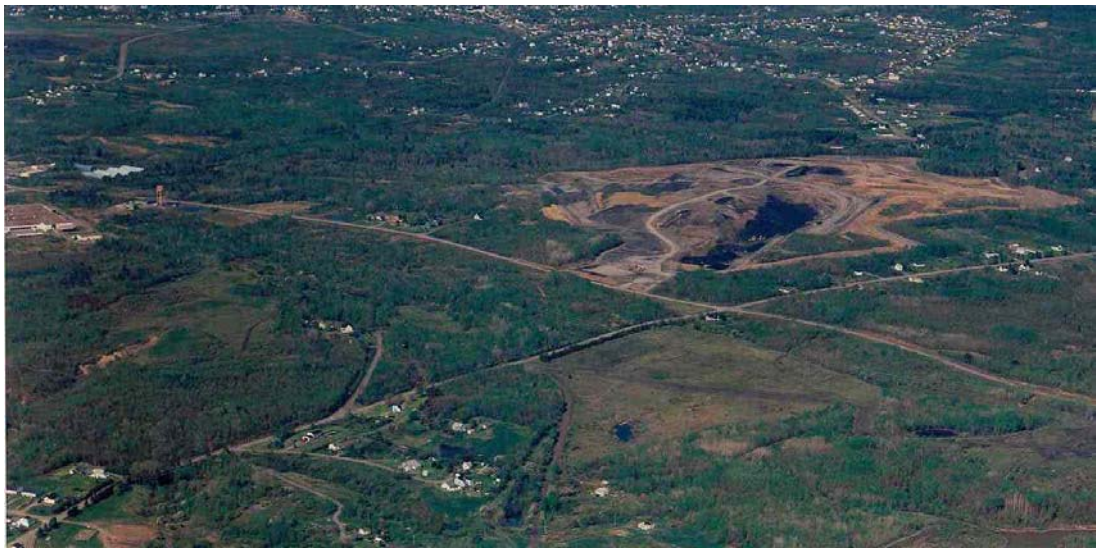
ENVIRONMENTAL REGISTRATION DOCUMENT

FOR STELLARTON PIT MINE EXTENSION

VOLUME I



Mining Operations – East of MacGregor Avenue

Submitted to Nova Scotia Department of Environment and Labour

By Pioneer Coal Limited

January 2004

PREFACE

Pioneer Coal Limited (Pioneer Coal) is submitting this Environmental Registration Document (ERD) for mining operations on the east side of MacGregor Avenue. This proposed undertaking is a continuation of the existing Stellarton Pit Mine located on the west side of MacGregor Avenue. The ERD is being filed subsequent to a response from the Minister of Environment and Labour (October of 2003) that the expansion of current operations has been defined as a Class I undertaking.

According to the Statement of Principle with respect to coal of Nova Scotia's Energy Strategy (Dec 2001), our Province "will encourage the use of indigenous coal where environmentally and economically appropriate, promote reclamation mining in lands previously disturbed by mining, and encourage development of clean coal technologies." The proposed undertaking embodies the goals of the Energy Strategy. As such, this document outlines project activities, the potential environmental and socio-economic impacts, associated mitigation, and monitoring for this undertaking.

The submission includes pertinent background information from the 1995 Environmental Assessment Report (EAR) for the Stellarton Pit Mine. Updated data, current methodologies and additional assessments have been incorporated into the ERD.

This additional information has been prepared utilizing the comments, advice and expertise of a number of different agencies and persons including: residents and elected officials from the local community; Nova Scotia Department of Natural Resources (NSDNR); Nova Scotia Department of Environment and Labour (NSDEL); Nova Scotia Museum (NSM); Confederacy of Mainland Mi'kmaq (CMM); Community Liaison Committee (CLC); and MGI Limited (MGI).

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EXECUTIVE SUMMARY

Pioneer Coal proposes to develop and operate an extension of the existing surface coal mine in Stellarton, Pictou County, Nova Scotia. The purpose of this document is to register the undertaking pursuant to the *Environmental Assessment Regulations* under the *Environment Act*. In October of 2003, the proponent was notified that the extension was determined to be a Class I undertaking in correspondence from the Nova Scotia Department of the Environment and Labour (NSDEL).

The existing mine that is located west of MacGregor Avenue has been operated by Pioneer Coal since 1996. This operation was approved by NSDEL in November of 1995 and it operates under Conditions of Approval, as well as an Industrial Approval. Since operations began in 1996, Pioneer Coal has mined approximately 1.6 million tonnes of coal to date. The anticipated recovery of coal from the proposed extension area east of MacGregor Avenue is 1.1 million tonnes.

Most of the land is owned by the Province and is administered by the Nova Scotia Department of Natural Resources (NSDNR). In 1994, the Province issued a "Call for Exploration and Surface Mine Development Proposals for the Stellarton Surface Coal Resource." Pioneer Coal was selected from the five proposals received by the Province. The proponent agreed to pay $2,050,000 to the Province for use of the necessary Crown property and for the surface resource at Stellarton. The proponent holds the mineral exploration and development rights for the site (both west and east of MacGregor Avenue) since 1996.

Pioneer Coal already owns or has access rights to most of the land area under consideration. There are 29 non-Crown owned properties in the immediate vicinity of MacGregor Avenue. The proponent is continuing negotiations or has made agreements with these land owners. To date, Pioneer Coal has purchased or signed an agreement to purchase eleven of these properties. Although not all of these properties are required for the project, Pioneer Coal has been attempting to secure ownership due to the proximity to the site.

The site has historically been the location of both authorized and bootleg coal mining. In its present condition, land is unsafe due to subsidence, near surface underground workings, old slopes and shafts, and abandoned concrete structures of previous mining activities. Future development on the land is contingent on reclamation; this can be achieved by surface mining. Future uses of the land (whether residential, recreational, etc.) are feasible only after final reclamation occurs after surface mining operations. Final reclamation is expected within approximately six years of operations commencing on the site.

The total area of the present site west of MacGregor Avenue is roughly 70ha, whereas the proposed area of the extension is approximately 50ha. The proposed extension site extends easterly approximately 700m from MacGregor Avenue. Surface mining will occur in five seams – Foord Seam, Cage Seam, Third Seam, Flemming/MacGregor Seam and New Seam. The deepest pit in the extension is in the Foord Seam which will be mined to a depth of approximately 65m. This is substantially less than the depth of the Foord Seam at the existing site. The pit depths for the remaining seams will be less than

65m. The resulting stockpiles are expected to be approximately half the height of the existing stockpile that is currently west of MacGregor Avenue.

In keeping with activities over the past eight years, the project will include: the excavation and stockpiling of overburden waste; the excavation, blending, stockpiling and transportation of coal; backfilling of waste rock; and, site reclamation. The existing equipment fleet (dozers, excavators, trucks, etc.) will form the basis for the operation as the mining extends eastward. The highwall miner will be used where appropriate (e.g., New Seam).

The existing mine surface structures will remain. These facilities were originally constructed so that they could be used over the full project (i.e., both west and east of MacGregor Avenue). Crushing, blending and load out of the coal product will occur in existing facilities west of MacGregor Avenue. The coal will be transported to the Nova Scotia Power (NSP) Inc. Trenton Generating Station using the same route as existing operations.

As in the past, coal from other operations (e.g., Coalburn) may be used to achieve the required blend specification. This will augment coal recovery in other areas and continue to provide employment and economical indigenous coal resources being used for Nova Scotia's energy requirements. This is in keeping with Nova Scotia's *Energy Strategy*.

The existing sedimentation ponds located west of MacGregor Avenue will be utilized. Settled effluent will be discharged to Bear Brook at the same locations as existing operations. Volume and quality of effluent is expected to be the same as existing. The operations east of MacGregor will not discharge to Coal Brook. A 30m minimum buffer zone will be maintained to Coal Brook.

A temporary realignment of portions of MacGregor Avenue and Foster Avenue is a component of this project. Services (including emergency vehicle access) will be maintained. The roads and intersections will be reinstated (including asphalt) to the original lines and grades.

Monitoring of dust, noise, surface water, groundwater and aquatic habitat has occurred over the past eight years. Results have been evaluated and submitted to NSDEL on a monthly basis. The knowledge gathered as part of past operations west of MacGregor Avenue has been incorporated into the design of the project. Regular monitoring and evaluation is part of the proposed extension.

This report describes the existing environment with emphasis on the Valued Ecological and Socioeconomic Components (VESCs). These include aquatic components (surface water, fisheries and rare or sensitive species), terrestrial components (flora, fauna, wetlands and sensitive or rare species), and socio-economic components (economy, air quality, noise levels, cultural resources, First Nations, transportation, community resources, domestic wells, aesthetics, human health and safety). Background data is presented for these components.

Two public consultation sessions were held in December of 2003. These were advertised and invitations were made to many nearby residents, elected officials and local/regional

staff representatives of NSDEL and NSDNR. The issues ranged from land reclamation to economic considerations (i.e., employment and property values). Concerns were noted and considered in the design of this undertaking as appropriate.

Environmental protection and management is an integral component of daily operations. Pioneer Coal has the dual goal of efficiently mining the coal and minimizing negative impacts to the environment. While there will be some temporary negative impact, mitigative measures are proven to successfully minimize their magnitude. The past eight years of monitoring data is evidence that the operations have met environmental commitments and no long term impact or trends are noted in the receiving environment.

The following describes the net positive and negative impacts:

Positive Residual Impacts

- A highly disturbed site within the Town of Stellarton boundaries will be progressively returned to a fully reclaimed area;
- Employment of approximately 40 to 50 persons with significant direct and secondary economic benefits during the period of operation; and,
- The NSP Trenton facility will be able to burn low sulphur indigenous coal for the period of the project.

Negative Residual Impacts

- Land use in the mine area will continue to be highly disturbed until progressive and final reclamation restores the area;
- Residents living close to the mine may be subject to some disruption from the operation due to somewhat elevated levels of dust, noise and general activity close to the site (although still within regulatory limits); and
- Negative impact to the small (less than 0.25ha) pond that currently exists on the site (likely from previous site activities).

The long term effect of the project will be very positive to the environment. The key advantages after reclamation on completion of the mine will be:

- a safe, contoured, vegetated site;
- return of property values for the neighbourhood; and
- longer term socio-economic benefits from employment and economic enhancements in the region.

It is concluded that the undertaking can be executed without significant long term adverse impacts on biophysical and socio-economic resources. The residual impact on the VESCs is overall positive when the economic and safety issues are considered.

LIST OF ACRONYMS AND ABBREVIATIONS

ARD	acid rock drainage
CLC	Community Liaison Committee
cm	centimetre
cm/sec	centimetre per second
CMM	Confederacy of Mainland Mi'kmaq
COA	Conditions of Approval
dB	decibel
EAR	Environmental Assessment Report
EEM	Environmental Effects Monitoring
ERD	Environmental Registration Document
ha	hectare
kg	kilogram
km/hr	kilometer per hour
m	metre
m^2	square metre
m^3	cubic metre
m^3/d	cubic metre per day
m^3/hr	cubic metre per hour
MGI	MGI Limited
mg/L	milligram per litre
mm	millimeter
NAPS	National Air Pollution Surveillance
NSP	Nova Scotia Power Incorporated
NSDEL	Nova Scotia Department of Environment and Labour
NSDNR	Nova Scotia Department of Natural Resources
NSM	Nova Scotia Museum
PAH	polycyclic aromatic hydrocarbons
Pioneer Coal	Pioneer Coal Limited
ppm	parts per million
ppb	parts per billion
ROM coal	Run of Mine coal
TSP	total suspended particulate
VESC	Valued Ecological and Socio-Economic Component
^{O}C	degree Celsius
ng/m^3	nanogram per cubic metre
$\mu g/m^3$	microgram per cubic metre
PCDPC	Pictou County District Planning Commission

TABLE OF CONCORDANCE

The following table shows the format as outlined in *Guide to Preparing an EA Registration Document for Mining Developments in Nova Scotia* (NSDEL, December 2002). The appropriate section of this ERD is matched with the guide format.

NSDEL Guide Format		**Corresponding Location in ERD**	
Section	***Title***	***Section***	***Title***
1	PROPONENT DESCRIPTION	1.1	Registration
2	THE UNDERTAKING		
2.1	Name	1.1	Registration
2.2	Location	1.1	Registration
3	SCOPE		
3.1	Scope of Undertaking	2.1	Scope of Undertaking
3.1.1	Purpose and Need for Undertaking	2.3	Project Justification
3.1.2	Consideration of Alternatives	2.3	Project Justification
3.2	Scope of the Environmental Assessment	2.7	Scope of Environmental Assessment
4	PUBLIC INVOLVEMENT		
4.1	Methods of Involvement	5.2	Components of Consultation Program
4.2	Public Comments	5.2	Stakeholder Input
4.3	Steps Taken to Address Public Concerns	5.2	Implication of Inputs
5	DESCRIPTION OF UNDERTAKING		
5.1	Geographical Location	2.4	Site Location and Physiography
5.2	Physical Components	3.2	Site Features
5.3	Site Preparation and Construction	3.4	Site Preparation
5.4	Operation and Maintenance	3.5	Operation and Maintenance
5.5	Decommissioning and Reclamation	3.6	Decommissioning and Reclamation

NSDEL Guide Format		Corresponding Location in ERD	
Section	***Title***	***Section***	***Title***
6	VECS AND EFFECTS MANAGEMENT		
6.1	Biophysical Environment		
6.1.1	Geology	4.6	Bedrock and Surficial Geology
6.1.2	Surface Water	4.3	Surface Water
6.1.3	Groundwater	4.4	Groundwater
6.1.4	Wetlands	4.5.3	Wetlands
6.1.5	Flora and Fauna Species and Habitat	4.5.2	Terrestrial Environment
6.1.6	Fish and Fish Habitat	4.5.1	Aquatic Environment
6.1.7	Atmospheric Conditions / Air Quality	4.1	Atmospheric Conditions
6.1.8	Noise Levels	4.2	Noise Levels
6.2	Socio-Economic Conditions		
6.2.1	Economy	4.7.2	Economy
6.2.2	Land Use and Value	4.7.3	Land Uses
6.2.3	Transportation	4.7.6	Transportation
6.2.4	Recreation and Tourism	4.7.7	Community Resources
6.2.5	Human Health	6.4	Socio-Economic
6.3	Cultural and Heritage Resources	4.7.4/.5	Archaeological Resources/First Nations
6.4	Other Undertakings in the Area	2.7	Scope of Environmental Assessment
7	EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT	6.0	Potential Environmental Impacts and Mitigation
8	EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING	7.1	Inspection and Maintenance
9	OTHER APPROVALS REQUIRED	1.2	Regulatory Environment
10	FUNDING	1.2	Regulatory Environment
11	ADDITIONAL INFORMATION	7.0	Follow up and Monitoring

1.0 INTRODUCTION

The proponent, Pioneer Coal Limited (Pioneer Coal), is registering an undertaking, Stellarton Pit Mine Extension, for Environmental Assessment Approval. The original Approval was issued in November of 1995 for the area to the west of MacGregor Avenue. The proposed extension includes the area to the east of MacGregor Avenue.

Included in the Report and Recommendations on the Stellarton Pit Mine dated October 14, 1995 (refer to Appendix B), the Environmental Assessment Administrator wrote:

"3.2.3 The following information is to be submitted as part of the application of any necessary Industrial Approvals required under the Environment Act.

1. Mining plans for all areas, including areas located north of Foster Avenue and east of MacGregor Avenue."

The Minister of Environment approved the project with conditions on November 1, 1995 (refer to Appendix B). Included in the Conditions of Approval (COA) is the following:

"12.0 Areas East of MacGregor Avenue

Due to the lack of information regarding the potential impacts of surface mining in the areas east of MacGregor Avenue, the open pit operation is to be confined to the area west of MacGregor Avenue."

In October of 2003, NSDEL informed the proponent that the request to extract coal during July and August could be addressed via an application to amend the existing Industrial Approval. However, the proposed 50 ha extension of the existing surface mine was declared a Class 1 undertaking pursuant to the *Environmental Assessment Regulations* and the *Environment Act*. As a result, the extension is being registered through submission of this ERD.

This document provides the additional information required prior to commencing proposed surface mining operations on the east side of MacGregor Avenue. This Environmental Registration Document (ERD) includes pertinent information from the 1995 Environmental Assessment Report (EAR). This information is augmented by eight years of actual operational experience and monitoring data acquired while mining operations were conducted on the west side of MacGregor Avenue.

The primary additions to this document include:

- Monitoring and operational data since 1996;
- Environmental screening from the Nova Scotia Museum (NSM);
- Terrestrial ecology assessment by Nova Scotia Department of Natural Resources (NSDNR);

- Approvals and permits (including terms and conditions of approval) as issued by the Nova Scotia Department of the Environment and Labour (NSDEL);
- First Nations Screening by Confederacy of Mainland Mi'kmaq (CMM);
- Surface water analysis and sediment pond sizing verification;
- Public consultation sessions in December, 2003; and
- Updated methodologies and approaches based on past experiences and feedback from various agencies and local communities.

The following sub-sections present registration information, outline the regulatory environment, detail sources of information and describe document purpose and structure.

1.1 Registration

The name and location of the undertaking and proponent information are outlined below. Regional and local scale mapping is located in Section 2.0.

Name of Undertaking:	Stellarton Pit Mine Extension Mining Operations – East of MacGregor Avenue
Location of the Undertaking:	Stellarton, Pictou County, Nova Scotia Universal Transverse Mercator (UTM) grid: Zone 20 UTM coordinates: N5047880 E4408430
Name of the Proponent:	Pioneer Coal Limited
Project Contact:	Mr. John W. Chisholm, President
Head Office:	P. O. Box 1328 3098 Post Road Antigonish, N.S. B2G 2L7 (902)863-4004 (telephone) (902)863-2291 (fax) novaconstruction@ns.sympatico.ca
Local Office:	P. O. Box 929 Westville, N.S. B0K 2A0 (902)396-4140 (telephone) (902)396-5898 (fax) pioneer@ns.sympatico.ca

Contact person for purposes of Environmental Registration:

Proponent:	Mr. John W. Chisholm, President See above for contact information

Project Consultant: Mr. Peter Oram, P.Geo.
MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9
(902)468-1248 (telephone)
(902)468-2207 (fax)
peter.oram@mgi-limited.com

Refer to Section 8.0 at the end of the document for the Company President's signature of acceptance of the Environmental Registration Document.

1.2 Regulatory Environment

There are various approvals required by statute or regulations. Pioneer Coal will submit additional detailed site and operational information beyond that contained in this ERD to meet requirements listed below and any others that are deemed necessary. It is noted that no government funding is sought for this undertaking. The undertaking is totally funded by the proponent.

1.2.1 Applicable Acts and Regulations

Federal and provincial environmental acts and regulations apply to Pioneer Coal in regards to the design, site preparation, operation, and reclamation and decommissioning of the proposed mine. In addition to the environmental legislation, other acts and regulations relating to labour standards, mining practices, and other phases are applicable to the project. The following provides a list of some pertinent acts that may be applicable for the undertaking and/or were considered in the preparation of the ERD:

Federal Legislation

- Canada Wildlife Act and Regulations;
- Canadian Environmental Protection Act and Regulations;
- Fisheries Act and Regulations;
- Migratory Birds Convention Act and Regulations; and
- Transportation of Dangerous Goods Act and Regulations.

Provincial Legislation

- Environment Act and Regulations;
- Dangerous Goods Transportation Act and Regulations;
- Endangered Species Act and Regulations;
- Labour Standards Code;
- Mineral Resources Act and Regulations;
- Mines Act and Regulations;
- Occupational Health and Safety Act and Regulations; and
- Wildlife Act and Regulations.

1.2.2 Municipal Planning Strategy and By- Laws

The Town of Stellarton Municipal Planning Strategy and land-use bylaw are derived from the Town Council's planning process. It serves to guide future decisions of Council with respect to land use and development activities in Stellarton.

The Municipal Planning Strategy recognizes the need to attract new industry to the town. It also recognizes that "mining operation (and including any development intimately associated with it) are under the sole jurisdiction of the Provincial Government".

The Strategy specifically addresses the issue of coal mining at the project site as it identifies a large area at the north end of town as a potential development site for coal mining. This area includes land occupied by residences on Foster Avenue, Foster Avenue Road, and Albion Mines Road. The Strategy identifies concerns relating to the development of the coal resources, the impact of mining operations on the community, and the disposition of the lands after mining is completed. The duty of Council with regard to development of the coal resource is summed up in Policy 35 of the Municipal Planning Strategy, as follows:

> "It is Council's intention to maintain close contact with the Provincial Department of Mines and Energy in order that the community's concerns may be resolved prior to the establishment of a coal mine in Stellarton."

The Strategy also acknowledges that Council cannot regulate the location of a mine. As the condition of the lands are currently unsafe due to subsidence, the lands are currently not suitable for development.

1.2.3 Lease, Permits and Approvals

As part of the ongoing mining operations west of MacGregor Avenue, Pioneer Coal has acquired the following permits and approvals:

- Environmental Assessment Approval, November 1995
  Approval includes area west of MacGregor Avenue subject to Conditions of Approval (COA). A new application is being submitted by way of this ERD.

- Mining Lease, January 1996, Amended October 2002
  Lease covers the coal reserves both east and west of MacGregor Avenue.

- Mining Permit, March 1996
  Permit covers the existing site west of MacGregor Avenue. A mining approval application for east of MacGregor Avenue will be requested separately.

- Industrial Approval 2001-023478-A03, June 2003
  Approval with conditions that covers the existing site west of MacGregor Avenue. Preceding approvals have been amended as site conditions and operations changed.

Copies of approvals listed above are contained in Appendix B for reference.

1.3 Sources of Information

Monitoring has been part of operating the site over the past eight years. This data forms an integral part of this submission as it provides quantitative measures to specific environmental concerns. Modeling and prediction techniques are not required as actual data exists and as a result, there are few, if any, unknowns. The ongoing monitoring program has included surface water, groundwater, dust, noise, and aquatic habitat as well as coal and overburden quality.

The process anticipated for the east side of MacGregor Avenue is able to be clearly defined due to knowledge and experience gained from the site just to the west. The general approach to mining, the local geology, and processes will not vary with the proposed extension. As such, this undertaking's process and environmental impacts have less uncertainty than with other projects.

1.4 Document Purpose and Structure

The purpose of this document is to register a proposed extension to the Stellarton Pit Mine. It is felt that the project is technically sound and incorporates principles of community involvement and environmental protection. This document provides sufficient information to enable an Environmental Assessment Approval to be granted by NSDEL subject to appropriate conditions.

The contents of this document are in accordance with the Guide to Preparing an EA Registration Document for Mining Developments in Nova Scotia (NSDEL, December 2002). As previously noted, the Concordance Table outlines the changes to formatting and locates pertinent information.

Following this introductory section, an overview of the project is presented with various maps and figures to illustrate. The text includes a scope of the undertaking, background chronology, a project justification and a defined scope of the ERD. As well, a discussion of area geography, and information on surface and mineral rights is included.

Section 3 provides a detailed project description under subsections of design and preconstruction activities, construction (e.g., surface water control features), operation and maintenance, and decommissioning and abandonment. Potential environmental impacts and protection methods are presented as they are an integral part of the project

description. The proposed project schedule is presented. Plans and profiles of proposed site facilities are presented.

A detailed description of the environment (including biophysical and socio-economic resources) is included in Section 4. This includes baseline data that incorporates the past eight years of monitoring data collected as part of operations west of MacGregor Avenue. The atmospheric conditions and noise levels are outlined. The freshwater systems – both water quality / quantity and aquatic habitat (including the site and downgradient areas) are presented. Subsurface conditions of overburden, coal resources and groundwater are detailed. Terrestrial wildlife and vegetation common to the area and specific to the site are discussed. The socio-economic setting is presented, such as land uses (past and present); population; employment; archaeological resources; First Nations knowledge; transportation; and community resources. Graphics are used to illustrate the existing environment.

The consultation program is presented in Section 5. This section describes the program's objectives, outlines the components (e.g., public information sessions, etc.), summarizes the stakeholder input and provides information on how public input was used in the project design.

Section 6 provides an analysis of the potential environmental impacts and proposed mitigative measures. These potential impacts are described as they relate to valued ecological and socio-economic components (VESCs).

The overview of plans for follow up and monitoring are presented in Section 7. These plans include inspection and maintenance programs, community liaison, environmental effects monitoring (EEM), contingency and emergency planning, and reclamation plans.

The impact assessment is presented in Section 8 of this report. Both the positive and negative residual impacts of the proposed project are defined. The signature of the proponent and closing statement is also provided.

The Appendices are under separate cover – "Environmental Registration Document For Stellarton Pit Mine Extension, Volume II - Appendices." A list of information sources and references is presented in Appendix A. The current approvals for the site are contained in Appendix B. The results of environmental monitoring (noise, dust, groundwater and surface water) from the past eight years of operating are in Appendix C. Site photographs and aerial photographs are presented in Appendix D. Appendix E contains the applicable portions of the Provincial Energy Strategy. Appendix F contains an independent report on noise and dust. Appendix G contains fish habitat and benthic survey data on Bear Brook and Middle River. The NSM Environmental Screening is found in Appendix H. Appendix I contains the NSDNR Terrestrial Survey. The First Nations Screening results are shown in Appendix J. A coal reactivity analysis (spontaneous combustion) is contained in Appendix K.

2.0 OVERVIEW OF THE PROJECT

Pioneer Coal proposes to expand the operation of the surface coal mine in the MacGregor Avenue / Foster Avenue area of Stellarton, Pictou County, Nova Scotia. The project location and study area are shown in Figures 2-1 and 2-2, respectively.

The following sub-sections provide a scope of the undertaking: present background information; justify the project by looking at alternative methods; discuss the coal resources; surface and mineral rights; and, defines the boundaries of the ERD. The details of the proposed operation are described in Section 3 of this report and the existing environment is presented in Section 4.

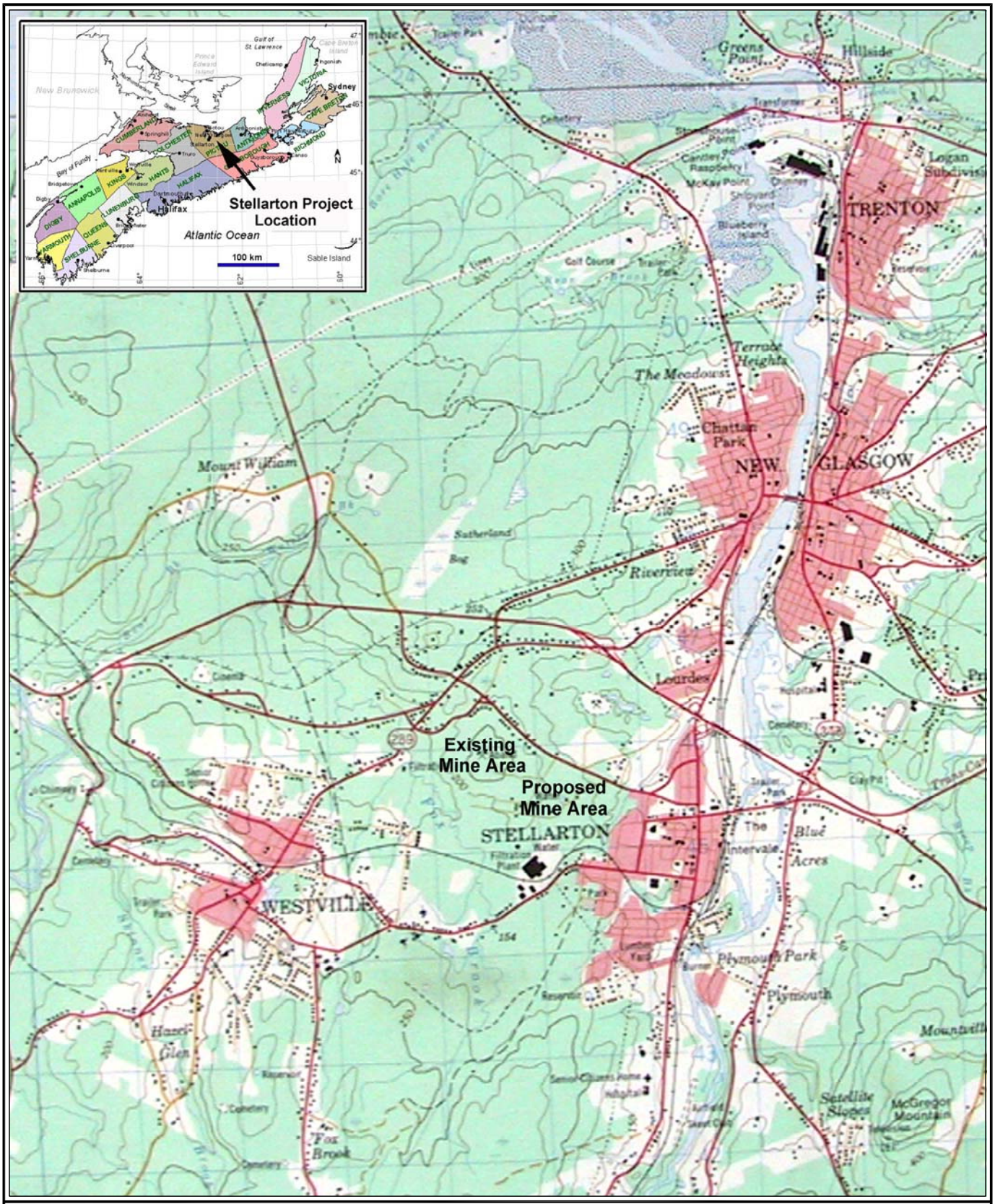
2.1 Scope of the Undertaking

Pioneer Coal presently operates a surface coal mine in the MacGregor Avenue / Foster Avenue area of Stellarton, Pictou County. The land is owned by the Province, administered by NSDNR, and was the location of past underground mining, both authorized and bootleg. The current operations on the west side of MacGregor Avenue have been operating for eight years. Approximately 1.6 million tonnes of coal have been mined by Pioneer Coal to date at the existing site. The anticipated recovery of coal from the area east of MacGregor Avenue is 1.1 million tonnes.

