TECHNICAL REPORT

DONKIN COAL PROJECT

CAPE BRETON

NOVA SCOTIA, CANADA

Report Prepared for
Xstrata Coal Donkin Management Limited
and
Erdene Resource Development Corporation
and

Pursuant to a Plan of Arrangement under the provisions of the Canada Business Corporations Act, Erdene's interest in the Donkin Project was acquired by Morien Resources Inc. ("Morien"). At the request of Morien, the author has readdressed and redated this technical report to Morien to facilitate filing on its SEDAR profile. The effective date of June, 2011 to the original technical report entitled, "Technical Report: Donkin Coal Project, Cape Breton, Nova Scotia, Canada," dated June, 2011, remains in effect, and this report does not contain any new information.

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November 2012

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1. Summary

This Technical Report presents the results of the Pre-Feasibility Study on the Donkin Export Coking Coal Project (PFS) and the reserves defined by the PFS prepared by Xstrata Coal Donkin Management (XCDM).

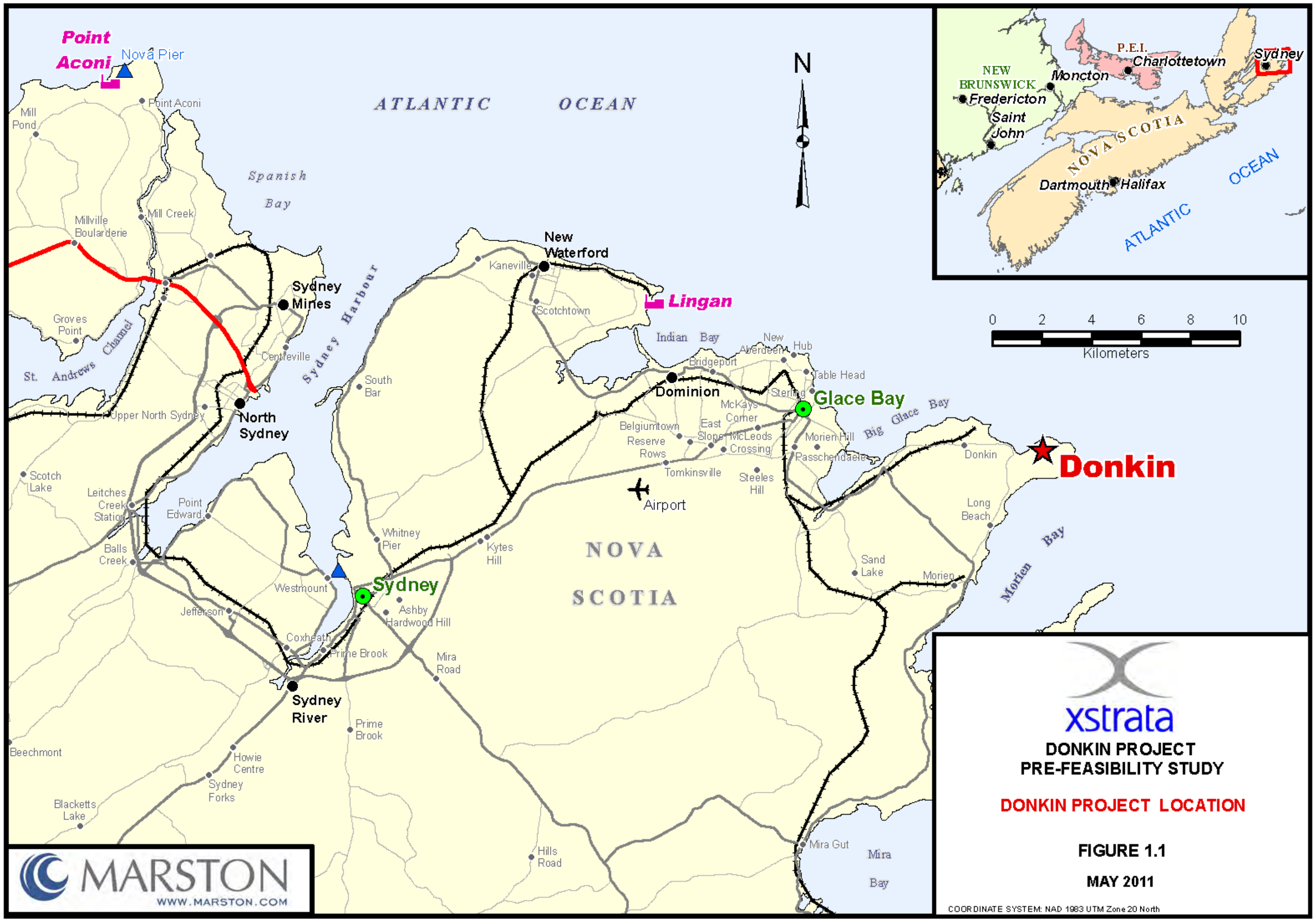
1.1 Location and Ownership - The Donkin Project is located adjacent to the town of Donkin on Cape Breton Island, Nova Scotia, Canada; see Figure 1.1, Donkin Project Location. In December 2005, the Nova Scotia Government announced that the Donkin Coal Alliance (DCA), a consortium of Xstrata Coal Pty Ltd., Kaoclay Resources Inc. (Kaoclay), American Transbridge Technologies LLC and PDC Resources Corporation, was the successful proponent for the exclusive right to explore and to develop the Donkin Resource Block. The DCA was awarded a Special License by the Nova Scotia Provincial Government in May 2006 for a period of three years to conduct exploration activities to determine the viability of developing the Donkin coal lease.

Erdene Resource Development Corporation (Erdene) acquired Kaoclay in June 2006 and Xstrata Coal Pty Ltd.'s interest in the DCA, was transferred to Xstrata Coal Donkin Limited (XCDL). In October 2006 XCDL and Erdene purchased the interests of American Transbridge Technologies LLC and PDC Resources Corporation to hold a 75% and 25% interest in the DCA, respectively. In October 2008 XCDL and Erdene executed a definitive joint venture agreement and a sales agency agreement and formed Donkin Tenements Inc. (DTI), a Nova Scotia company, to hold certain of the interests of the joint venture. XCDM, a related party to XCDL, is the project manager for the joint venture. If the Donkin Coal Project is approved to proceed to development, the project manager will be responsible for mine development, including infrastructure, coal mining and processing, and coal distribution and sales programs.

Pursuant to a Plan of Arrangement under the provisions of the Canada Business Corporations Act, Erdene's interest in the Donkin Project was acquired by Morien Resources Inc. ("Morien"). At the request of Morien, the author has readdressed and redated this technical report to Morien to facilitate filing on its SEDAR profile. The effective date of June, 2011 to the original technical report entitled, "Technical Report: Donkin Coal Project, Cape Breton, Nova Scotia, Canada," dated June, 2011, remains in effect, and this report does not contain any new information.

A 33-year Special Coal Lease No. 09/02 (Donkin Lease) was granted to DTI on May 1, 2009, which may be renewed for a further 20 years provided DTI is working the lease and is in compliance with applicable laws. The Special Coal Lease grants DTI exclusive rights to mine coal within the lease boundary. On January 31, 2007 DTI entered into a 5-year Coal Gas Exploration Agreement (No. 31-07-01-01), which authorized DTI to explore for coal gas in the Donkin Resource Block.

1.2 Geology and Mining - The Donkin Coal Project area occurs within the Sydney Coalfield of Nova Scotia, a large coal basin of Carboniferous age that extends north and northeast from the northern part of Cape Breton Island under the Atlantic Ocean towards Newfoundland. The landward portion of the coalfield constitutes less than 5% of the total coal measure sequence. The first coal mine in North America was located at Cape Breton, and open cut mining and submarine underground mining have been carried out in the area for more than 150 years, until 2001 when the last underground mine (Prince Mine) was closed. Some small open cut mines are still in operation to supply the domestic market. In the past, coal from these mines has supplied local power stations with fuel stock, and a proportion of the product coal was used in a local steel making plant, which has since been dismantled. Some coal, both thermal and coking quality, has been sold into the export market. Up to 11 coal seams are recognized in the Donkin area, and three of those may have potential for eventual underground extraction: Lloyd Cove, Hub and Harbour seams (in descending stratigraphic order). The Harbour and Hub seams have been evaluated as a potential mining opportunity by this PFS.



DONKIN PROJECT
PRE-FEASIBILITY STUDY

DONKIN PROJECT LOCATION

FIGURE 1.1

MAY 2011

COORDINATE SYSTEM: NAD 1983 UTM Zone 20 North

1.3 Exploration - Three major exploration drilling campaigns collected core data from the Donkin area between 1977 and 1979. A two-dimensional marine seismic reflection survey was conducted in 1981. Between December 1981 and February 1987, two parallel tunnels, 50 meters (m) apart, were driven 3,500 m to intersect the Harbour Seam at a depth of 200 m below sea level (BSL). The ocean floor is about 35 m BSL at that point. In 1992 the Cape Breton Development Corporation (CBDC), a Canadian federal crown corporation, ceased development of the Donkin Coal Resource Block without ever extracting the resource, due to a number of factors including a down-turn in the global coal economy. The 3.5-kilometer (km) subsea tunnels were sealed and allowed to fill with water. After receiving the necessary regulatory approvals, XCDM breached the tunnel seals and commenced pumping water from the tunnels in late 2006 in order to reclaim access to the Harbour Seam coal face. This work is complete, and unimpeded access to the Harbour Seam is now possible.

A 3,000-tonne bulk sample and five strip samples (T2, SS1 - SS4) were obtained from the Harbour Seam at the base of the tunnels in 1985. An intensive program of coal analysis and washability was conducted on the bulk sample. The strip samples investigated a variety of potential working sections within the Harbour Seam.

A channel sample was taken from the Miners Museum in Glace Bay in 2006 by XCDM. The Harbour Seam at this location is 1.6-m thick, significantly thinner than the thickness recorded in the east of the Donkin lease. An initial sample was tested in approximately 0.15-m plys for proximate analysis and forms of sulfur at a local Sydney, Nova Scotia laboratory. A bulk sample was taken in larger subsamples and was air-freighted to Australia and analyzed at the CCI Newcastle Laboratory, under the supervision of A&B Mylec Pty Ltd (A&B Mylec). A full range of tests was carried out, including washability analysis and clean coal tests. Additional coal was recovered and sealed in 2 x 44 gallon drums and stored in Sydney pending any further testing requirements.

An additional strip sample (DCH01) was extracted approximately 4 m inby from near the T2 channel sample in October 2007. This sample was analyzed by ACIRL in Maitland, Australia to confirm likely coal quality at the base of the tunnel.

1.4 Development – Other than the dewatering of the two tunnels, the coal extracted from the two tunnels and the initiation of various environmental and permitting studies, no development has taken place.

1.5 Studies - A Technical Report and geological model of the Donkin property were prepared by McElroy Bryan Geological Services (MBGS) for XCDM and Erdene in April 2007. The MBGS Technical Report, filed on May 14, 2007, is available for public viewing on SEDAR under the various documents that have been filed by Erdene. The report is titled, *Technical Report Donkin Coal Project* (April 2007). The geological model from this Technical Report provided grid information on the seam thicknesses, roof and floor elevations, and coal quality parameters of air dried ash, air dried sulfur and relative density for the PFS.

The Donkin Project has been previously reviewed and a Technical Report released by Mr. Donald Fraser (D.M. Fraser Services Inc.) for Kaoclay in April 2006. Material in that report was utilized in the preparation of the MBGS report.

An internal Pre-Feasibility Scoping Study was prepared in May 2007, which evaluated continuous mining development and single longwall extraction of the Harbour Seam. An Independent Preliminary Assessment of the mining opportunities at Donkin was prepared in November 2007. A Pre-Feasibility Study, detailing the mining concepts of the May 2007 study, was prepared in May 2008 by XCDM. The PFS, which expanded on the continuous miner (CM) option of the May 2008 study, was prepared in May 2010. The CM option prepared in May 2010 was modified to incorporate the Hub Seam, was completed March 2011, and is the subject of this Technical Report.

1.6 Conclusions – The following conclusions are based on the PFS and this Technical Report.

- The Donkin Project Harbour Seam can be reasonably accessed through the two existing tunnels once the tunnels are rehabilitated. The Hub Seam can be accessed from two slopes proposed to be driven between the Harbour and Hub seams.
- The room-and-pillar mining method utilizing "place change" CMs is a reasonable and cost effective method of extracting the resource. The mine plan can be easily modified to take advantage of longwall mining if the mining conditions are suitable and the coal market will support the increased production.
- The first 20 years of mining in the room-and-pillar mine plan presented in this Technical Report are located within the Indicated resource boundary of the MBGS Technical Report. The mine plan shows the extension into Inferred resource areas once additional coal thickness, coal quality and geotechnical data are acquired. This additional data can and should be acquired during mining. The project economics are based on probable reserves only.
- Methane management/ventilation will be critical to successfully mining both the Harbour and Hub seams.
- Other than at the base of the two tunnels, additional off-shore drilling exploration data (other than indirect data) will probably not be obtained. The reasons include the high cost of drilling in an ocean environment and any drill hole that penetrates the coal seams sterilizes the resources adjacent to the drill hole and significantly impacts potential mine plans. Based on the mine plan, the mining extractable coal reserves within the Indicated resource are summarized in the following table.

Seam	Indicated Insitu Resource tonne (Mt)	Probable[1] Mineral Reserve tonne (Mt)	Probable[2] Saleable Reserve tonne (Mt)
Hub	**73**	**28**	**23**
Harbour	**101**	**30**	**25**
Total	**174**	**58**	**48**

1 Extracted run-of-mine tonnes

2 Tonnes after coal preparation

- Approximately 75% of the coal is being targeted at the international metallurgical coal market and 25% at the domestic and export thermal coal markets. Metallurgical coal quality advantages include low ash, low phosphorus, and high crucible swell number (CSN) and fluidity. Quality limitations include high sulfur and iron in the ash (from pyrite and contributes to high reactivity). High calorific value and location relative to local markets are the primary thermal coal advantages while sulfur and iron in the ash are the primary disadvantages.
- Hub Seam metallurgical and thermal coal quality data is limited and not considered sufficient for coal quality representation to potential customers.
- Production based on the mine plan is estimated at 3.5 million tonnes per annum (Mtpa) run-of-mine (ROM) and 2.75 Mtpa clean saleable.
- The capital investment for the project ranges from approximately CDN$550M to CDN$497M and includes mine access, mine equipment, coal processing, ancillary facilities, transportation to a port facility, a 20 % contingency factor and CDN$94.211 for a Feasibility Study. The reason for the range in capital is that both rail and marine

transportation options are still being considered although the lower capital investment cost marine option is preferred.

