Probable	2	5		2
Rusty Blackbird	*Euphagus carolinus*	Possible	1			
Purple Finch	*Carpodacus purpureus*	Possible	1	1		