Mining of the proposed extension is expected to take approximately six years, and therefore, is within the originally proposed mining project time frame of twenty years. The original scope of work as per the 1995 EAR estimated a total potential resource on both the east and west sides of approximately 4 million tonnes which would have been sufficient resources to mine for approximately 20 years. The anticipated total project length has been reduced to just under fifteen years. The coal will be recovered through conventional surface mining methods and innovative highwall mining technology as per existing operations.

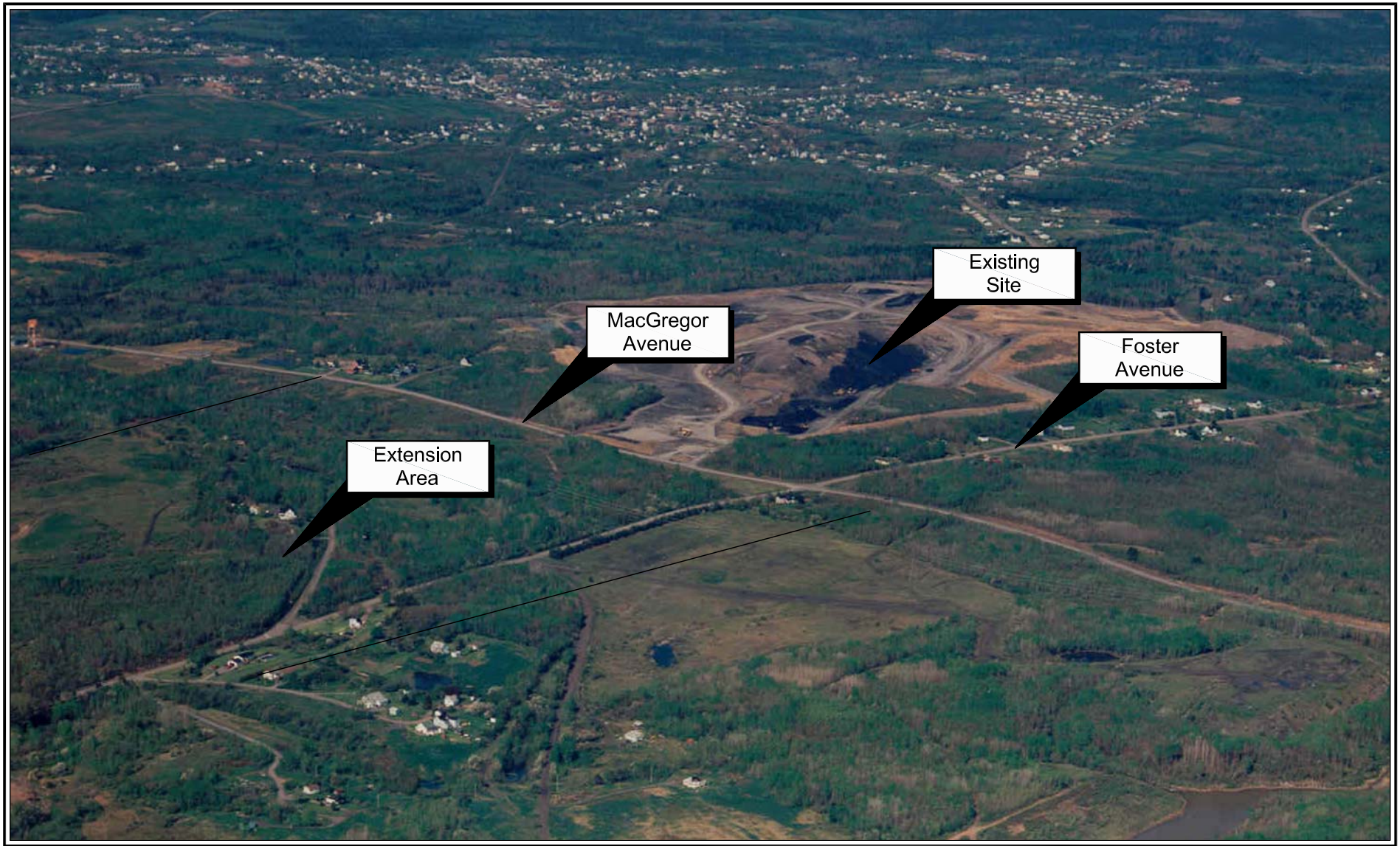
The total size of the present site west of MacGregor Avenue is roughly 70ha. The proposed area east of MacGregor Avenue is approximately 50ha. The proposed mine site extends easterly approximately 700m from MacGregor Avenue. The deepest pit east of MacGregor Avenue is in the Foord Seam and will be mined to approximately 65m deep, compared to the 90m depth in the Foord Seam at the existing site. The pit depths for the remaining seams will be significantly less than 65m.

In keeping with activities over the past eight years, the project will include the excavation and stockpiling of overburden/wasterock; the excavation, blending, stockpiling and transportation of coal; backfilling of overburden/wasterock; and, site reclamation. The existing equipment fleet (dozers, excavators, trucks, etc.) working today will still form the basis for the operations as the coal mining sequence continues eastward.



CADFILE No. 20841AF2-1.dwg

PIONEER COAL LIMITED	TITLE: **Site Location**	DATE: January 2004	PROJECT NO.: 20841A
	PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**	SCALE: N.T.S	FIGURE NO.: **2-1**
		DRAWN: JDA	



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PIONEER COAL LIMITED

TITLE
Study Area (Aerial Looking Westerly)- June 1996

PROJECT
Stellarton Pit Mine Extension
Pioneer Coal Limited
Stellarton, Nova Scotia

DATE	PROJECT NO.
January 2004	20841A
SCALE	FIGURE NO.
N.T.S	2-2
DRAWN	
JDA	

Mitigation and monitoring results have been submitted to NSDEL monthly over the past eight years. Pioneer Coal has summarized this information and it forms part of this submission. Raw data has also been provided at various point in the document, as in Appendix C.

The existing mine site surface structures will remain. These facilities, constructed so that they could be used over the full project (west and east of MacGregor), include load out building (weigh scales, coal storage bin); support services buildings (coal testing lab, employee lunchroom); enclosed coal crusher facilities; enclosed coal blending facilities; mechanical shop; power lines into the site; and, settling ponds. As is the case now, the coal will be transported to the Nova Scotia Power Inc. (NSP) Trenton Generating Station on paved roads via MacGregor Avenue, westward on the TransCanada Highway 104, then onto the TransCanada Highway 106, and to Trenton via Mount William. The haul distance is approximately 13 kilometres. Photographs of operations on the existing facility and aerial photographs can be found in Appendix D.

Crushing, blending and load out of the coal product will be at the existing facilities west of MacGregor Avenue. As in the past, coal from other operations may also be utilized to achieve the required blend specifications. This will augment surface mining, reclamation mining and highwall mining operations in other areas, such as the Coalburn location, and continue to provide employment and economical indigenous coal resources being used for Nova Scotia's energy requirements.

A number of residential properties exist on Albion Mines Road in the center of the proposed extension and north of Foster Avenue. Pioneer Coal is in the process and/or has completed negotiations to purchase some of these properties (refer to Table 2-1). As the proposed extension area also includes the existing roadways of Foster Avenue and MacGregor Avenue, a temporary detour is proposed when mining beneath the existing roadways is underway. The detour would include temporary roadway construction parallel to existing roadways and a new temporary intersection. The proponent would restore MacGregor Avenue and Foster Avenue to the lines and grades of the original roadways and to a standard that is at or better than its present condition.

The settling pond system located at the west end of the existing site will remain and continue to be used. The active pit areas of the extension will be used to contain and settle out any surface and groundwater that is encountered before it is pumped to the settling pond system. As reclamation progresses at the existing site, provisions will be made to utilize depressed areas for containment and settlement prior to pumping to the sedimentation ponds.

The easterly site will not require separate areas for water containment and treatment. Surface water will be directed away from the active site, where possible, via constructed berms to limit water volumes entering the mine and reduce losses to the Coal Brook sub-watershed. All water entering the active site will be directed into the active pit areas and pumped across MacGregor Avenue to the existing system. Coal Brook will not be utilized for water discharge.

Mining activity and final reclamation is expected to be completed in two years at the present location (i.e., west side). The proponent is currently over a year into progressive reclamation of the western end of the Foord seam. Final site stabilization west of MacGregor Avenue will be completed closely behind final coal removal. East of MacGregor Avenue, progressive backfilling directly into previously mined areas will enable restoration of areas as mining progresses. The final reclamation on the extension site is expected to occur in the year 2009.

2.2 Background

In August 1994, the Province of Nova Scotia issued a "Call for Exploration and Surface Mine Development Proposals for the Stellarton Surface Coal Resource." Five proposals were submitted to NSDNR. In December of 1994, the Province selected the Pioneer Coal proposal. Pioneer Coal agreed to pay $2,050,000 to the Province for the use of the necessary Crown property and for the surface coal resource at Stellarton. This amount was over and above the regular royalties and rentals payable to the Crown, the owner of the coal resource. This proposal was the only proposal that offered money to the Province. The mining lease (Special Lease No. 96-1: Mining Lease that was approved by Order in Council and issued by the Minister of Natural Resources) includes the area east of MacGregor Avenue. Pioneer Coal has a Letter of Offer – Proposed Lease of Crown Land from NSDNR for the Crown land that is required for mining east of MacGregor Avenue (see Appendix B).

On November 1, 1995 Pioneer Coal received a letter of approval from the Minister of the Environment, subject to conditions, for the Stellarton Surface Coal Mine. Condition 12 of this letter of approval indicated additional information would be required regarding potential impacts of mining in the areas east of MacGregor Avenue. In addition, the COA included specific requirements for mining plans and operations (Condition 2). The proponent has applied for amendments to the current Industrial Approval. An example of the requested amendments would include the use of the highwall miner in order to improve coal recovery.

These requested changes were unforeseen during preparation of the 1995 ERD. The closing of mines in other areas of the Province increased the demand for coal within Nova Scotia. Innovative technology created by Pioneer Coal allowed an efficient, less disruptive way to mine the coal (i.e., highwall miner), in addition to traditional surface mining methods. The Industrial Approval process makes provisions for amendments to existing approvals. To date, five amendments have been made since the original Industrial Approval in 1996.

Pioneer Coal has worked over the past several years planning specifically for the continuation of mining to the area east of MacGregor Avenue. The proponent has carried out an exploration drilling program in the spring of 2002 to gather information allowing the development of preliminary mine design and site drawings. The following information relates to the site east of MacGregor Avenue:

- Rock characteristics and properties (including acid producing/consuming properties) are very similar to that at the existing mine site.

- Depths and character of overburden are similar to that encountered at the existing site.

- Stockpile quantities will be approximately 25% the volume as at the existing location. As a result, stockpile elevation will be substantially less than that at the existing site (estimated to be approximately 50% less).

- Pioneer Coal expects to encounter underground workings, comparable to that west of MacGregor Avenue. The history of the east area indicates that past mining activity was much more extensive than west of MacGregor Avenue.

- The water levels in the old workings will be well below the bottom of pit elevations. The static water level should be the same as the present location.

- Highwall mining technology will be utilized where practical and highwall design will follow the same criteria as the existing site.

2.3 Project Justification

The following sub-sections present the purpose and need for the undertaking and consideration of alternatives. The purpose of this sub-section is to demonstrate that the proposed methodology and project scope is justified.

2.3.1 Reason for Undertaking

In their present condition, lands at the site east of MacGregor Avenue are unsafe due to subsidence, near surface underground workings, old slopes and shafts, and abandoned concrete structures of previous mining infrastructure. Future development on the lands would require reclamation; this can be achieved by surface mining. Future uses of the land (whether residential, recreational, etc.) are only feasible once final reclamation occurs after surface mining operations. Final reclamation is expected within approximately six years of operations commencing on the extension site.

Development of the surface mine also provides an economic means of extracting low sulphur coal. The current market for coal from the site west of MacGregor Avenue is for use at the NSP Trenton Power Generating Station. Economic viability is therefore a primary reason for undertaking the project. In addition, there are not significant environmental or socio-economic concerns with mining the site when using mitigative measures.

The following are excerpts from Nova Scotia's Energy Strategy dated Dec 2001 (refer to Appendix E):

"Coal has an important role in satisfying our primary energy demand because 70-80% of our electricity is currently generated from coal. Until very recently, this demand was satisfied using Nova Scotia coal. However, with the recent closure of the underground coal mines in Cape Breton, the province relies increasingly on imported coal for electricity generation."

"Until fairly recently, Nova Scotia was self-sufficient in coal. This is no longer the case. Nonetheless, there are still opportunities for coal mining to contribute to the province's economy and to community development over the short and medium terms. Environmental targets would not be relaxed in favour of indigenous coal, nor should government financially support non-economic mining operations. However, where coal mining can provide a net benefit to the province and to the communities where it occurs, and where it is economically feasible and environmentally appropriate, the province will facilitate business opportunities in this sector."

The project also provides the following additional benefits to the immediate area as a direct result of the project extension:

- Direct employment of approximately 40 to 50 workers at the mine site, and in supporting roles, plus additional spin-off employment;
- Use of local suppliers to support the operation;
- Allows operation of Coalburn mining facilities to continue, as blending with Stellarton coal is required;
- Significant direct and indirect economic activity in the region; and,
- Demonstrated ability to carry out mining activities at Stellarton within specific environmental guidelines.

2.3.2 Other Methods of Carrying Out the Undertaking

Pioneer Coal implemented highwall mining in the Stellarton Mine in 2001. A test panel of five mining cuts was conducted in May/June of 2001 with subsequent highwall mining production taking place in the fall of 2001. The NOVAMINER 2000 highwall miner used was specifically designed for mining on steep dip coal seams such as those encountered in the Stellarton area. This highwall miner was designed and built by Nova Construction Company Limited of Antigonish, Nova Scotia. No other highwall miner in the world is capable of mining at these steep dips. This technology is unique, not only to Nova Scotia, but to the global mining industry. It is intended that highwall mining methods will also be utilized on the coal resources on the east side of MacGregor Avenue.

Steep dip highwall mining technology, when applied to the New Seam, will enhance resource recovery on the east side of MacGregor Avenue. The use of this innovative highwall mining technology in this setting is in keeping with the spirit of Nova Scotia's Energy Strategy as outlined in government document *"Seizing the Opportunity" Volume 2, Part V Coal.*

With respect to mining methods, Pioneer Coal has refined its mine plan since initial operations began. Changes were made and approved in accordance with established guidelines set by NSDNR, Mineral Development and Policy.

2.3.3 Alternatives to the Undertaking

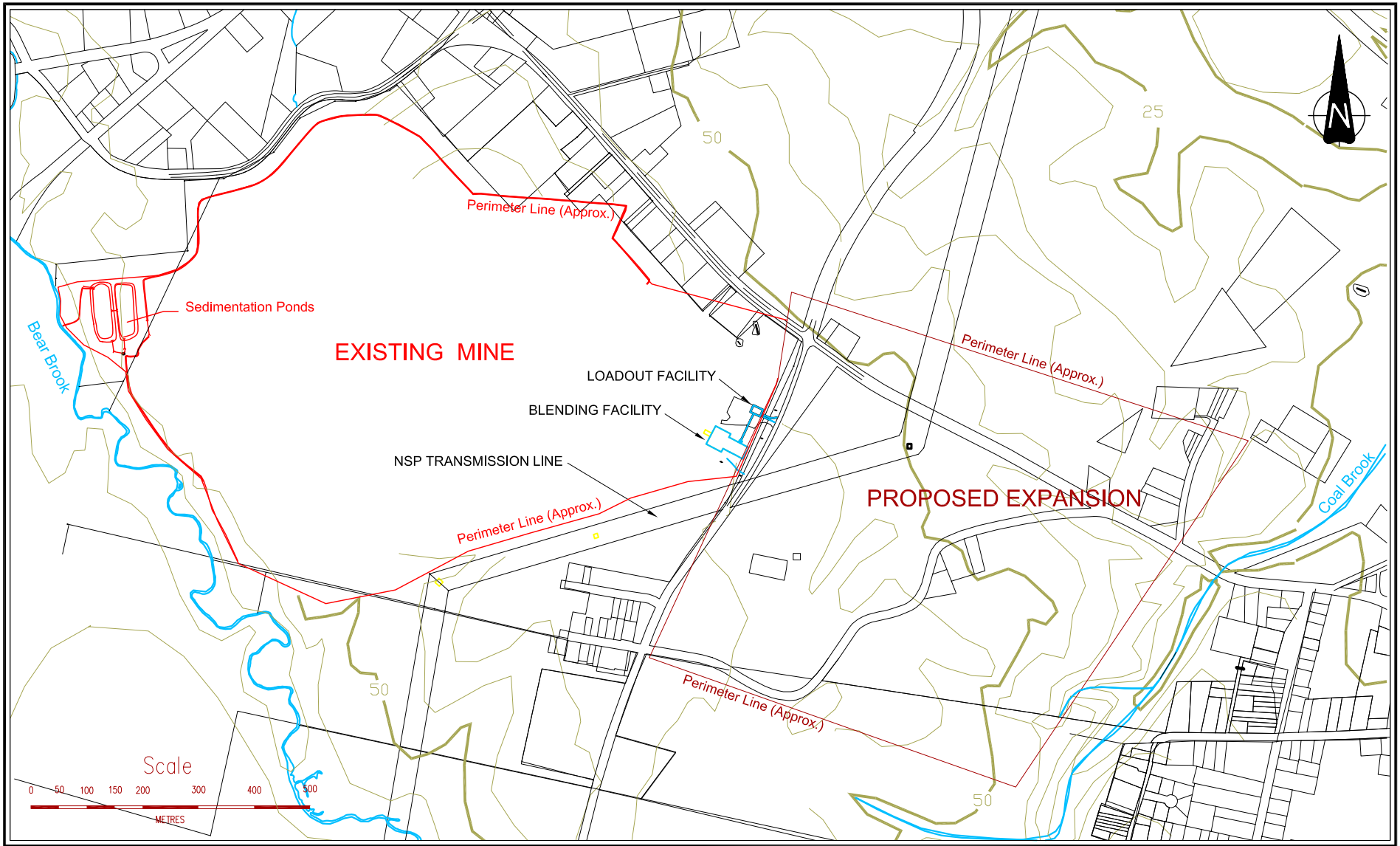
The location of the mine is fixed by the coal body. Thus, the only alternative to the expanded undertaking is a "do nothing" alternative. With the recent closing of other Nova Scotia coal sources, a "do nothing" approach puts increasing demand on NSP to import coal to meet the energy requirements of the province. As well, the low sulphur content of the coal has environmental benefits and assists in meeting the Provincial cap on sulphur emissions.

The undertaking has and will continue to provide employment in the mining sector. Since the start of operations in 1996, approximately 40 to 50 persons have been employed at the site annually. This is a boost to the economy of the local area and the province in general.

2.4 Site Location and Physiography

The proposed extension area is located to the east of MacGregor Avenue. A minumum 30m vegetated zone along the watercourse will form the eastern boundary of the proposed mining activity. The south border of the area is defined by the Stellarton Industrial Park. The site is approximately 1.5km west of the downtown area of Stellarton. The current conditions and structures of the site are shown in Figure 2-3 Existing Features. The regional and local context of the site can be seen on Figure 2-1 and Figure 2-2 that are found earlier in this section.

The area has been largely disturbed over the past century by past mining, habitation and fire. In addition, it has been bisected by roads, rail lines and power transmission easements. A rehabilitation project was completed about 30 years ago that leveled, contoured and seeded some of the area. The vegetation ranges from open field to 10



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PIONEER COAL LIMITED

TITLE: **Existing Features**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:10,000	FIGURE NO.: **2-3**
		DRAWN: JDA	

metre canopy of hardwoods (predominantly birch and poplar) and a plantation of pine trees. The topography is gently sloping to the northeast except for a relatively steep slope (upwards of 45 degrees) existing on the eastern perimeter (toward Coal Brook).

The estimated coal resources in the area of the proposed extension are 1.1 million tonnes. The following figure (Figure 2-4 Coal Seam Locations) shows the distinct seams and the extended area in which surface mining is feasible.

Detailed discussions of the environmental setting (i.e., surface water, groundwater, aquatic and terrestrial habitat, and geology (including coal resources)) and the socio-economic environment (i.e., population, employment), land use, archaeological resources, First Nations knowledge, transportation and community resources are presented in Section 4 of this report.

2.5 Surface Rights

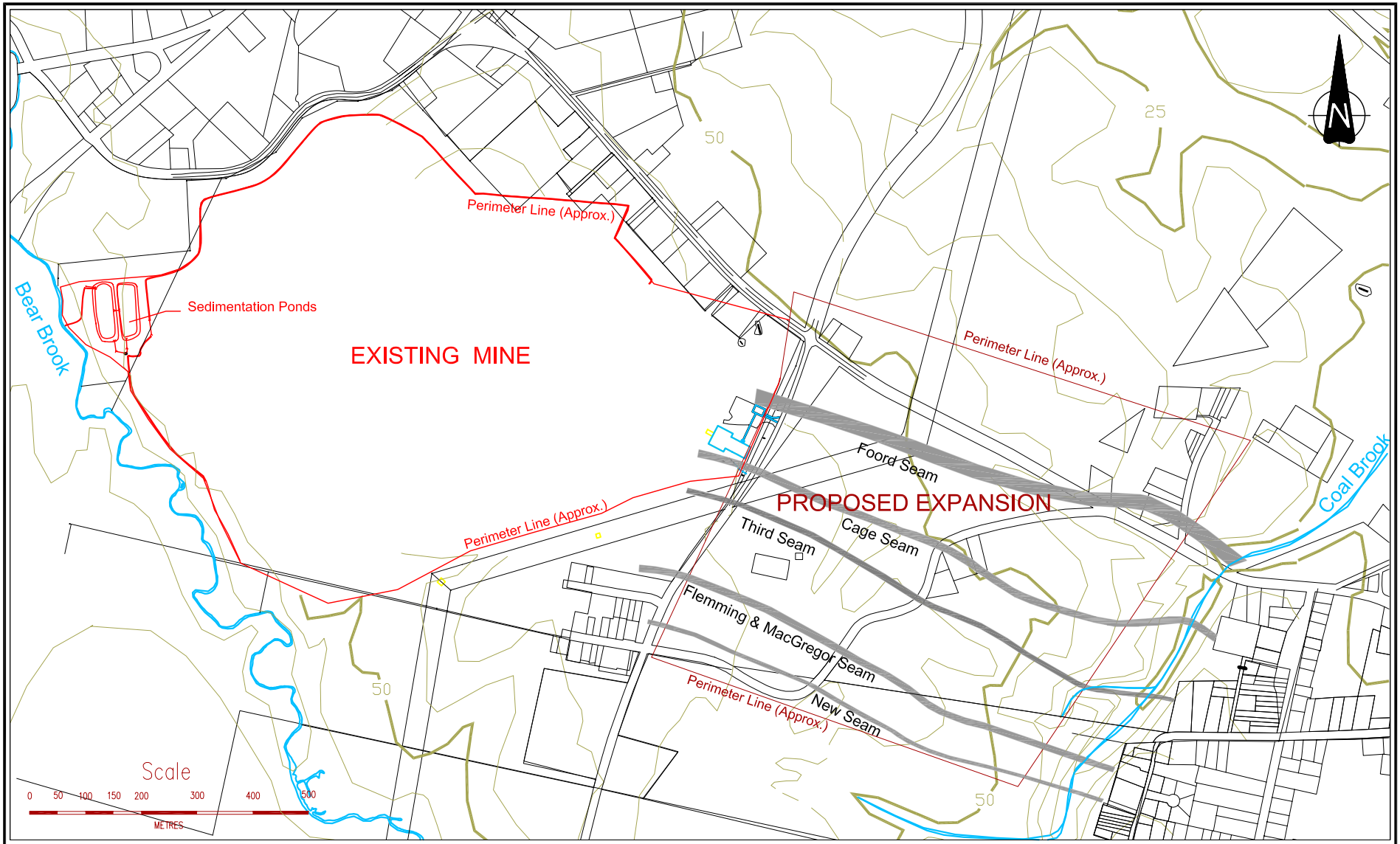
Pioneer Coal already owns or has access rights to most of the land area under consideration. Current land ownerships are illustrated by Figure 2-5 Surface Rights that has been adopted from Service Nova Scotia and Municipal Relations Land Information Centre data.

Of the approximate 105 ha of land on the proposed site and surrounding buffer zone, 76ha of land is subject to a Land Lease or an Offer to Lease from the Crown (NSDNR); approximately 23ha is owned by Pioneer Coal and/or Pioneer Coal has signed a purchase agreement or option to purchase; and, approximately 6ha is privately held land or held by the Town of Stellarton (at time of registration).

There were 29 non-Crown owned properties in the immediate vicinity of MacGregor Avenue. To date, Pioneer Coal has purchased, signed an agreement to purchase or signed an option to purchase agreement for 11 of these properties. Although not all of these properties are required for the project, Pioneer Coal has been attempting to secure ownership due to their proximity to the site. An overview of the current status of property acquisition is on the following table (Table 2-1).

Table 2-1: Current Property Ownership Status

	Land Only	**Land and Dwelling**	**Total**
Purchased	2	1	3
Purchase agreement signed, closing pending	2		2
Option to purchase signed		6	6
Owned by Town of Stellarton	2		2
Owners contacted, no agreement at this time	4	12	16
TOTAL	**10**	**19**	**29**



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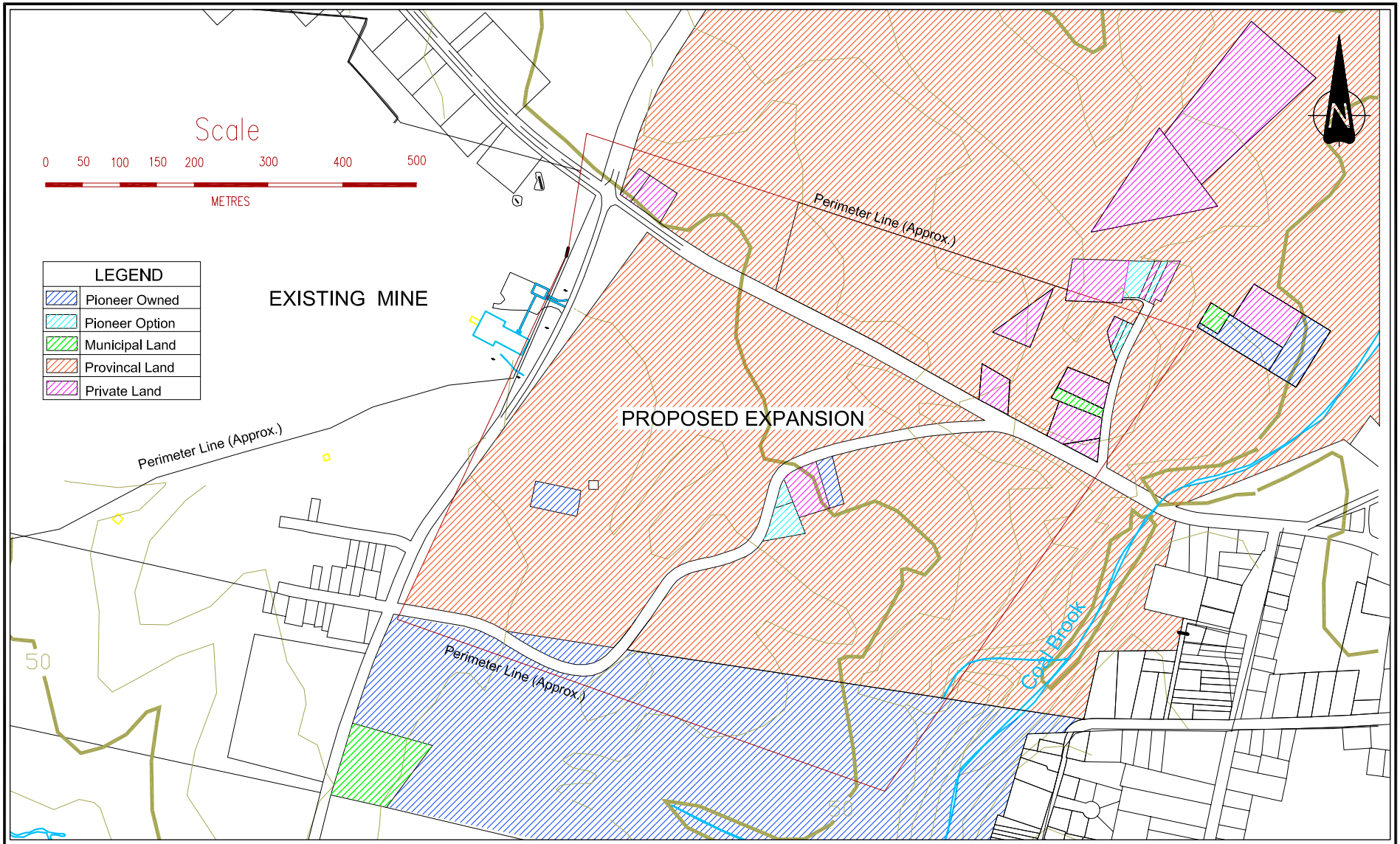
PIONEER COAL LIMITED

TITLE: **Coal Seam Locations**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:10,000	FIGURE NO.: **2-4**
		DRAWN: JDA	



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PIONEER COAL LIMITED

TITLE: **Surface Rights**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:10,000	FIGURE NO.: **2-5**
		DRAWN: JDA	

Pioneer Coal will continue with negotiations following approval of the undertaking. Some of the property owners are waiting on the approval of the proposed extension before entering in an agreement with the proponent. The property owners are aware that environmental approvals and permits do not interfere with their ability to fairly negotiate a sale price. The actual extent of mining depends upon the results of ongoing property negotiations.