- The regulatory and community environment are supportive of the Donkin Project.
- The economic analysis for the preferred marine option generates a net present value (NPV) of CDN$1,060M at an 8% discount rate and an internal rate of return (IRR) of 36.0%.

1.7 Recommendations – The following recommendations are based on the PFS and this Technical Report.

- XCDM should proceed with the preparation of the Donkin Project Feasibility Study including the exploration phase.
- Customers in the identified market regions should be contacted, provided detailed coal quality specifications for the Harbour Seam and the limited data for the Hub Seam coal, and queried as to reasonable sales volumes.
- Continuation of the work on the plans and licenses necessary to start construction and to operate the mine.
- Implementation of the exploration plan to facilitate data acquisition and analysis.

2.0 Introduction

This Technical Report was prepared for XCDL and Erdene. The purpose of the report is to present the results of the PFS and the reserves defined by the PFS.

The geological data, resource boundaries and resources for the PFS are based on the MBGS Technical Report dated April 2007. The data and grids from the MBGS report were provided by XCDM. The author did not participate in the collection of any exploration data or the preparation of the MBGS Technical Report but reviewed the data and the report in sufficient detail such that it appears the report was prepared in a professional manner and is consistent with the data available, and the output is suitable for mine planning.

The PFS and Technical Report are also based on the May 2008 and May 2010 Pre-Feasibility Studies; *Coal Handling and Preparation Plant Design* by Sedgman, April 2010; *Pillar Panel Ventilation and Gas Management* by Dr. Roy Moreby, April 2010; *Coking Coal Quality* by Bob Leach (Bob Leach) Pty Ltd, January 2010; *The Coal Marketing Report, An Independent Report* prepared by AME Consulting Pty Limited (AME), October 2010; and, *Donkin Mining Project Conceptual Level Transshipment and Marine Options Study* by Ausenco Sandwell, September 2010.

The author visited the site on March 13 and 14, 2008 and again during the period of July 29 through August 2, 2008. During the July visit, the Museum Mine and Donkin Tunnel sample sites were also visited.

3.0 Reliance on Other Experts: The conclusions, opinions and data presented in this report relied on technical and non-technical studies commissioned by XCDM and on data provided by XCDM that was used in the preparation of the studies. Many of the studies are non-author specific but are presented by companies, corporations and consultants that are considered to be experts in their respective fields. The author has read and agrees with the content, use and relevance of these reports in the preparation of the PFS.

The primary source for geological data and the grids used for mine planning was the MBGS Technical Report. As stated in the MBGS Technical Report:

"The opinions and conclusions presented in this report are based largely on the data provided to MBGS during site visits, data transferred electronically to MBGS by XCDM and Nova Scotia DNR, and from reports prepared by a variety of authors during the development of the Donkin Project in the 1980's. Much of the data used in this report was not within the control of XCDM or MBGS. MBGS believes that the information and estimates contained herein are reliable under the conditions, and subject to the qualifications, set forth in this report. MBGS considers that standard geological and engineering practices appear to have been used by operators of previous technical surveys in conducting the exploration programs, data analysis, and resource estimation. MBGS makes no expressed or implied warranties regarding the accuracy of the exploration results, however the data has been reviewed by a team of technical experts in the field of coal exploration and mine development and this report presents the results of those studies."

Other specific areas of reliance included:

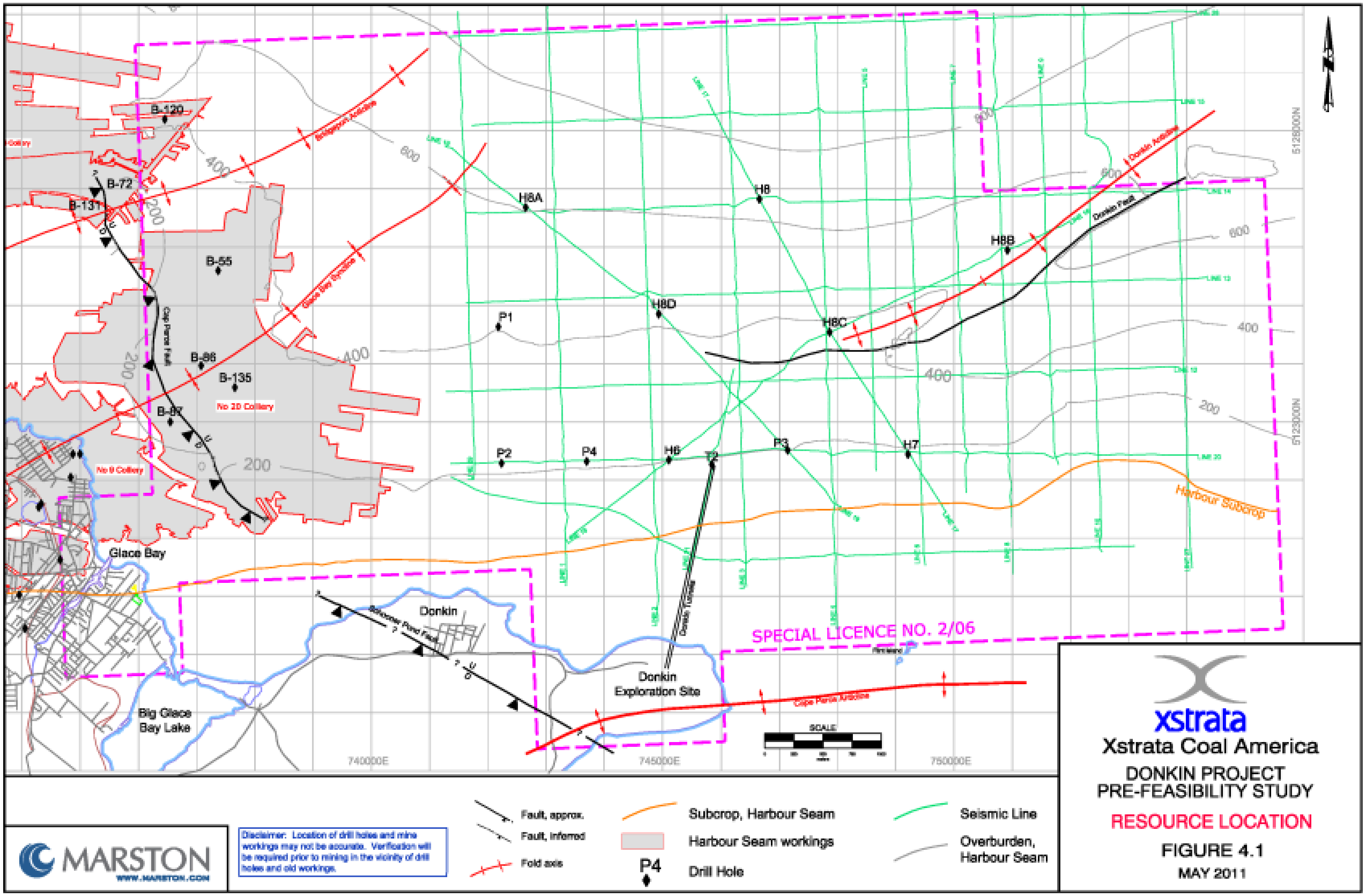
- Coal Preparation: Sedgman Limited, Queensland, Australia
- Ventilation and Gas Management: Dr. Roy Moreby, Morvent Mining Ltd, United Kingdom
- Coking Coal Quality: Bob Leach Pty Ltd, Queensland, Australia
- Mine Planning: Xstrata Coal Donkin Management
- Marketing: AME Consulting Pty Limited

4.0 Property Description and Location

4.1 Property Area: The Donkin Project resource block is located approximately 28.5 km east of Sydney, Cape Breton, Nova Scotia, Canada. The coal resource lies under the Atlantic Ocean and is accessible by two decline drifts currently extending some 3.6 km from the surface. The resource block comprises an area of approximately 100,000 hectares (ha). Figure 4.1, Resource Location, shows the lease and its relationship to significant Cape Breton geographic features and the historic mining areas.

CBDC developed a local grid known as the DEVCO grid, and data was reported in the DEVCO coordinate system. There is little documented information on this coordinate system and how it relates to the Nova Scotia local survey grid, ATS77. The DEVCO grid was based on a NAD27 (North American Datum 1927) datum with a projection in Meridian Transverse Mercator (MTM) Zone 4, with possible adjustments made to the grid in the 1970s. A decision was made by XCDM to convert the historical data to a modern and internationally recognized survey system NAD83 (North American Datum 1983 datum) with a projection in Universal Transverse Mercator (UTM) Zone 20. XCDM employed the services of Mr. Gerard MacKinnon from the Cape Breton University to convert data. Mr. MacKinnon developed a rubber sheeting algorithm using GIS software to translate the data, using the best possible fit across the Donkin area. There may be an error of up to 30 m involved in this process. The process was checked by overlaying the new and old images in AutoCAD. The coordinates for the surface location of the two inclined tunnels is approximately 745,088E, 5,118,773N.

4.2 Mineral Tenure: In December 2005 the Nova Scotia Department of Natural Resources (NSDNR) announced that the DCA was the successful proponent for the Donkin Coal Project. The DCA and the NSDNR entered into an agreement dated May 31, 2006 for Special Coal License No. 2/06. On January 31, 2007, the Province, as represented by the Minister of the Department of Energy, and the DCA entered into a Coal Gas Exploration Agreement (No. 07-31-01-01), which authorized the DCA to explore for coal gas in the Donkin Resource Block. The May 31, 2006 award of the Special Coal License allowed the DCA to access the site previously operated by CBDC (also known as DEVCO). The Special Coal License No. 2/06 is shown in Figure 4.1.


SPECIAL LICENCE NO. 2/06
Glace Bay
Donkin
Donkin Exploration Site
Big Glace Bay Lake
No 20 Colliery
No 9 Colliery
Harbour Subcrop
Donkin Anticline
Donkin Fault
Cape Percy Anticline
Glace Bay Syncline
740000E
745000E
750000E
Fault, approx.
Fault, inferred
Fold axis
Subcrop, Harbour Seam
Harbour Seam workings
Drill Hole
Seismic Line
Overburden, Harbour Seam
MARSTON
WWW.MARSTON.COM
Disclaimer: Location of drill holes and mine workings may not be accurate. Verification will be required prior to mining in the vicinity of drill holes and old workings.
xstrata
Xstrata Coal America
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RESOURCE LOCATION
FIGURE 4.1
MAY 2011

In October 2008 XCDL and Erdene executed a definitive joint venture agreement and a sales agency agreement and formed DTI, a Nova Scotia company, to hold certain of the interest of the joint venture, and the DCA was renamed the Donkin Joint Venture. As a normal progression from the Special Coal License, a 33-year Special Lease was granted to DTI on May 1, 2009 by NSDNR. The Special Lease is renewable for an additional 20 years and grants DTI exclusive right to coal within the lease boundary.

4.3 Royalties, Back-payments, Other Encumbrances: With the cessation of coal mining activities by the CBDC, the mineral rights to areas previously held by CBDC (Special Lease No. 90-2) were surrendered in July 2003. Because the mineral rights were surrendered to the Province of Nova Scotia, there are no back-in rights, payments, or other agreements and encumbrances to which the property is subject. Nova Scotia charges a royalty for coal produced, prescribed under section 174 of the Mineral Resources Act (S.N.S.N. 1990 c.18, as amended) and the Mineral Resource Regulations, Section 71 (d), at $1.09 per short ton ($1.20 per metric tonne). The province also collects revenue in the form of an annual mining lease rental fee, which mining companies pay for the privilege of maintaining "exclusive right" to the lease area for a specified period of time (usually 20 years). The mining lease rental rate in Nova Scotia is currently set in the Mineral Resources Regulations, Section 70 (d) at $100 per claim per year (a claim is approximately 40 acres or about 16 ha).

The Special Lease requires a nominal rental amount of $1 per year for the first four years of the lease; then, the rental increases to $136,192 in May 2013. This amount is based on current regulatory fees.

4.4 Environmental Liabilities: Other than general regulatory requirements, if the project was terminated at this phase of the project, XCDM would be required to remove surface infrastructure for which no alternatives have been identified, safely abandon and close the mine tunnels, and restore the project site in a manner that enables its reuse for another purpose or its rehabilitation as natural areas. The environmental liabilities will change if the project progresses to feasibility stage.

4.5 Permit Requirements: In addition to the Special License and Special Lease referred to above, certain permits and approvals related to mineral resource management are issued by NSDNR under authority of the Mineral Resources Act (MRA). They include exploration licenses, excavation permits, letters of authority, mining leases and mining permits. A requirement of all permits and approvals granted under authority of the MRA is that work must be conducted in compliance with the Occupational Health & Safety Act and Regulations thereunder and the Environment Act and Regulations hereunder.

Donkin Mine (common name for the potential mine site) has an existing environmental permit which allows for development works to prepare an unwashed thermal coal product at the mine both on the surface and underground; and use of a CM system for up to two years to remove an average of 2,000 tonnes of coal per day (approximately 0.5 Mtpa), load it onto trucks and transport the product offsite to a Nova Scotia Power utility, only during the times of 0600 hours and 2000 hours, Monday to Saturday. As the approval does not suit the needs of the Export Coking Coal Project, a new Environmental Assessment (EA) is required to obtain the necessary permit.

Authorization will be required from both Federal and Provincial regulatory agencies, and it will be in the form of a full comprehensive study, due to the new nature of works at the proposed sites and the regulatory sensitivities associated with activities in marine areas (rail is an alternative). This approval pathway is considered the most rigorous EA process and is expected to take nearly two years to complete from its initiation. It is expected that the project description will be lodged for the preferred option in July 2011, and approval granted in June 2013.

A significant number of environmental and social baseline studies have been completed over the past five years; however, additional field work is required to be completed for the Comprehensive Study. There are 25 key studies from 13 categories that are largely handled as part of the EA process.

Tables 4.1 and 4.2 provide a comprehensive list and schedule of the permitting and plan required to commence mining. The time frame will shift in time to correspond to the requirements of the EA. Some permit items in these tables have already been completed.

5.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Access to the Property: The Donkin property is located on Cape Breton Island, Nova Scotia approximately 28.5 km east of the city of Sydney and 6.6 km east of the town of Glace Bay. Paved roads extend from Sydney to within approximately 1 km of the site with an all-weather gravel road extending the remaining 1 km. The property is approximately 14 km east of the regional airport.