2.6 Mineral Rights

Coal exploration and development rights in Nova Scotia are issued by NSDNR by means of a Special Lease granted by the Governor in Council. Special Lease No. 96-1 was issued to Pioneer Coal effective January 15, 1996. A copy of this document can be found in Appendix B.

The resource area identified by the Special Coal Lease encompasses the claims as shown on the following table. The aerial extent of the claims is shown on Figure 2-6 Mineral Rights.

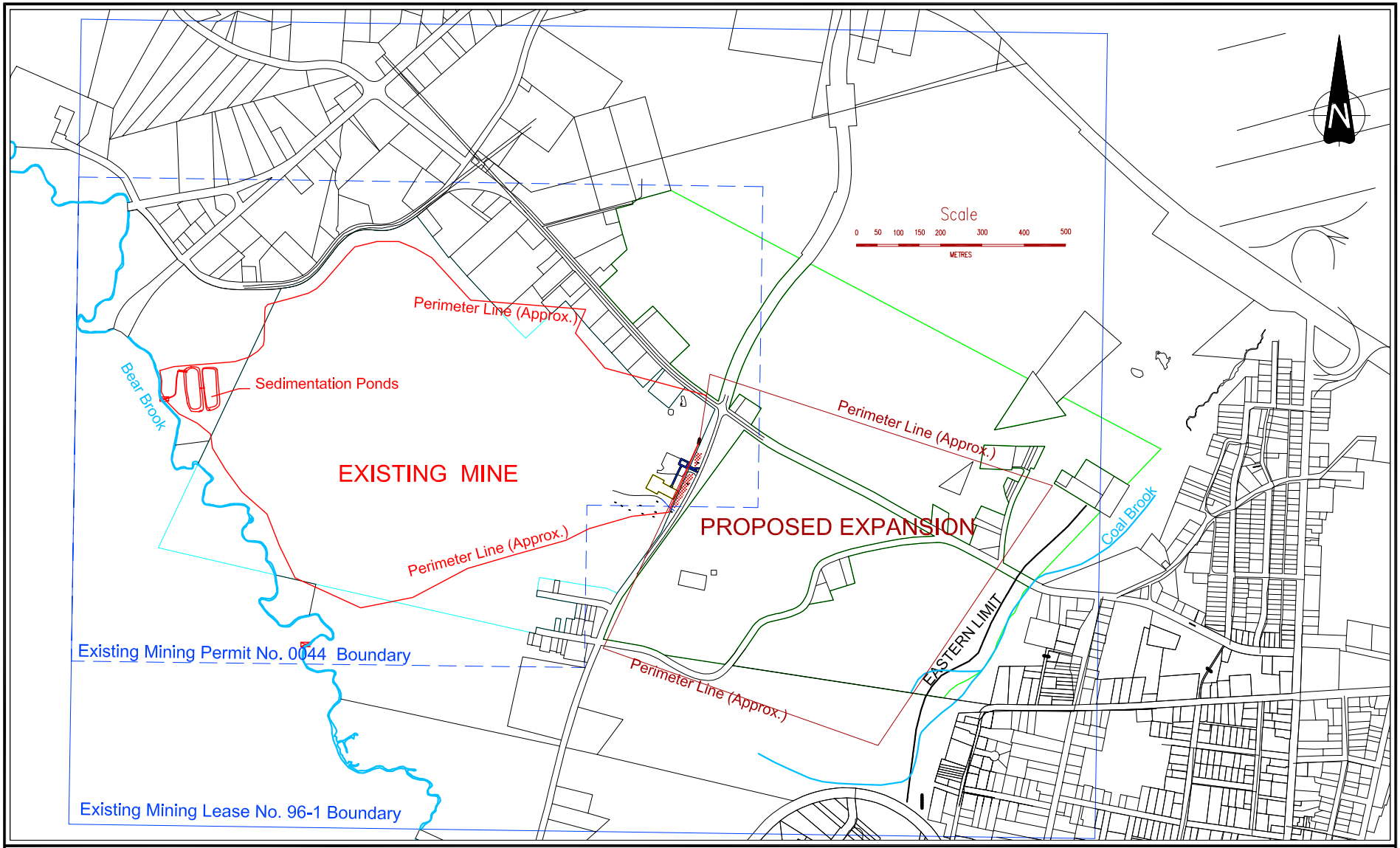
Table 2-2: Pioneer Coal Claims

Claims	Tract Number	Claim Reference
EFGH JKLM NOPQ	57	11 E 10 A
GH JK PQ	58	11 E 10 A
AB GH	63	11 E 10 A
ABCD EFGH	64	11 E 10 A

2.7 Scope of Environmental Assessment

This document serves to provide additional information required for NSDEL to approve the extension of the present operation to the area east of MacGregor Avenue. Updated methodologies and approaches to reflect current knowledge is also contained in this ERD, as are results and implications of the recently completed public consultation program.

A significant improvement exists on this ERD as compared to the 1995 EAR. Pioneer Coal has operated at the Stellarton site for almost eight years and has completed the environmental monitoring commitments. There is much more specific site and process knowledge. The data exists to quantitatively measure specific environmental concerns based on existing operations. Data from noise, dust, groundwater, surface water, fish habitat and benthic organism monitoring is presented in graphical and tabular formats. Other items such as spontaneous combustion, subsidence, reclamation, mine planning and layout are presented in text (see Section 3, Detailed Project Description).



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PIONEER COAL LIMITED

TITLE: **Mineral Rights**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:12,500	FIGURE NO.: **2-6**
		DRAWN: JDA	

The environmental bounds are confined to the immediate area of the site and the downgradient or receptors. With respect to socio-economic components and mobile terrestrial species, a wider study area is used as appropriate. A detailed presentation and discussion of VESCs can be found in Section 6.1 of this report. The VESCs analysis is based on the project description (refer to Section 3), the environmental setting (refer to Section 4) and public input (refer to Section 5).

This undertaking is an extension of the existing operation with no known or planned third party undertaking that would adversely impact the project. Within the ERD, references are made to existing impacts to the receiving environment from other projects in the area.

Regulatory officials from both NSDEL and NSDNR have been aware of Pioneer Coal's intention to submit information supporting the continuation of mining on the east side of MacGregor Avenue. As such, regulators have assisted in scoping the ERD by bringing forth issues of concern and/or uncertainty.

Environmental management is a priority to Pioneer Coal. The operations are meeting the current standards and exceeding them to achieve a higher level of environmental performance. This ERD presents these environmental goals and outlines Pioneer Coal's methodology to continue to protect the VESCs; however, it is important to recognize that process changes may occur due to conditions unforeseen at this time. The proponent will keep NSDEL and the Community Liaison Committee (CLC) updated on process and schedule. Pioneer Coal has the ability to meet environmental goals while efficiently mining the coal resource under its lease agreement with NSDNR.

3.0 DETAILED PROJECT DESCRIPTION

Once a resource has been identified and the mineral rights secured, the development of a surface coal mine progresses through several distinct stages. These are typically the design and preconstruction activities, site preparation, operation and maintenance, decommissioning and reclamation stages.

Following a discussion of the overall approach of the undertaking and a description of the site facilities, the project is described with respect to each of these planned stages. An overview is presented of potential environmental impacts and environmental management and protection plans. At the end of this section, the proposed schedule is presented.

3.1 Overall Strategy

The following two sub-sections present the mining strategy for the existing site and the proposed extension.

3.1.1 Existing Site – West of MacGregor Avenue

Reserves west of MacGregor Avenue are close to depletion and will be exhausted within approximately six months depending on NSP demand. Continued coal recovery at the present location will require maximum effort. Overburden piles directly over the Cage Seam coal need to be removed. They will be utilized in the reclamation progress. To date, approximately 1.5 million cubic metres of backfill have been placed directly into excavations made at the far west end of the Foord Seam. Cage Seam coal recovery will significantly boost the reclamation for the site. The majority of overburden placement will take place over the next two years. The isolated overburden stockpile north of the "saw cut" Foord pit will be reclaimed upon completion of the approved highwall mining plans. The highwall mining operations for the site west of MacGregor Avenue are expected to be completed by mid 2004.

Pioneer Coal will work both the Foord and Cage Seams easterly to MacGregor Avenue. Pits for the Third Seam, presently being uncovered, will not extend as far west as the Foord and Cage Seams. Quality becomes an issue, but it is anticipated that approximately 80,000 tonnes can be extracted. Flemming/MacGregor and the New Seams will not be recovered west of MacGregor Avenue. A review of technical data available concludes these seams do not have adequate quality to support recovery.

On occasion, documents supporting a "Change in Mine Plan" or "Amendment to the Industrial Approval" have been submitted to the regulatory agencies since the EAR. This is an expected result of mining operations that seek continual improvement. A number of factors contributed to the requirements for the changes. These included implementation

of new technology or a modified highwall design to reflect actual conditions encountered or purchase of additional properties.

3.1.2 Extension Site – East of MacGregor Avenue

Approximately 1.1 million tonnes of coal resource is available on the lands east of MacGregor Avenue. Continued development of the Stellarton resource will allow Pioneer Coal to fulfill its commitment to resource extraction and land restoration.

The approach to mining east of MacGregor Avenue will be much the same as at the existing site. Overburden and coal extraction will be performed with the existing conventional mining equipment. A combination of dozers, trucks and conveyors will carry overburden to the stockpile areas. Coal is typically transported to the loadout facility by tandem trucks.

Potentially five separate coal seams can be mined in the area east of MacGregor Avenue. The sequence of mining will be from east to west with the exception of the Foord Seam. Typically, the initial pit will be constructed at the east end of the reserve. The overburden will be located adjacent to the pit on the highwall and/or lowwall side. Perimeter ditching around the stockpile will direct runoff into the active pit area. The initial pits will be of adequate size to allow overburden volumes from the second pit to be placed directly into the initial pit excavation to the east. This sequence will be followed westerly to MacGregor Avenue. It is planned to have four pits along each seam. The final excavation will be filled with the overburden material from the first excavation. This progressive reclamation approach will limit stockpile sizes for the site and enable final reclamation to follow closely behind mining operations.

Access to the site will be off MacGregor Avenue. A reinforced concrete structure will be put in place approximately 60m north of the existing site access. This structure will be located beneath MacGregor Avenue and put in place to allow the transportation of coal to the loadout facility without having to cross MacGregor Avenue.

The erosion and sedimentation control plan demonstrates how the site controls will be put in place. The existing environmental controls west of MacGregor Avenue will be utilized when mining to the east (e.g., sedimentation ponds). Surface and groundwater will be directed and contained within the active pit. This water will then be pumped across MacGregor Avenue into the present system. This arrangement of ditches and settlement ponds works very well at the Stellarton site. Coal Brook will not be utilized as a location to discharge treated water. The erosion and sedimentation control plan shows how Pioneer Coal plans to protect Coal Brook against site runoff.

Coal storage and handling will remain unchanged. The existing infrastructure will be utilized in the extension of operations.

3.2 Site Facilities

All of the existing facilities of the site (as shown on Figure 2-3) are retained and used for the proposed mine extension to the east. The proposed facilities and layout of the expanded mine site are as follows:

- Diversion berm at south/southeastern end of the site to direct runoff away from the active areas;
- Silt fencing at the edge of a minimum 30m buffer zone to Coal Brook to filter surface water runoff (especially during construction of diversion berm) and to demarcate the buffer zone;
- Sump in the active pits and an east transfer pond that is connected to the existing drainage system on the west side of MacGregor Avenue;
- Existing site drainage control, treatment ponds and discharge point in the area west of MacGregor Avenue; and
- Overburden / waste stockpiles.

Details on mining operations and maintenance are found in sub-section 3.5.

3.3 Design and Preconstruction Activities

In order to assess the economic and environmental feasibility of mining the resources on the east side of MacGregor Avenue, the proponent completed a variety of studies and assessments. In addition, the proponent has gathered a variety of inputs as a result of operating the existing site for eight years. The following items were completed and used in the design and assessment of the proposed mine extension:

- Exploration drilling program in the spring of 2002 to gather information to assist in the development of preliminary mine design and site drawings;
- Baseline sampling of surface water at Coal Brook in autumn 2003;
- Groundwater impact assessment based on groundwater level data in monitoring wells during operations on west side of MacGregor Avenue (based on all existing data);
- Surface receiving water assessment as part of ongoing monitoring during operations on west side of MacGregor Avenue (based on all existing data);

- Aquatic habitat and benthic organism survey of Bear Brook and the area of its confluence with Middle River (based on all existing data);

- Noise and dust assessments as part of monitoring program on existing site (based on all existing data);

- Data collection of baseline noise in the proposed extension site in December of 2003;

- Terrestrial habitat assessment of proposed site by NSDNR in autumn of 2003 to update prior assessment;

- Environmental screening (desktop assessment of cultural and natural heritage resources in the area) completed by the Nova Scotia Museum (NSM) in autumn of 2003;

- First Nations screening in Autumn 2003 by Confederacy of Mainland Mi'kmaq (CMM) to determine likelihood of Mi'kmaq interests and site knowledge;

- Periodic testing of representative rock units for acid production/consumption and assessment of actual mining experience and operational data (e.g., surface water pH) during existing operations (based on all existing data);

- Monitoring program in place to address any initial concerns over spontaneous combustion (based on all existing data);

- Visual impact assessment of proposed development on adjacent properties and roadways;

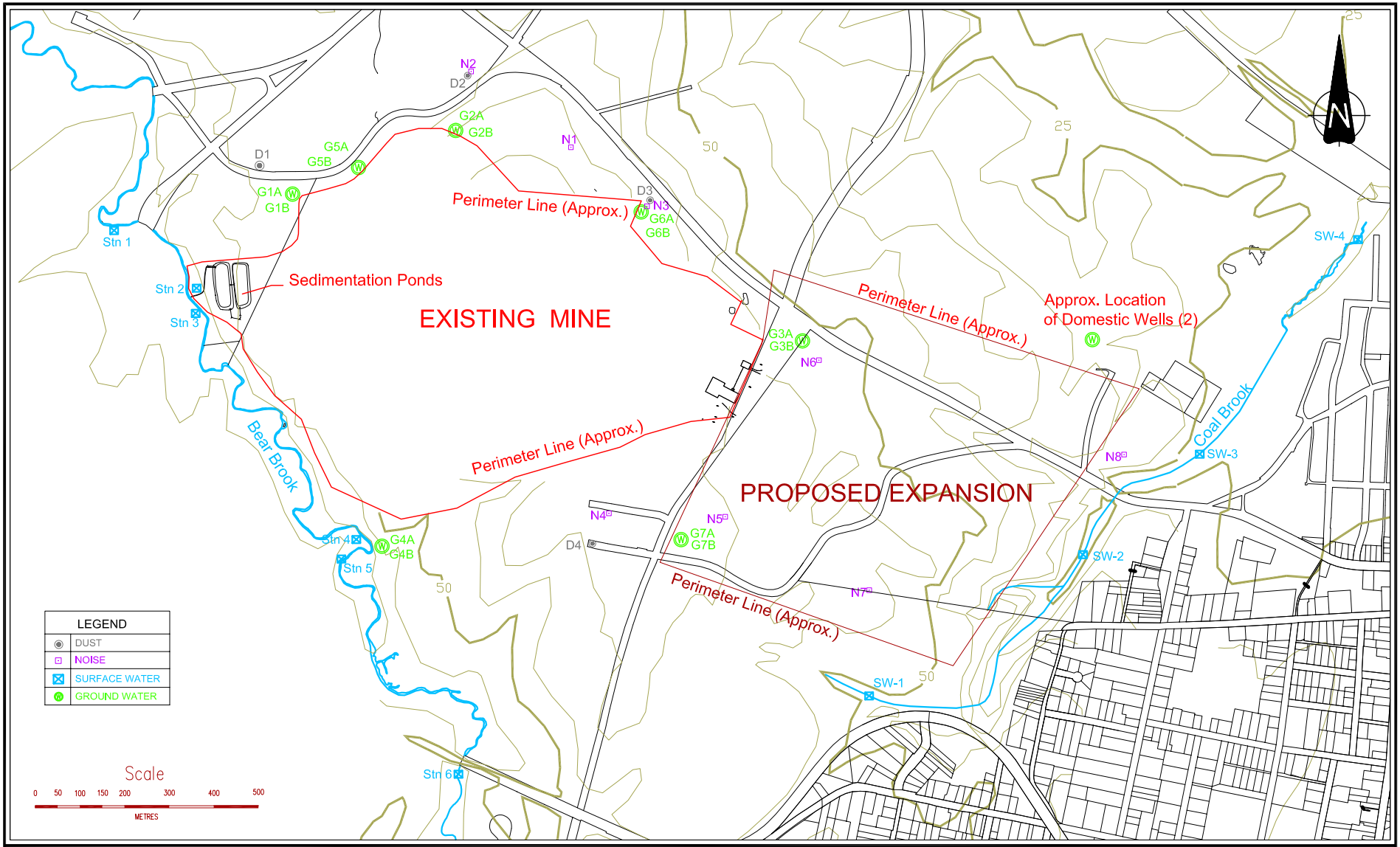
- Meetings with the CLC during existing operations (1996 to present);

- Discussions with some immediate neighbours as part of property negotiations for proposed extension;

- Public Information Session for the general public in the Museum of Industry on December 11th and 12th, 2003; and

- Ongoing discussions with elected officials and staff of Municipal and Provincial governments about existing operations and proposed extension.

Results of these biophysical and socio-economic assessments are found in their respective locations in Section 4 of this report. The following map, Figure 3-1 Existing Environmental Monitoring Stations, shows the locations of existing monitoring (both operational and baseline) for noise, dust, surface water and groundwater.



PIONEER COAL LIMITED

TITLE: **Existing Environmental Monitoring Stations**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:12,500	FIGURE NO.: **3-1**
		DRAWN: JDA	

3.4 Site Preparation

The following sub-sections describe the activities to be completed by the proponent to prepare for active surface coal mining operations. These activities are in addition to existing operations and the design and pre-construction activities listed in the last sub-section.

3.4.1 Erosion and Sedimentation Control

The proponent is familiar with and utilizes NSDEL's Sediment and Erosion Control Handbook. This document will be used in the design of all mitigative measures.

A riparian zone border of a minimum of 30m from the adjacent watercourse (Coal Brook) will be retained. This edge of disturbance area will be delineated with sedimentation control fencing. The fencing will also wrap the southeast and northeast edges of the development based on land contours.

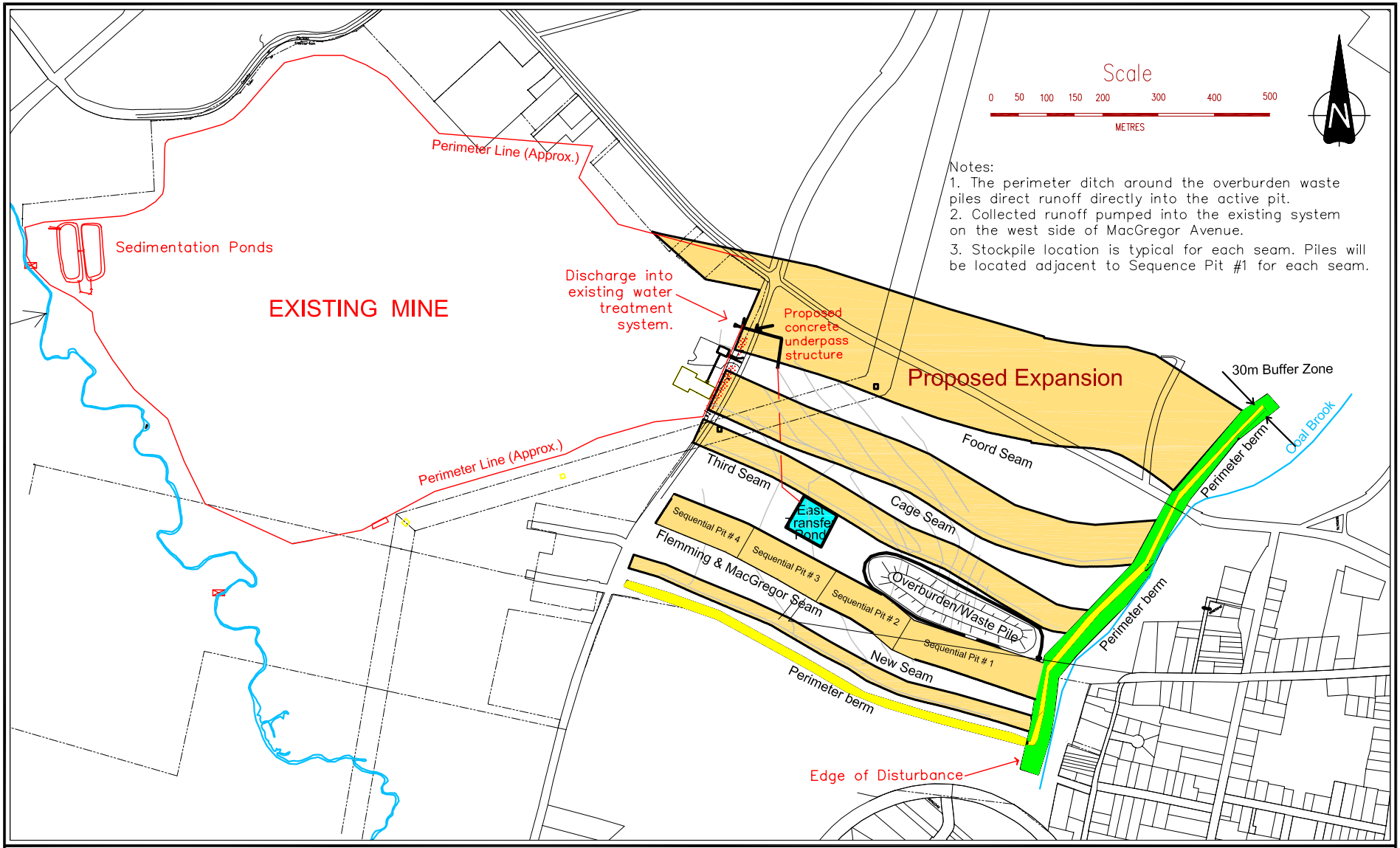
Diversion berms and ditching will be constructed to direct surface water runoff from the site as part of the surface water management plan. Where required, the berms and ditching will be hydroseeded to minimize erosion. As needed during establishment of grass cover, temporary erosion and sedimentation control measures will be in place (e.g., rock dams with geotextile, hay mulching, etc.).

Refer to the following plan, Figure 3-2 Erosion and Sedimentation Control Plan, for details.

3.4.2 Clearing and Grubbing

Clearing and grubbing requirements are minimal on the new site. As a result of past mining activities, the site is relatively free of any concentrated growth. A large portion of the site is covered with waste rock and coal fines which have supported very little growth over the past number of years. The existing scrub plant material and debris will be properly disposed of.

Clearing and grubbing requirements will follow a work progression schedule limiting the areas open to those required for active mining activities. The delineated area of clearing and grubbing will not be exceeded, such that stated riparian zones will be maintained.



PIONEER COAL LIMITED

TITLE: **Erosion and Sedimentation Control Plan**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:10,000	FIGURE NO.: **3-2**
		DRAWN: JDA	

3.4.3 Surface Water Management

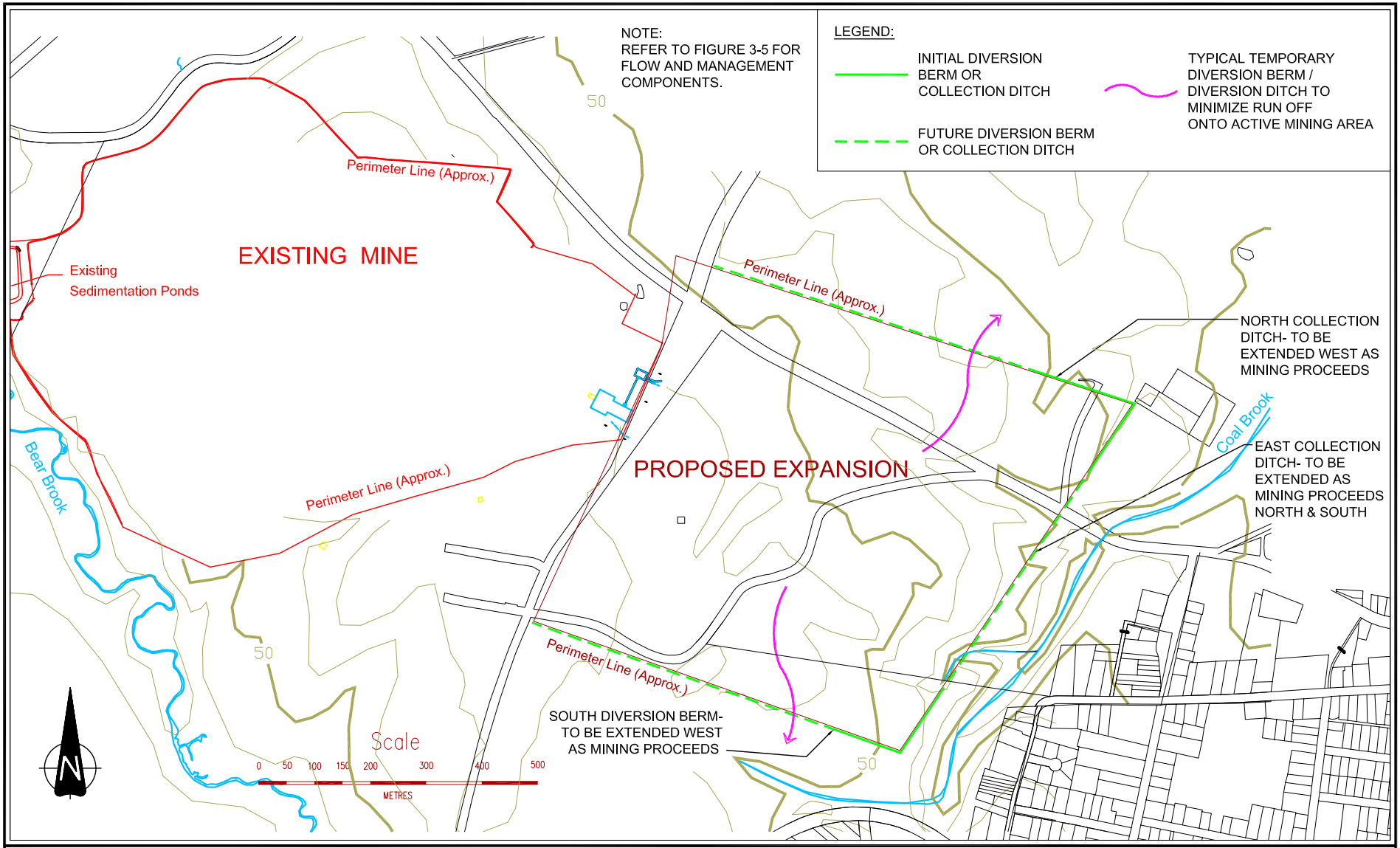
The proposed extension will occupy an area of approximately 50ha between MacGregor Avenue to the west and Coal Brook to the east. MacGregor Avenue will form a drainage divide along the western limit of the site. The site slopes at a grade of approximately 3 to 4% in a northeasterly direction to Coal Brook. An undisturbed buffer zone of at least 30m will be maintained between Coal Brook and the eastern limit of mining activities. The southern limit of the site will be located along a slight natural drainage divide such that runoff from offsite will be prevented from entering the active mining area from this direction. The site is generally covered with grass and other low-brush vegetation with limited forest cover. A plan of the site is shown in the Figure 3-3, Surface Water Management Plan.

Surface drainage from the active areas east of MacGregor Avenue will contain suspended solids due to construction and mining activities and from the storage of waste rock, topsoil and overburden. The drainage system will be designed to collect surface runoff from active areas within the site for the removal of suspended solids by gravity sedimentation. The collected water will be pumped to the west of MacGregor Avenue for treatment in the existing sedimentation ponds. A schematic of the drainage control system is given in Figure 3-4 Surface Water Process Flow Diagram.

As indicated in the schematic, runoff will be collected in ponds formed in low points of exhausted pits (i.e., sumps). Generally, these sump areas will be located toward the east end of the coal seams. Runoff collected in the pits will be pumped into the east transfer pond for initial settling. From there, the water will be pumped to a holding pond west of MacGregor Avenue providing additional settling. This water will be pumped into the existing sedimentation ponds.

The sedimentation ponds will be operated at the same flow rates as the existing operations and under the same conditions of performance as specified in the Industrial Approval 2001-023478-A03 (copy contained in Appendix B). Coagulant addition, if required, will be added as was planned for the original operation. In past operations on the west side of MacGregor Avenue, addition of coagulant has generally not been required to meet effluent objectives.

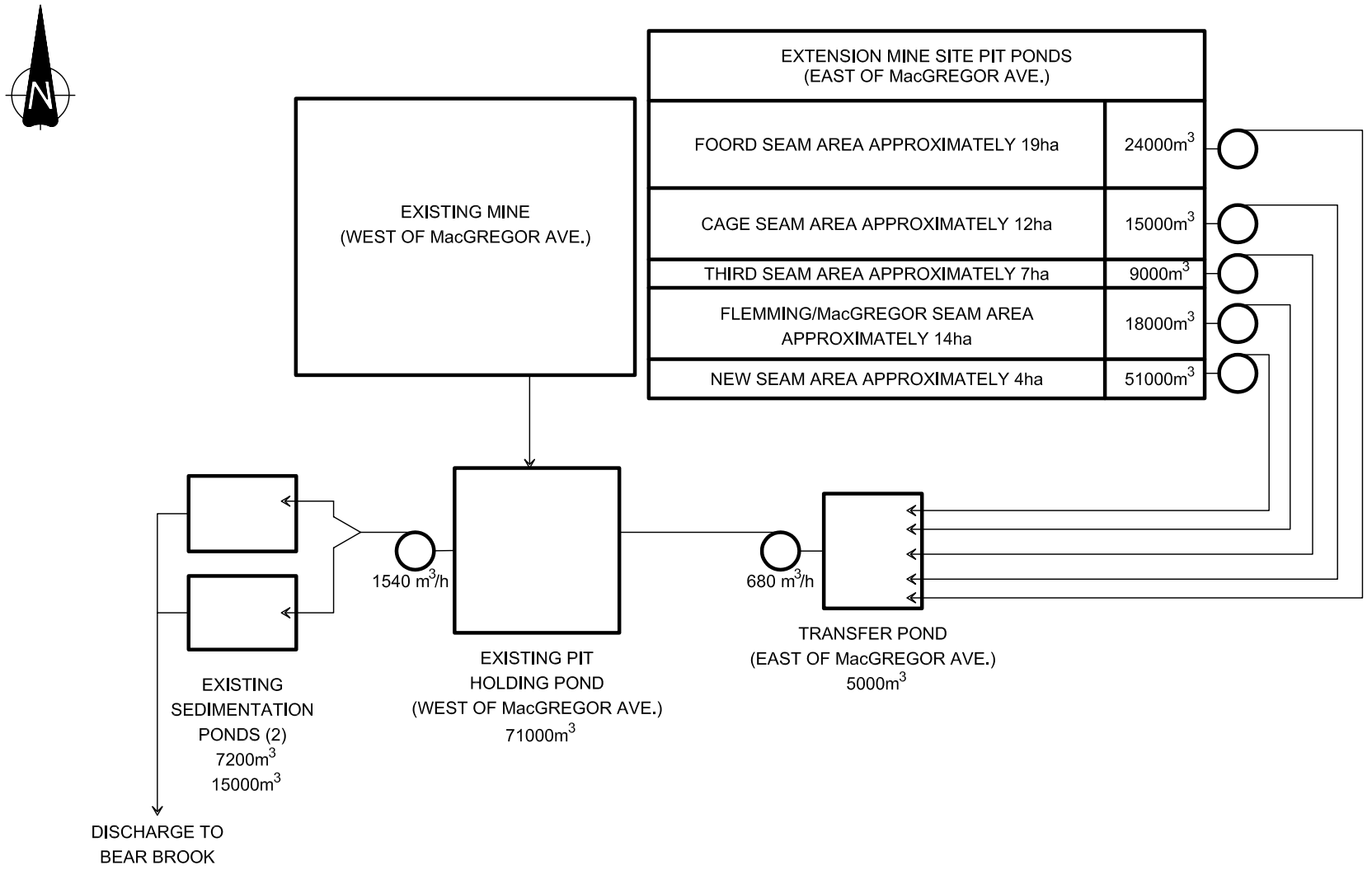
Temporary diversion berms and ditches will be used within the extension site to divert runoff away from the active mining areas. Other ditches will be used to isolate and collect runoff from the active mining area(s). Ultimately, at full mine site development, the drainage control system will consist of perimeter ditches/berms along the north, south and east limits of the site, and the various pit ponds.



CADFILE No. 20841AF3-3.dwg

PIONEER COAL LIMITED

TITLE: **Surface Water Management Plan**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:12,500	FIGURE NO.: **3-3**
		DRAWN: JDA	



CADFILE No. 20841AF3-4.dwg

PIONEER COAL LIMITED

TITLE
Surface Water Process Flow Diagram

PROJECT
Stellarton Pit Mine Extension
Pioneer Coal Limited
Stellarton, Nova Scotia

DATE	PROJECT NO.
January 2004	20841A
SCALE	FIGURE NO.
N.T.S	3-4
DRAWN	
JDA	

As the mining progresses, the sumps may move as mining advances and the exhausted sections are progressively reclaimed. In any case, sufficient pit volume will be developed to contain the design storm runoff from each active pit.

Similarly, the holding pond that is located west of MacGregor Avenue will be maintained at sufficient volume to contain the storm runoff from the active mining area to the east of MacGregor Avenue. Storm runoff will be stored in the various sumps east of MacGregor Avenue until storm volume collected in the western holding pond has been passed through the sedimentation pond system.

The drainage control system is designed for a storm with duration of 24 hours and a return period of 25 years, resulting in a runoff of 127 mm. This is the same criterion that had been used for the existing mine and implied under the conditions in the Industrial Approval. Mean annual runoff from the actively mined area will be approximately 1000 m^3/d based on long term climate normals for the Truro Meteorological Station (source: Environment Canada). All holding ponds will have sufficient capacity to capture the complete runoff from the associated active mining areas.

The existing sedimentation ponds (as referenced in the existing Industrial Approval) have a total surface area of approximately 7400 m^2 and a volume of approximately 15,000 m^3; therefore, highly conservative sedimentation conditions will be provided at a maximum flow rate through the ponds of 1540 m^3/h. Under normal runoff conditions, the applied flow rate will be considerably less than the maximum design flow rate.

The sedimentation ponds will be operated following the same procedures that exist for current operations west of MacGregor Avenue. When required, accumulated sediment will be removed from the sedimentation ponds during summer low-flow periods by sequential draining of the ponds and removal of the sediment with excavators or front end loaders. Treated effluent from the ponds will discharge into Bear Brook and be in accordance with existing Industrial Approval discharge limits. The flow rate of discharge from the ponds will not exceed 1540 m^3/h, the maximum flow rate specified for the existing mine operation.

Sediment control fences will be installed at appropriate locations prior to the start of construction work. The water diversion, collection and holding pond system will be constructed prior to any major earth work at the site. This will ensure control of surface drainage quality throughout the development and operating phases of the mining operation.

All drainage channels will be designed to maintain stable conditions to minimize erosion for the estimated peak flow rates of storm drainage. Longer term ditches with unstable slopes will be rock lined to minimize erosion. Temporary diversion ditches and berms will be seeded and temporarily stabilized to minimize erosion during the establishment of vegetation.

The flow rate of effluent into Bear Brook will not exceed flow rates experienced during operation of the original operations west of MacGregor Avenue, hence there will be no effects on the hydraulic features of Bear Brook.

Only treated effluent will be discharged from the site. The holding ponds will provide substantial containment capacity for storm runoff and for any other emergency situations that require holding of water prior to treatment in existing sedimentation ponds and discharge. No significant changes to existing chemistry of discharge water is expected for mining operations east of MacGregor Avenue.

3.4.4 Access to Existing Facilities

The existing coal storage and processing facilities on the west side will be retained for the proposed extension. In order to access these facilities on the other side of an existing roadway (i.e., MacGregor Avenue), an underpass will be constructed for truck traffic. The feasibility of a crossing at grade was evaluated and the underpass option was chosen due to tracking from tires, traffic flow and traffic control considerations.

The underpass will be a reinforced concrete structure. The clearance box will be of adequate size to allow coal transport from the east side of MacGregor Avenue to the existing coal processing facilities. Typically tandem trucks are used to carry coal out of the pit areas. Additionally, the structure will provide a throughway for pumping as part of the surface water management on the east side of MacGregor Avenue.

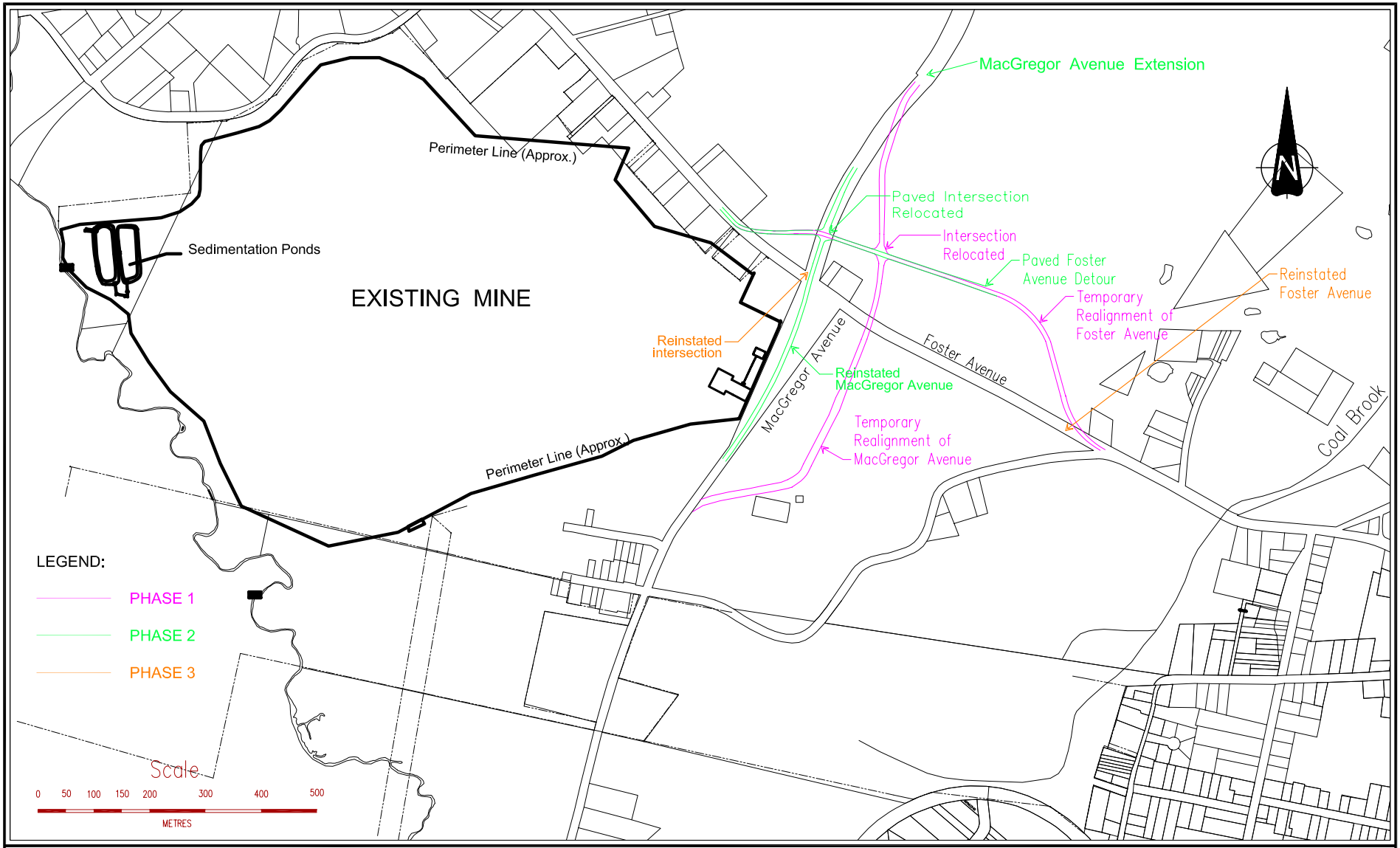
The proposed structure will be located approximately 60m north of the existing site access off MacGregor Avenue. The underside of the structure deck will be at an elevation of approximately 1.5 to 2.0m below the existing top of pavement.

3.4.5 Roadways

As part of the proposed mine extension, a temporary detour of portions of MacGregor Avenue and Foster Avenue is required. During the temporary detour, the two roads will meet at a new intersection northeast of the existing intersection. The proposed alignment of the detour is shown in Figure 3-5 Roadway Detour Details. The roads would be constructed approximately 160m east and parallel to MacGregor Avenue and 200m north and parallel to Foster Avenue.

The first phase of this work includes the construction of temporary roadways that are surfaced with granular materials. The expected duration of granular temporary roadway is one construction season.

Once mining has been completed under MacGregor Avenue the second phase of the detour would occur. The new intersection would be located on MacGregor Avenue approximately 150m north of existing location. The new intersection and detour of Foster Avenue would be paved.



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PIONEER COAL LIMITED

TITLE: **Roadway Detour Details**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:10,000	FIGURE NO.: **3-5**
		DRAWN: JDA	

Once the Foord seam was mined to its eastern limit, Foster Avenue would be reinstated to the lines and grades of original roadway. After the third phase, the layout and road geometry would be as it is today.

All road construction would be in accordance with Geometric Design Standards for Canadian Roads. The construction of the reinstated roads would be at or better than the state of the existing roads. The level of service would meet or exceed requirements for the road classification.

Permits and approvals required for this proposed work would be secured prior to work commencing.

3.4.6 Overburden / Waste Rock Stockpiles

The site will be prepared for the overburden / waste rock stockpiles. The typical location and relative size is shown on a previous plan (Figure 3-2). The total estimated height is below 35m (which is also below maximum height of stockpile used in current operations). Existing trees east of the proposed stockpile location will act as a partial visual barrier. The drainage from the pile will be directed to a sump which will then be pumped to the water management system.

Refer to sub-section 3.5.3 Waste Rock Handling for details on estimated height, characteristics and management of the stockpiles.

3.4.7 Contingency Planning

As part of current operations, Pioneer Coal has contingency plans for operations west of MacGregor Avenue. The existing contingency plans outline protocols should an emergency occur (e.g., fuel spill or spontaneous combustion). A contingency plan for the extension will be submitted as part of the Industrial Approval application specific for the east side operations.

This contingency plan will address the provision of emergency services for local residences and the mine site during detour, as well as existing plans for spill and spontaneous combustion. Additional detail on contingency planning can be found in sub-section 7.2 that outlines scope of contingency and emergency planning.

3.5 Operation and Maintenance

The following sub-sections describe the activities to be completed by the proponent during active surface coal mining operations.

3.5.1 Mining Operations

The overall mine development for the area east of MacGregor Avenue is shown on the following two figures. Figure 3-6 Plan of Typical Pit Sequencing is a plan view of the site showing pit sequencing. Typical limits of work and overburden stockpile locations are shown on a previous Figure 3-2. The drawing shows pit layout and design along with their relative locations. Figure 3-7 Mine Staging Profile is a typical cross-section cut north/south through the site.

Mining operations will be 12 months per year and on a 24 hour a day basis. Waste rock will be transported from within the pit by use of conveyors, haul units and/or dozers. Pioneer Coal has and will continue to meet the required noise and dust guidelines and will alter operations should monitoring show an exceedance.

3.5.2 Equipment

Equipment requirements vary through the life of the project. Substantial upgrading occurs from time to time. Upgrades to current operations included two Caterpillar D11 Ripper Dozers™ and the NOVAMINER 2000. Traditional earth moving equipment will also be used, as well as pumps, generators and other related equipment.

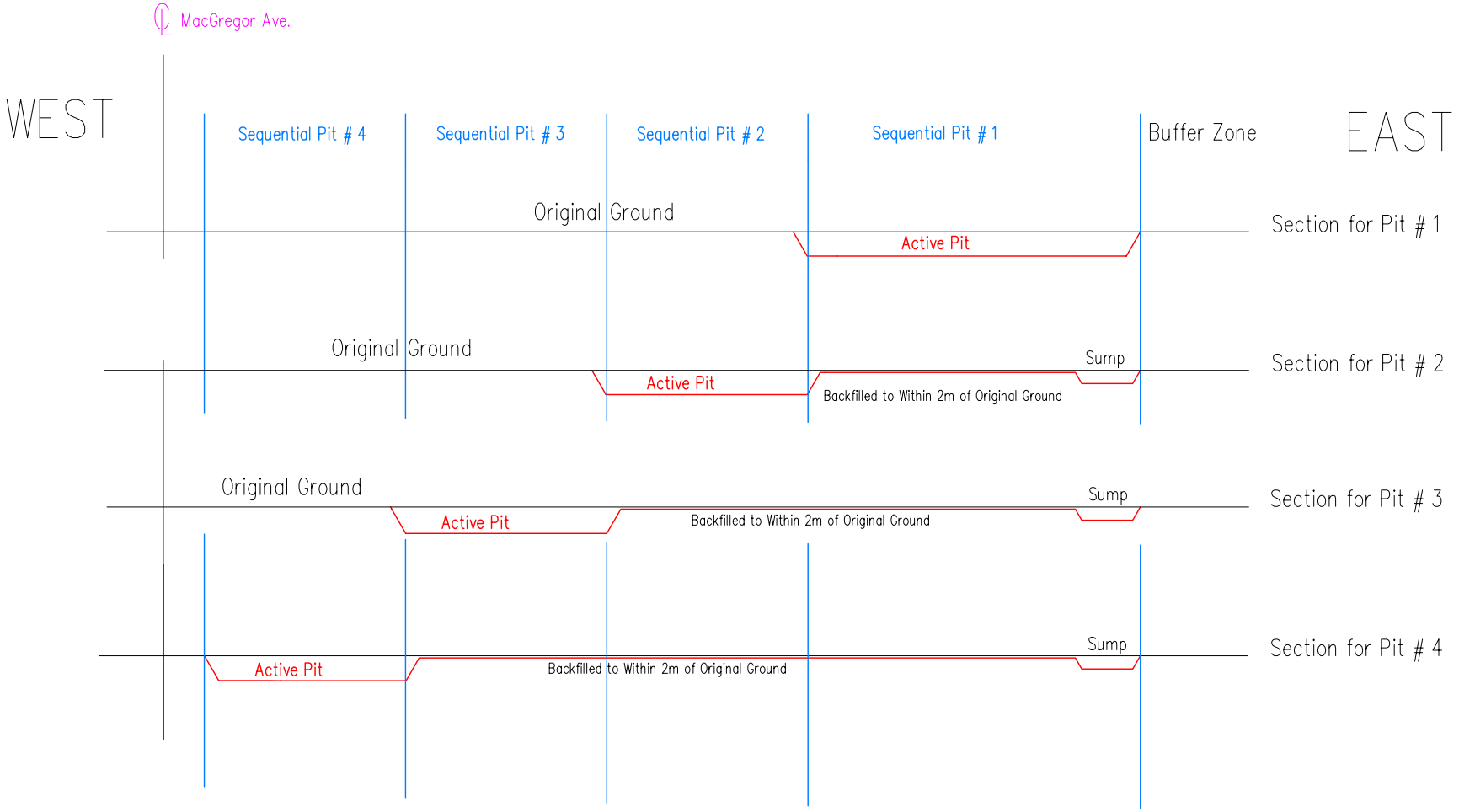
Travel on the site will be on temporary access roads constructed from site materials. Dust control on site roads will be achieved via a water spray truck where required.

3.5.3 Waste Rock Handling

East of MacGregor Avenue waste rock handling will be executed much the same as the present site. Transportation of materials will be via conveyor, haul units and/or dozer. Limited amounts of topsoil will be encountered. Much of the site is currently covered with old mine tailings.

Estimated volumes of topsoil, tailings, overburden and rock in the area east of MacGregor Avenue are based on the following parameters:

-	Angle of coal from horizontal plane:		22-24 degrees
-	Angle of highwall (overall):		51 degrees
-	Thickness of topsoil:		0.15 m
-	Thickness of tailings:		0.60 m
-	Thickness of overburden:		2.44 m
-	Thickness of coal seams:	Foord	10.7 m (with parting)
		Cage	5.3 m (with parting)
		Third	3.3 m
		Flemming/MacGregor	4.0 m
		New	1.5 m



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PIONEER COAL LIMITED

TITLE: **Plan of Typical Pit Sequencing**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: N.T.S	FIGURE NO.: **3-6**
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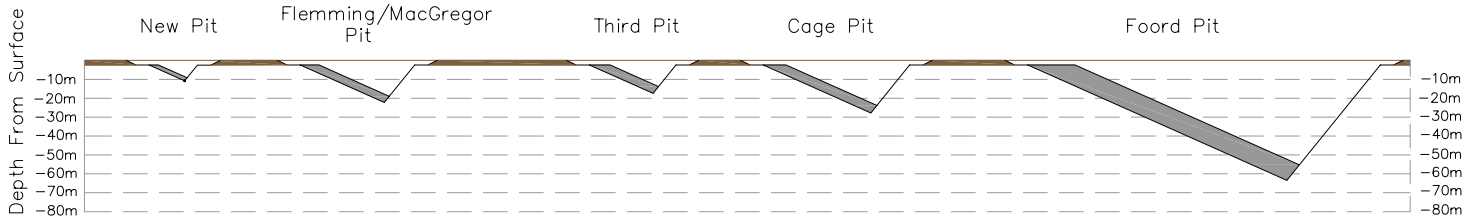
Scale (Metres)

0 50 100 150 200 300



PIONEER COAL LIMITED	TITLE: **Mine Staging Profile**	DATE: January 2004	PROJECT NO.: 20841A
	PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**	SCALE: N.T.S	FIGURE NO.: **3-7**
		DRAWN: JDA	

- Overburden density 2000 kg/m^3
- Waste rock density 2400 kg/m^3
- Swell factor 30 %
- Height of highwall 65 m
- Recovery 50 %

The following table shows these estimated volumes of stockpile quantities for the area east of MacGregor Avenue.

Table 3-1: Estimated Stockpile Quantities

Material	Pit	Volume (m^3)
Overburden including tailings & topsoil		
	Foord	400,000
	Cage	200,000
	Third	150,000
	Flemming / MacGregor	150,000
	New	100,000
Waste Rock		
	Foord	4,700,000
	Cage	900,000
	Third	300,000
	Flemming / MacGregor	500,000
	New	100,000
Total		**7,500,000**

Each of the five seams will be sectioned into four separate pits along strike. For planning purposes, Pioneer Coal has estimated stockpile volumes based on a requirement to blend coal from two seams. Using the two largest pits (i.e., the Foord and Cage Seams) the maximum stockpile volume will be approximately 25% of the total excavation. This figure works out to be 1.5 million cubic meters which is approximately 25% of the stockpile encountered west of MacGregor Avenue. The first pit for each seam will be stockpiled, and thereafter, material will be returned to the previously mined area as a function of the progressive reclamation plan.

The waste will consist of Joggins type soils (light brown loam) and Pliestocene (glacial / glaciofluvial origin) surficial deposits. The waste rock overlying the Foord, Cage, Third and the Flemming/MacGregor and New Seams consists of gray shales, mudstones, black shales and very fine to fine grained sandstones. These result in relatively inert waste rock material.

The acid generation potential (as described in sub-section 4.6.3.5) indicates that the waste rock will not be acid generating. The only acid generating material identified at the Stellarton property was the actual coal in the Cage Seam and this had a relatively low potential.

3.5.4 Wastewater Management

Ongoing wastewater management activities include:

- Pumping of water collected in pits to the transfer pond located east of MacGregor Avenue;
- Pumping of settled water to the holding pond located west of MacGregor Avenue;
- Pumping of settled water to the existing sedimentation ponds;
- Monitoring of sedimentation pond and discharge as per existing operations;
- Addition of coagulant (where required) as per existing operations;
- Construction of temporary berms and ditches to divert surface water as work progresses;
- Maintenance of diversion berms and ditches; and
- Maintenance of water holding areas and pumping systems.

Refer to sub-section 3.4.3 for information on the surface water management plan.

3.5.5 Coal Processing

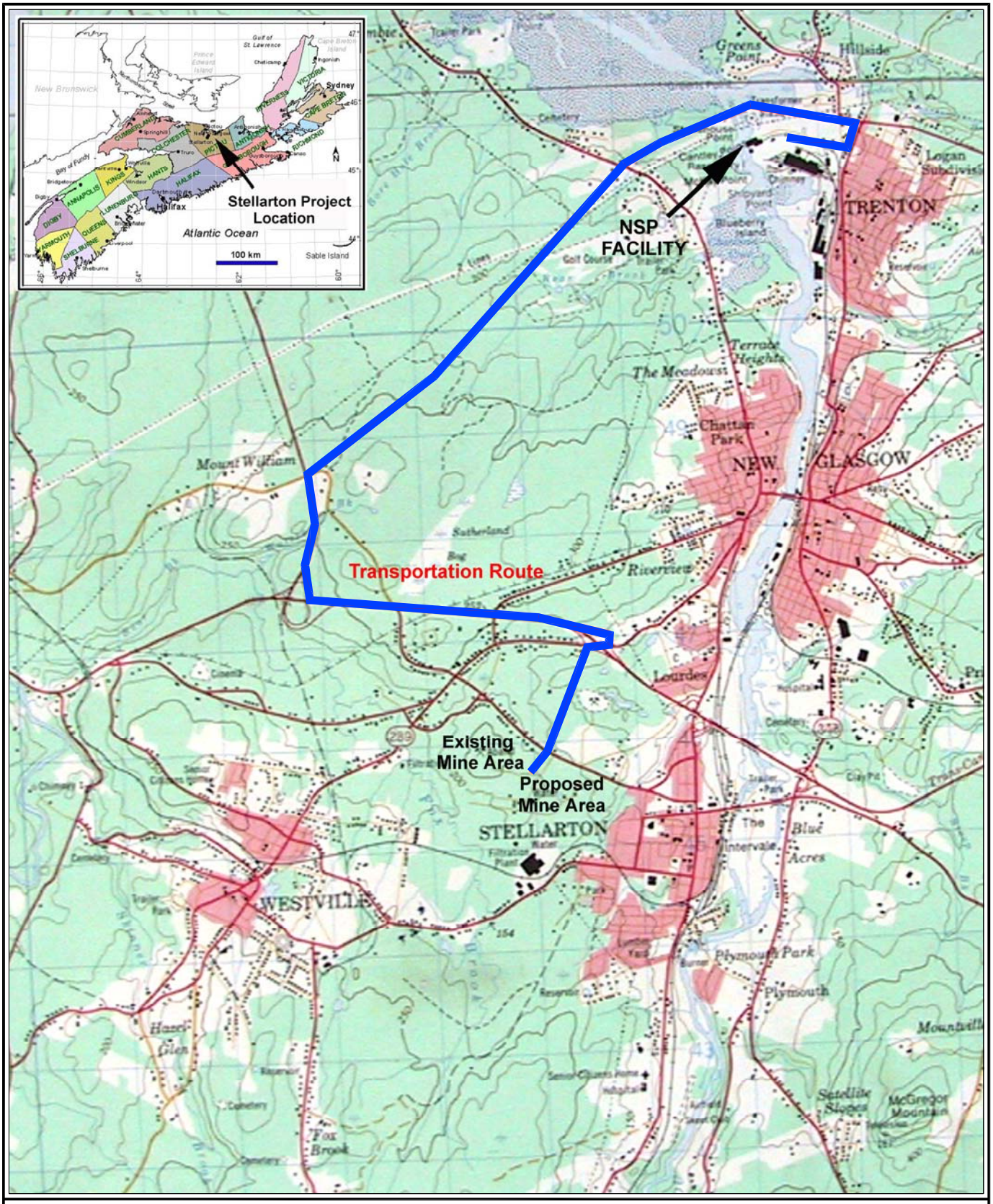
Pioneer Coal is proposing to mine coal for delivery on a twelve month per year basis. The estimated production days will be in the range of 250 per year, with a daily production rate comparable to the average daily production rate in current operations of 900 tonnes per day.

Based on past operations at the site, it is anticipated that there will be limited processing required for the Run of Mine (ROM) coal. Blending is completed as required to maximize resource recovery. The ROM coal has not always achieved NSP specifications during current operations, and therefore, the coal blending facility is used. This existing blending facility will be used for material from the proposed extension and from other operations (e.g., Coalburn).

Additional details about the coal resources and processing implications are in sub-section 4.6.3 Coal Resources.

3.5.6 Coal Transportation

All coal will be transported from the site in standard 35 tonne tractor trailers via MacGregor Avenue, and westward on the TransCanada Highway to Trenton through Mount William (Figure 3-8). Pioneer Coals' policy has been and will be to continue to limit the use of Stellarton’s town streets by these vehicles.



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PIONEER COAL LIMITED	TITLE: **Proposed Transportation Route**	DATE: January 2004	PROJECT NO.: 20841A
	PROJECT: **Stellarton Pit Mine Extension Pioneer Coal Limited Stellarton, Nova Scotia**	SCALE: N.T.S	FIGURE NO.: **3-8**
		DRAWN: JDA	

The trucks will be fitted with tarp covers to reduce dust emissions and reduce potential for spillage. To eliminate the tracking of site materials onto local roads, the trucks and trailers will be washed as required.

On average, there will be four round trip shipments per hour. Transportation of the coal will fluctuate somewhat with market demands. It is intended to ship the coal 10 hours per day, 5 days per week (Monday to Friday). The proposed coal transportation is the same as exists for current operations.

3.5.7 Site Security

Site security has not been an issue at the Stellarton site for the past eight years of operation. The site has gated access and the gate is locked during non-operating hours. No changes to the current security plan are proposed for the extension.

3.6 Decommissioning and Reclamation

The major component of the reclamation process for the site is the replacement of the excavated material back into the pits. This progressive reclamation is designed to be an integral component of the mining operation itself.

Because the majority of the site is Crown land, Pioneer Coal is constrained from defining the ultimate land use of this site after the completion of mining activities. Various future land use options available include municipal services, recreational, transportation, residential and industrial. All final reclamation activities will be completed with the approval of NSDNR, the representative of the owner, the Province of Nova Scotia.

Once the pits are backfilled and contoured, the area will be covered with topsoil stored at the site and additional off-site sources, if required. Previous horticultural studies in the Thorburn/Westville/Stellarton area show that revegetation of mining areas could be effectively attained using conventional seed and fertilizer product. Other components of the reclamation process include removal of structures and equipment to provide an attractive, safe site.

The following sub-sections describe the components of reclamation.

3.6.1 Reclamation Bond

A bond exists for current operations west of MacGregor Avenue. This bond will remain in place for the duration of the mining and site reclamation. Pioneer Coal will arrange for bonding for the extension.