Xstrata Coal currently owns approximately 99% of the land on the Donkin Peninsula. The peninsula, once divided into eight blocks of land, was purchased by Xstrata Coal from CBDC. The land includes all the land that would be required onsite including the mine tunnels, the CBDC settling pond and all land required for site facilities including the access road and transport corridor. Xstrata Coal does not own the government-owned Fisherman's Reserve at Schooner Cove and five small resident lots, which are not required for the Project and are sufficiently distant from any expected Project impacts.

A portion of the rail transport corridor was also purchased by Xstrata Coal. The rail transport corridor is as initially allocated by CBDC as the rail corridor for its planned mine at Donkin. Much of the corridor was a rail line to the township of Donkin and through to Fort Louisburg, which has not had a rail line since the 1960s.

Two million dollars have been allocated in the Project capital budget for land or related expenses for the development of either the marine or rail option.

5.2 Climate and Physiography: Cape Breton is at 46°N but is temperate by Canadian standards because of its location in the Atlantic Ocean. Winter minimum temperatures rarely drop below -20°C; however, strong winds and the associated wind chill factor can make it seem much colder.[1] Table 5.1, Average Weather Statistics for Sydney, Nova Scotia, provides mean weather statistics from 1961 to 1990.

[1] From http://www.theweathernetwork.c com/statistics/C02028/cans0048, mean values for 30 years between 1961 and 1990.

Table 4.1
Permits, Plans and License Requirements

Legislative Instrument: Nova Scotia Underground Mining Regulations, 296-2008 (UMR)					
Item#	Section	Issue	Content	Timeframe	Criteria
A-001	34 (1) (a)	Initial development or construction of a mine.	File mine plan, electrical plan, ground control procedure, ventilation plan and plans required in Section 37.	90 days	Before proceeding with any of the activities.
A-002	34 (1) (b)	Initial development or construction of a mine.	File electrical Engineer's certification report for use of non-IS/flameproof electrical equipment UG.	90 days	Before proceeding with any of the activities.
A-003	34 (1) (c)	Initial development or construction of a mine.	File document estimating flammable gas released at each stage of mining.	90 days	Before proceeding with any of the activities.
A-004	34 (1) (d)	Initial development or construction of a mine.	Give written notice with anticipated start date for the initial development?????.	30 days	Before proceeding with any of the activities.
A-005	35 (7)	At a sub-sea coal mine.	Make an application for approval of mine, electrical, ground control, ventilation, emergency preparedness and coal dust minimization plans/procedures (some items duplicated withi 90 day timeframe, A-001).	Not specified	Obtain approval before carrying out work.
A-006	35 (8)	At a sub-sea coal mine.	Make an application for approval on 32 categories of mining activities ranging from developing/constructing a mine to performing hot work and handling misfires (see list of activities in appendix 1).	Not specified	Before proceeding with any of the activities.
A-007	49 (1)	Proposes to develop or construct a coal mine.	File a business plan and feasibility study report prepared by a financial expert approved by the Director.	Not specified	If requested by Director.
A-008	92 (4)	Proposes to offer an incentive bonus program.	Provide a copy of the program to the Director.	90 days	Before implementation of the program.
A-009	160 (1)	Contraband Search	File a procedure for conducting searches.	Not specified	Not specified
A-010	520	Initial start up of a mine	File a notice in relation to the job training program with Director.	Not specified	Not specified
A-011	521	Training program external review	Have all course materials for each course in the job training program reviewed externally (see exception 522 (2)).	Not specified	Not specified
A-012	522	Training program course details	File course information for each course in the job training program with Director (see exception 522 (2)).	Not specified	Not specified
A- 013	523 (6) & (7)	Unqualified instructor	File request to designate instructor who does not have all qualifications.	Not specified	Not specified

Legislative Instrument: Nova Scotia Mineral Resources Act, Ch 18 1990					
Item#	Section	Issue	Content	Timeframe	Criteria
B-001	24	Special License Extension or Reissue	Application to Minister to extend current special license to 2013.	Not specified	Current license expires in May 2009
B-002	97 (1)	Security bond for B-004 and possibly for B-003	To provide for the reclamation of the area to be disturbed by the lessee.	Not specific	Not specified
B-003	101 (1)	Driving declines, levels and bulk sample < 100 tonnes	Submit Excavation Registration.	7 days	Before commencement of activities
B-004	102 (1)	Bulk sample of 100 tonnes or more	Application for Letter of Authorization.	Not specific	Obtain letter before conducting work
B-005	112 (1)	Removal of mine output to place outside of Canada	Obtain consent from Minister.	Not specified	Prior to export
Legislative Instrument: Nova Scotia Mineral Resources Regulations					
C-001		Remove drill core to place outside Nova Scotia			
Legislative Instrument: Nova Scotia Petroleum Resources Act,					
D-001	14 (1)	Explore for coal gas	Coal Gas Exploration Agreement extension to 2013	Not specified	Current agreement expires in January 2012
D-002	18	Dispose of coal gas	Written approval from Minister	Not specified	Not specified
Legislative Instrument: Nova Scotia Petroleum Resources Regulations,					
E-001	75	Drilling a coal gas well	Approval from Minister	Not specified	Not specified

Legislative Instrument: Nova Scotia Environment Act, Ch 1 1994-95					
Item#	Section	Issue	Content	Timeframe	Criteria
F-001	33	EA approval of exploration undertaking	Environmental Assessment Registration, public process.	25 to 245+ days	Before commencement of work
Legislative Instrument: Nova Scotia Activities Designation Regulations (environmental)					
G-001	3 (1)	Industrial Approval for mining and coal handling	Application for approval of environmental designated activities, non-public process.	60+ days	After receiving confirmation from Exc. Director OHS
G-002	3 (1)	Operation of a water dam	Application for approval of environmental designated activities, non-public process.	60+ days	
G-003	3 (1)	Water withdrawal in excess of 23 m3	Application for approval of environmental designated activities, non-public process.	60+ days	
G-004		Drinking water > 25 people	Application for approval of environmental designated activities, non-public process.	Not specified	
G-005	3 (1)	Diesel fuel storage in excess of 40001	Application for approval of environmental designated activities, non-public process, registration.	Not specified	
G-006	3 (1)	Sewage holding tank or on site sewage disposal	Application for approval of environmental designated activities, non-public process.	60+ days	

Table 4.2
Submissions in Preparation for Room-and-Pillar Mining

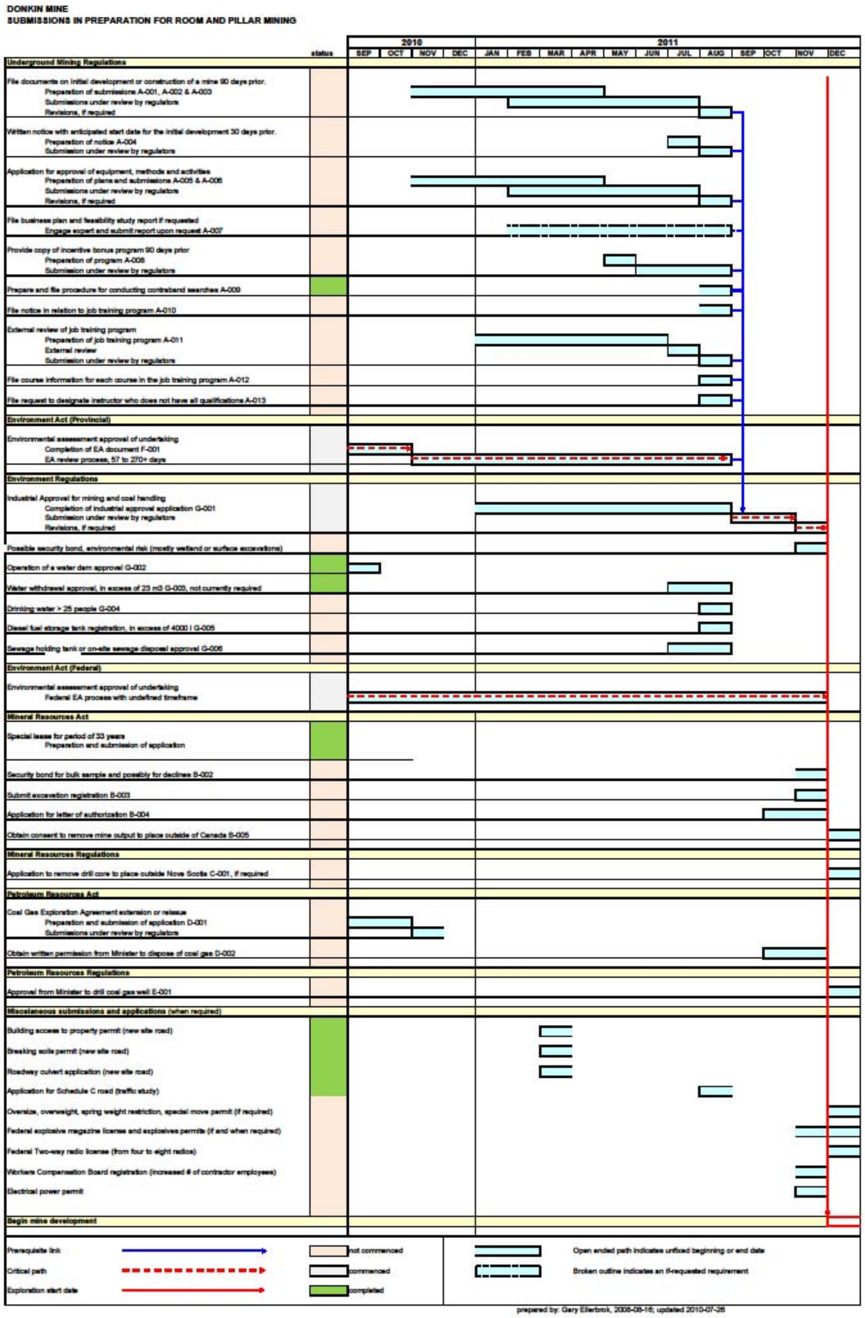

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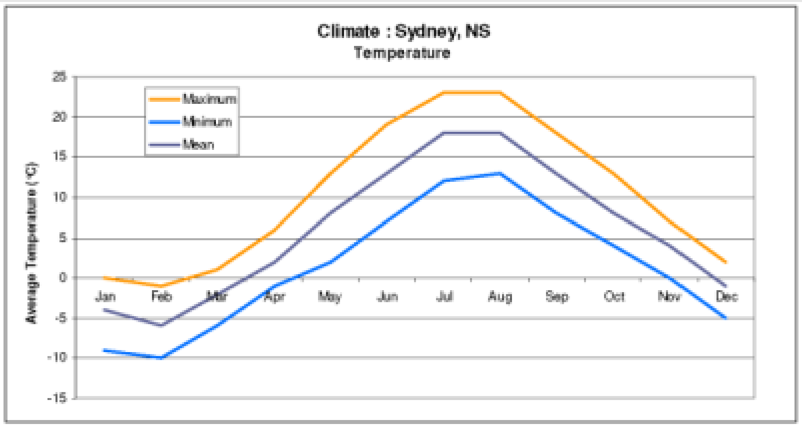
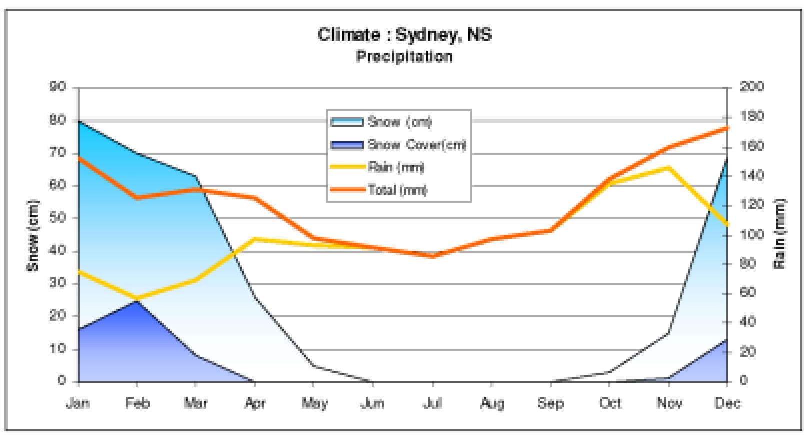
Table 5.1
Average Weather Statistics for Sydney, Nova Scotia

Sydney, NS		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature °C													
	Maximum	0	-1	1	6	13	19	23	23	18	13	7	2
	Minimum	-9	-10	-6	-1	2	7	12	13	8	4	0	-5
	Mean	-4	-6	-2	2	8	13	18	18	13	8	4	-1
Precipitation													
	Rain (mm)	75	57	69	97	93	91	86	97	103	135	146	107
	Snow (cm)	80	70	63	26	5	0	0	0	0	3	15	69
	Total (mm)	152	125	131	125	98	91	86	97	103	138	160	173
	Snow Cover(cm)	16	25	8	0	0	0	0	0	0	0	1	13
Other Weather Information													
	Rel.Humidity(%)	80	79	80	81	79	79	81	81	81	81	82	82
	Wind Speed(km/h)	23	22	22	21	20	18	17	17	17	20	21	22
	Wind Direction	W	W	W	N	SW	SW	SW	SW	SW	SW	W	W





Although weather is not a significant impact on the operation of the mine and coal processing facilities, it is an important planning factor for the potential marine shipping option. The potential loading and transshipment sites are located on the Eastern Coast of Cape Breton Island. As such, the site is exposed to the North Atlantic Ocean and is affected by the storms, wind, ice and waves generated in the Atlantic Ocean. As loading or transshipment operations would be in close proximity to the coastline, there is some sheltering provided by local islands and headlands, but the sites remain fully exposed to wind and waves that originate from the northeast to southeast sectors. There is large seasonal variation as winter storms produce high winds and large sea states, whereas summer provides substantially calmer wind and sea states.

A significant portion of the Ausenco Sandwell Marine Options Study was dedicated to analyzing the potential impact of weather on the various transshipping options.

Ausenco Sandwell concluded:

"that the development of a suitable facility for the berthing and loading of all three main types of marine fleet considered is technically feasible and with good design the annual throughput level of 2.75 Mt/y can be achieved. This can be achieved through judicious management of the loading from May to September prime loading months, and with October, November, December and early January becoming less favourable due to seas, swell and wind (non winter ice period where the down time due to ice is 0%)."

The non-winter ice period is the period when there is no ice, but loading may be impacted by other climatic conditions.

5.3 Infrastructure: The existing infrastructure includes the two dewatered tunnels providing access to the Harbour Seam; a metal storage building being utilized as an office, storage, and maintenance facility; a generator for power to the storage building and mine fan; an access road; sediment control structures; and, sufficient land to accommodate all proposed facility requirement. A high voltage power line is located at Victoria Junction, approximately 25 km from the site.