3.6.2 Waste Rock Management

The complete cycle of the material handling process consists of excavating the overburden (soil and bedrock overlying the coal), initial placement of it in temporary storage piles, and then returning the materials to the excavated pit as mining progresses, or as progressive backfilling can be practiced to meet the overall reclamation objective.

The excavated pit volume will equal the quantity of coal and overburden/waste rock which was mined; however, only the volume of the overburden/waste rock is available for placement back in the pit, suggesting that there may be a depression after all the material has been placed back in the pit. This should not be the case because in excavating the bedrock, the material experiences an increase in volume. This "swell" occurs because the material, formerly a solid rock mass, is broken and voids become abundant. Typically, these types of rocks will experience a "swell factor," or increase in volume, of approximately 30 percent, which is more than the volume of coal removed.

3.6.3 Site Contouring

The final contouring of the site will include the following features in its design:

- Establishment of site drainage controls;
- Removal of existing structures;
- An allowance for any anticipated settling of backfilled areas;
- Safe abandonment of retention ponds by grading slopes and reducing the depth; and,
- Grading of slopes to minimize erosion.

After re-contouring, topsoil will be spread over the area to provide a suitable bed for the revegetation process.

Throughout the life of the mining and reclamation operations, the sedimentation control ponds will provide good protection against the release of suspended solids and other contaminants into the surface streams. These ponds will continue to be operated during the reclamation process until such time as the site is sufficiently stabilized to prevent the release of suspended solids.

3.6.4 Re-vegetation

The goal of the re-vegetation program is to provide a ground cover which will prevent soil erosion, support local flora and fauna, be self-sustaining and diverse, and require no ongoing maintenance.

Re-vegetation planning will involve the selection of the type of planting or sowing that will be done, as well as to the selection of plant species. The selection will be made after considering the current native plant species, the plant's survivability, local wildlife and the proposed land use.

The site reclamation process will include conditioning with lime as required by acidity testing of the materials. The vegetation cover will include the addition of fertilizer and a robust seed product. At present, the recommended mix will include 40 kg to 50 kg of Kentucky Fescue seed per ha and 400 to 500 kg per ha of 12-12-12 commercial fertilizer. The growth of the vegetation will be monitored, and where required areas will be reseeded or fertilized again. Actual mix of seed will depend on conditions at time and previous success rate.

3.7 Potential Environmental Impacts and Mitigation

There are both positive and negative impacts of the proposed undertaking on the biophysical and socio-economic environment. These are assessed based on the potential interaction of the project description (as outlined in this section, Section 3) with the existing environment (as described in the next section, Section 4). The analysis of the interaction of the project on the environment produces VESCs. This analysis is presented later in the report (refer to section 6.1).

Based on the project description and typical issues of concern for a surface mine development (given its proximity to a residential area, its past land use as an industrial site and upgradient location to an aquatic resource), the potential impacts (positive and negative) may include:

- Safety (subsidence);
- Social environment;
- Air quality;
- Noise;
- Groundwater;
- Economy;
- Surface water;
- Fisheries habitat and resources;
- Transportation; and,
- Archaeology.

Design and operational approaches to environmental management are needed to mitigate the negative issues. Environmental management for the proposed undertaking includes ongoing monitoring of groundwater, surface water, noise and dust and process controls to minimize impacts to these resources. The prior eight years of knowledge from mining the adjacent site and additional baseline studies allow a very well supported plan to mitigate negative impacts.

3.8 Project Schedule

The proposed schedule for mining operations east of MacGregor Avenue commences in early 2004 with site preparation followed by mining activities. Site reclamation is ongoing with progressive backfilling and environmental monitoring is part of daily operations.

It is difficult to predict an accurate schedule of mining locations and timeframes, however, given ideal conditions, final reclamation is expected by 2009. The actual schedule of work is expected to vary depending on market demand, weather, quality of coal recovered, environmental monitoring, equipment and process changes, and a number of other factors.

4.0 ENVIRONMENTAL SETTING

This section of the report presents information on the existing environment of the site and the immediate area. The data relies on a compilation of existing data (primarily from the 1995 EAR), baseline surveys and eight years of monitoring data from the existing operations west of MacGregor Avenue.

The environmental setting is divided into seven sub-sections. These are atmospheric conditions, noise levels, surface water, groundwater, habitat, bedrock and surficial geology and the socio-economic environment.

4.1 Atmospheric Conditions

The current atmospheric conditions are described based on existing data (primarily from 1995 EAR) and augmented by monitoring data and observations as part of existing operations. This text is divided into three sub-sections which are climate (including temperature and precipitation), winds (including typical speed and direction), and air quality (regional and local, where available).

4.1.1 Climate

The mine site is located within a cool, humid, temperate climatic zone. This zone is influenced by prevailing westerly winds which cause many of the low-pressure systems moving across North America to pass Atlantic Canada. The frequent passage of these systems, plus its maritime location, results in a moderate precipitation occurrence within the study area (approximately 1100 mm/year).

The study area experiences a modified continental climate, exhibiting variability in all seasons. This results from the interaction of continental and maritime air masses and, because most of the weather systems originate in the interior, continental influences often dominate the marine influence. The continental influence in the area produces a wide range in annual temperatures. Winters are typically cold with frequent snowfalls; springs are late, cold and cloudy; summers warm and relatively humid. In general, rainfall is most abundant during the fall months. The prevailing winds are westerly and northwesterly in the winter months and south to southwesterly during the summer months.

Normally, the site would be sufficiently close to the ocean to be effected by marine influences. These tend to moderate the climate, thereby reducing the temperature range in coastal area; resulting in milder winters, cooler summers, and longer frost-free periods than in the interior. The Northumberland Shore area is an exception, because the waters of the Northumberland Strait are typically warmer, tending to keep air temperatures warmer in summer and into the fall. As well, in winter, the ice covered strait has little influence in moderating air temperatures and also delays spring warming.

The following table summarizes the typical temperature and precipitation data from Environment Canada's data on Canadian Climate Normals 1971-2000 (http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.htm). The nearest data location to the site is Lyons Brook, Pictou County, Nova Scotia (latitude 45°39'N and longitude 62°48'W).

Table 4-1: Climatology Summary, Pictou County

Temperature (°C)	
Annual Mean	6.5
Maximum Mean Daily	(Jul) 24.7
Minimum Mean Daily	(Jan) –11.1
Extreme Maximum	(Aug) 36.0
Extreme Minimum	(Feb) –32.5
Precipitation (mm)	
Annual Total	1232.9
Rainfall	956.7
Snowfall (cm)	276.2
Maximum Mean Monthly	(Nov) 131.6
Minimum Mean Monthly	(Jul) 81.1
Greatest 24 hr. Rainfall	(Sept 1996) 83.0
Greatest 24 hr. Snowfall (cm)	(Feb 1986) 45.0
Mean Annual Days with Rain	121
Mean Annual Days with Snow	47

4.1.2 Winds

Predominant winds in the general area are from the south to west. North and easterly winds tend to predominate during storm events, while winter winds are often from the north and west quadrant. East and southeast winds occur least frequently.

Average annual winds at Abercrombie Point, determined primarily by adjacent geography, are 17.7 km/hr, which is on the high side of regional averages. Winds are strongest during winter months and peak in December at 20 km/hr on average. Maximum hourly speeds range from 50 km/hr in August to 74 km/hr from January to April inclusive. Wind speeds at the mine site will be slightly lower due to its inland location but will retain the same directional characteristics.

The following table shows wind speed and direction data that is typical of Pictou County (from 1995 EAR).

Table 4-2: Typical Wind Speed and Direction Data, Pictou County

Month	Mean Wind Speed, km/hr	Maximum Hourly Wind	
		Speed, km/hr	Direction
January	18.6	74	S
February	18.6	74	SW
March	20.4	74	NW
April	18.3	74	NW
May	18.9	60	NW
June	16.1	50	SW
July	15.9	58	S
August	14.6	50	NW
September	15.6	64	N
October	17.5	58	SW
November	18.3	60	W
December	20.0	68	NW
Annual	17.7	74	SW

4.1.3 Air Quality

The existing air quality in the region is influenced by natural conditions, local point sources, distant point sources and mobile sources. Larger, local point sources of emissions include existing mining operations, producers of aggregates, asphalt, chemicals, coatings, electrical power, pulp, railway rolling stock, tires and wood products. Other local air quality influences include traffic related emissions or intermittent agricultural/industrial operation or equipment sources. More distant air quality influences include contributions from the industrial complexes in the Strait of Canso and Halifax areas, as well as from Central Canada and the New England states.

The National Air Pollution Surveillance (NAPS) network has been established to monitor air pollution levels in Canada. There are five sites in metro Halifax, two in Sydney, N.S. and one each in Saint John, N.B., St. John's, NL, Charlottetown, P.E.I., Glace Bay, N.S. and Fredericton, N.B. Not all pollutants are measured at each site. Data from the Atlantic Province stations, local monitoring facilities and from elsewhere on the continent are used to present information of the existing air quality in the study area. This data is primarily that presented in the 1995 EAR; however, where ongoing monitoring has been completed (i.e., dust), this data is included in discussions.

The following presents a regional and local (if available) overview of air quality with respect to total suspended particulates, polycyclic aromatic hydrocarbons, sulphur dioxide, nitrogen dioxide and carbon monoxide.

Total Suspended Particulates

Total suspended particulates (TSP) is the most relevant variable to the proposed mine site. It describes solid or liquid particles which tend to stay suspended in the air and thereby available for inhalation. Particulates are the most commonly observed form of air pollution, resulting in visibility reduction, soiling, and respiratory irritation. Point sources for TSP in Nova Scotia include thermal generation plants, pulp and paper mills and other industrial operations. Environment Canada has estimated that of 790,000 tonnes of TSP emissions generated in Nova Scotia in 1980, 55 percent was from unpaved roads, 35 percent resulted from construction sites and 3.5 percent was from paved roads. Wood fuel burning, slash burning, quarrying operations, agriculture and asphalt production resulted in an estimated 1.0, 0.8, 0.5, 0.7 and 0.4 percent respectively. The remaining quantity involves numerous small volume sources.

Background TSP levels in North America generally average less that the 60 microgram per cubic meter ($\mu g/m^3$) "Maximum desirable objective" and the 120 $\mu g/m^3$ "Maximum acceptable limit" for a 24 hour period as set by regulatory authorities. As per the latest Industrial Approval (June 2003), particulate emissions shall not exceed 70 $\mu g/m^3$ for the annual geometric mean and 120 $\mu g/m^3$ in a daily (24 hour) average.

Previous monitoring data on the entire study area (i.e., both east and west sides) was completed in 1992. This data demonstrates that the previous TSP concentrations occasionally exceeded the maximum daily acceptable limit and monthly averages often exceeded the maximum desirable objective, especially in the spring and summer months.

Ongoing monitoring of TSP in four monitoring stations has been completed as part of operations since 1996 (locations of monitoring stations can be found on Figure 3-1). As also outlined in the dust monitoring results of Appendix C, the monthly average dust monitoring results of the four stations are consistently below 60 μ/m^3. Typically, values are between 10 μ/m^3 and 30 μ/m^3; however, there have been select individual daily readings above the maximum acceptable limit. Refer to Appendix F for a Noise and Dust Assessment (CBCL, January 2002).

Polycyclic Aromatic Hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAHs) cause concern because of their indicated ability to precipitate changes in living cells. PAHs are created by smelting operations and motor vehicles and are generated in large quantities by wood combustion. PAH levels in Truro and Lower Sackville, NS were found, in a 1985 study, to range between 0.1 and 30 nanograms per cubic metre (ng/m^3). These levels were interpreted as being well below those which would have a public health impact. Ambient levels in the study area would be expected to fall in the lower middle to upper portion of the range depending on the season of the year.

As PAHs are created by the combustion of hydrocarbons, operations testing of PAH levels in ambient air is not part of ongoing monitoring as they are not relevant to this project.

Sulphur Dioxide

Sulphur dioxide originates from several regional sources. However, 75 to 80 percent of the sulphur deposited in the region originates from Central Canada and the northeastern United States.

Power generation produces 87 percent of this region's own sulphur dioxide production while fuel combustion, including motor vehicle operation, produces approximately 12 percent of the total. "Maximum acceptable limit" annual means have been set at 20 parts per billion (ppb) while "Maximum desirable objective" limits are 10 ppb. Between 1974 and 1983, readings at Mount Saint Vincent University in Halifax ranged up to 0.5 ppb, averaging less than 0.1 ppb. In 1989, sulphur dioxide levels in Sydney, averaged 2 ppb, while in Charlottetown and Saint John, yearly averages of 2 and 7 ppb were recorded. Annual means for the study area are likely to be in the 4 to 6 ppb range.

Again, because increased ambient concentrations of sulphur dioxide is not expected as part of surface coal mine operations, no monitoring for sulphur dioxide was completed as it is not relevant to this project.

Nitrogen Dioxide

Gasoline combustion is the largest single source of nitrogen dioxide generation in the Atlantic region, followed by diesel engines, industrial fuel and power plant combustion, fuel wood burning and residential and commercial fuel combustion. Point sources include thermal plants, oil refineries and pulp mills. In 1980, Nova Scotia produced an estimated 48,000 tonnes of nitrogen dioxide emissions. Oxides of nitrogen can be carried thousands of kilometres from the point of emissions.

The "Annual maximum acceptable" limit for nitrogen dioxide is 50 ppb while the "Maximum desirable objective" limit is 30 ppb. Readings at Shearwater ranged up to 90 ppb between 1974 and 1983, averaging well below 10 ppb. Readings in downtown Halifax averaged up to 40 ppb during the early 1980s but annual means are generally less that 30 ppb. Annual means for stations in Canada and the United States were around 25 ppb during the same period, slowly dropping over the years. Annual averages in the study area would be expected in the 12 to 25 ppb range.

As no significant emissions of carbon monoxide are expected from surface coal mining operations, no monitoring for carbon monoxide was completed as it is not relevant to this project.

Carbon Monoxide

In 1980, 77 percent of the carbon monoxide produced in Nova Scotia was estimated to have come from gasoline powered vehicles. Other sources include wood burning, gasoline use and diesel combustion. Point sources include oil refineries, thermal plants and pulp mills. Annual means for carbon monoxide declined during 1974 to 1978 but have remained more constant since. Target levels are expressed in terms of short term exposures with the "Maximum Desirable Objective" 8 hours limit being 5 ppm. Test results in downtown Halifax ranged up to 9 ppm between 1977 and 1983, averaging less than 2 ppm. The annual mean from downtown Halifax in 1989 was 1.0 ppm, while in Toronto it was as high as 2.4 ppm. Canadian annual means for urban centres averaged about 1.6 ppm between 1977 and 1981. Annual mean for the study area would likely be less than 0.8 ppm.

As no significant emissions of nitrogen dioxide are expected from surface coal mining operations, no monitoring for nitrogen dioxide was completed as it is not relevant to this project.

4.2 Noise Levels

Sound is a sensation produced in hearing receptors as the result of waves or vibrations caused in the surrounding air by a disturbance. Sound levels decrease with distance and are also attenuated by geographic and surface features. Different vibration frequencies create different pitches of sound.

The minute variations in air pressure which result in sound are measured by sound level meters which are calibrated to describe those levels in decibels (dB). Weighting networks are built into meters to result in different responses to portions of the sound frequency spectrum received. The "A" weighting network most closely corresponds to the range of human hearing and is therefore used in most sound impact assessment work with measurements recorded in units of dBA.

Extremely low levels of sound are in the 20 to 35 dBA range while sounds causing immediate and noticeable disturbance start at 70 to 80 dBA. A quiet location such as library or inactive residential area will register a sound level of approximate 35 dBA. A tractor trailer passing at a distance of 15m will create a 90 dBA reading, similar to that of a blender at 1m.

As per the Industrial Approval, the current allowable limit at the site is 65 dBA for daytime hours (0700 hours to 1900 hours). This corresponds to the outdoor noise level in a commercial area, an indoor noise level in a large business office or normal speech at 1m distance. Evening noise limits are 60 dBA (1900 hours to 2300 hours) and night noise limits (including maximum instantaneous levels) are 55 dBA (2300 hours to 0700 hours).

The baseline noise emissions (i.e., those not generated from surface coal mining activity) in the immediate vicinity of the site include:

- Local vehicular traffic;
- Occasional tandem truck and tractor trailer traffic with variable traffic volumes throughout the day; and
- Traffic along TransCanada Highway 104.

The noises generated from activity associated with the mine site typically include:

- Trucks hauling coal from the pit and those leaving and arriving at intersection of MacGregor and Foster Avenue;
- Mine trucks hauling waste to spoil piles;
- Reverse warning signals on mine equipment;
- Non-mine vehicles delivering supplies to the site; and
- Tree cutting at the site.

As part of current operations by Pioneer Coal, noise monitoring has been completed at four locations on the site. This data can be found in Appendix C for both day and evening readings (locations of monitoring stations can be found on Figure 3-1). The average monthly readings are typically well below allowable limit for both daytime and evening readings. There are select exceptions of exceedances in maximum allowable noise emissions. When an unacceptable noise emission is noted, the operations are evaluated and mitigative measures are implemented, where required. These data are communicated to NSDEL as required as part of submissions. Refer to Appendix F for a Noise and Dust Assessment (CBCL, January 2002).

It is noted that similar exceedances occur when monitoring was completed during non-operating hours from baseline noises. For this reason, baseline monitoring of noise has occurred on the site east of MacGregor Avenue (December 2003). This information is included in Appendix C.

4.3 Surface Water

The proposed site of the surface coal mine extension sits within two major watersheds (Middle River watershed and East River watershed). These watersheds drain into Pictou Harbour (brackish) which enters the Northumberland Strait (marine).

As discussed in sub-section 3.4.3, surface runoff from the existing mine west of MacGregor Avenue is treated for the removal of suspended solids and discharged into Bear Brook. This has occurred since the startup of mining operations in 1996. Surface runoff from the active areas of the proposed extension will be pumped to existing facilities for treatment and then discharged into Bear Brook (as per the existing operation). Only surface runoff from areas not disturbed by mining activities will continue to flow into Coal Brook from the site east of MacGregor Avenue. All surface runoff which contacts the active mine site will be pumped to existing treatment facilities

west of MacGregor Avenue. At the completion of mining activities and final reclamation, surface runoff from the extension east of MacGregor Avenue will have been restored to flow into Coal Brook.

Although no effluent is discharged directly into Coal Brook, there will be changes to its catchment area. Monitoring plans have been developed to outline changes, if any, in flow regime and chemistry for Coal Brook. As a result, characterizations of hydrology and water quality are presented for both watersheds in the following sub-sections.

4.3.1 Hydrology

The two immediate receptor streams from the existing site runoff are Bear Brook in the Middle River watershed and Coal Brook in the East River watershed. The following is a discussion of the hydrology of each under the sub-sections by watershed, as well as a presentation of activities within the watersheds.

4.3.1.1. Middle River Watershed

Bear Brook contains a drainage area of approximately 26 km^2 at its confluence with the Middle River. The Middle River watershed controls a total drainage area of approximately 234 km^2 at its outlet to Pictou Harbour.

The existing mine contains a drainage area of approximately 70ha. The existing effluent discharge point is approximately 7 km upstream of the confluence of Bear Brook with Middle River. The drainage area located upstream of the site is approximately 11 km^2.

Based on these drainage areas and assuming uniform unit runoff rates, the existing mine site contributes approximately 2% of the stream-flow in Bear Brook. Bear Brook contributes approximately 11% of the stream-flow in the Middle River. The addition of surface runoff from the proposed extension east of MacGregor Avenue would increase the contribution of the two mine sites to approximately 4% of the stream flow in Bear Brook.

The Bear Brook drainage basin exhibits a full range of land use types from natural, to suburban, urban, industrial, commercial, mining, transportation, and re-growth on abandoned farm land and forestry cuts. Major alterations include approximately 40 km of roads, 1 km of rail line, and 10 ha of commercial land. In addition, there are some 100 residences within the drainage area positioned primarily as ribbon development along the major roads. A number of these residences are on individual septic fields. Runoff from the Stellarton Industrial Park enters Bear Brook at locations upstream of the existing mining operations.

Treated municipal sewage from the Town of Westville is discharged into Bear Brook upstream of the discharge point for the existing mining operations. Storm sewers in

Westville discharge into Bear Brook at locations which are downstream from the existing mining operations.

The Town of Westville uses the Middle River as a source of water supply; the extraction point is located approximately 1 km upstream of the confluence of Middle River with Bear Brook. Water is pumped from an approximate 54 ha impoundment on the Middle River, downstream of Bear Brook, to supply the Scott Maritimes and Michelin Tire Plant.

4.3.1.2. East River Watershed

Coal Brook contains a drainage area of approximately 4.2 km^2 at its confluence with East River. The East River watershed controls a total drainage area of approximately 565 km^2 at its outlet to Pictou Harbour.

The proposed extension to the east of MacGregor Avenue will contain a maximum drainage area of approximately 50ha. The site will occupy approximately 13% of the total drainage area of Coal Brook. Coal Brook controls a small drainage area and acts more as a drainage channel for the collection of periodic overland flow due to snowmelt and rainfall events than as a stream with year-round base flow. The proposed extension will reduce the amount of drainage which enters this channel by approximately 13%, at maximum development of the mining area. This is temporary as drainage will be restored to Coal Brook as part of final reclamation of the site. The drainage entering the East River watershed is reduced by less than 0.1%.

The Coal Brook watershed exhibits a similarity to Bear Brook with a wide variety of existing land uses, including urban, suburban, roads, previous mining activities, and other industrial activities.

The Town of Stellarton is the only major user of water from the East River. Water is withdrawn approximately 3.4 km upstream from the confluence of East River and Coal Brook. Sewage plant effluent for the towns of Stellarton, New Glasgow, and Trenton is discharged into East River at a location approximately 3.5 km downstream of the confluence of Coal Brook with East River.

4.3.2 Water Chemistry

Since existing operations began in 1996, surface water monitoring has been ongoing. A summary of data for monitoring to date are given in Appendix C. Coal Brook was sampled for water chemistry analyses at several locations on December 01, 2003. The data are presented in Appendix C. The sampling locations are shown in Figure 3-1. Summaries for selected water chemistry parameters are presented in the following tables.

Table 4-3: Summary of Bear Brook/Middle River Chemistry Parameters (1997 to 2001)

		Middle River Upstream of Bear Brook	Middle River Downstream of Bear Brook	Bear Brook Upstream of Mine	Bear Brook Downstream of Mine	Discharge from Mine
Pioneer Coal Sample Location		SSW8	SSW9	SSW6	SSW1	SSW2
Number of Samples		5	5	5	5	9
Turbidity (NTU)	Median Range	4.2 2.0-4.5	5.0 3.0-7.5	6.8 6.8-8.0	6.0 4.5-10.0	6.4 1.5-19
Colour (TCU)	Median Range	31 21-34	40 7-43	62 39-78	35 5-54	15 5-362
pH	Median Range	7.4 7.2-7.5	7.4 7.3-7.6	7.3 6.6-7.4	7.8 7.8-8.0	8.1 7.8-8.8
Alkalinity (mg/L as $CaCO_3$)	Median Range	36.4 21.3-42.4	37.0 30.4-46.9	26.5 24.9-55.9	141 111-224	152 51.2-800
TDS (calculated, mg/L)	Median Range	221 113-302	188 146-295	136 99-217	683 481-900	624 237-1516
Sulphate (mg/L)	Median Range	45.0 25.0-64.0	45.6 27.0-80.9	19.0 7.0-32.0	240 153-356	189 80-385
Nitrate (mg/L as N)	Median Range	1.00 0.05-1.40	1.40 0.03-1.80	0.11 <0.02-6.70	8.00 0.99-23.20	34.50 <0.02-120.00
Iron (mg/L)	Median Range	0.13 0.07-0.20	0.16 0.09-0.20	0.38 0.34-0.57	0.27 0.15-0.35	0.07 0.03-0.46
Manganese (mg/L)	Median Range	0.02 0.02-0.43	0.08 0.02-0.04	0.06 0.03-0.21	0.12 0.03-0.32	0.13 <0.01-0.30

Table 4-4: Summary of Bear Brook/Middle River Chemistry Parameters (2002 to 2003)

		Middle River Upstream of Bear Brook	**Middle River Downstream of Bear Brook**	**Bear Brook Upstream of Mine**	**Bear Brook Downstream of Mine**	**Discharge from Mine**
Pioneer Coal Sample Location		SSW8	SSW9	SSW6	SSW1	SSW2
Number of Samples		22	22	22	22	3
Turbidity (NTU)	Median Range	2.2 1.0-11.0	1.9 1.0-8.9	5.5 2.5-12.0	4.9 1.0-13.0	7.7 1.6-16
Colour (TCU)	Median Range	33 5-86	31 5-80	66 27-123	57 6-95	37 10-57
pH	Median Range	7.5 7.1-8.0	7.4 6.8-8.0	7.5 6.9-8.1	8.0 6.6-8.3	8.3 8.2-8.4
Alkalinity (mg/L as $CaCO_3$)	Median Range	28.0 5.7-153	22.0 5.2-153	29.0 5.9-129	113 4.0-444	232 109-251
TDS (calculated, mg/L)	Median Range	149 32-691	101 31-590	98 35-529	472 39-1790	807 466-1050
Sulphate (mg/L)	Median Range	11.5 5.2-172	9.1 4.9-177	7.4 4.2-178	150 3.7-611	300 156-344
Nitrate (mg/L as N)	10%tile Median 90%tile Range	0.06 0.09 3.2 0.06-25.3	0.06 0.06 2.66 0.06-26.0	0.06 0.08 11.1 <0.06-23.0	1.51 3.12 20.3 0.06-28.0	- 17 - 4.02-20.0
Iron (mg/L)	Median Range	0.10 <0.01-0.37	0.10 <0.01-0.35	0.22 0.10-1.06	0.15 0.10-0.35	0.1 0.1-0.14
Manganese (mg/L)	Median Range	0.013 0.004-0.090	0.009 0.001-0.096	0.041 0.004-1.16	0.029 0.005-0.098	0.026 0.004-0.064

Table 4-5: Summary of Coal Brook Chemistry Parameters (December 01, 2003)

	Coal Brook Upstream of Mine	Coal Brook South of Foster Rd	Coal Brook North of Foster Rd	Coal Brook South of Highway 104	Coal Brook South of Highway 104
Pioneer Coal Sample Location	SW-1	SW-2	SW-3	SW-4	SW-4
Number of Samples	1	1	1	1	1 (duplicate)
Turbidity (NTU)	10.0	4.0	111	3.3	3.4
Colour (TCU)	25	17	33	14	15
pH	7.0	7.4	7.5	7.7	7.9
Alkalinity (mg/L as $CaCO_3$)	16	45	42	120	120
TDS (calculated, mg/L)	275	249	249	385	379
Sulphate (mg/L)	130	76	76	93	95
Nitrate (mg/L as N)	Not detected	0.12	0.12	0.47	0.50
Iron (mg/L)	0.530	0.300	2.0	0.670	0.630
Manganese (mg/L)	0.025	0.046	0.230	0.220	0.210

Discharge from the mine site sedimentation ponds is similar in composition to other surface waters in the area, but with somewhat elevated concentrations of total dissolved solids due to the presence of increased concentrations of the major cations and anions, especially: sodium, sulphate, and bicarbonate, likely caused by the mixing of groundwater (i.e., mine water) with surface runoff from the mine site. The relatively higher concentrations of dissolved solids in the mine effluent results in an increase in dissolved solids content of Bear Brook downstream from the mine site. This increase is not observed in the Middle River, downstream of Bear Brook, due to the very large dilution capacity provided by this river. The alkalinity added by discharge from the mine site would provide some beneficial buffering capacity to Bear Brook, downstream of the site.

The chemistry of surface water bodies in the area can be expected to remain basically the same with operation of the proposed extension east of MacGregor Avenue. Surface runoff and mine water, collected from the active mine area, will be treated for the removal of suspended solids and discharged from the existing sedimentation ponds into the Bear Brook (as per existing operations). Effluent will not be discharged into Coal Brook.

4.3.3 Sediment Characteristics

Eatonville basal till generally overlies the project area. This soil type is classified as highly erodible. Visual assessment of the bed and floodplain of Bear and Coal Brooks suggests high background loading rates are present due to the extent of altered land use in the watershed. This can be observed as the sporadic covering of stream beds with fine grained sediments.

4.4 Groundwater

This sub-section describes the hydrogeology in terms of regional and local characteristics. The overburden, bedrock and the groundwater regimes are presented. The expected groundwater quality and quantity on the site and the implications to the proposed project are also noted. At the end of this sub-section, an overview of groundwater users (e.g., domestic well) is presented.

As per previous, the data is based on the information collected for the 1995 EAR and is augmented by monitoring data, site operations knowledge and changed conditions since 1995.

4.4.1 Regional Hydrogeology

Within Pictou County the main formations of hydrogeological interest are the Riversdale, Cumberland, Pictou and Stellarton Group of Carboniferous Age. The surficial deposits which cover the majority of Pictou County are tills of Quaternary age. These tills tend to be fine grained, and consequently, are not considered significant as a source of groundwater. Wells in the Pictou Group and the Riverdale Group (with yields in the range of 0.2 m^3/min) have a considerably higher yield than wells located in the Stellarton Group and the Cumberland Group (less than 0.1 m^3/min).

The primary source of groundwater from these formations is due to secondary permeability (fractures) which predominantly occurs along bedding planes, fault planes and joints. There is no indication of the degree of interconnection between these major hydrostratigraphic units.

Groundwater quality is typically best in the Cumberland Group and poorest in the Stellarton Group. All but the Cumberland Group have guideline exceedances for iron and manganese. The water quality of wells located in the Stellarton Group is often of lower quality than those in the Pictou Group which is likely the result of influence by the coal formations and abandoned coal mines.

Within the Pictou Basin, one would expect the regional groundwater flow to migrate down-dip towards the northeast and for the shale units to act as very effective aquitards, especially at depth. However, the numerous major structural features surrounding and

within the Basin will have a substantial impact on the groundwater flow systems. It is likely that such features will serve as conduits for groundwater recharge and discharge which will tend to "short-circuit" movement along bedding planes.

McLellans Mountain to the southeast, the Cobequid Mountains to the west, and the upland area to the south, are the most likely sources of recharge to the deep flow systems. This recharge probably takes thousands of years to reach the deeper flow systems within the Basin. Most regional discharge within the study area will be directed towards Pictou Harbour while the Middle and East Pictou Rivers will also serve as important discharge points.

4.4.2 Site Hydrogeology

The site is located within the Northeastern Appalachian Hydrogeological Region of North America and is characterized by hilly terrain underlain by glacial deposits over a mixture of sedimentary and metamorphic rock complexes intruded by igneous rocks. This section describes the two primary hydrostratigraphic units (overburden and bedrock) found at the site and their physical and chemical characteristics.

4.4.2.1. Overburden

This hydrostratigraphic unit is comprised of the glacial till which is not considered of significance as an aquifer. This is due to its low primary permeability which has been estimated to range between 10^{-6} to 10^{-8} cm/sec.

Representative sampling and analysis was completed prior to the 1995 EAR. Four piezometers were installed in this till unit. As well, samples of the till were collected and grain-size analyses were performed.

In summary, the hydraulic conductivity values ranged from 4.6×10^{-7} cm/sec to 7.8×10^{-6} cm/sec. As such, this unit is classified as an aquitard which is best described in macro context as a homogeneous, anisotrophic, non-fractured, semi-consolidated media with relatively high matrix porosity.

Analysis of groundwater samples indicated that the groundwater in this unit may be characterized as a fresh, very hard and predominantly sodium/calcium-bicarbonate type water. In general, the water quality is good with only iron and manganese exhibiting concentrations above regulated concentrations.

Ongoing monitoring has occurred since 1996 on groundwater levels and chemistry. This data is summarized in Appendix C and detailed reports have been regularly submitted to NSDEL. Locations of boreholes and wells are previously shown on Figure 3-1. A discussion of groundwater quality and quantity is presented in sub-sections 4.4.3 and 4.4.4.

4.4.2.2. Bedrock

This hydrostratigraphic unit is comprised of the geological facies of the Stellarton Group which encompass the inter-bedded units lying between the New and the Foord Seams. An analysis of the hydraulic testing previously performed on this unit is contained in the EAR.

Based on this analysis, the hydraulic conductivity values ranged from 8.2×10^{-2} to 2.4×10^{-3} cm/s. In general, the upper portion of this unit at the site exhibits high hydraulic conductivity values. This hydrostratigraphic unit can best be described as a relatively homogeneous, anisotropic, fractured, consolidated media which exhibits low primary porosity. Flow will be fracture controlled, with fractures characterized as open, orthogonal, discontinuous and poorly interconnected in some areas in three dimensions. Given the broad range in hydraulic conductivities measured at the site, it would appear that mining and other constructed influences have resulted in increased hydraulic conductivity in some areas.

4.4.3 Drawdown Assessment

Assessment of the drawdown effects due to mining at the site of the current operation have been conducted using static water level measurements collected on a weekly basis during the period from 1996 to present. It is believed that an assessment of the drawdown effects caused by mining at the current site will provide a plausible model with which to predict drawdown likely to result from planned operations of the proposed extension. This is based on similar geological conditions and mining techniques.

The yearly average static water levels for each monitor well were used to determine the overall cumulative drawdown of the water table. The graphs of average yearly static water levels show a marked decrease during the period from 1996 to present for monitor wells located within the area of influence of the mine and show only minor fluctuations (attributed to climatic conditions) in monitor wells outside the area of influence.

There exist a total of 14 groundwater monitor wells installed in pairs at seven locations surrounding the current mine site. The wells are identified as G1A/G1B through G7A/G7B. The “A” series of monitor wells are drilled into bedrock and screened entirely within the bedrock to provide assessment of the hydrogeological and chemical characteristics of the bedrock aquifer. The “B” series of monitor wells are drilled to bedrock and are constructed entirely within the overburden. Their purpose is to assess the hydrogeological and chemical characteristics of the surficial materials aquifer. It is noted that no water level data for monitor wells G3A or G3B was available, as these wells have been dry since they were installed. Limited water level data is available for G6A and G6B, wells which are intermittently dry and for which a consistent data set has not been established.

Drawdown due to mining operations at the site is most easily quantified on the northwestern flank of the mine site where six viable monitor wells (G1A, G1B, G2A, G2B, G5A and G5B) are located. Drawdown values for the on site monitor wells were calculated and are presented in Table 4-6. These wells are all located within a 250m radius of the mine site.

Table 4-6: Groundwater Drawdown

Monitor Well	Distance From Mine Edge (m)	Distance From Mine Centre (m)	Cumulative Drawdown (m)
G1A	250	600	1.89
G1B	250	600	3.00
G2A	250	415	2.00
G2B	250	415	2.13
G3A	70	610	n/a
G3B	70	610	n/a
G4A	400	670	N/D
G4B	400	670	N/D
G5A	250	490	5.78
G5B	250	490	1.51
G6A	115	300	n/a
G6B	115	300	n/a
G7A	440	670	N/D
G7B	440	970	N/D

Notes: n/a not available
N/D no discernible drawdown

There are no discernible effects in monitor wells G4A, G4B, G7A and G7B located to south side of the mine site. In the case of monitor wells G4A and G4B, the absence of a discernible drawdown effect is believed to be due to distance from the active mine site (estimated to be approximately 400m at the closest point). In the case of monitor wells G7A and G7B, the distance between the monitor wells and the active mine site is estimated at approximately 440m.

Based on the magnitude of drawdown (5.78m in G5A – the greatest drawdown observed from any monitor well at the site) within a 250m radius of the mine excavation and the absence of discernible influence at a distance of 400m from the mine, it is estimated drawdown effects would be limited to an area within 300m of the excavation. This would result in an area of influence of approximately 1,000,000m^2 (100ha) that would encompass the mine site (excavated areas are estimated to cover approximately 250,000m^2 or 25ha). The resultant ratio of the area of influence to the area of the mine excavation would be approximately 4:1.

As geological conditions at the site of the proposed expansion are similar to those at the current site, and as mining operations are anticipated to reach similar elevations, the area

of groundwater influence is expected to be approximately four times greater than the area of the excavation.

4.4.4 Chemistry

An assessment of groundwater quality at the site was completed using existing information. General chemistry analytical results indicate relatively good quality, except that colour and turbidity results are consistently higher than guideline criteria in water samples from each monitor well.

Metals analytical results indicate iron and manganese concentrations to be consistently above applicable guideline limits for groundwater samples from most monitor wells. Aluminum, copper and zinc concentrations for groundwater samples from most monitor wells have been found to occasionally exceed applicable guidelines. Thallium and selenium concentrations in groundwater samples occasionally exceed guidelines; however, this is expected due to geochemical associations with the local geology.

4.4.5 Groundwater Users

At the time of registration in 1995, there were local residences who relied on domestic wells as their water source. Since this time, many of these residents have connected to the Town of Stellarton municipal water supply. The site is within the Town's water supply boundary. The primary reason for the transition is the inferior groundwater quality due to high levels of iron, manganese and total dissolved solids.

Based on review of best available records and discussions at the public consultation sessions, two wells are located in the immediate area that are still thought to be used for domestic water supply. These are located on the extension of Foster Avenue (as shown on Figure 3-2) and are within 50m of the proposed maximum mine extension area (extent of mine area is pending negotiations with land owners). No other domestic wells are known in a 1km radius (based on available knowledge at time of registration).

4.5 Habitat Evaluation

The habitat of the site and the local / regional context is presented in this sub-section. The description is broken into three categories: aquatic, terrestrial and wetlands.

The data is based upon information gathered as part of the 1995 EAR, baseline aquatic monitoring, environmental screening by NSM and a terrestrial update of the site by NSDNR.

4.5.1 Aquatic Environment

Pictou Harbour constitutes the estuary formed at the junction of the East, Middle and West rivers. The surface salinity of this estuary gradually decreases inland from the outer harbour. Shellfish (oysters, blue mussels, softshell clams and lobster) and finfish (gaspereau, smelt, mackerel and eel) are important commercial species found in the harbour.

A fishery for gaspereau developed in the estuary, initially as a result of additional spawning habitat created by the freshwater impoundment behind the harbour causeway in the early 1960s. Subsequently, salt water was allowed to enter the area behind the causeway, which led to modifications to the Middle River dam (near Granton) to allow gaspereau passage into this freshwater impoundment for spawning. This fishery has reported significant economic value in recent years. Commercial smelt and eel fishing also takes place near the mouths of the rivers, but contribute little to the overall landings and values. Lobster provides the largest landed value in the Pictou area; however, lobster, along with rock crab, and scallop landings represent, for the most part, landings outside Pictou Harbour.

The three rivers (East, West and Middle), flow predominantly through wooded terrain with small amounts of cleared land. The waters of the rivers are soft with slight to moderate colour and approximately neutral pH. The East River has remained a significant salmon river while the numbers of salmon have precipitously declined in the West and Middle Rivers. Along with salmon, other recreational fish species reported in the area are brook, rainbow and brown trout, yellow and white perch, smelt, shad and striped bass.

Past water quality surveys of the Middle River showed significant nutrient loading (orthophosphate, nitrate-nitrite and ammonia) and evidence of bacterial contamination from malfunctioning sewage disposal systems and possible from agricultural-related activities within the Bear Brook watershed.

4.5.1.1. Regional Fisheries

Brook trout are the most important recreational fish species in the Middle River and its tributaries, but spawning to support this population is likely concentrated in the smaller brooks, including headwater streams. Estimates of brook trout catch or fishing effort are not available for individual rivers, however the annual catch in Pictou County is estimated to be in the order of 5000 trout.

Atlantic salmon are more dependent on the larger main river than small tributary streams. Salmon had disappeared from the Middle River for many years but recent fish passage improvements and stocking have resulted in returns of adult salmon. Angling for salmon has been reported on the Middle River. Salmon enhancement efforts on the Middle River have occurred in recent years. A noticeable increase in salmon has resulted.

Fish in the East River system include gaspereau, American eel, smelt, striped bass, Atlantic salmon, brook trout, brown trout, and sea-run brook trout. The East River is a scheduled salmon river; that is, it has a regulated fishing season for salmon. There is a major run of Atlantic salmon in the fall. Depending on the depth of water, these fish may spend from a few weeks to over a month in the water below New Glasgow. They then go upstream to spawn in the various tributaries.

Fishing for Atlantic salmon has special prestige, and a high value is associated with each fish caught. Because of this high value and the relative scarcity of Atlantic salmon, compared to brook trout, Atlantic salmon are considered the most sensitive resource in the study area. Brook trout are also considered important but, because they are ubiquitous, the brook trout resource is considered less sensitive.

4.5.1.2. Bear Brook

Bear Brook is about 12km long, running between the Towns of Westville and Stellarton for most of its length. The Brook is typically 4m wide and 0.6m deep, with 0.5m high, sandy clay banks, at its mouth. Here the canopy is open with primarily alder-covered banks, only about 10 percent of the bank is undercut. Substrate is comprised of 50 percent silt and sand with 40 percent gravel and 10 percent boulder. About 200m upstream, immediately below the Highway 104 bridge, cover remains similar but substrate changes to 40 percent silt and sand, 10 percent gravel, 20 percent cobble, 10 percent boulder and 20 percent bedrock. These lower sections of the brook provide poor rearing and no spawning habitat.

The brook passes under the Route 289 bridge about 5km upstream. The Westville sewage treatment plant discharges into the brook 300m further upstream. In the 300m between the sewage treatment plant and Route 289 bridge, forest cover near the Brook is largely mixed wood and alder. The east bank is steep and roughly 10m high in the initial 125m of the section. Stream substrate ranges from a high proportion of boulder and sand to

predominantly gravel. The first 125m is primarily a moderately deep run, changing to primarily pool habitat with small riffle areas for the next 17m. The latter section has some areas of gravel of appropriate size for trout spawning, but the sand and silt content is too high for these areas to be considered significant spawning habitat.

The next 500m of the brook (300m to 800m upstream of the Route 289 bridge) shows some improvement in trout habitat, but the proportion of silt and sand in the substrate remains relatively high. Banks generally slope gently and about 30 percent are undercut. In some areas, the east bank ranges from 3m to 10m high and some erosion is occurring. In riffle areas, substrate is generally about 70 percent gravel with cobble and boulder ranging from 5 to 20 percent. Fish habitat is about 70 percent pool with riffles common at bends. Some pockets of possible trout spawning were observed 500m and 650m upstream of the bridge. Substrate in a small area 500 m upstream of the bridge also could provide pockets of marginal spawning for salmon.

The remaining 800m to the CN rail crossing of the brook is primarily muskrat area with many small dams. Overall, this section provides marginal trout habitat. Substrate in a small area immediately below the first muskrat dam is approximately 80 percent cobble and could provide some marginal spawning habitat for salmon. Other small areas of riffle and possible salmonid spawning habitat exist between dams, but overall quality is poor. None of the dams appeared to be barriers to fish migration under normal flow conditions.

Electrofishing was completed in the spring of 1992. The air temperature was approximately 30° C and the water temperature at the mouth of Bear Brook was 17° C. Electrofishing approximately 200m upstream from the mouth indicated that trout were absent from the lower section of Bear Brook.

Electrofishing over a 50m section immediately above the sewage plant discharge found only white sucker. The absence of trout even above the sewage plant discharge suggests that at least the lower main section of Bear Brook no longer provides significant fish habitat.

A spawning habitat assessment was completed as part of the 1995 EAR. The conclusion of this study suggests that trout may migrate up to Bear Brook to spawn; however, the lower and middle sections of Bear Brook do not appear to provide useful spawning habitat.

Bear Brook is unlikely to be important for reproduction or rearing of Atlantic salmon because of the limited amount of marginal salmon habitat available, the water quality and siltation impacts on the Brook and the relatively low numbers of salmon present in the Middle River. The potential quality of salmon habitat in Bear Brook is sufficiently poor that salmon likely would only use this stream if the population of the Middle River was near its carrying capacity.

A baseline fish habitat and benthic organism survey was completed in 1996 and 1997 as part of the COA. This baseline assessment was extensive and assessed Bear Brook at five

stations (including its confluence with Middle River) and two within Middle River (upstream and downstream of the confluence). As part of the Industrial Approval, semi-annual fish habitat and benthic organism surveys have been completed at low and high flow conditions. Refer to Appendix G for results of fish habitat and benthic organism monitoring in Bear Brook and Middle River.

4.5.1.3. Coal Brook

Coal Brook runs along the eastern border of the project area. The brook passes along areas which have been disturbed by past mining activities or urban development. The brook bank vegetation is dominated by alders and sparse grass cover. North of Foster Avenue, it has been diverted by the Town of Stellarton into abandoned underground mine workings. The flow is thought to eventually surface at the Allen Shaft and Bridge Street before entering the East River. Coal Brook should not be considered as actual or potential fish habitat because of these characteristics.

4.5.2 Terrestrial Environment

An environmental inventory of the terrestrial environment was completed as part of baseline data collection for the 1995 EAR. The inventory included desktop analysis and field assessments. To augment this information, an environmental screening was completed by NSM to overview known natural heritage resources in the general study area (refer to Appendix H for results of this analysis). A field assessment of the proposed extension site east of MacGregor Avenue was carried out by NSDNR (refer to Appendix I).

The following three sub-sections describe the flora, fauna and wetlands in the general area and on the site (where applicable). Information from the 1995 EAR is summarized and/or referenced and the recent information is included.

4.5.2.1. Flora

The majority of site vegetation is in an early stage of succession likely resulting from past disturbance, logging, land clearing and fire. Evidence of logging, fire, land clearing and previous mining activity was noticed during field observations. The majority of trees on site are shade intolerant hardwoods (red maple, large-toothed poplar) with scattered shade intolerant softwoods (white spruce, white pine, red pine). Balsam fir, a moderately shade tolerant softwood, occurs in limited numbers. The bracken fern plant association is the dominant ground cover and the cinnamon fern plant association occurs in poorly drained areas. Forest and ground cover vegetation observed within the study area is common throughout Nova Scotia.

A detailed species list is contained in the 1995 EAR. The results of the update assessment by NSDNR (see Appendix I) correspond to the assessment completed in 1995.

The conclusion of the flora surveys completed in 1995 was that no rare or endangered species were on the site. The plants of concern that were identified in the NSM screening as known for the area were not identified during detailed inventories. The update in 2003 concluded that the presence of species of concern on the site are unlikely and there was no need for further assessment.

4.5.2.2. Fauna

Wildlife habitats within the site are capable of supporting large mammals only on a migratory basis; however, habitat in general is most suited to small mammals. During site visits evidence of small mammals and common birds were observed.

Common game animals harvested within Pictou County include white-tailed deer, snowshoe hare, grouse and pheasants. Muskrat, beaver, raccoon, coyote and fox make up about a large percentage of the forbearing harvest in Pictou County. Game animals found on the site at some times of year probably include white-tailed deer, coyote, raccoon, beaver, muskrat, otter, mink, bobcat, snowshoe hare, red fox, weasel, red squirrel, ruffed grouse, and pheasant. Signs of coyote, snowshoe hare and raccoon were observed on site during field assessments. Tracks of non-game mammals were observed on the site and probably represent short-tailed shrew, meadow jumping mouse and/or the meadow vole.

The Maritimes Breeding Bird Atlas provides estimates of abundance of birds based on the observation of experienced volunteers. These data are available by 10km by 10km squares. The study area is centered within one of these squares roughly bounded by Trenton and Churchville to Union Centre. Birds observed in this area include green-winged teal, American black duck, killdeer, rock dove, barred owl, chimney swift, tree swallow, barn swallow, American crow, common raven, American robin, starling, red-eyed vireo, Tennessee warbler, Nashville warbler, yellow warbler, Cape May warbler, and the black and white warbler.

The NSM screening indicated that there are records for wood turtle, blue spotted salamander and little brown bats in the general area; however, suitable habitat does not exist in the site nor immediate area for these species of concern. Similarly, the NSM screening indicated that the general study area was confirmed breeding grounds to various species of concern. These are osprey, northern oriole, northern mockingbird, eastern kingbird, piping plover, common loon and common terns; however, there is not suitable habitat within the site or immediate area for these birds.

Based on surveys (including 2003 NSDNR site survey) and desktop analysis, it can be concluded that it is unlikely that species of concern exist on the site.

4.5.3 Wetlands Habitats

A review was completed of the site area for the east side operations and none were found within the Nova Scotia Wetland Atlas. As previously noted in Section 4.5.2, NSDNR staff completed a field assessment of terrestrial ecology in 2003, which noted a small (0.25 hectare) pond in the western portion of the site. This pond was noted as being likely the result of site contouring in the past with no defined influent or effluent and likely habitat for frogs and herpitiles; however, none were evident at the time of the survey (September 10th). Mammal tracks (raccoon) were noted to be along the banks of the pond at the time of the survey as well.

The pond does not contribute significantly to the hydrological, hydrogeological or biochemical characteristics of the area. While some reptiles and amphibians likely utilize the habitat, the habitat is not significant in size or quality and comparable habitat exists within the local area. There are no rare or sensitive flora or fauna resident in the pond nor species that display biological diversity that is of interest. As the habitat was created anthropogenic activities, it is not part of a regional or local system. There are no social, cultural or resource production values associated with this small man-made pond.

4.6 Bedrock and Surficial Geology

This sub-section outlines the surficial geology and bedrock geology of the region and the site. This is followed by a description of coal resources including the structure, seams, burnability, ash content, and reactivity. The processing and availability of the coal is outlined in sub-section 3.5.5.

The information is based on data presented in the 1995 EAR and augmented by knowledge and data accumulated since operations commenced on the existing site.

A discussion of groundwater resources is contained in sub-section 4.4. An overview of historical mining on the site is presented in sub-section 4.7.3.1.

4.6.1 Surficial Geology

The two most predominant soil types developed within the Pictou Basin are the Queens and Joggins Association soils. The Queens Association consists of light brown loam to silty loam over light-brown clay loam. It is derived from a dark reddish-brown clay till which originated from reddish-brown shale. This soil type underlies most of the Towns of Stellarton and Westville, south of these towns, and immediately east of Stellarton.

The Joggins Association soil consists of grayish-brown loam over mottled grey and yellowish-brown clay loam. It is derived from a grey-brown clay till and originated from a dark grey shale. The Joggins soil occupies the northern and eastern section of the proposed mine site, while the Queens Association soil can be found in the area of Bear Brook, south of the mine site.

Recent excavations at the site confirm existing mapping and indicate presence of the Joggins Association soil. This soil type is loose to compact and ranges from 0.1 to 0.45m in depth.

Regionally, the surficial deposits within the area of the Pictou Coalfield unconformably overlie rocks of Carboniferous Age. These unconsolidated sediments are predominantly of glacial or glacifluvial origin with minor alluvial deposits along the current rivers and creeks. The overburden materials vary in thickness from a few centimeters to 30m; however, a thickness of 3 to 5m is more typical than the extremes. Tills, which are the predominant overburden, vary from clay to gravelly mixtures in which the silt and sand fraction are the predominant particle sizes.

The Wisconsin glaciation was the most recent ice sheet to cover the area, its retreat having occurred between 12,000 and 13,000 years ago. It seems likely that previous glaciations also spread ice over the area; however, the record of such events is not well understood or documented.

Excavations associated with overburden removal to obtain the bulk sample at the existing site indicate the presence of Eatonville Till. This basal till is characterized by its high percentage of silt and clay fractions (50 to 75 percent) with some sand and gravel and occasional cobbles and boulders. The Eatonville Till is typically classified as compact to very dense and has a thickness varying between 3 and 13m at the site. Based on previous laboratory testing the till has a calculated porosity in the range of 0.28 to 0.33. In situ permeability has yielded hydraulic conductivity values of approximately 10^{-4} to 10^{-5} cm/sec. This is an indication of a low permeability condition.

4.6.2 Bedrock Geology

Rocks of the Stellarton Group (also referred to as the Stellarton Series) are a sequence of shales, mudstones, sandstones, conglomerates, oil shales, and coals, which form the coal-bearing measures in the Pictou Coalfield. The Stellarton Group is underlain either by the Canso Group, at an angular unconformity, or by the New Glasgow Formation at a disconformity. At the top of the unit is a lengthy unconformity extending from the Carboniferous rocks to Quaternary glacial sediments.

The Stellarton Group is divided into six members for convenience of description and discussion. Some of the contacts adopted for use herein have been refined slightly from those proposed by Bell; however, the basic concept and nomenclature have been retained.

Contacts have been chosen arbitrarily and are based on the practical principle of separating coal-bearing and non-coal-bearing sedimentary sequences. Members are not believed to be field mappable due to the relatively restricted outcrop in the coal field. They are however, generally identifiable in drill holes providing sufficient markers are present to determine which part of the stratigraphic profile was cut by the drill hole.

The bedrock underlying the proposed surface mine site consists predominantly of shales and mudstones interbedded with sandstone, coal and conglomerate, belonging to the Albion and Coal Brook Members of the Stellarton Group. These are described as follows:

- The Albion Member is the most prolific of the coal-bearing sequences in the sedimentary basin with more than twenty coal seams of varying thicknesses recorded. The Albion Member extends from the base of the Academy Seam to the top of the Foord Seam. The mining block of the proposed surface mine operations constitutes part of the Albion Member. The coal seams that are in the proposed mining area, namely: the Foord, Cage, Third, Flemming/MacGregor, and New Seams.

- The Coal Brook Member overlies the Albion and contains only a few coal seams, most notably the McLeod Seam, which is up to 2m thick, and several thin, discontinuous seams. The upper limit of this member is defined as the base of the McBean Seam in the overlying Thorburn Member.

4.6.3 Coal Resources

The nature of the coal resources were defined in the 1995 EAR from data gathered by diamond drilling and trench sampling. This information is also augmented by operating experience on the existing site west of MacGregor Avenue. Coal resource qualities are expected to be fairly consistent along the seams as the coal mining progresses.

4.6.3.1. Description

A total of approximately 1.1 million tonnes of available coal has been determined to exist on the east side of MacGregor Avenue. This resource will be recovered over approximately five years. The coal resources available to the project are summarized in the following table.

Table 4-7: Available Coal Resource Estimates

Location	Coal (tonnes)	Method
Foord Seam	700,000	conventional methods
Cage Seam	150,000	conventional methods
Third Seam	50,000	conventional methods
Flemming/MacGregor Seam	100,000	conventional methods
New Seam	30,000	conventional methods
	70,000	highwall miner
TOTAL	**1,100,000**	

A brief description of each seam is as follows. The descriptions are approximate averages based on selective mining of the seams west of MacGregor Avenue. The coal seam locations and proposed area of mining is shown on Figures 2-3 and 3-1, respectively.

Foord Seam

The Foord Seam is comprised of two layers separated by up to 1.8 m of mudstone. The upper layer is approximately 4.3 m thick and the lower one 6.4 m.

Cage Seam

The Cage Seam is an average of 5.3 m in thickness and lies approximately 50 m below the Foord Seam. The Cage Seam has been extensively mined within the proposed area. It is the only seam in the area with a potential for acid generation; however, this has been assessed as only a very low potential. The seam deteriorates to the northwest and southeast from the center of Albion area.

Third Seam

The Third Seam lies approximately 30 m below the Cage seam and is approximately 3.3 m in thickness. It has been primarily worked by the Albion Mine. It deteriorates to the northwest and southeast.

Flemming / MacGregor Seam

These seams are separated by an average of 1.5m of strata and are occasionally grouped together as one seam. Flemming Seam averages 1.5m thick. Mining has not been extensive on Flemming Seam as MacGregor Seam has been generally extracted first.

MacGregor Seam varies from 2.4 to 3.0m thick. Its quality rapidly decreased 400m southeast of MacGregor Mine.

New Seam

This seam is the lowest member of the Albion series that has sustained mining operations. The typical thickness is 1.5m. It was historically mined in Acadia No. 1 (just east of MacGregor Avenue) and in MacGregor Mine.

4.6.3.2. Structure

The structure experienced in the existing site on the west side of MacGregor Avenue has been consistent with the drill hole interpretations and mining predictions that were stated in the 1995 EAR. The coal seams strike east-west and dip to the north at dips ranging up to –28 degrees. There have been no major structural variations locally within the pits,

nor any structural features that precluded or caused difficulty with any of the mining activities.

The structure on the east side of MacGregor Avenue is quite simple, as can be seen by reviewing the mine workings maps from previous historical mining activities. The seams strike generally east-west and dip to the north at dips of –22 to –24 degrees. The sub-crops of the coal seams of interest on the east side of MacGregor Avenue have been identified by a series of short air percussion drill holes that were drilled in the spring of 2002.

On the east side of MacGregor Avenue, mining activities were conducted from underground mines in a similar fashion, using similar methods and equipment for extraction as those encountered on the west side of MacGregor Avenue. These methods are also consistent with the mine workings experienced during surface mining operations by Pioneer Coal in the Westville area. Daily operations, mining activities and procedures are well suited for the conditions that exist on the east side of MacGregor Avenue.

4.6.3.3. Burnability of Coal Resource

At the time that the 1995 EAR was submitted, there was no specific burn test data for coal products from the previous pit on the site. Pioneer Coal has been shipping coal from west of MacGregor Avenue to the NSP generating plant in Trenton for the past eight years. Blending at the Stellarton Mine has been conducted using both on-site resources and coal from various other pits operated under the management of Nova Construction Company Limited. These blending operations have enabled Pioneer Coal to not only utilize resources from the Stellarton site that would not otherwise have been of a burnable quality for NSP, but also coal resources from other coal seams within the Province of Nova Scotia.

Coal resources from highwall mining activities in Coalburn would not be viable without the blending capabilities created at the Stellarton site. Surface mining operations on the east side of MacGregor Avenue will provide blendable coal resources that will allow continued utilization of other coal seams within the immediate area and elsewhere within the Province. This will also ensure that the unique highwall mining methods that were developed by Nova Construction for steeply dipping coal seams, continues to be improved upon and utilized to its full extent. These types of mining initiatives are a fine example of ideas and philosophy the Provincial Energy Strategy is targeting towards maximum utilization of indigenous natural resources.

4.6.3.4. Ash Content of Coal Resources

The initial mining that took place by Pioneer Coal on the western end of the site was troublesome from an operational prospective in that extensive selective mining was required to separate out the various qualities layered within an individual coal seam. Low ash, high ash and waste rock had to be separated on the spot in order to produce a

consistent product for blending purposes. The company's equipment operators have become experts at separating seam quality plies right in the pit during mining operations. The question of ash in the seam and inseam dilution due to mining operations is no longer just a concept, it is a daily activity at the site.

Coal seam ash and final blended product ash is determined on a continual on-going basis. It is a fundamental key for maximization of the coal resources. Pioneer Coal has demonstrated their ability to efficiently manage and control the ash characteristics that have been experienced in the coal seams of the Stellarton Pit Mine. Separation mining and blending operations have been utilized to their fullest in order to maximize coal recovery.

4.6.3.5. Acid Production / Consumption

Periodic testing of representative rock units at the Stellarton Pit Mine on an on going basis has confirmed that for the most part the units are largely acid consuming. The exception is, in some instances, rock units in close contact with the Cage Seam coal.

Mining operations have taken place in the Cage Seam for the past two years with no measurable acid generation having taken place. This is most likely due to the large volume of exposed acid consuming rock compared to the relatively small volume of acid producing rock throughout the pit, as well as the mixing and dilution by waters from sources other than the Cage Seam prior to any pumping to the settling ponds. Acid producing volume is less than 1% of the total volume which is acid consuming.