6.0 History

6.1 History - As quoted from Paragraph 5 of the MBGS NI43-101 Technical Report:

"The inhabitants of Fort Louisbourg began extracting coal from exposed seams along the cliffs from Port Morien to Lingan shortly after the French settlement began in 1713. Seven years later, in 1720, they opened the first organized coal mine in North America at Port Morien. Following the formation of the Dominion Coal Company in 1893, a number of mines were opened in Glace Bay. The town of Donkin was the site of one of the many coal mining operations that were carried out throughout the region. Mining the coal on the land area ceased by the mid 1800's. Workings then proceeded to follow the seams down dip under the sea in 1867 and, by 1941, mining had reached a distance of almost 5kms from shore and a depth of 600m below sea level. Mining in the submarine portion of the coalfield took place mainly in the Harbour Seam at Sydney Mines prior to 1907. Later, entrances were begun at several other points on the south side of Sydney Harbour over a frontage of 15 miles.

In 1928, following the bankruptcy of Dominion Coal Company, a new company called the Dominion Steel and Coal Corporation (DOSCO) was incorporated and took over coal mining and steel manufacturing in Cape Breton. On July 7, 1967, the Cape Breton Development Corporation, a Federal Crown Corporation formed by an Act of Parliament, was incorporated to acquire and manage DOSCO's coal mining operations including the exploration of the Donkin Resource Block.

Between 1977 and 1987, CBDC spent considerable effort and funds to explore and to evaluate the resources and potential mining of the Donkin Block concluding with the drivage of two tunnels to intersect the Harbour Seam. These tunnels are side-by-side and generally measure 7.6 m in diameter. Each is about 3.5 km in length. They were driven sequentially and completed in 1984 and 1987. The first kilometer of the first tunnel was driven by conventional blasting and mining methods and is, therefore, about 5-m high. The tunnels accessed the Harbour seam where a crosscut was driven in the coal seam to allow channel samples and bulk samples to be taken. Development waste was stockpiled on the surface.

The Donkin property was largely rehabilitated by CBDC following the exploration program. In 1992, both of the tunnel portals were sealed, and the surface site reclaimed. The tunnels were sealed with bulkheads, backfilled at the surface, and then allowed to flood. Underground mining operations in the Sydney Coalfield ceased with the closure of Prince Mine in the fall of 2001. Historical coal production from the Sydney Coalfield totaled 329 Mt by 2001. With the cessation of coal mining activities by CBDC, the mineral rights to areas previously held by CBDC (Special Lease No. 90-2, July 2003) were surrendered. Since the mines were closed, extensive closure and reclamation activities have taken place throughout the Sydney Coalfield.

After receiving the necessary regulatory approvals, XCDM breached the tunnel seals and commenced pumping water from the tunnels in late 2006 in order to reclaim access to the Harbour Seam coal face."

The tunnels have been drained and access to the Harbour Seam reestablished. The tunnels will require extensive renovation before full scale mining can commence.

Other than the coal extracted during the construction of the tunnels, there has been no production from the property. The tunnel construction coal was used for coal quality testing purposes. An additional strip sample (DCH01) was extracted from near the T2 channel sample in October 2007 and was also used for testing purposes.

6.2 Historical Resource Estimate: Although not a historical estimate per the definition of historical estimate in Part 1 Definitions and Interpretation of National Instrument 43-101, Standards of Disclosure for Mineral Projects, XCDM commissioned MBGS to provide an independent technical review of the geology and resources of the Donkin property. The report was issued in April 2007. The author has reviewed the report and considers the report to meet the requirements of National Instrument 43-101. The report provides the geological basis for all of the recent scoping and pre-feasibility studies, the PFS and this Technical Report.

7.0 Geological Setting: Reported in *Technical Report Donkin Project* prepared by MBGS, dated April 2007. Although the MBGS report addressed all of the Donkin Project seams, this report only considers the Harbour and Hub seams.

8.0 Deposit Type: Reported in *Technical Report Donkin Project* prepared by MBGS, dated April 2007. Although the MBGS report addressed all of the Donkin Project seams, this report only considers the Harbour and Hub seams.

9.0 Mineralization: Reported in *Technical Report Donkin Project* prepared by MBGS, dated April 2007. Although the MBGS report addressed all of the Donkin Project seams, this report only considers the Harbour and Hub seams.

10.0 Exploration

10.1 Previous Exploration: *Technical Report Donkin Project* prepared by MBGS, dated April 2007, describes the exploration for the Donkin Project in detail and is paraphrased below.

- Drilling, 1977: In 1977, four holes (H6, H7, H8, H8B) were drilled by Global Marine Company for CBD. Heave, caused by movement of the sea, was accommodated by a bumper consisting of two barrels, sliding one inside the other. This isolated the bottom hole assembly from the vessel's motion. Both conventional and wireline coring systems were trialled. Drill penetration rate was slow, and very poor core recovery was achieved with the wireline system, so conventional coring was preferred, selectively coring the coal intervals. Typically, a tricone bit (8.5-inch (in) diameter) was used for the non-core sections, and core was

(4-in diameter) recovered using a diamond core bit. Where the coal seam was not fully recovered in the coring program, sidewall cores were taken using a Schlumberger CST Sidewall Sampler throughout the targeted seams as identified from geophysical logs. Accurate correlation of the positions of the sidewall cores and the conventional cores was not possible. Possibly due to time constraints, coring was not attempted in hole H8B, and only sidewall cores were retrieved for coal analysis. The geophysical log suite, run in each hole by Schlumberger Canada Ltd., comprised gamma ray formation density, caliper, geodip and continuous dipmeter.

- Drilling, 1978: In 1978 three more holes (H8A, H8C, H8D) were drilled by Global Marine Co using an improved motion compensator on the ship. The previous year's drill results allowed a better estimate of the depth of coal seams, and drilling was faster as a result. In addition, core recovery was improved by the use of a face discharge coring bit. The geophysical logging suite was similar to the 1977 program, with the addition of sonic and neutron logs.

- Drilling, 1979: Four holes (P1, P2, P3, P4) were drilled in 1979 by Odeco Drilling and Exploration Company using technology and methodology similar to that used in the previous year. To obtain material for geotechnical testing of the coal measure strata, P4 was cored from 25 m above the Harbour Seam to below the Emery Seam. The geophysical log suite included microlaterologs and dual induction laterologs.

  Core and non-core cuttings were sampled and logged at approximately 1-m intervals on board the ship by CBDC or contract geologists. Coal seams were logged in detail and sampled for analysis on shore by Dr. P. Haquebard (Geological Survey Canada) or Mr. S. Forgeron (CBDC).

  The final drill pattern comprised three east-west drill lines. The southernmost line had four holes, between 1 km and 2 km apart. The middle line, approximately 2.5 km north of the southern line, had four holes between 2.5 km and 3.5 km apart and the northern line, approximately 2 km north of the middle line, had two holes, 4 km apart.

  A Well History Report was prepared for each drill hole, and included hole details, a drilling diary, rod and casing use record, geological descriptions, casing and abandonment records. All holes were reportedly cleaned out and grouted from the base of the hole to the sea floor on completion. Samples of the cement were taken at regular intervals to ensure the seal material was competent.

- Sparker Survey, 1978: A sparker survey was carried out in 1978 by the Nova Scotia Research Foundation and Integrated Survey Systems Limited. The survey was a marine seismo-acoustic reflection survey, similar to an echo sounder, and thus had very shallow sea floor penetration. The survey provided information on the geological features of the sea floor strata and the thickness of unconsolidated sea floor sediments. Studies of the data identified the Flint Flexure (the Donkin Anticline and Donkin Fault) in the eastern part of the area, and prompted the decision to carry out a high-resolution seismic survey over the Donkin-Morien area.

- Seismic Survey, 1980: Geoterrex Ltd. carried out an offshore high resolution Multi-Flexichoc two-dimensional seismic survey in 1980. A total of 213 line kilometers was surveyed in a total of 22 lines.

- Drilling, 1980: Nine shallow fully cored geotechnical holes (R1 - R9) were drilled on the Donkin peninsula in 1980 to investigate the stratigraphy along the line of the projected tunnels. The holes were shallow and did not intersect coal seams of interest as the land-based section of the tunnels was stratigraphically below the Harbour Seam. Detailed geotechnical logging and packer testing were undertaken on samples from these drill holes. The holes were drilled for CBDC.

- Tunnel Excavation, 1981 to 1987: Two parallel tunnels to the Harbour Seam for CBDC. Between December 1981 and February 1987, two parallel tunnels, 50 m apart, were driven 3,500 m to intersect the Harbour Seam at a depth of 200 m BSL. The ocean floor is about 35 m BSL at that point. Lithological descriptions of the strata encountered were made while the tunnels were being driven, to record the conditions throughout the length of the tunnel.

- Bulk Sample and Five Strip Samples, 1985 – In 1985, a 3,000-tonne bulk sample and five strip samples (T2, SS1-SS4) were obtained from the Harbour Seam from within the cross tunnel driven in the coal seam connecting the two access tunnels. The coal extracted during this sampling and pit-bottom construction is the only coal produced from the Harbour Seam within the Donkin license area. Almost 50,000 tonnes of coal were mined from the main tunnels and connecting roadway.

- Bathymetry, 1995: A bathymetry survey was carried out in July 1995 by the Geological Survey Canada Atlantic (GSCA) over the central part of the Donkin area using a Simrad Em1000 multibeam bathymetric sounder. Soundings were corrected for sound speed variations in the water column and, also, for tidal variations. Detailed images of the sea floor were obtained.

As stated by MBGS:

"Due to the difficulties of exploration below the seabed, historical mine development was based on inference and experience from the existing mining areas and very limited drilling. Drilling by ship is often difficult, expensive and sterilizes a significant block of coal from future mining. As a result, the risk profiles for this type of property and the assessment methods differ from land-based coal resources.

The information from the drilling and seismic exploration historical mining and coal marketing/utilisation studies provide valuable information in evaluating the Donkin coal deposit and the Sydney Coalfield in general. Donkin has 11 drill holes within the licence area, high resolution 2D seismic survey lines across the lease and mine data from neighbouring underground Harbour Seam mines No. 20 and No. 26. This information amounts to substantially more than the amount of data that previous Sydney Coalfield mines had to work with before mining commenced."

10.2 Exploration by XCDM – Previously Reported: *Technical Report Donkin Project* prepared by MBGS, dated April 2007 describes the following XCDM exploration.

- Miners Museum Bulk Sample, 2006: Harbour Seam sample taken by MBGS for XCDM Prior to the dewatering of the Donkin tunnels, a convenient location to view and sample the Harbour Seam was at the Miners Museum, a tourist attraction in Glace Bay, within the XCDM license. The seam at this location is 1.6-m thick, significantly thinner than the Harbour Seam thickness in the east of the license area. A channel sample of the seam was taken for testing in 2006 by MBGS for Xstrata Donkin Coal. The sample was transported to Australia where the coal was subjected to an extreme drop shatter and wet tumble sizing treatment and detailed chemical analysis.

Any slightly oxidized material was removed from the exposed face at the sample point using a pneumatic drill to a depth of approximately 0.5 m. Sub-samples were taken at 0.15-m intervals from the roof of the seam to the floor of the seam and each was tested for proximate analysis and forms of sulfur at a local Sydney, Nova Scotia laboratory, Certispec, to confirm that the coal was fresh at this location before a larger sample was extracted.

Following the reporting of these preliminary results, a 400 kg bulk sample was taken in larger subsamples and was air-freighted to Australia and analyzed at the CCI Newcastle Laboratory, under the supervision of A&B Mylec, coal quality consultants. A full range of tests was carried out, including raw coal analysis, drop shatter and sizing, washability analysis and clean coal tests. Additional coal was recovered and sealed in 2 x 44 gallon drums stored at Sydney, Nova Scotia for further testing if required.

- Seismic Survey Reprocessing and Reinterpretation, 2007: Reprocess 1980 data by Velseis Processing for XCDM - XCDM has re-processed the original 1981 two-dimensional seismic data. The aim of the re- processing was three fold:

  1) Validate the existing interpretation.
  2) Enhance and update the information gained from the data.
  3) Learn lessons from the process that may assist in maximizing results from any future program.

  The original data tapes from the two-dimensional seismic survey were located, and the files extracted and converted into SEGY format for processing and interpretation with modern computer technology. The original operator's logs were located and used in the processing. The two-dimensional survey was initially designed to provide a systematic grid of information over the area and to identify any large structural anomalies in the strata. Lines 16, 17, 18 and 19 were then recorded to tie the offshore drill hole information into the seismic sections. These seismic tie lines allow horizon control throughout the systematic grid. The navigation device for the seismic ship was an onboard computer that plotted a plan but did not record the location of the track points separately; hence, the shot point locations are not available to accurately locate the seismic data in space. Rayworth Roberts Surveys Ltd in Parrsboro, Nova Scotia searched its archives and concluded that the map held by DNR/XCDM was the most accurate record of the track of the seismic vessel. The points were digitized from a high resolution scanned copy of the map. Plotting, paper distortion and digitization errors are likely.

  Re-processing commenced in May 2006 with several geophysicists from Australia involved to maximize the amount of information gained from the data. Interpretation of the re-processed data was carried out at Velseis Processing of Brisbane, Australia. The re-processed data identified Harbour Seam floor elevation along each seismic line, and this data will be used in future generations of the Donkin geological model.

  The seismic data successfully identified the Flint Flexure (fold and fault complex) and has interpreted a number of possible faults with smaller displacements.

10.3 Exploration by XCDM – Not Previously Reported: Strip sample DCHO1, collected in October 2007, is the only exploration sample not reported in the MBGS Technical Report. The Harbour Seam sample was collected in the south side rib of the No. 2 crosscut, 3 m east of the No. 2 tunnel rib and in close proximity to the site of the 1985 strip samples. The sample was collected by Mr. Peter Dalton, a geologist employed by Erdene. This location was selected due to its excellent access to the entire Harbour Seam profile. The area was prepared by the removal of oxidized coal on the coal face. Once a fresh coal face was exposed, a channel sample was cut at a specified dimension, width by depth, to provide a representative sample. In accordance with the code of practice approval, the sample dimensions were not to exceed 1 m by 1 m. The sample was taken from the entire seam profile, and included roof and floor material. The coal was cut from the face with manually operated compressed air chipping hammers.

Samples of the coal were packaged in a ply-by-ply arrangement in 45-gallon steel drums and labeled accordingly; the drums bolted shut; and, then the samples were shipped to Australia as quickly as practical, to prevent oxidization of the coal. ACIRL Ltd. Maitland, New South Wales, Australia was the laboratory that performed all of the coal quality analysis.

As noted, bulk sample DCH01 was collected by ply, and the various analyses were performed by ply. Table 10.1, below, shows the ply configuration for the sample.

Table 10.1
Bulk Sample DCH01

Ply	From (m)	To (m)	Thickness (m)	Weight (kg)
Roof	0	0.1	0.1	23.6
4	0.1	0.27	0.17	95.46
3	0.27	0.31	0.04	18.45
2_2R	0.31	2.73	2.42	156.8
1B	2.73	2.93	0.2	51.14
1A	2.93	3.23	0.3	62.4
Floor	3.23	3.38	0.15	29.26
Total				**437.11**

The roof and floor plys would be considered as out-of-seam dilution (OSD). The other plys represent the coal.

11.0 Drilling: All drilling, drilling procedures and results associated with the Donkin Project are discussed in detail in *Technical Report Donkin Project* prepared by MBGS, dated April 2007. The drilling from the report is paraphrased in Paragraph 10.

12.0 Sampling Method and Approach: All sampling procedures and results associated with all Donkin Project samples with the exception of Bulk Sample DCH01 are reported in detail in *Technical Report Donkin Project* prepared by MBGS, dated April 2007. The procedures and results from the report are paraphrased below. The procedures and results for sample DCH01 follow.

12.1 Drill Hole Coal Core Sampling

During the drill programs in 1978 and 1979, the coal core was described by CBDC geologists on board the ship, then re-logged and sampled for analysis on shore within days of drilling. Laboratory testing of the core commenced within a week of drilling in most cases.

Records of broken coal and core loss are variable - in a few logs; these records are well kept, and an attempt has been made to account for core loss.

Insufficient core for representative analysis was recovered from the first series of holes drilled in 1978, so analysis only of sidewall cores exists for these holes. While the tests provide indicative coal quality information, there was insufficient volume of coal (20% - 50% of seam) from these sidewall cores to give meaningful results, and they were not taken into account in the resource estimation process reported herein.

Seam cores recovered from the 1978 and 1979 holes were commonly sampled in some detail: divided into plies at visible partings or otherwise at approximately 0.15-m intervals (approx. 6 in). Testing of "half-cores" was conducted in Calgary, Alberta. Some sub-samples were combined for further testing; however, the majority of testing was conducted on the sub-samples, which provided some flexibility in the study of potential working sections.

12.2 Core Recovery

Core depths recorded in the Well History Reports were not reconciled to geophysical log depths, nor was there allowance for tidal variations. The difference in depths recorded between core runs in some holes ranges from - 2m (overlap in data - logged twice) to +2m (missing data). When entering the lithological data into modern format, a "best fit" approach was taken to resolve the thickness of units where these gaps or overlaps occur. Drill logs indicated "broken core" or "possible core loss", although no records that reconciled the "lost" section with the length of the core drilled could be located.

Attempts to locate the core detail are an ongoing process. Due to the poor resolution of the available geophysical data, the possible error in thickness for each seam is considered to be up to 50 centimeters (cm).

12.3 2006 Coal Sample

Details of the 2006 Miners Museum coal sample were as follows.

- The exposed coal face was cleaned by removal of 0.5 m oxidized coal.
- Coal beams were cut using a pneumatic chainsaw.
- Sample A (check samples analyzed in Sydney, Nova Scotia) was taken on June 9, 2006. Coal plies were 0.15-m thick unless divided by a geological boundary such as a dull band or stone parting.
- Sample B (large sample sent to Australia) was taken 15-16/6/06 from a coal seam 0.38 m x 0.38 m.
- The coal was extracted from the coal face using a pick and placed into plastic bags, taking care to capture all fines with a dustpan and broom.
- The plastic bags were labeled using a sample tag inside the bag and outside the bag, sealed and transferred to the surface.
- The bags were loaded into 44- gallon drums with a plastic liner, and the drums were sealed for transport.

12.4 Sampling Method (DCH01): The sampling procedure is described in Section 10.3 above.

12.5 Sample Quality (DCH01): Harbour Seam sample DCH01 was obtained from the crosscut between the two tunnels and adjacent to the five strip samples (T2, SS1, SS2, SS3 and SS4) that were extracted in 1985. The sample was used to compare coal quality results with the other samples at the Harbour Seam intersection with the tunnels and washability testing for preparation plant design and for metallurgical coal characterization. The sample quality can reasonably be considered as representative of the coal quality within indicated distance of the sample location but does not represent the resource as a whole.

Raw coal results from the six channel samples (including DCH01) in the tunnel region (see Table 12.1, below) suggest the coal quality characteristics of the Harbour Seam may be variable over short distances. DCH01 was extracted a few meters from T2. The seam thickness varied from 3.13 m to 3.58 m in the two samples. Similarly, the recorded seam thickness varied from 3.58 m at T2 to 4.03 m at SS1 (17 m east), and decreased to 3.45 m at SS2 (further 10 m east). For SS3 and SS4, the thickness was 3.44 m. The integrity of the thickness data from the historical data has not been verified.

Table 12.1
Tunnel Channel Sample Raw Qualities

Parameters	DCH01	T2	SS1	SS2	SS3	SS4	Average
Thickness (m)	3.13	3.58	4.03	3.45	3.44	3.44	**3.51**
Ash %	8.9	9.2	8.0	5.8	6.9	7.7	**7.8**
T Sulfur %	4.45	4.02	5.15	3.29	3.45	3.45	**3.97**

Total sulfur varied from 4.45% (DCH01) to 4.02% (T2) to 3.29% to 3.45% moving easterly to the other strip samples over an estimated distance of approximately 50 m. Raw ash varied from approximately 9% at T2/DCH01 to 5.8% at SS2 increasing to 7.7% at SS4.

The average results of all six strip samples have been assumed to represent raw quality at the base of the tunnel.

12.6 Geological Controls (DCH01): The DCH01 sample was extracted between the roof and the floor strata of the Harbour Seam. The sample included the entire seam profile, and included roof and floor material. The coal was cut from the face with manually operated compressed air chipping hammers. Samples of the coal were packaged in a ply-by-ply arrangement and labeled accordingly. Table 12.2, below, provides the description of each ply including thickness and weight.

Table 12.2
Configuration and Ply Quality of Channel Sample DCH01

Ply	From (m)	To (m)	Thickness (m)	Relative Density	Relative Thick (m)	Moist %	Ash %	T Sulfur %	CA MJ/kg
roof	0.00	0.10	0.10	2.00	0.2	0.80	73.10	6.31	0.00
4	0.10	0.27	0.17	1.42	0.2	1.80	12.50	6.09	29.54
3	0.27	0.31	0.04	1.85	0.1	1.30	73.20	4.74	0.00
2_2R	0.31	2.73	2.42	1.33	3.2	2.50	5.00	3.50	32.52
1B	2.73	2.93	0.20	1.34	0.3	2.50	6.00	3.72	32.05
1A	2.93	3.23	0.30	1.61	0.5	1.90	24.90	12.54	24.41
floor	3.23	3.38	0.15	2.00	0.3	1.50	73.10	7.86	0.00
Total			**3.38**		**4.8**	**2.25**	**15.61**	**4.97**	**27.62**

The weight average ROM quality including the roof and floor plys is shown in the total line of the table.

13.0 Sample Preparation, Analyses and Security: All sample preparation, analyses and security associated with the Donkin Project are discussed in detail in *Technical Report Donkin Project* (see Section 9) prepared by MBGS, dated April 2007 with the exception of DCH01. The procedures are paraphrased below followed by the procedures associated with DCH01 follow.

13.1 Sample Preparation and Analysis

Coal from bore cores recovered during the 1978-79 drill programs at Donkin were sampled on a ply-by-ply basis prior to extensive raw coal analysis. Working section composites were created from the ply samples and subjected to washability and clean coal analysis. These bore cores intersected several of the seams in the coal sequence at Donkin. Cores recovered by sidewall methods were excluded from this coal quality review as the technique of extraction and integrity of the samples could not be assessed adequately.

Five channel samples (T2, SS1-SS4) were cut from the Harbour Seam in the cut through at pit bottom that connects the two access tunnels. These samples were analyzed on a ply-by-ply basis similar to the bore cores, and subjected to composite seam washability and clean coal analysis.

A bulk sample of several thousand tonnes of coal was extracted from the cut through in the Harbour Seam. The coal was washed through the Victoria Junction beneficiation plant in July 1985. A range of raw, washability and clean coal tests were conducted on a variety of feed, product and reject streams.

A 74- tonne sub-sample was the subject of an intensive pilot plant study by CAN-MET at its Devon facility. The purpose of this study was to evaluate the impact of wash plant circuit configurations on product yield and particularly, sulfur liberation and beneficiation. This study was completed in January 1986 and was of a very high standard. While recent advances in coal preparation have resulted in likely changes in circuit configuration compared to those reviewed in the pilot plant study, the findings (from this study) remain relevant to the current project.

A 400 kg channel sample, extracted from the Harbour Seam Miners Museum site at Glace Bay, was analyzed in Australia in August 2006 as a basis for quality comparisons with the earlier DEVCO and CAN-MET data. The channel sample was subjected to intensive breakage and liberation pre-treatment with subsequent, raw coal, washability and clean coal analysis.

13.2 Sample Preparation (DCH01): The DCH01 samples were prepared, bagged by individual ply and placed in 45-gallon steel drums by or under the supervision of Mr. Peter Dalton, a geologist employed by Erdene. The report author did not participate in collecting or securing the sample. The report author has seen the location where the sample was collected.

13.3 Sample Analyses (DCH01): The samples were sent to and analyzed by ACIRL Ltd. Maitland, New South Wales, Australia. This laboratory is accredited by the National Association of Testing Authorities Australia, and the accreditation number is 15784. This facility complies with the requirements of ISO/IEC 17025:2005. The samples were received at the laboratory on October 18, 2007, and the laboratory report was issued on May 12, 2008. The laboratory report number is 20005388.

13.4 Sample Security (DCH01): Other than XCDM transporting the 45-gallon steel drums of coal to Kuehne - Nagel Ltd. in Halifax, Nova Scotia for shipping to Australia, there was no special sample security protocol. A shipping manifest was maintained, and the samples were inspected by Australian customs.

14.0 Data Verification: Data verification and limitations for the data that MBGS used for its resource determination are discussed in detail in *Technical Report Donkin Project* (see Section 10) prepared by MBGS, dated April 2007. The summary from this section is quoted below and provides a reasonable representation of the limitation of the data used for mine planning and economic analysis.

"The review of the existing geological data carried out by MBGS identified a number of issues:

- *Potential inaccuracies with original survey of shore to ship for offshore holes; this may result in errors in drill hole location of +/- 15 m to 30 m.*
- *Possible errors associated with determining geophysical log datum point on board the ship, resulting in a possible error of approximately +/- 5 m – 10 m in seam depth from sea floor.*
- *Hole deviation data is available for the offshore holes to obtain the survey of the seam at seam level; however, this has not yet been utilized in the geological model.*
- *Poorly aligned geodip, core and density logs led to some uncertainty in seam thickness in the offshore holes. The potential seam thickness error from the low resolution of the geophysical logs is in the order of +/- 0.15 m, while the potential thickness error from the mismatching data sets may be up to 0.6 m.*
- *The quality of lithological data collected from the offshore holes is variable; some are adequate while others do not appear to have captured all relevant information.*
- *No geotechnical data (rock strength, discontinuity descriptions, etc.) was recorded in core descriptions in the offshore holes; however, relevant data, such as roof and floor conditions from the nearby historical underground mines, is a useful guide to indicative underground mining conditions likely to be experienced at Donkin.*
- *Drill hole spacing is such that sandstone channels or other zones of geotechnical significance if present are unlikely to be detected by drilling. The re-processed seismic data has not identified any such strata anomalies.*
- *Drill hole spacing is inadequate to identify local variability in seam floor dip, seam rolls, etc., if present.*
- *The accuracy of the ship navigation with respect to the seismic surveys is likely to be within 20 m - 50 m of actual position. Resolution in the vertical direction appears to be quite good, within 5 m, and some faults with interpreted throws in excess of 5 m have been resolved.*
- *There is a paucity of core loss records, thereby making a judgment on reliability of drill results less certain. The core that was recovered was cut in half prior to analysis. The 1978-1979 coal cores were supplemented by sidewall cores, which are not representative of the whole seam quality. The 1977 holes recovered sidewall cores only. There is a general lack of reliable coal quality information especially in the east and northeast of the license.*
- *No seam gas content and strata permeability measurements were recorded in the Donkin drill holes.*

While these issues need to be addressed in the future, none is considered to be material to the viability of the project as a whole. Where there was doubt, a conservative seam thickness was chosen so that coal resources were unlikely to be overestimated. The issue of poorly understood core loss has not yet been resolved; however, the main impact is on the accuracy of some of the detailed coal quality data, and in general, the influence of core loss will tend to underestimate the quality of the deposit since the better quality, friable, vitrinite-rich coal is the most likely to be affected by core loss. The impact on the resource estimate is not considered to be significant."

15.0 Adjacent Properties: Mining has taken place within the Sydney Coalfield for many years although all of the underground mining has shut down.

The Federal body, National Resources Canada (NRCan), implemented a large scale project in the late 1990s to compile much of the geological information from Canadian mineral exploration. An agreement between NRCan and XCDM allowed the Sydney Coalfields section of the access database from NRCan to be obtained.

The database contained collar information and basic lithology information for drill holes across the area. There were also thickness and/or floor position data points for the Harbour and Phalen seams from the submarine mines in the coalfield. These mine data points and boreholes were useful in providing information in the western third of the Donkin lease area for the geological model. The data is closely spaced and hence causes some inconsistencies in the seam thickness and seam floor grids where the data is averaged within a grid cell.

No coal quality data for Sydney Basin holes were provided with the database.

The author for this report was unable to verify the historic data used in the model, but there is no reason to believe the data does not accurately represent seam thickness west of the resource.

16.0 Mineral Processing and Metallurgical Testing

The following coal quality information was prepared for XCDM by Bob Leach in a report titled, *Coking Coal Quality – Donkin Project, Nova Scotia, Canada*, dated January 29, 2010, and is included in the PFS. The report is largely drawn from work completed in 2008 by A&B Mylec during the PFS into the Exploration Phase of the project. Several tables of quality data are also provided in the *Technical Report Donkin Project* prepared by MBGS, dated April 2007. Also, the same coal quality data has been analyzed by Sedgman and a slightly different coal processing alternative developed. The results are consistent with the Bob Leach analysis presented in the following paragraphs and tables. The analysis is for the Harbour Seam.