Continued evaluation and monitoring will ensure that any changes to the present situation will be quickly identified, however, experience to date with over two years of daily production from the Cage Seam indicates that there will not be any acid mine drainage problems associated with this operation.

Since the rock units associated with and overlying the coal seams are essentially the same on either side of MacGregor Avenue, conditions relating to the potential for acid production/acid consumption will be consistent for both areas. Actual mining experience and operational data for this area is available to make the assertion that acid production and acid mine drainage will not occur as a result of mining operations proceeding to the east side of MacGregor Avenue (refer to surface water monitoring data in Appendix C).

Acid producing / consuming test results are included in Appendix K.

4.6.3.6. Spontaneous Combustion

Due to an incident in 1964 with reported fire which was potentially a result of subsidence in the Cage Seam, there is an awareness of the potential of spontaneous combustion. In December 1964, several cave-ins on the Cage Seam allowed oxygen to flow through the

abandoned workings. Coal combustion was assumed to result from the oxygen inflow; however, other potential causes exist. The fires were contained by backfilling the openings with clay material, thereby removing the oxygen supply from the fires.

Another incident was outlined in the 1995 EAR, in which a sinkhole in the Cage Seam developed in 1989 near the site of the combustion in 1964. The site was backfilled within three days of its discovery; however, prior to its being sealed, smoke was observed, but no flames were reported.

Other sinkholes in the Cage Seam have occurred without any indication of coal combustion taking place. No reasons for concern have occurred as part of eight years of operations on the west side of MacGregor Avenue.

In order to objectively assess the potential for spontaneous combustion, the oxygen uptake and self heating ability in the presence of moist oxygen were assessed by an independent laboratory (i.e., Hazen Research Inc.). This testing and analysis was completed in 2000.

The letter report is contained in Appendix K. Its conclusion states that the coal sample did not evolve gases during oxygen uptake tests and the sample demonstrated slow oxygen absorption. The self-heating tests showed that the sample had very little tendency to self heat.

4.7 Socio-Economic Environment

The proposed site of the surface mine operation is situated in the northwestern corner of the Town of Stellarton. The site is proximate to residential and industrial areas.

The history of coal mining in Pictou County is well documented and forms an integral part of this area's heritage. Coal was first mined in Stellarton as early as 1792. The Foord Seam was first worked in the 1830s. It is very common for people in the area to readily identify themselves as part of a mining community.

The following nine sub-sections present the existing socio-economic environment of the area, specifically as it relates to the proposed surface coal mine extension. Topics include: population, economy, land uses, archaeological resources, First Nations, transportation and community resources.

4.7.1 Population

The data in this sub-section is a summary of information gathered for the 1995 EAR. This general information is suitable for the purposes of presenting a general overview of population in the region.

Pictou County has a population of 50,000 of which over 5,000 reside in the Town of Stellarton. The labour force totals 21,000. The unemployment rate is relatively high at approximately 15 percent.

The labour force is broken down into industry divisions with community, business and personal services and manufacturing approximately equal with about one quarter of the workforce each. Just slightly less with approximately one fifth of the workforce is the general trades. The remaining third of the workforce is involved in primary services, construction, public administration and finance.

4.7.2 Economy

Based on stated coal reserves, it is anticipated that the proposed Stellarton mine extension will operate for approximately six years. The development and operation of the mine will generate both direct and indirect economic benefits in the local communities.

Indirect employment would be created in the local community and Nova Scotia by the purchase of goods and services required for the development and operation of the surface mine. These services would include such items as:

- Supplies and fuel oil;
- Purchase of goods;
- Equipment maintenance services;
- Equipment purchases;
- Equipment rental;
- Professional services; and
- Haulage operation.

Conventional surface mining operations (coal extraction and reclamation) will proceed 24 hours per day throughout the year. Typically, operations will run five days a week; however, occasional work on the weekend may occur because of production requirements.

It is anticipated the mine would employ approximately 40 to 50 people which is generally comparable to operations on the west side of MacGregor Avenue.

4.7.3 Land Uses

The following sub-sections outline historical land use of the site and immediate area and the existing land uses of the site and immediate area. The issue of subsidence is also addressed throughout this sub-section.

4.7.3.1. Historical Land Uses

Organized mining in the Pictou Coalfield began in 1827 when the General Mining Association started operations on the Foord Seam. From that time until 1984, eleven seams were mined extensively by underground mining methods. It is indicated that over 57 million tonnes of coal have been mined from the Pictou Coalfield. Figure 4-1 indicates the location of historical underground mine workings in the Pictou Coalfield in the area of the Stellarton mine. Five known sets of workings were located in the area of the site.

Surface facilities existed as part of these operations. Some of these included wash plant, hoist house, administration buildings, settling pond and waste rock piles. These areas drained directly into Coal Brook above Foster Avenue. Figure 4-2 is an aerial photograph from the 1950s demonstrating the coal mine facilities on the site.

The associated waste dumps were located between the proposed extension site and the TransCanada Highway. The coal in these dumps was recovered between 1972 and 1978, after which grading and reclamation was carried out. Resulting waste from coal dump reclamation was placed north of Foster Avenue.

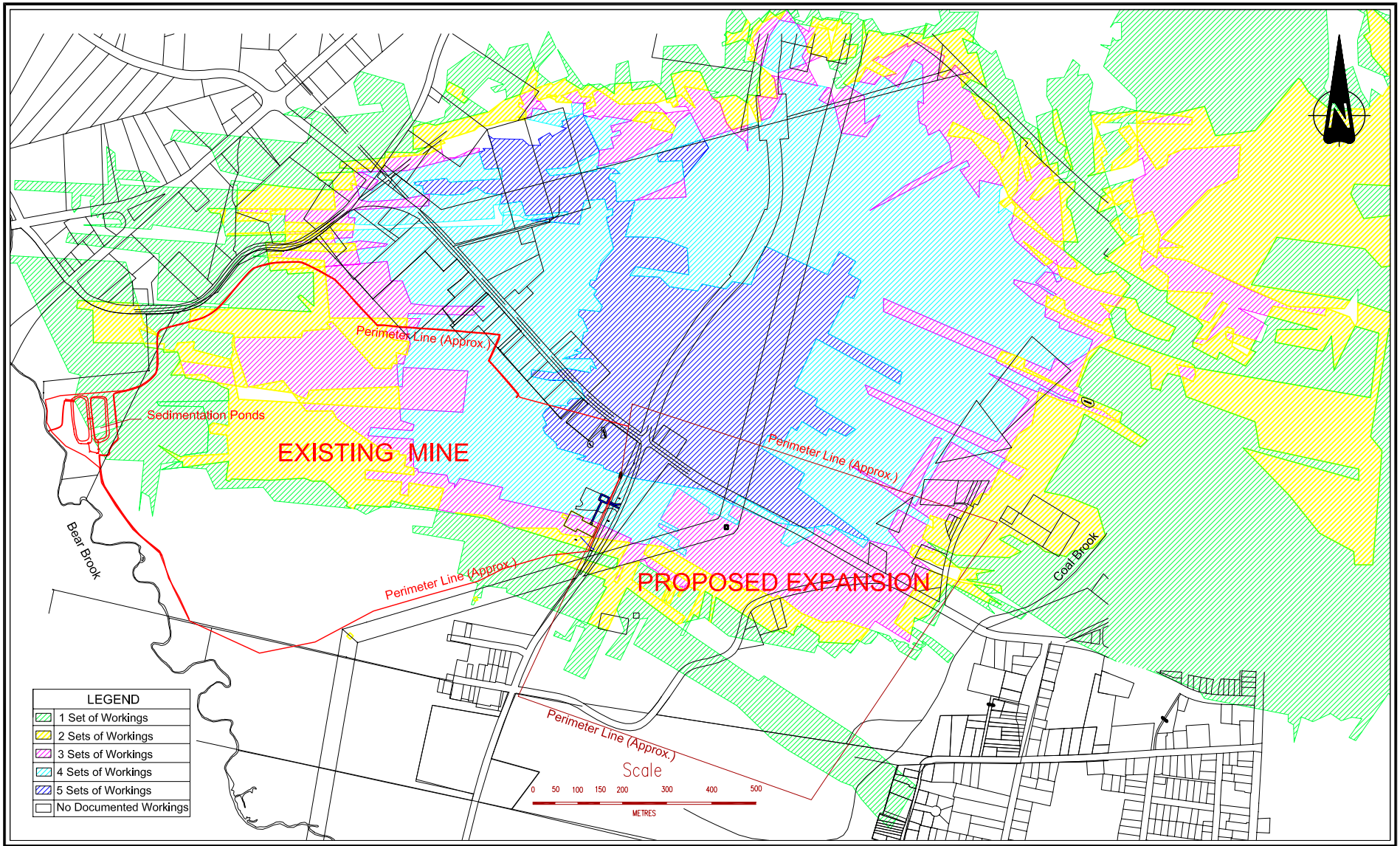
In addition, there was historical unauthorized (i.e., bootleg) mining in the area due to the proximity of coal to the surface. This outcropping of coal often directed the location of residential areas.

4.7.3.2. Existing Land Uses

Land use within the proposed mining block is restricted to resource development based on M2 (Provincial Resource) zoning. The Municipal Planning Strategy of the Town of Stellarton and the plan for future land use indicate that a number of areas close to the mine which are zoned as R1 or R2 (Residential – single family and attached residences) are intended to be rezoned for resource development. Refer to a land use plan (Figure 4-3) from the Town of Stellarton showing municipal zoning.

The site is bounded by general industry (M1) which is the Stellarton Industrial Park and residential (R1 and R2). Some recreational lands are in the general area of the site. The commercial area of Stellarton (i.e., downtown) is located east of the proposed development at a distance of more than 1km.

Some of the site is in a meadow and forested state, dissected by numerous old roads and scattered settlements with widespread evidence of previous mining operations. This area is locally regarded as being very hazardous due to unmarked pits and shafts. It is therefore currently of no value for residential development or recreational purposes.



CADFILE No. 20841AF4-1.dwg

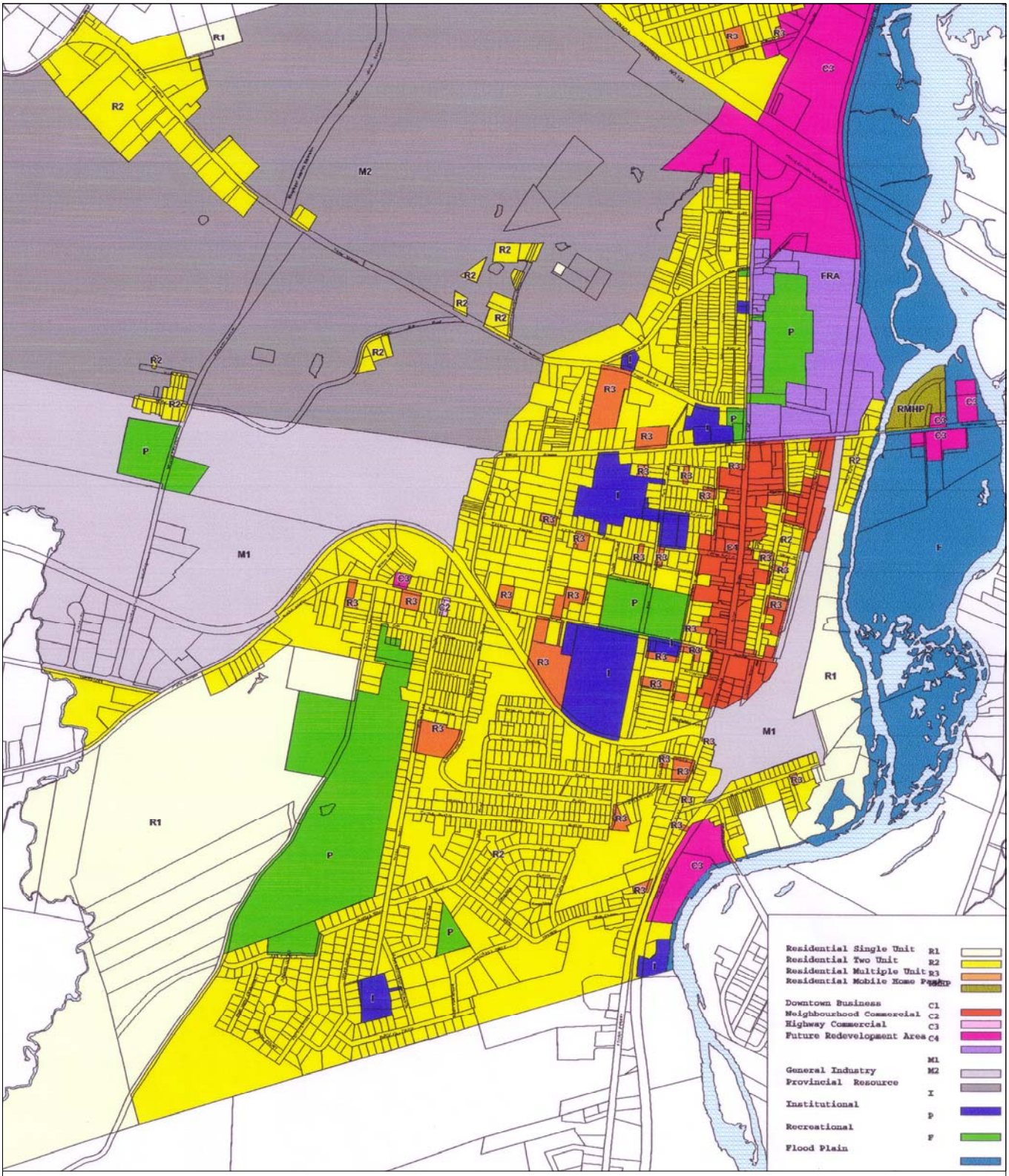
PIONEER COAL LIMITED

TITLE: **Areas of Historic Mining Underground Workings**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: 1:12,500	FIGURE NO.: **4-1**
		DRAWN: JDA	

CADFILE No. 20841AF4-2.dwg

PIONEER COAL LIMITED

TITLE: **Area of MacGregor Mining Activity in the 1950's**		DATE: January 2004	PROJECT NO.: 20841A
PROJECT: **Stellarton Pit Mine Extension** **Pioneer Coal Limited** **Stellarton, Nova Scotia**		SCALE: N.T.S	FIGURE NO.: **4-2**
		DRAWN: JDA	



Source: Town of Stellarton

CADFILE No. 20841AF4-3.dwg

PIONEER COAL LIMITED

TITLE: **Existing Land Use Types**	DATE: January 2004	PROJECT NO.: 20841A	
PROJECT: **Stellarton Pit Mine Extension Pioneer Coal Limited Stellarton, Nova Scotia**	SCALE: N.T.S	FIGURE NO.: **4-3**	
	DRAWN: JDA		

Long term planning for the area is currently being completed by the Pictou County District Planning Commission (PCDPC) in consultation with many stakeholders (e.g., NSDNR and the Town of Stellarton are key players with respect to future development of the project site). The PCDPC has only recently presented its plans for commercial, residential and recreational areas within Stellarton. The future land use for the project site is residential development and a recreational corridor.

The area west of MacGregor Avenue is an active site. This area will be rough graded within the next two years. Hazards associated with past mining activities will be eliminated. Lands here will become available to the owner for future land use planning.

The area east of MacGregor Avenue is unchanged. Hazards associated with this location remain. As recently as December 2002, the effects of past underground mining activities became apparent. A vertical shaft extending approximately 85m to the Foord Seam was exposed at the surface. Although located on Crown land, it was obviously lands utilized and maintained regularly by the adjacent landowners. Sinkholes are apparent throughout the area east of MacGregor Avenue. They are always a concern but demand more attention when they appear adjacent a family dwelling. Photos of the existing condition are included in Appendix D. Subsidence is discussed in the following sub-section.

4.7.3.3. Subsidence

There are generally three predominant types of subsidence observed in the Pictou Coalfield. These are: trough shaped depressions that cover a generally large surface area as a result of a collapse of underground workings or pillar failure in a large mined-out area; localized sinkholes resulting from the collapse of rock overlying an underground excavation in the coal seam; and shaft collapse is a result of failure of the shaft covering.

Of 29 subsidence occurrences recorded by the NSDNR in the Pictou Coalfield, 14 were in either the Foord or Cage Seams, near or adjacent to the proposed project site. These were all localized events, being either a sinkhole or a shaft collapse, and generally appeared suddenly.

NSDNR have indicated that the majority of subsidence events have taken place where the depth to mine workings is less than 60m. Based on the history of mining and subsidence events, the NSDNR has developed zones of probable subsidence, defined as areas of previous mining activity located within 50m of the surface.

4.7.4 Archaeological Resources

The cultural resource assessment of the area was completed as part of preparation of the 1995 EAR. The assessment included a background historical document survey combined with informant interviews and an archaeological field reconnaissance of the study area. This involved experienced archaeologists traversing the study area locating and recording

archaeological resources (i.e., foundations and historic dumps). The field data was checked against that collected by the project historian.

The results of the background search, seven possible heritage locations within or in close proximity to this area indicated. They included Dalhousie Pits, Roy's Slope, East Slope, Albion Mine, MacGregor Mine, Acadia No. 1 and Purvis Seam workings.

The area is covered by extensive evidence from past mining activities as well as modern cultural events. Although extensive in number, the primary issue remains as to their significance as heritage resources. What was viewed consisted of a variety of concrete slabs, foundations, abandoned railway beds, roads, spoil heaps and pits related to coal seam testing or bootleg mines. The modern events consisted of use of the area for disposal of large household objects (i.e., furniture, appliances and abandoned automobiles).

The reconnaissance team checked each of the features, noting in particular, the quality of the concrete. It is estimated that, with one exception, the features are all twentieth century. The exception was a small remnant of a cust stone wall in the area of Acadia No. 2 portal which was most likely a late-nineteenth century feature. However, the area around the wall contained very little rubble suggesting that most of this structure had been removed at some time in the past.

The NSM's screening in Autumn 2003 for cultural heritage sites located two within the broad study area. They are the Albion Iron Foundry and the Stellarton Pump House. Both are located near the Museum of Industry (approximately 3km to the site) and will not be impacted by the proposed site development.

The archaeological investigation of the Stellarton Pit Mine project area did not reveal any cultural resources that are considered to be significant.

4.7.5 First Nations

The proposed undertaking was reviewed by CMM in order to rule out potential impacts to First Nations heritage. Based on this review, CMM feels that the project does not require further assessment to determine Mi'kmaq interests due to the fact that most, if not all of the site, has been extensively disturbed in the past.

Refer to Appendix J for a letter from CMM outlining their conclusions.

4.7.6 Transportation

This sub-section documents the existing conditions of the proposed routes including physical attributes, traffic and pedestrian conditions and any safety related issues. The existing truck route is shown in Figure 3-8.

Routes along existing roads have been identified for the trucking operations from the mine to the Trenton plant. The condition review was conducted on a section by section basis as part of preparing the 1995 EAR. In general, each road section was found to have rutting, settlement, and cracking. Based on a preliminary review, the general roads assessment has not varied widely since this time.

An assessment of traffic volumes was completed as part of the 1995 EAR (refer to pp. 113 to 114). Truck traffic volume along MacGregor Avenue (both directions) was found to be approximately 1250 trucks per year (or an average of three trucks per day). Traffic and pedestrian counts were also taken in April 1995 at the intersection of MacGregor Avenue and Foster Avenue. During a 4 and one half hour period (11:30 a.m. to 4:00 p.m.), a total of 1061 vehicles and nine pedestrians were counted. Most of the traffic volume (approx. 70%) was traveling in an east-west direction along Foster Avenue. Approximately 65% of vehicular traffic was automobiles and the remaining were trucks. Of the nine pedestrians encountered, all were adults.

It was concluded that the daily traffic and pedestrian volumes are sufficiently low that no peak hour capacity problems would be anticipated. No increase is existing truck traffic due to proposed extension is expected.

4.7.7 Community Resources

The mine property rests at the western end of the Town of Stellarton. The landform rises from the East River which passes through Stellarton at approximately 4km to the east. This localized topographic high area reaches an elevation of approximate 75 to 80m (Geodetic). Beyond the mine property (to the west) the surface topography drops off to a level plain near the border with the Town of Westville.

Regionally, the property rises within a valley with higher ground to south, southeast and northeast. The knoll on which the property is located is only locally visible. The regional value is with respect to fisheries and downgradient water quality. This is a significant community resource.

During the early stages of coal mining in Stellarton, there was significant development in the Foster Avenue/MacGregor Avenue area. With the closure of the underground mine, there was a decline in residential and industrial activity. The proposed mine extension site was mostly overgrown with vegetation including wild grasses, alders and hardwood

stands. Today most of the visual access to the site is blocked by free growth. Stockpiles on the existing site can be viewed from immediate roadways only.

Despite the concerns of subsidence, some local residents have indicated that the site has been used by some as a recreational area for walking and berry picking. There is also evidence of four-wheel drive vehicle activity throughout the site. It is noted that there are other areas of land owned by the Town and Province in the local area that are deemed recreational areas.

5.0 CONSULTATION PROGRAM

Pioneer Coal believes that most community members are familiar with the original call for proposals and submissions for the Stellarton Pit. Both of these included the area east of MacGregor Avenue. The property owners in the immediate vicinity across MacGregor Avenue are aware of Pioneer Coal's plans through negotiations to acquire the properties and informal consultation with Pioneer Coal staff and representatives.

This section outlines the formal public consultation program completed as part of finalizing plans to expand mining operations to the east side of MacGregor Avenue.

5.1 Objectives

The objective of completing a formal public consultation program is to solicit and use public input in the design of a proposed undertaking. Although no formal public consultation is required for a Class I undertaking (other than Notice of Registration – refer to sub-section 5.2.6), the proponent felt it important to consider public input in the preparation of this ERD. The design of the undertaking has considered input received from the various types on informal and formal public consultation described in this Section.

5.2 Components

There were six components of the consultation program for the project. These included public information sessions, the CLC, First Nations assessment, elected officials consultation, consultation with regulatory agencies and Notice of Registration. These components are outlined in the following sub-sections.

5.2.1 Public Information Sessions

The details of the Public Information Sessions are described below, along with information on ways in which the information has been used by the proponent in the design of this undertaking.

The public information sessions were held in the Feature Gallery of the Museum of Industry in Stellarton. This site is well known, relatively close to the proposed site and centrally located. There is sufficient parking and the room has sufficient floor space (approximately 2500 sq. ft.). The public information sessions were held over two days and included afternoon and evening times to allow varied attendance. The exact times were 4pm to 9pm, December 11, 2003, and noon to 9pm, December 12, 2003.

The public information sessions were advertised in the The Evening News, a local daily newspaper, on December 8th through to December 12th, 2003. In addition, invitations were hand delivered to nearby residents and invitations were extended via fax, telephone

calls or personal invitations to elected officials from Stellarton and to local and central office staff representatives of NSDNR and NSDEL.

The format of the public information sessions was chosen to facilitate personal contact between the proponent and members of the public. A series of information panels were created to outline the undertaking with topics of project, process, land use, environmental issues and transportation. Additional information items included a video of operations at the existing facility west of MacGregor Avenue and reclamation activities at the Coalburn and Thorburn sites, a Power Point™ presentation of the NOVAMINER 2000, and a representative sample of coal from the Stellarton operation.

Input was sought and recorded during the sessions to be used in the project design. Participants were able to fill out comment sheets and send them back to Pioneer Coal after the sessions as well, a total of 4 comment sheets were received. A total of 72 participants were recorded in the Guest Book, which was manned at the entrance to the sessions. Of the 72 participants approximately 45 were residents from local communities, 7 were elected officials and the remainder from a variety of regional and provincial public service organizations. The population of Pictou County is roughly 50,000 with approximately 60% within the Stellarton- New Glasgow- Westville area. Issues recorded by the staff facilitating the sessions are outlined below along with the number of concerns noted in these specific areas:

A. Dust Concerns – 7 noted
B. Property Value Concerns – 7 noted
C. Reclamation Plans – 9 noted
D. Employment – 4 noted
E. Mining Techniques – 4 noted
F. Road Detour Plans – 4 noted
G. Noise Concerns – 5 noted
H. CLC – 5 noted on the need for continuation, 3 noted relative to need for change in representation
I. Domestic Wells – 2 noted
J. Fund for Subsidence Damage – 1 noted
K. Compensation to Town (Stellarton) and affected citizens– 1 noted

All of the above noted concerns were considered in the design of this undertaking. The proponent feels that Concerns A. to I. have been properly addressed by the mine design, CLC commitments monitoring and mitigation plans put forward. Concern J relates to a suggestion that a fund be set-up by the proponent for potential future damage caused to homes built near or at the site. The proponent does not feel this is appropriate as they are assisting in stabilizing the area for future use by completing the mining and are completing reclamation of the land as per the instructions of the landowner (i.e. the Province). Concern K relates to a suggestion that the proponent pay the Town of Stellarton and affected citizens compensation. The proponent does not feel this is appropriate as the project has considerable social (safety), environmental (reclaimed lands) and economic benefits that outweigh the negative effects. See Section 8 for additional evaluation of impacts (positive and negative).

5.2.2 Community Liaison Committee

The Community Liaison Committee (CLC) was established at the commencement of operations in 1996. The COA (Condition 1.0) state the minimum terms to be applied to the CLC. As well, the Industrial Approval addresses the issues of dispute resolution (Section 12) and public consultation (Section 13). Approvals can be found in Appendix B. The CLC is based upon NSDEL's "Guidelines for the Formation of Community Liaison Committees".

The CLC has been an integral part of the operations west of MacGregor Avenue since 1996 by serving as a conduit for information on the project to flow to local residents and for concerns from the residents to flow to Pioneer Coal. The CLC has enabled a number of community issues to be effectively dealt with by Pioneer Coal including but not limited to noise issues, dust issues, and visibility issues. The CLC is strongly in favour of continuing the operations east of MacGregor Avenue and have expressed this in written form as recently as 2003, (see Appendix B). The proponent recognizes the value in having an effective CLC. The proponent feels that revised representation may be appropriate considering a shift in the operations to areas of the community not previously as close to the operations. Upon approval, the proponent would discuss a revision in representation with the CLC and may be further directed by the Environmental Assessment COA for the new operation with respect to representation.

5.2.3 First Nations Assessment

The Confederacy of Mainland Mi'Kmaq (CMM) was contacted to determine Mi'kmaq stakeholder interests in the proposed undertaking. CMM felt that First Nations interest in the operation and the lands included in the operation did not have the potential to host or affect First Nations resources (eg. artifacts, healing plants, fish/game harvesting). Refer to sub-section 4.7.5 and Appendix J for additional detail.

5.2.4 Elected Official Consultation

The local MLA has been provided details of the operations on the west side of MacGregor Avenue since inception and is fully aware of the plans, schedule and overall approach for extension of operations east of MacGregor Avenue.

Meetings were held with Town of Stellarton officials to keep them informed of our mining plans and to work towards a mutually beneficial relationship, both as the mine site presently exists and for east of MacGregor Avenue.

5.2.5 Regulatory Agency Consultation

Discussions with the various regulatory agencies have been held since project inception in 1995. Specific meetings associated with the east side operations have been held including meetings with the Environmental Assessment Branch and the Regional Office of NSDEL, and the mining and resource management divisions of NSDNR. Issues raised at all of these meetings have been carefully recorded and used in the design of the current undertaking.

5.2.6 Notice of Registration

A Notice of Registration will be placed in two newspapers (The Evening News and the Chronicle-Herald) in accordance with the *Environmental Assessment Regulations*. The registration notice will also be posted on the NSDEL website (www.gov.ns.ca/enla/ess/ea) and available for viewing at that location as well. The Environmental Registration Document will be available for the general public to review and provide comment at several locations in the project area. The locations will be provided in the notice, as well as instructions on ways in which to get comments to the Environmental Assessment Branch and the review timeframe.

6.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

This section of the report provides a review of potential environmental effects and proposed mitigation that will result in a project that will have the minimal possible impact on the environment. The VESCs are outlined in the first sub-section. The following three sub-sections outline potential effects and proposed mitigations in the categories of aquatic, terrestrial and socio-economic. The majority of these mitigation measures are integrated features of the project design and have been described in other sections of the report, and particularly in Sections 2.0 and 3.0.

6.1 Valued Ecological and Socio-economic Components (VESCs)

Given the description of the project proposed in Section 3.0, the biophysical and socio-economic environment presented in Section 4.0 and the results of the consultation program as outlined in Section 5.0, a prediction of possible impacts on the VESCs can be made.

The table shown on the next page, Table 6-1 Potential Impacts on VESCs Matrix, presents the potential impacts as interactions between the project activities and the VESCs. The ecological and socio-economic components are listed on the left side of the table and the major project components (as divided by site preparation, maintenance and operation and decommissioning and reclamation) are listed at the top of the table. Impacts are scored as positive (+), negative (-), and unknown effect (o), whereas the score is left blank where no effect is expected.

The remainder of this section describes the potential impacts and proposed mitigation measures for the VESCs. The proposed follow up and monitoring is presented in Section 7.0.

6.2 Aquatic

The potential effects of the undertaking and the proposed mitigative measures for aquatic resources are outlined in this sub-section.

6.2.1 Potential Effects

Of the aquatic resources, potential impacts (both positive and negative) exist for both surface water and fisheries. The sensitive or rare species have some potential for impact (both positive and negative) due to the presence of Atlantic Salmon in the Middle River watershed. Main positive impacts of project activities occur during environmental control measures (e.g., erosion and sedimentation control, wastewater management, etc.), monitoring / follow up and vegetation as part of land reclamation.