Coal quality data for the Donkin Project in the Harbour Seam was obtained from five sources.

- A series of bore cores drilled in the late 1970s, which were sampled on a ply-by-ply basis prior to extensive raw coal analysis. Seam composites of the ply samples were created and subjected to washability and clean coal analysis.
- A series of five channel samples extracted from the Harbour Seam at the base of the tunnel. These samples were analyzed on a ply-by-ply basis similar to the bore cores, and subjected to composite seam washability and clean coal analysis. The sampling was undertaken in an easterly direction commencing with sample T2 near the end of the tunnel. The remaining four channel samples (named SS1 to SS4) were extracted 10 m to 20 m apart in an easterly direction from sample T2, across the face of the bulk sample area.
- A bulk sample was extracted from the Harbour Seam at the base of the tunnel. Several thousand tonnes of coal were extracted and washed through the Victoria Junction wash plant in July 1985. Various feed, product and reject streams were subjected to a range of raw, washability and clean coal analysis. A pilot scale subsample (74-tonnes) from the bulk site was also subjected to detailed testing by CAN-Met at its Devon facility.
- A 400-kg channel sample was extracted from the Harbour Seam Museum Site at Glace Bay. This sample was analyzed in Australia in August 2006 as a basis for quality comparisons with the existing data. The channel sample was subjected to intensive breakage and liberation pre-treatment with subsequent, raw coal, sizing, washability and clean coal analysis.
- An additional strip sample (DCH01) was extracted near the T2 channel sample in October 2007. This sample was analyzed by ACIRL in Maitland, Australia to confirm likely coal quality at the base of the tunnel.

Coal quality data for the Donkin Project for the Hub Seam was based on the series of bore hole cores drilled in the late 1970s. No mineral processing or metallurgical testing has taken place. Once the Harbour Seam exploration program advances far enough downdip, it may be possible to drill core holes upwards into the Hub Seam and to collect sufficient samples for washability testing.

16.1 Raw Coal Quality

16.1.1 General

The Harbour Seam increases in depth in a northerly direction from 250 m at the bulk sample site to 670 m at hole H8A approximately 5 km to the north. The seam generally appears to thicken in an easterly direction from 2 m at P2 to 3.6 m at P3, 5 km to the east.

The bore cores to the west had full seam raw ash in the range 15% to 20%. The ash decreased to < 10% from a line east of the tunnel sites.

Hole P2 in the southwest recorded total sulfur percent in excess of 8% as did H8D, 2 km to 3 km north of the tunnel site, whereas the regions east had levels below 4%.

Calorific value dry, ash free (CV_{daf}) was approximately 15,000 Btu/lb throughout.

Volatile matter dry, ash free (VM_{daf}) appeared to increase from 34% to 37% in the west to 38% to 39% in the east. Raw CSN appeared to increase from 5.5 to 6 in the west to 7.5 in the east.

Ultimate carbon, hydrogen and nitrogen were typically 82%, 5.5% and 1.4%, respectively (dry, ash free basis).

Initial ash deformation temperatures were very low (often <1,100^{o}C) due to the presence of iron in pyrite. T2 reported 37% iron oxides in ash, but other results in excess of 50% have been observed where the ash (silicon and aluminum source) is very low.

Chlorine in coal was high (0.10% to 0.20%). In many markets, this chlorine % would be consider mid-level.

Phosphorus in coal was generally low (<0.03%).

Vitrinite was generally high (often exceeding 80%). Reflectance is not fully understood across the Donkin Lease but appeared to range from 0.90 to 1.10, indicating the coal may be suitable to produce semi-soft to semi-hard coking coal.

Gieseler fluidity on raw coal generally exceeded 10,000 Mddm.

Hardgrove Grindability Index (HGI) was 60 to 65.

16.1.2 Tunnel Region

Raw coal results from the six channel samples (including the September 2007 channel) in the tunnel region (Table 16.1, Tunnel Channel Samples: Ash and Sulfur Results) suggest the coal quality characteristics of the Harbour Seam may be variable over short distances. DCH01, sampled in 2007, was extracted a few meters from T2. The seam thickness varied from 3.13 m to 3.58 m in the two samples. Similarly, the recorded seam thickness varied from 3.58 m at T2 to 4.03 m at SS1 (17 m east), and decreased to 3.4 5m at SS2 (further 10 m east). For SS3 and SS4, the thickness was 3.44 m. The integrity of the thickness data from the historical data has not been verified.

Total sulfur varied from 4.45% (DCH01) to 4.02% (T2) to 3.29% to 3.45% moving easterly to the other strip samples over an estimated length of approximately 50 m.

Raw ash varied from approximately 9% at T2/DCH01 to 5.8% at SS2 increasing to 7.7% at SS4.

The average result of all six strip samples has been assumed to represent raw quality at the base of the tunnel. The average ash was 7.8%, and the average TS was 3.97%.

Table 16.1
Tunnel Channel Samples: Ash and Sulfur Results

Parameters	DCH01	T2	SS1	SS2	SS3	SS4	Average
Thickness (m)	3.13	3.58	4.03	3.45	3.44	3.44	**3.51**
Ash %	8.9	9.2	8.0	5.8	6.9	7.7	**7.8**
T Sulfur %	4.45	4.02	5.15	3.29	3.45	3.45	**3.97**

16.1.3 Ply-by-Ply Results

All of the channel samples had a thin, high ash band (0.03-m to 0.05-m thick, ash 47% to 60%) approximately 0.2 m to 0.5 m from the top of the sampled section. Ash in the section above the band varied from 10% to 15%. The basal ply in all cases exceeded 10% in total sulfur. Sulfur in the top plys was more variable sample to sample but often well in excess of 5%. The high sulfur results are generally due to the presence of pyrite (Table 16.2, Channel Sample SS1: Forms of Sulfur) with a background organic level within the plys generally of 1% to 2%. The high sulfur ply in SS1, 0.15 m from the top of the seam, had 12% pyritic sulfur. Most plys had little or no sulfate sulfur. All samples had a central section in excess of 2-m thick with ash <4%. Total sulfur in this section generally varied from 1% to 3% within the plys and averaged slightly in excess of 2% for all channel samples.

Table 16.2
Channel Sample SS1: Forms of Sulfur

Channel SS1					
Thickness (m)	Height from Base (m)	Total Sulphur % (ad)	Forms of Sulphur - Pyritic % (ad)	Forms of Sulphur - Sulphate % (ad)	Forms of Sulphur - Organic % (ad)
0.15	4.03	6.99	5.70	0.27	1.02
0.15	3.88	14.40	12.16	0.06	2.18
0.24	3.73	6.03	4.17	0.02	1.84
0.03	3.49	6.11	4.61	0.03	1.48
0.15	3.46	7.49	4.76	0.03	2.70
0.15	3.31	2.64	0.61	0.00	2.03
0.15	3.15	2.20	0.52	0.00	1.68
0.15	3.00	1.88	0.36	0.00	1.52
0.15	2.85	1.16	0.08	0.00	1.08
0.15	2.70	1.22	0.03	0.00	1.19
0.15	2.55	1.02	0.06	0.00	0.96
0.15	2.39	1.18	0.10	0.00	1.08
0.15	2.24	1.07	0.04	0.00	1.03
0.15	2.09	0.96	0.32	0.00	0.64
0.15	1.94	1.40	0.01	0.00	1.39
0.21	1.79	1.55	0.30	0.00	1.25
0.04	1.58	2.66	1.24	0.01	1.41
0.15	1.54	3.73	1.60	0.02	2.10
0.15	1.39	3.22	1.58	0.02	1.62
0.15	1.24	3.86	2.24	0.03	1.59
0.15	1.08	3.61	1.94	0.03	1.64
0.75	0.93	3.26	1.80	0.02	1.44
0.18	0.18	13.24	12.80	0.17	0.28

16.2 Washability and Sizing Characteristics

16.2.1 Washability

The coal has high mass (often >90%) and low intrinsic ash at low density such as 1.40 (Table 16.3, Typical Washability Data: Channel Samples T2 and DCH01), strip samples T2 and DCH01, respectively, 90% and 92.5% F1.40 cumulative mass, 2.3% and 2.6% cumulative ash).

There is a tendency for the lowest density fractions to contain lower incremental total sulfur (see Table 16.3: T2 F1.25 1.05% TS and DCH01 F1.30 2.20%); however, the sulfur rises rapidly above F1.40 (cumulative at T2 1.99%, cumulative at DCH01 2.70%). Note in Table 16.3, the results for T2 are full seam (as analysed by CAN-MET at the time), while DCH01 represents the best quality central section which excluded the upper and lower plys containing the highest sulfur. The full seam results for DCH01 show higher sulfur (approximately 2.9% - 3%) at F1.40 compared to 2.7% for the central section.

The sulfur results for T2 and DCH01 indicate that the pyritic sulfur is very finely disseminated and will not likely liberate well during washing except at extremely low density (<1.40).

A further confounding aspect of the sulfur results is that these two strip samples (T2 and DCH01) were taken only meters apart in the base of the tunnel. A similar outcome was observed in the raw coal sulfur results from all six strip samples.

16.2.2 Sizing

Wet tumble tests conducted by CAN-MET on the 74-tonne pilot scale sample and sizing work undertaken by A&B Mylec on the Museum Site sample and DCH01 suggest the coal will likely contain approximately 20% -0.5mm (0.7 millimeter (mm) square mesh) coal following typical dry and wet breakage of the coal during washing (at 40 mm to 50 mm coal top size). Similar results were obtained by CAN-MET on washed coal samples from the Victoria Junction bulk sample wash.

Table 16.3
Typical Washability Data: Channel Samples T2 and DCH01

SAMPLE: T2, FULL SEAM						
Density	Fractional			Cumulative		
	Mass %	Ash %	Sulphur %	Mass %	Ash %	Sulphur %
F1.25	2.26	0.71	1.05	2.26	0.71	1.05
S1.25 - F1.275	39.20	0.69	1.16	41.46	0.69	1.15
S1.275 - F1.30	32.00	2.47	2.13	73.46	1.47	1.58
S1.30 - F1.35	12.19	5.08	3.43	85.65	1.98	1.84
S1.35 - F1.40	4.40	9.27	4.96	90.05	2.34	1.99
S1.40 - F1.45	2.69	12.87	7.43	92.74	2.64	2.15
S1.45 - F1.50	1.05	17.71	9.03	93.79	2.81	2.23
S1.50 - F1.60	1.07	22.35	10.38	94.86	3.03	2.32
S1.60 - F1.80	1.30	30.88	12.64	96.16	3.41	2.46
S1.80 - F2.00	0.65	39.40	16.82	96.81	3.65	2.56
S2.00 - F2.10	0.38	46.55	18.77	97.19	3.82	2.62
S2.10	2.81	74.17	17.14	100.00	5.79	3.03

SAMPLE: DCH01, OPTIMUM CENTRAL SECTION						
Density	Fractional			Cumulative		
	Mass %	Ash %	Sulphur %	Mass %	Ash %	Sulphur %
F1.30	73.57	1.65	2.20	73.57	1.65	2.20
S1.30 - F1.35	14.49	5.40	4.00	88.06	2.27	2.50
S1.35 - F1.40	4.42	9.72	6.61	92.49	2.62	2.70
S1.40 - F1.45	1.95	12.48	8.25	94.43	2.83	2.81
S1.45 - F1.50	1.13	16.07	9.81	95.57	2.98	2.89
S1.50 - F1.60	1.10	20.32	11.22	96.67	3.18	2.99
S1.60 - F1.80	0.71	28.10	12.41	97.38	3.36	3.06
S1.80 - F2.00	0.35	36.85	14.58	97.73	3.48	3.10
S2.00 - F2.20	0.24	46.10	16.28	97.97	3.59	3.13
S2.20	2.03	59.73	24.38	100.00	4.73	3.56

16.3 Washplant Simulations

Data from strip sample DCH01 was simulated by A&B Mylec (2008 Feasibility) for yield, ash and sulfur and for a dense medium cyclone / teeter bed or spirals / column flotation system, using the Resource_Mastor simulation program (note: similar simulations were reported on the Museum sample in the 2007 Pre-Feasibility Scoping Report).

Two coking coal product wash concepts were considered.

1) Wash all coal in a single stage process to meet an ultralow ash coking coal specification (low density, 1.40) using primary dense medium, teeter beds or spirals and flotation. Increasing the density (1.60) would realize a higher ash, higher yield coking coal specification.
2) Wash the coal in a two-stage process with primary product routing to a metallurgical coal (primary dense medium, teeter beds or spirals and flotation) with secondary rewash of the primary dense medium rejects to form a thermal product.

The simulation results for Concept 2 are not reported here as they realized sulfur in the secondary product in excess of 4% to 5%.

16.3.1 Concept 1 Simulation Results

Table 16.4, below, summarizes the simulations that were completed on ply sections in DCH01. Either the full seam or the central section, which excludes roof and floor coal, are options for a CM operation.

OSD was not considered.

Both the roof and floor coal plys realized high sulfur at low (1.40) and high (1.60) cut point densities (4.4% to 5.2% and 4.7% to 5.0%, respectively). Sulfur ranged from 2.7% to 2.9% in the optimum central section. On a full seam basis, sulfur washed to 2.8% to 3.2%.

Yield ranged from 87% to 92% in the central section and 78% to 84% in the full seam. Product ash ranged from 2.7% to 3.3% (central section) and 3.1% to 3.8% (full seam).

Table 16.4
Simulation Results: DCH01

Section	From (m)	To (m)	Thick (m)	Low Cut Point Density (1.40)			High Cut Point Density (1.60)		
				Yield %	Ash %	TS %	Yield %	Ash %	TS %
Roof Coal (above marker band)	0.00	0.27	0.27	65	6.0	4.4	85	7.4	5.2
Optimum Central Section	0.31	2.93	2.62	87	2.7	2.7	92	3.3	2.9
Floor Coal	2.93	3.28	0.35	32	9.5	4.7	41	10.7	5.0
Full Seam	0.00	3.28	3.28	78	3.1	2.8	84	3.8	3.2

16.3.2 Reject Handling

The likelihood of acid drainage from reject coals is a strong possibility with all plant designs for Donkin coal if traditional stockpiling of coarse materials and dam storage of flotation tails are followed. An alternative reject handling system that requires investigation may be to filter the flotation tailings and to dispose of the solids with coarse rejects (dry co-disposal). Treatment of the dry rejects with limestone or possibly power station fly ash as the reject exits the plant may reduce the likelihood of acid drainage being a problem for future mine rehabilitation.