Table 6-1: Potential Impacts on VESCs Matrix

	Site Preparation						Operations and Maintenance								Reclamation			
	E&S Control	Clearing /Grubbing	Water Management	Access To Facilities	Road Detour	Stockpiling	Mining Operations	Equipment	Waste Management	Wastewater Management	Coal Processing	Transportation	Monitoring	Security	Backfilling Overburden	Contouring	Vegetation	Follow up
Aquatic																		
Surface water	+	-	+			-	-	-	-	+	-		+		-	-		+
Fisheries	+	-	+			-	-	-	-	+	-		+		-	-	+	+
Sensitive or Rare Species			+			-	-	-	-	+	-		+					+
Terrestrial																		
Flora		-			-		-	-									+	+
Fauna		-			-		-	-									+	+
Wetlands		-															+	
Sensitive or Rare Species																		
Socio-economic																		
Economy	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Air Quality	-	-		-	-	-	-	-	-		-	-	+		-	-	+	
Noise Levels	-	-		-	-	-	-	-	-		-	-	+		-	-		
Cultural Resources																		
First Nations																		
Transportation					-							-						
Community Resources															+	+	+	+
Domestic Wells							-						+		+			
Aesthetics		-				-									+	+	+	
Human Health and Safety					+		-							+	+	+	+	+

Impact to the Coal Brook and East River system is expected to be minimal as only diverted surface water outside of the active mine site will enter the watershed. All other water (i.e., all water that has come into contact with the active mine, including groundwater) will enter the water management and treatment system and discharge into Bear Brook.

Ongoing long term monitoring of surface water chemistry and fish habitat and benthic organisms in Bear Brook / Middle River (as located in Appendix C and Appendix G) have determined that no significant impact has occurred to the aquatic resources from operation of the surface coal mine at the present site.

6.2.2 Proposed Mitigation

The following sub-sections present the proposed mitigative measures to protect aquatic resources. These are comparable to the mitigations used as part of existing operations on the west side of MacGregor Avenue.

6.2.2.1. Erosion Control

The drainage control system described in sub-sections 3.4.3 and 3.5.4 will prevent the migration of any impacted runoff from the site.

It is inevitable in a site of this nature, with active waste piles and earth moving activity, that there will be some erosion of exposed surfaces leading to high sediment levels in the runoff before settlement. The operator will make every effort to reduce the area subject to erosion so as to reduce the loadings on the sedimentation ponds, to reduce the frequency at which the ponds have to be cleaned, and to control fugitive dust emissions from exposed surfaces.

Measures that will be applied include the following:

- Design and construct waste piles in lifts maintaining side slopes that will be progressively vegetated;
- Progressive reclamation will occur as part of ongoing operations;
- All areas contoured to their final grade will be fertilized and seeded to promote rapid re-establishment of permanent vegetation;
- Temporarily inactive areas subject to erosion will be stabilized with mulch, or geotextiles as required;
- Surface water will be diverted away from active mining area via existing land contours and constructed berms;
- Sediment traps will be constructed to slow erosional surface flows and reduce the volume of sediment reaching the main treatment ponds;
- Riparian border to Coal Brook of minimum 30m will be maintained;

- All channels for the drainage control system will be made with a view to minimize channel erosion and will require minimum maintenance; and,
- Work will be completed in accordance with legislation and standards, including the Erosion and Sediment Control Handbook for Construction Sites.

6.2.2.2. Surface Water Management

The essential element in mitigating significant impacts to the receiving systems is the surface water management and treatment system described in sub-sections 3.4.3 and 3.5.4, as referenced in the prior sub-section.

All runoff from disturbed areas of the site will flow through the surface water management and treatment system before discharge to Bear Brook. The final treatment consists of two ponds providing for batch treatment using coagulants, if required. Use of coagulant with existing operations has been minimal due to generous sizing of ponds (1 in 25 year design storm). The existing discharge location and structure are used. The use of a primary settling pond on the east side prior to pumping to existing ponds on west side allows for additional settling of sediment.

Water quality monitoring on Bear and Coal Brooks will be maintained in addition to the discharge from the treatment ponds. Ongoing monitoring of surface water chemistry will occur as part of operations. The overall approach to surface water effects monitoring is presented in sub-section 7.5.

The sediment anticipated from the wastewater treatment facilities will be periodically removed from the settling ponds. This material will be disposed of as mine backfill on site.

6.2.2.3. Acid Rock Drainage Control

Periodic testing of representative rock units has confirmed that over 90% of the units are acid consuming. In addition, mining operations have taken place in the Cage Seam for the past two years with no measurable acid generation having taken place. Since the rock units associated with and overlying the coal seams are essentially the same on either side of MacGregor Avenue, the conditions relating to the potential for acid production/acid consumption will be consistent for both areas.

Although acid rock drainage (ARD) is not expected to be a problem at the mine site, continued evaluation and monitoring will ensure that any changes to the present situation will be quickly identified. If mining the Cage Seam results in ARD, lime can be added to the mine sump prior to pumping the water to the settling ponds or at the influent point to the settling ponds. Refer to discussion in sub-section 4.6.3.5 for additional detail.

6.2.2.4. Groundwater Management

As occurred on the existing site to the west of MacGregor Avenue, old mine workings are expected to be encountered on a regular basis. Based on relative depth of mining and level of water in these workings, flooding is not expected from water within the historical mine workings. During operations on the west side of MacGregor Avenue, no underground water was encountered. As the planned depth of mining for the extension is less than the maximum depth of mining on the existing site, no issues are expected with respect to underground water management.

6.2.2.5. Reclamation

Reclamation of previously mined and disturbed areas will involve contouring, replacing of topsoil and revegetation. The ongoing mining operations incorporate progressive reclamation. Final site contouring and vegetation will be completed in accordance with NSDNR. As per the COA (Condition 4.0), a final reclamation plan will be submitted to NSDNR/NSDEL for review and approval six months prior to cessation of mining work. The activities involved in reclamation is outlined in sub-section 3.6.

6.3 Terrestrial

The potential effects of the undertaking and the proposed mitigative measures for terrestrial resources are outlined in this sub-section.

6.3.1 Potential Effects

Of the terrestrial resources, potential impacts (both positive and negative) exist for both flora and fauna but are limited in nature. There is no known impact to rare or sensitive species as there are none known in the vicinity. The negative effects are primarily due to clearing of land and operations (noise and dust). Positive impacts are associated with vegetation and follow up measures as part of land reclamation.

In addition, a small pond is located within the area to be mined as part of the operations east of MacGregor Avenue. This will be negatively impacted most likely in the first year as part of site preparation and initial mining.

6.3.2 Proposed Mitigation

The following presents the proposed mitigative measures to protect terrestrial resources. These are comparable to the mitigations used as part of existing operations on the west side of MacGregor Avenue.

6.3.2.1. Maintain Limit of Work

The extent of proposed area of disturbance (as outlined in Figure 3-2) will be maintained. No disturbance of the land beyond the limits of work will occur. The maintenance of the treed buffer on the eastern perimeter is also important to aquatic and socio-economic resources.

6.3.2.2. Noise/Dust Control

As many noise and dust impacts effect wildlife and humans alike, many of the noise and the dust mitigations are significant in protecting socio-economic components, as well as terrestrial components. These include noise and dust control. The specific mitigations to control noise and dust are outlined in sub-sections 6.4.2.1 and 6.4.2.2.

6.3.2.3. Final Reclamation

The loss of the small pond cannot be mitigated, however, Pioneer Coal will consult with the landowner, NSDNR, and suggest that wetland habitats be part of the final reclamation plan for the site. As Pioneer Coal will be involved in the final reclamation for the current operations, it is possible that NSDNR would consider replacement of the wetland habitat at that location as well. This would be in line with the overall "no net loss" approach generally taken with respect to wetland habitat.

6.4 Socio-economic

The potential effects of the undertaking and the proposed mitigative measures for socio-economic resources are outlined in this sub-section.

6.4.1 Potential Effects

Of the socio-economic resources, potential impacts (both positive and negative) exist for many of the components. The negative effects are primarily due to site activities that increase baseline levels of noise and dust. There are effects to the road network as a result of the detour and ongoing truck usage. Aesthetics may be impacted due to stockpiling of overburden and waste material. The negative effects are temporary. Ongoing monitoring will provide feedback to improve operations, where required, and final reclamation is a positive for many components.

Potential negative effects on community resources of the recreational fishery that is downgradient of the site; however, these mitigations are addressed via aquatic protection measures. Positive effects on community resources is the creation of a safe public space once the site is reclaimed as the site is now a health and safety issue due to subsidence.

Potential negative impacts to human health and safety are due to slope stability and spontaneous combustion concerns.

No effects are expected on cultural resources or First Nations interests based on conclusions as described in sub-sections 4.7.4 and 4.7.5, respectively.

Ongoing long term monitoring of dust, noise and groundwater levels at stations around the site perimeter (as presented in Appendix C) have determined that no significant impact has occurred to baseline levels.

Where occasional exceedances were observed for dust or noise, quick action with process changes rectified the concern. Often baseline monitoring or monitoring during a non-operational period of the mine showed exceedances in dust or noise associated with third party activities.

6.4.2 Proposed Mitigation

The following sub-sections present the proposed mitigative measures to protect socio-economic resources. These are comparable to the mitigations used as part of existing operations on the west side of MacGregor Avenue.

6.4.2.1. Dust Mitigation

The primary air quality impact requiring consideration is the control of fugitive dust from the site and related trucking operations. Dust control requires careful and consistently applied mitigative measures throughout the project, if non-compliant or nuisance levels are to be avoided. The proposed mitigation measures for various process components are outlined below. These are similar to measures outlined in the 1995 EAR and used on the existing site. These have been effective for the past eight years of mine operations.

Mining Operations

The control of fugitive dust from the mining operations must center on provision of moisture control measures, such as spraying with water as required. Operations based in relatively deep pits will not generally have much direct offsite impact but could contribute to general dust levels at critical times if not controlled.

On-site Vehicle Operations

To minimize dust produced by on-site vehicle operations, the following may be used as required:

- Wet suppression controls on unpaved surfaces;
- Hardened surfaces where practical (i.e., existing coal processing area);
- Speed reduction; and,

- Use of large haul vehicles so as to minimize trip frequency.

Waste Rock Conveyor

The use of a belt conveyor to transport the waste rock from the pit to the waste rock pile can provide benefits in the control of dust levels on the site due to the reduction of truck loading and travelling. The conveyor will be used when it is feasible given the logistics of the site. Material on the conveyor can be moistened by the use of sprays so that wind entrainment from the belt will be minimized.

Waste Piles Surface Stabilization

Wind erosion from elevated waste piles containing finely divided material can be a major source of dust at mine sites. Slopes will be stabilized with mulching and or vegetation where appropriate.

Off-Site Transportation

The tractor trailers are fitted with tarp covers to minimize dust emissions and spillage. To eliminate the tracking of site materials on local roads, the truck and trailers will be washed as required. Dust monitoring will be conducted and the results submitted to the regulators as requested (see sub-section 7.5). The proponent may vary the mitigations depending on specifics of the situation so long as the dust levels are in accordance with the Industrial Approval.

6.4.2.2. Noise Mitigation

A number of dwellings in this rural-urban area may be occasionally impacted by sound from the site, as well as by vehicular traffic to and from the site. The proposed mitigation measures are outlined below. These are similar to measures outlined in the 1995 EAR and used on the existing site.

As per regulations, a minimum buffer zone of 30m will be maintained between the farthest extent of the mine operations and any property line (unless written consent of property owner is obtained). The distance to any residences will therefore be considerably more than this. The majority of operations will occur in the pit which will provide excellent noise shielding.

Noise from the equipment and lack of effective mufflers is a source of noise. Regular maintenance of the equipment will reduce noise levels.
This combination of measures will adequately mitigate potential noise impacts. Noise monitoring will be conducted and the results submitted to the regulators as requested. The mitigation procedures may vary as long as noise levels are in accordance with the Industrial Approval.

6.4.2.3. Aesthetics

A vegetation strip of at least 30m of medium growth hardwoods will be maintained to the east of the development to provide a partial visual aesthetic screen. The top of the waste pile will continue to be visible from some vantage points above the tree line to the east during its existence. The slopes will be vegetated and will not be more obtrusive than the existing pile on the site for most receptors (e.g., to the south, north and traveling on roads adjacent to the site). As per existing operations, the mine itself is only visible from adjacent areas.

The progressive reclamation of the site will involve removal of the materials progressively into the depleted pit areas with contouring of the surface and planting of surface cover. This will allow a reduced height in the stockpile as compared to existing. Refer to sub-section 3.5.3 for a discussion on expected stockpile dimensions.

6.4.2.4. Spontaneous Combustion

Spontaneous combustion of coal has not been experienced at the Stellarton site as part of surface coal mining operations conducted by Pioneer Coal. Mining operations have been conducted in areas of old mine workings on the Cage Seam for more than two years. A safe work practice for mining in areas of old workings is consistently followed and has been further augmented by the use of experienced equipment operators.

Pioneer Coal has a monitoring program in place to address any initial concerns over spontaneous combustion. A copy of the report entitled “Analysis and Reactivity of the Coal Sample" is attached for review (Appendix K). Testing was performed by Hazen Research, Inc.

6.4.2.5. Methane

Methane rises to the top of old workings and migrates up dip in slanted or inclined openings. Mining operations are taking place on steeply dipping coal seams and any methane that may be present is quite readily dissipated to the atmosphere through any openings and break-ins into the old workings. Further, there is a consistent lack of any source ignition in and around the mining operations in association with these old workings.

The methane level in coal seams is known to increase with depth in seams that contain methane. Surface mining activities are conducted at such a shallow depth comparative to underground mining that methane would not be expected to be a problem even in a virgin coal seam that was being surfaced mined. Given that the old workings are water filled at depths below the current surface mining levels and the extent of past mining activities over extended periods of time, it is hard to perceive that any substantial amount of methane would still be contained within these workings. Normal surface mining

operations and extraction cycles as conducted in conjunction with the safe work practice would allow dissipation of any amounts of residual methane.

A study was completed in 2001 by Vaughan Engineering entitled "Stellarton Methane Determination."

The total methane content of each seam was estimated and recommendations for appropriate procedures were made. It was concluded that low methane emissions can be expected.

6.4.2.6. Coal Dust

Experience to date at the Stellarton Pit has confirmed the idea that any dust in the old workings would likely be caked by moisture and not likely to be dispersed in the air. In fact, there is a marked lack of dust in the old workings that have been exposed over the past two years of surface mining in the Cage and Foord Seams. Mainly, the ribs and roof have been clean and devoid of dust, and the floor mostly has larger/coarser coal pieces and fragments that have spalled from the roof over time. Water has most likely washed through these old workings and cleaned away any mobile dust that may have once existed in these areas.

6.4.2.7. Slope Stabilization

The slope angle of the pit walls is determined based on the stability of the rock mass. A study was completed on the stability of the highwall in 1997 by Dr. Steve Zou. The study assessed the rotational shear and strength failures of the slope and provided recommendations for practice.

Based on experience to date and assessment, a slope of 51 degrees overall is judged to be a stable angle given the strength and structural characteristics of the rock. The design and construction of the waste rock piles will also be properly designed and constructed to ensure stability against slope failures.

6.4.2.8. Domestic Well Monitoring

A pre-activity survey will be completed at the two domestic wells located in the area, dependant permission being granted by the homeowner. This work will consist of static water level measurements, well yield tests and a general chemical analysis with metals (i.e., RCAp-MS).

As part of operations, ongoing monitoring and record keeping will occur for domestic wells, as well as monitoring wells. Effects monitoring for groundwater and reclamation planning are discussed in sub-sections 7.3.1 and 7.5, respectively.

7.0 FOLLOW UP AND MONITORING

By including inspection, maintenance, contingency / emergency planning and reclamation planning into daily operations, the environmental management practices become integral to the mining operations. In addition, incorporating a continual open exchange with stakeholders (including the CLC and regulators) allows concerns to be addressed immediately. The ongoing environmental effects monitoring (dust, noise, surface water, groundwater and aquatic habitat) provides continual feedback to the quality of environmental protection measures to allow changes in process to occur as part of daily operations.

This section outlines the continual monitoring and follow up that is part of Pioneer Coal operations.

7.1 Inspection and Maintenance

All project activities will be monitored continually by the company's supervisory personnel. As well, the ongoing environmental monitoring provides continual feedback on the operations and their impact to the environment. The numerical results of the environmental monitoring (dust, noise, surface water, groundwater and aquatic habitat) are augmented by visual assessment and community liaison. The operation is continually changing as environmental (e.g., weather) and operational conditions vary.

As part of operations, regular inspections of the site are made by Pioneer Coal supervisory personnel. In addition, members of the community (i.e., CLC) and regulators (e.g., NSDEL inspector) are welcome to complete inspections of the site.

It is a dual goal of Pioneer Coal to recover the coal efficiently and minimize negative impact on surrounding environment and community.

7.2 Contingency and Emergency Planning

Pioneer Coal currently has contingency and emergency plans for spills and spontaneous combustion / coal fires. A specific contingency and emergency plan will be completed for the extension, that is specific to operations east of MacGregor Avenue. The plan will define responsive action required, responsibilities, assistance agencies and contacts with names, telephone numbers and addresses. The plan will specifically address all contingency situations at the mine and any accidents involving coal transportation.

In addition, the plan will include emergency response to the site and surrounding properties during the proposed road detours of MacGregor and Foster Avenues to ensure emergency vehicle access at all times.

7.3 Reclamation Planning

While no impacts are expected to groundwater or fish habitat, plans will be in place as a contingency. Final reclamation of the site is part of the scope of work for this project. These items are discussed in the following sub-sections.

7.3.1 Zone of Influence

An estimate of the area of groundwater influence at the site of the proposed extension is based on an analysis of groundwater levels during current operations (1996 to present). The ratio of the area of groundwater influence to the area of excavation at the current site was found to be approximately four to one. This figure is based on an area of excavation which totals approximately 25 hectares and a corresponding area of groundwater influence which was found to be approximately 100 hectares.

Assuming mining to reach depths in the order of 65m below ground surface, and encounter similar geological conditions, the area of groundwater influence is expected to be very similar to that exhibited by current mining operations. If the excavation extent were to cover 50% of proposed 50 hectare expansion (~25 ha), the area of groundwater influence is projected to be approximately 100 ha. Drawdown of the water table within a radius of approximately 250 metres from the excavation would be expected to range from a minimum of 1.5 metres to a maximum of 6 metres, and vary according to pumping rates. Drawdown effects are expected to be limited to a radius of approximately 300 metres from the excavation.

7.3.1.1. Domestic Wells

No significant impact is expected to the domestic wells in the area of the mine; however to monitor this component, monitoring wells will be used to assess impact. In this way, any changes can be observed in sufficient time to provide mitigation to those dependent on groundwater supplies. The domestic wells will also be subject to a well survey prior to operations commencing and have on-going monitoring for water level and chemistry.

In the event of any impact to domestic water wells:

- Provide temporary water supplies to the resident; and,
- Discuss options with owner, including deepen existing well to correct the water quality or shortage problem or drill new well or make alternative arrangements.

If both parties are not in agreement and cannot resolve the dispute, Pioneer Coal would engage the services of an independent arbitrator to resolve the dispute. The arbitrator will be acceptable to both parties and the process binding.

7.3.1.2. Groundwater – Surface Water Interaction

Two potential impacts of groundwater regime changes to surface waters are possible. The first is a reduction in the base flow due to the dewatering of the mining area. In order to monitor the groundwater in the immediate vicinity of the Bear Brook, piezometers are located in the area as per existing operations. If monitoring of the hydraulic heads in these piezometers indicates a decrease in base flow to the stream, then waters from the sedimentation ponds could be released to mitigate this effect.

The second possible impact is a change in the surface water quality due to discharge of groundwater from the dewatering pumps, if required. However, this will not have an adverse impact on the stream because all groundwater pumped from the dewatering system will be released to the sedimentation ponds where the quality and quantity of water released to the surface stream is controlled.

7.3.2 Fish Habitat

The project is not expected to impact on fish habitat in the Bear Brook or Coal Brook systems due to the existing site conditions and treatment system proposed. No specific fish habitat reclamation methods are therefore proposed; however, if reclamation is required, appropriate federal and provincial agencies, as well as local non-governmental organizations, will be consulted in the development and implementation of fish habitat reclamation. Aquatic habitat surveys (fish and benthic organisms) are part of continually evaluating the receiving environment for early sign of impact. This monitoring will be incorporated into the overall EEM program as discussed in sub-section 7.5.

7.3.3 Final Land Reclamation Planning

The final reclamation plan is to be submitted to NSDNR for review at least six months prior to cessation of mining work. The plan will be based upon direction from the land owner, NSDNR. It is expected that NSDNR will keep up ongoing consultations with PCDPC and the Town of Stellarton. Interested residents may contact NSDNR directly to input into final reclamation planning.

7.4 Stakeholder Consultation

This aspect of the operation has and will continue to be of value to the proponent and local communities. See the following for specific information on key areas.

Property Purchase

Pioneer Coal has completed negotiations with several of the local property owners for the purchase of their property and is continuing discussions with the other local property

owners. The status of property purchase (at time of registration) is presented in sub-section 2.5.

Compensation to the Community

With the proposed mitigative measures in place, the project will have very little, if any, long-term negative environmental impacts. The land form of the area will continue to be disrupted during the operation, but will be reclaimed to useable land. This, coupled with the employment and economic benefits which the project will provide to the area, are seen as significant compensation of the project. The project will also allow the NSP Trenton Generating Plant to continue the use of indigenous low sulphur coal, thus reducing its effect on the atmospheric environment.

Community Liaison Committee

Pioneer Coal is committed to the continuation of the CLC as a working mechanism of providing regular information to local residents and obtaining input from them. This process has proven very effective to date. Pioneer Coal will also deal with the Town of Stellarton and other governments on an open and cooperative basis. While Pioneer Coal will use the CLC as the primary vehicle for dealing with concerns of the local residents, it is apparent that local residents also feel quite comfortable contacting the Company directly with requests, suggestions, comments and questions.

7.5 Environmental Effects Monitoring

Pioneer Coal has carried out mining activities in the area west of MacGregor Avenue since 1996. As a part of these operations, Pioneer Coal has monitored the existing environment for the past eight years. All aspects of the monitoring program were developed in conjunction with the NSDEL. Results continue to be submitted at regular intervals to NSDEL.

Based on review of monitoring data, Pioneer Coal believe it reasonable to conclude that the operations have met environmental commitments and no long term impact or trends are noted in the receiving environment.

It is recognized that no projects are carried out without incident. Specific requests or concerns from regulatory agencies have been dealt with immediately at the Stellarton site. Environmental management continues to be a priority, Pioneer Coal strives to resolve matters to the satisfaction of all parties involved.

It is recommended that the existing monitoring program be reviewed in light of an overall EEM program. The objectives of the EEM are to:

- Provide an early warning of changes to the environment;
- Increase the understanding of cause and effect relationships between specific project activities and the receiving environment; and,

- Account for cumulative effects from surrounding environment, as well as project specific impacts.

The proponent will consider the following principles in the development of the EEM program:

- Focus on the VESCs of greatest ecological or social concern and those which are least known or understood;
- Allow the attribution of cause and evaluation of relative effectiveness of mitigative measures in the monitoring program; and,
- Fill data or knowledge gaps where is it required for the development of mitigative or compensatory measures.

The results and interpretations of the EEM program will impact the environmental management of the site and operations such that there is a mechanism of responding to notice of early impact.

The regular assessment of data for trends or cause and effect relationships is key to the EEM program. The data must also be reviewed for any need to change locations of monitoring frequency and variables and to review any impacts identified by the data. This data must be stored for future reference and reported to regulatory agencies as requested. Equipment usage (including its calibration and detection limits) will be documented and follow standard procedure.

The following outlines considerations to the specific components to be monitored as part of the EEM.

- ***Dust:***
  - The emissions of dust from the site are a specific concern to the adjacent residents.
  - The current dust monitoring stations need to be evaluated given extension plans. Additional stations are required east of MacGregor Avenue and north of Foster Avenue and the retirement of some stations west of the site should be assessed and included in the overall EEM (schedule of commissioning and decommissioning stations depending on planned activities on the site – both east and west of MacGregor Avenue).
  - The ongoing monitoring must allow a continual feedback to operations for evaluation of efficiency of mitigations.
  - Year round operations will require specific attention to dust during summer months.

- ***Noise:***
  - As with dust, noise is a concern to adjacent residents.
  - The monitoring stations should be evaluated as locations of mining changes.

- The ongoing monitoring must allow a continual feedback to operations for evaluation of efficiency of mitigations. This includes instantaneous noises as well as average dBA levels.
- Baseline noise must be considered in the evaluation of impacts from the site.

- ***Surface Water:***
  - Maintenance of water quality and quantity in adjacent watercourses is an important component of environmental protection.
  - As proposed outlet location and effluent characteristics in Bear Brook are the same as existing, no substantial changes are expected to monitoring in Bear Brook / Middle River.
  - Although no direct discharge will be directed to Coal Brook, flow and general chemistry with metals should be assessed in Coal Brook.
  - The flow and chemical analysis should be correlated to sedimentation pond outlet discharge (also to be monitored as per existing), as well as operational and environmental conditions.

- ***Aquatic Habitat:***
  - A detailed assessment of fish habitat and benthic organism survey data should be completed to determine if regular surveys are warranted given past eight years of data.
  - A plan should be created to incorporate aquatic habitat surveys based on specific triggers (e.g., trends in water chemistry, etc.).

- ***Groundwater:***
  - The EEM must incorporate mechanisms for assessment of groundwater levels and chemistry. This is key as there are currently two domestic wells in the immediate area.
  - Monitoring of these wells and assessment of current array of monitoring wells is required.
  - To better assess any groundwater impacts from mining activity, the static water levels should be correlated to mining activities.

8.0 ENVIRONMENTAL IMPACT STATEMENT

The potential impacts of the project on the VESCs and the proposed mitigative measures to reduce any significant negative impact are presented in Section 6. The monitoring and follow up measures to verify the efficiency of these mitigations are outlined in Section 7.0. This section discusses the predicted residual impacts of the proposed undertaking. The residual impact statement presents both the positive and negative impacts of the project after mitigative efforts have been taken into account. In addition the proponent's acceptance and signature of this ERD is included in this section.

8.1 Residual Impacts

The following text describes the positive and negative residual impacts, as well as impacts that can be controlled by mitigation:

Positive Residual Impacts

- A highly disturbed unsafe site within the Town of Stellarton boundaries will be progressively returned to a fully reclaimed area;
- Employment of approximately 40 to 50 persons with significant direct and secondary economic benefits during the period of operation; and,
- The NSP Trenton facility will have an indigenous low sulphur coal supply for the period of the project.

Negative Residual Impacts

- Land use in the mine area will continue to be highly disturbed until progressive and final reclamation restores the area;
- Residents living close to the mine may be subject to some disruption from the operation due to somewhat elevated levels of dust, noise and general activity close to the site (although still within regulatory limits);
- Removal of the small (less than 0.25ha) wetland habitat that currently exists on the site (likely from previous mining activities at that site); and,
- There is a possibility of change to hydrogeological conditions in the site area.

Impacts to be Controlled by Mitigation

- Impact of site surface erosion and mine water due to the comprehensive collection and treatment system already in place. No significant impact are expected in the Bear or Coal Brook systems based on existing site operation and monitoring results;
- Noise impact from the mine site will be controlled and monitored such that the regulation levels at the receptive monitoring points will not be exceeded;
- Use of waste rock conveyor, where appropriate, will reduce noise and dust levels relative to the use of trucks alone; and,

- Dust migration off the site will be controlled and monitored such that the regulation levels at the receptive monitoring points will not be exceeded.

It is apparent that the long term effect of the project will be very positive to the environment. The key advantages of mine reclamation are:

- a safe, contoured, fully vegetated site;
- return of property values for the neighbourhood; and,
- socio-economic benefits from employment and economic enhancements in the region.

The following table, Table 8-1 Residual Impact Assessment, presents a qualitative summary for each impacted VESC with the following assessment criteria:

- nature of effect, i.e., positive (+) or negative (-);
- magnitude of effect on background levels, i.e., small, moderate or large;
- reversibility of the effect, i.e., reversible (REV) or irreversible (IRR);
- timing of effect during operations or after reclamation, i.e., short (short) or long (long) term; and,
- aerial extent of the effect, i.e., area of construction (local) or watershed (regional).

Table 8-1: Residual Impact Assessment

	Nature	Magnitude	Reversibility	Timing	Extent
Surface Water	-	Moderate	REV	Short	Regional
Fisheries	-	Small	REV	Short	Regional
Flora	-	Small	REV	Short	Local
Fauna	-	Small	REV	Short	Local
Wetland	-	Small	IRR	Long	Local
Economy	+	Moderate	REV	Short	Regional
Air Quality	-	Moderate	REV	Short	Local
Noise Levels	-	Moderate	REV	Short	Local
Transportation	-	Small	REV	Short	Local
Community Resources	+	Moderate	REV	Long	Local
Aesthetics	-	Moderate	REV	Short	Local
	+	Moderate	REV	Long	Local
Human Health / Safety	-	Small	REV	Short	Local
	+	Large	IRR	Long	Local

It is concluded that the undertaking can be executed without significant long term adverse effects on biophysical and socio-economic resources. It is believed that the residual impacts on the VESCs is overall positive when the economic and safety issues are considered.

8.2 Closing and Signature

This Registration document is prepared to comply with the Environment Act, Chapter 1, Acts of 1994-95. A review of the information indicates that there are no significant adverse environmental or socio-economic effects, which may be caused by the undertaking, or that such effects can be mitigated.

Pioneer Coal requests that the Minister of Environment approve the Undertaking, subject to specified terms and conditions and the other approvals required by statute or regulations.

Pioneer Coal Limited

Per: _____
John W. Chisholm
President & Chief Executive Officer

Dated January 8, 2004