16.4 Product Specifications

16.4.1 Basic Specifications

Apart from a reduction in ash and sulfur, most of the properties of raw or washed coal will be very similar for Harbour seam coal. “Hard” washing of the coal at low density to realize an ultralow ash coking coal product will reduce sulfur slightly and ash more significantly whereas washing at high density will primarily only remove freely liberated pyritic sulfur and most stone (ash) components. A potential clean coal specification profile for the coal (utilizing raw and clean coal properties) is presented in Table 16.5, below.

Notes:

- The specifications are derived from the six strip samples at the base of the tunnel and may not reflect variation in quality across the lease.
- The raw coal specification assumes minimal OSD.
- Total sulfur specifications are based on the higher results from DCH01 rather than an average of the strip samples.

Table 16.5
Typical Product Specifications

	Raw Coal	Washed Coal
Total Moisture %	6.0	10.0
Air Dried Moisture %	1.0	1.0
Ash% ad	8.0	3.0
Volatile Matter % ad	37.0	39.0
Total Sulphur % ad	4.50	3.00
CV Btu/lb gar	12800	13000

Average raw coal quality for the Hub Seam based on the drill hole data is shown in Table 16.6, below. Partings and OSD are not included.

Table 16.6
Summary of Raw Coal Quality, Hub Seam

Hole No.	Seam Name	Thickness (m)	Ash % (ad)	VM % (ad)	Sulphur % (ad)	Gross calorific Value Btu/lb (ad)	Crucible Swelling Number	Insitu Density (g/cc @ 6% moisture)
H8A	Hub (Upper)	2.0	12.1	30.4	5.6	13,404	6.5	1.36
H8D	Hub (Upper)	1.9	19.6	30.9	7.2	11,862	6.5	1.46
H8D	Hub (Lower)	0.7	12.6	32.7	4.3	13,156	7.5	1.37
P-2	Hub (Upper)	2.6	22.9	30.0	6.8	11,037	6.5	1.50
P-4	Hub (Upper)	2.4	16.9	32.5	5.0	11,830	7.0	1.42
H8C	Hub	3.8	11.3	34.4	4.8	13,122	7.5	1.35
P-3	Hub	3.4	11.4	34.1	6.3	12,942	7.0	1.35
Average (arithmetic)		**2.4**	**15.3**	**32.1**	**5.7**	**12,479**	**6.9**	**1.40**

16.4.2 Detailed Specifications

Table 16.7, below, presents a range of additional product properties that may be applied to either raw or washed coal for the Harbour Seam. Similar Hub Seam data is not available. The following properties should be noted.

- CSN and Gieseler maximum fluidity of 7 and >10,000 Mddm, respectively.
- High vitrinite content (typically 80%)
- Moderate rank (typically 1.00 Romax)
- Low initial ash deformation and flow temperatures (1,100^{o}C and 1,300 ^{o}C), respectively, due to the high iron from pyrite
- Low to moderate (market dependent) phosphorus in coal (typically 0.03%)
- High (market dependent) chlorine in coal (typically 0.15%)

Table 16.7
Additional Product Specifications

Ash Fusion (Celcius,reducing)	Spec	Range
Initial Deformation Temperature	1100	1050 - 1150
Flow Temperature	1300	1200 - 1400
Ash Chemistry (oxides of ash, % dry)		
Silicon	20	15 - 40
Aluminium	20	15 - 25
Iron	50	35 - 55
CSN	7	7 to 8
Gieseler Fluidity Mddm	>10000	10000 - 25000
Chlorine in coal (% dry)	0.15	0.12 - 0.2
Phosphorus in coal (% dry)	0.03	0.01 - 0.04
Vitrinite % (by vol.)	80	75 - 85
Reflectance	1.00	0.90 - 1.10
Hardgrove Grindability Index	65	60 - 70
Ultimates (% daf)		
Carbon	83.0	80 - 85
Hydrogen	5.4	5.2 - 5.5
Nitrogen	1.3	1.2 - 1.5
Oxygen	7.0	5 - 10

16.4.3 Coking Studies

The coal has many excellent coking coal properties including:

- low ash;
- low phosphorus; and,
- high CSN and fluidity.

However, pilot scale studies on coke strength and reactivity conducted on several raw and clean coal composites derived from strip sample DCH01 (Table 16.8, below) suggest the coal has low to moderate coke strength after reaction (CSR typically 25).

ACIRL's carbonization facility offered the opinion that the coke test results are typical of a semi-soft coking coal with a reactive ash composition. The high reactivity (CRI) and resultant low coke strength after reaction (CSR) are a result of the low rank and ash characteristics. Both the raw and clean coke composites have extremely high iron in the ash, which contributes significantly to the high CRI.

Setting aside the high sulfur, the coal suits a semi-soft market. The impact of iron on coke strength may be minimized by appropriate blending with other materials.

Table 16.8
Coke Strength Results: Mid-Section Clean Coal Composite, Strip Sample DCH01

Carbonisation Report			
Sample: 2_2R_1B Clean Coal Composite			
Coke Reactivity Index (CRI)	58.4	59.5	59.0
Coke Strength after Reaction (CSR)	24.5	26.2	25.4

Again, similar testing was not available for the Hub Seam.

17.0 Mineral Resource and Mineral Reserve Estimates

As mentioned previously, the purposes of this report are to present the results of the PFS and the reserves defined by the PFS. The geological data, resource boundaries and resources for the PFS are based on the MBGS Technical Report, dated April 2007. The data and grids from the MBGS report were used by XCDM to prepare the mine plans for the PFS and in turn estimate the reserves. The author considers the available data and the output from the MBGS report suitable for mine planning. The lack of washability quality data for the Hub Seam does not support an estimate of the washed quality for the Hub Seam reserves.

The assumptions and resources for the Harbour and Hub seams as identified in the MBGS Technical Report are included for continuity followed by the Harbour and Hub seams reserve estimates. The procedures for the resource estimate from the MBGS report are paraphrased.

17.1 Geological Modeling

A geological model of the Donkin lease has been developed using ECS-Surpac MINEX software on the basis of offshore drill hole seam intersections and data from the Harbour Seam workings in No. 20 and No. 26 collieries. Reprocessing and reinterpretation of seismic data were recently completed, and a revised geological model will be prepared utilizing this data when the seismic results are analyzed in detail.

The coal seam depth and thickness records that formed the basis of the MINEX geological model were derived from a combination of the geological descriptions, density logs, geodip logs and coal analysis information. Despite the issues with data resolution, the LAS digital geophysical data provided continuous data throughout the drill hole so interburden thicknesses are probably more accurate than the shipboard logs (affected by partially cored intervals, poorly recorded core loss and tidal variations).

The main geological structures modeled are the Cape Perce Fault (identified in previous underground workings) and the Donkin Fault (interpreted from seismic data). All have been modeled as vertical faults at this stage, awaiting analysis and incorporation of the seismic data into the model. All faults shown on plans are at the Harbour Seam level, and have been sourced from the Donkin-Morien Development Project 1981 plan, Structure Contours – Base of Harbour Seam.

17.2 Mineral Resource

17.2.1 Framework Developed from GSC Paper 88-21

Geological Survey of Canada Paper 88-21, *A Standardized Coal Resource/Reserve Reporting System for Canada*, is referenced by National Instrument 43-101 for the preparation of Mineral Resource/Mineral Reserve estimates on coal deposits. GSC Paper 88-21 outlines definitions, concepts and parameters used to determine coal resource and reserve quantities, and to provide a framework to facilitate consistent categorization of coal quantities found within various depositional and tectonic regimes.

- Geology Type: Low-Type A structural Complexity
- Deposit Type: Underground
- Exploitation Feasibility: Immediate and Future Interest
- Assurance of Existence: Measured, Indicated, Inferred

Geology Type: Paper 88-21 specifically recognizes the lateral continuity and consistency of coal seams in the Sydney Coalfield as typifying the least complex coal deposits in Canada, based on the extensive mining history in the area. In the Sydney Coalfield, data from drill hole intersections spaced several kilometers apart can be correlated with confidence. At Donkin, the network of exploration drill holes, generally between 1.5 km - 2.5 km apart, is strongly augmented by the regular grid of seismic survey lines, the Harbour Seam exposure in the pit bottom area at the base of the two Donkin access tunnels and the Harbour Seam workings throughout No. 20 Colliery, a short distance to the west of the Donkin Resource Block.

Deposit Type: All coal resources reported within the Donkin Lease fall within the underground category. There are no resources suitable for surface mining. Coal resources that are deeper than 700 m rock cover are present at Donkin and would be classified as non-conventional at this stage. Non-conventional resources have not been included in this resource statement. Sterilized resources are those that are unavailable for mining due to environmental or other restrictions. At Donkin, coal within 75 m of an offshore drill hole that intersects the coal seam in question is unable to be mined. For a 2-m thick seam, this equates to approximately 50,000 tonnes of coal. For the three potentially mineable seams, Lloyd Cove, Hub and Harbour, approximately 1.3 million tonnes (Mt) of coal would be sterilized by this legislative requirement. In addition, seams under less than 200 m of solid rock cover were not considered for longwall mining. An estimate of in-situ resources of coal in the three seams where the rock cover is between 100-m and 200-m thick is included in the Inferred category in this report. Bord-and-pillar mining may be possible in parts of these areas, as it has in other submarine mines in the Sydney Coalfield. No resources were estimated for coal under less than 100 m cover.

Exploitation Feasibility: At Donkin, resources of immediate interest are considered to be those within the envelope defined by the offshore drill holes. All resources outside this envelope were considered as resources of future interest.

Assurance of Existence:

Measured: There are no Measured Resources within the Donkin Resource Block.

Indicated: Indicated Resources are those resources within the envelope of offshore drill holes where the combination of drill spacing, coal quality data and seismic survey data provides sufficient confidence in the reliability of the data points and the seam continuity between data points to warrant a classification of Indicated.

Inferred: All coal resources outside the envelope defined by the offshore drill holes are considered to be of Inferred status.

Within the drill hole envelope: The eastern portion of the area is classified as Inferred because the coal quality and seam thicknesses reported in the easternmost drill hole (H8B) is of lower confidence than in other holes.

17.2.2 Resource Categories based on CIM Definition Standards

The following are the limits and considerations applied to the resource estimate.

- A density of 1.3g/cc was applied to coal volumes to estimate tonnages of in-situ coal for all seams. The ash content from the very reliable strip sample data, and therefore the density of the seam, is significantly lower than the ash in drill holes, particularly those holes where coal losses had occurred. After reviewing the ash and density for Lloyd Cove, Hub and Harbour seams, in conjunction with core losses that occurred, 1.3g/cc was accepted as the average coal density for all seams. This density also ensured that the tonnage estimate was not overstated as the lower density, friable, vitrinite-rich coal was likely to be the coal that was lost during the core drilling process.
- A minimum of 100 m of rock between the seabed and the seam. Coal occurring between 100 m – 200 m cover may be suitable for bord-and-pillar extraction as the subsidence constraints that relate to longwall extraction may not apply to bord-and-pillar extraction.
- A maximum depth below the sea floor of 700 m for the Harbour Seam. There is potentially a very large coal inventory in the Harbour Seam in this area, and further work may enable this coal to be included in future coal resource estimates.
- Exclusion zones of 75 m radius (150 m diameter) were applied to the drill holes centered on the projected position of the drill hole in the seam (please note, a 100 m radius was used for the mine plan and reserve calculation) . This was CBDC's chosen practice, incorporating the Federal requirement of 55 m solid strata to be left between workings and any material likely to flow, and a contingency because of the uncertainty in the degree of success of sealing/cementing the drill holes and the uncertainty over the precise location of the drill hole at seam level. This coal was not included in the resource estimate.
- An exclusion zone of 150 m was applied to the Donkin Fault, due to the uncertainties in its position and character as well as the extent of disturbance to the coal seams.
- Resources were not estimated within 100 m of the existing Harbour Seam workings in the No. 20 mine to the west of the Donkin license.
- Full seam thickness was used for the Harbour Seam, for which the minimum seam thickness was 1.8 m.

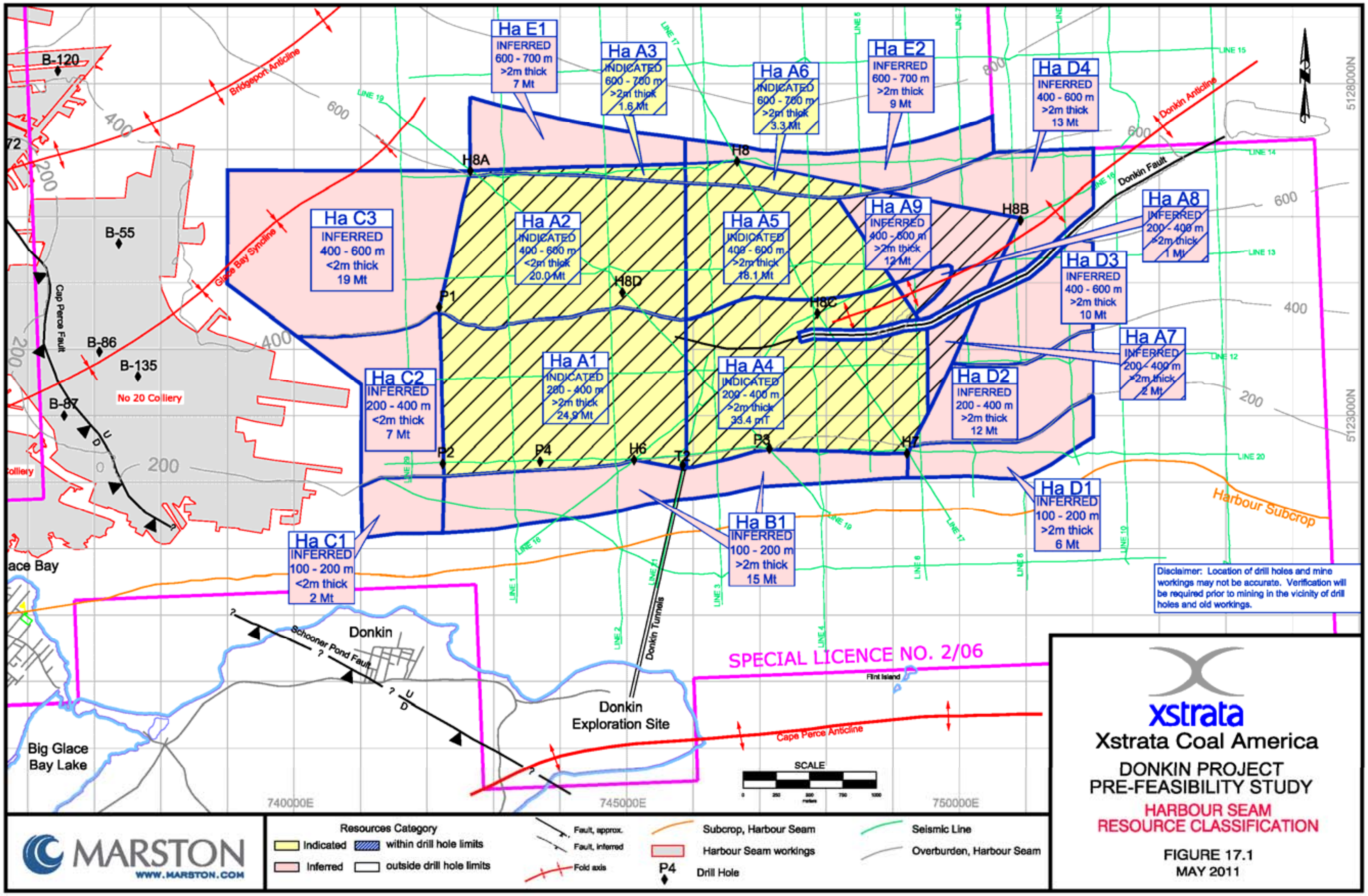
17.2.3 Summary of Coal Resources

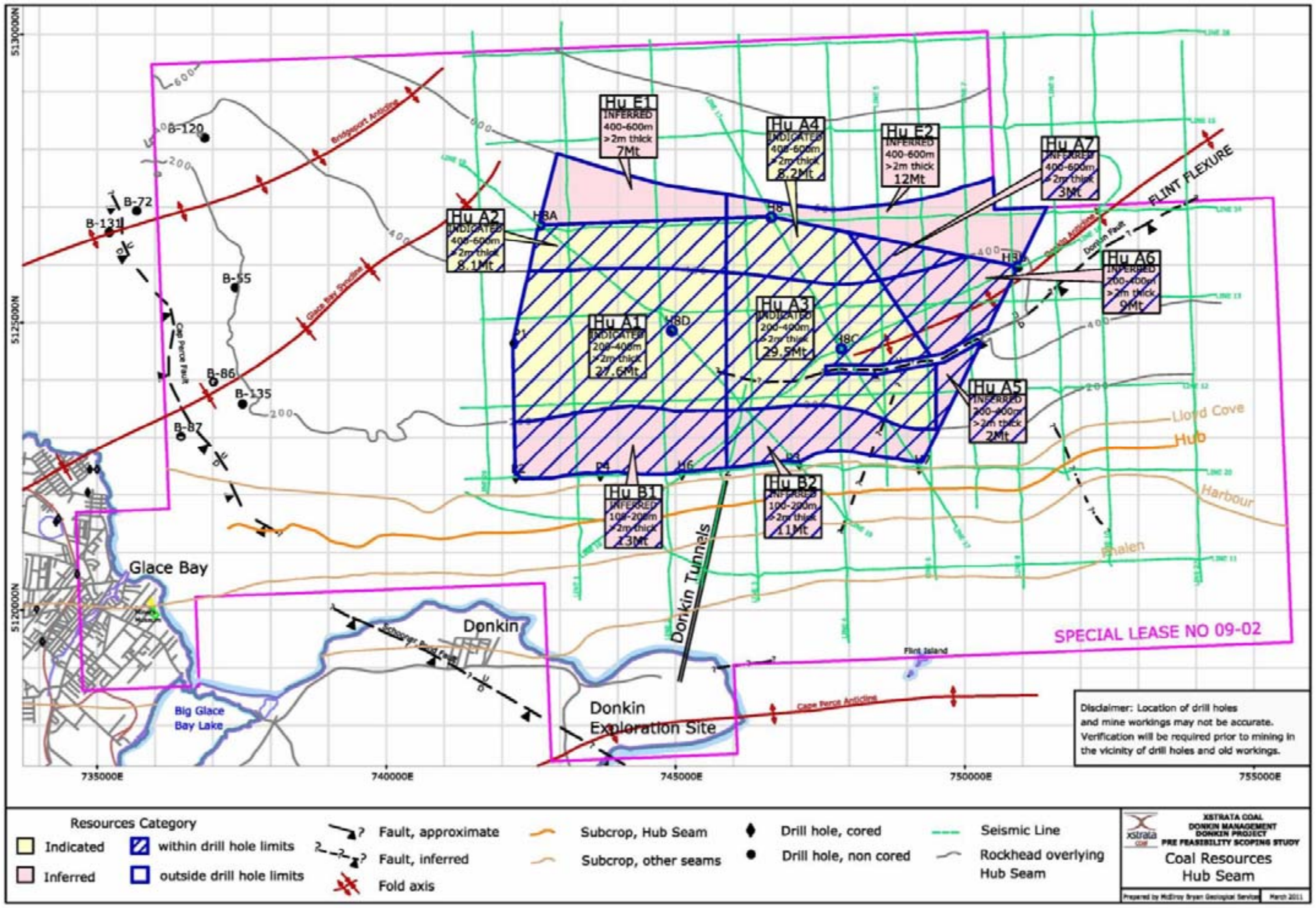
The Donkin coal resource was subdivided into a number of blocks, and the coal resources in each block were classified according to the CIM Definition Standards. The blocks are divided internally on the basis of depth of cover and resource classification status (Indicated or Inferred). The location of the resource blocks and the resource estimate for each sub-block for the Harbour and Hub seams are shown in Figures 17.1 and 17.2, respectively. Each sub-block has a seam code (Ha) and a resource block designation (A, B, C, D, E) followed by a numeric reference, [e.g. HaA1 = Harbour Seam, Block A, sub-block 1; HuA1 = Hub Seam, Block A, sub-block 1].

In broad terms, the resource blocks are as follows.

- **Block A**: Coal in the Hub (Hu A) and Harbour (Ha A) seams within the envelope defined by the offshore drill holes and under more than 200 m of rock cover below the sea floor.
- **Block B**: Coal in each seam where the seam occurs under less than 200 m of cover below the sea floor. For the Hub Seam, Block B is immediately updip (south) of Block A. Any coal under less than 100 m of rock cover was not included in the resource estimate.
- **Block C**: Coal in the Harbour Seam only, from the western limit of Blocks A and B to within 100 m of the Harbour Seam workings in No. 20 Colliery, to the west of Blocks A and B.
- **Block D**: Coal in the Harbour Seam only, to the east of Blocks A and B, nominally extending eastwards to 752000E, a maximum distance of approximately 2.5 km from the drill hole envelope boundary.
- **Block E**: Coal to the north of Block A to a maximum depth below the sea floor of 700 m for the Harbour Seam and 600 m for the Hub Seam.

MBGS has identified an Indicated Resource of 101 Mt and an Inferred Resource of 15 Mt in the Harbour Seam within the envelope bounded by the offshore holes (Block Ha A). A summary of the coal resources is presented in Table 17.1, Summary of Harbour Seam Indicated Coal Resources, and Table 17.2, Summary of Harbour Seam Inferred Coal Resources. MBGS has also identified an Indicated Resource of 73.4 Mt in the Hub Seam within the envelope bounded by the offshore holes (Block Hu A) and the coal resource summaries are presented in Tables 17.3 and 17.4. The author has reviewed MBGS's procedures and assumptions used to prepare the resource estimate and considers the estimate accurate and appropriate for mine planning.


Ha E1
INFERRED
600 - 700 m
>2m thick
7 Mt
Ha A3
INDICATED
600 - 700 m
>2m thick
1.6 Mt
Ha A6
INDICATED
600 - 700 m
>2m thick
3.3 Mt
Ha E2
INFERRED
600 - 700 m
>2m thick
9 Mt
Ha D4
INFERRED
400 - 600 m
>2m thick
13 Mt
Ha C3
INFERRED
400 - 600 m
<2m thick
19 Mt
Ha A2
INDICATED
400 - 600 m
<2m thick
20.0 Mt
Ha A5
INDICATED
400 - 600 m
>2m thick
18.1 Mt
Ha A9
INFERRED
400 - 600 m
>2m thick
12 Mt
Ha A8
INFERRED
200 - 400 m
>2m thick
1 Mt
Ha D3
INFERRED
400 - 600 m
>2m thick
10 Mt
Ha A1
INDICATED
200 - 400 m
>2m thick
24.9 Mt
Ha C2
INFERRED
200 - 400 m
<2m thick
7 Mt
Ha A4
INDICATED
200 - 400 m
>2m thick
33.4 mT
Ha D2
INFERRED
200 - 400 m
>2m thick
12 Mt
Ha A7
INFERRED
200 - 400 m
>2m thick
2 Mt
Ha D1
INFERRED
100 - 200 m
>2m thick
6 Mt
Ha B1
INFERRED
100 - 200 m
>2m thick
15 Mt
Ha C1
INFERRED
100 - 200 m
<2m thick
2 Mt
B-120
B-55
B-86
B-135
B-87
No 20 Colliery
Cap Perce Fault
Bridgeport Anticline
Glace Bay Syncline
Donkin Anticline
Donkin Fault
Harbour Subcrop
H8A
H8
H8B
H8D
H8C
P1
P2
P3
P4
H6
H7
T2
Donkin
Schooner Pond Fault
Donkin Tunnels
Donkin Exploration Site
Big Glace Bay Lake
SPECIAL LICENCE NO. 2/06
Flint Island
Cape Perce Anticline
SCALE
740000E
745000E
750000E
5128000N
5123000N
Disclaimer: Location of drill holes and mine workings may not be accurate. Verification will be required prior to mining in the vicinity of drill holes and old workings.
xstrata
Xstrata Coal America
DONKIN PROJECT
PRE-FEASIBILITY STUDY
HARBOUR SEAM
RESOURCE CLASSIFICATION
FIGURE 17.1
MAY 2011
MARSTON
WWW.MARSTON.COM
Resources Category
Indicated
Inferred
within drill hole limits
outside drill hole limits
Fault, approx.
Fault, inferred
Fold axis
Subcrop, Harbour Seam
Harbour Seam workings
Drill Hole
Seismic Line
Overburden, Harbour Seam



Source: 2011 PFS

Figure 17.2
Hub Seam Resource Area

Table 17.1
Summary of Harbour Seam Indicated Coal Resources

Thickness Range (m)	Depth Below Sea Bed (m)	Resources within Drill Hole Limits (Mt)
		Block A
1.8 - 3.6	100 - 200	0
	200 - 400	58
	400 - 600	38
	600 - 700	5
Total		**101**

Table 17.2
Summary of Harbour Seam Inferred Coal Resources

Thickness Range (m)	Depth Below Sea Bed (m)	Resources within Drill Hole Limits (Mt)	Resources outside drill hole limits (Mt)					
		Block A	Block B		Block C	Block D	Block E	Total
1.8 - 3.6	100 - 200	0	0	15	2	6	0	**23**
	200 - 400	3	0	0	7	12	0	**22**
	400 - 600	12	0	0	19	23	0	**54**
	600 - 700	0	0	0	0	0	16	**16**
Total		**15**	**0**	**15**	**28**	**41**	**16**	**115**

Table 17.3
Summary of Hub Seam Indicated Coal Resources

Thickness Range (m)	Depth Below Sea Bed (m)	Indicated Resources Block A (Mt)*
3.2 - 4.0	100 - 200	0
	200 - 400	57.1
	400 - 600	16.3
Total		**73.4**

*Within the drill hole limits as prescribed by XCDM

Table 17.4
Summary of Hub Seam Inferred Coal Resources

Thickness Range (m)	Depth Below Sea Bed (m)	Resources within	Resources outside drill hole limits (Mt)					
		Block A	Block B		Block C	Block D	Block E	Total
3.2 - 4.0	100 - 200	0	24	0	0	0	0	**24**
	200 - 400	11	0	0	0	0	0	**11**
	400 - 600	3	0	0	0	0	19	**22**
Total		**14**	**24**	**0**	**0**	**0**	**19**	**57**

The Indicated Resources are summarized in Table 17.5, below.

Table 17.5
Indicated Resource Summary

Seam	Indicated Tonnes (Mt)
Hub	73
Harbour	101
Total	**174**

17.3 Mineral Reserves

As defined by the Canadian Institute of Mining, Metallurgy, and Petroleum:

"Mineral Reserves are those parts of Mineral Resources which, after the application of all mining factors, result in an estimated tonnage and grade which, in the opinion of the Qualified Person(s) making the estimates, is the basis of an economically viable project after taking account of all relevant processing, metallurgical, economic, marketing, legal, environment, socio-economic and government factors. Mineral Reserves are inclusive of diluting material that will be mined in conjunction with the Mineral Reserves and delivered to the treatment plant or equivalent facility. The term 'Mineral Reserve' need not necessarily signify that extraction facilities are in place or operative or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals."

A "Probable Mineral Reserve" is the economically mineable part of an Indicated and, in some circumstances, a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This study must include adequate information on mining, processing, metallurgical, economic and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.

17.3.1 Qualifications

The Donkin Export Coking Coal Pre-Feasibility Study determined the most practical and an economical mining method for the Donkin underground resource as room-and-pillar mining with partial pillar extraction utilizing CMs for mining equipment. Longwall equipment is an alternate method.

For reserve reporting purposes, mine plans were limited to the Indicated Resource boundaries defined by the MBGS Technical Report; see Figures 17.1. and 17.2. Although plans were prepared for the PFS which extended into Inferred Resource areas, neither these plans nor the requisite economics were used to define the reserve base reported in this Technical Report.

Effectively, reserves were limited to the internal area defined by the drill holes with the exception of drill hole H8B, which was considered only to support an Inferred Resource determination. The drill hole boundary limits the maximum overburden thickness to less than 700 m (approximately 550 m), which historically in adjacent mines has been the depth of overburden where "sandstone outbursts" are more likely. Minimum overburden thickness is approximately 175 m at the Harbour Seam intersection with the tunnels. The minimum overburden thickness to accommodate full extraction mining is considered to be 200 m.

Minimum Harbour Seam thickness is 1.8 m. Minimum extraction thickness is 2.2 m. The Hub Seam minimum thickness is 1.5 m with an average thickness of 2.5 m. A 10% OSD (approximately 20% ROM ash) was considered in reserve calculations. The specific gravity (SG) for all calculations was 1.45. A barrier of approximately 75 m was left on either side of the Donkin Fault. Mains or submains can be extended across the fault. For the mine plan, a 100-m barrier surrounds each drill hole.

In room-and-pillar mining with pillar extraction, mining recovery is dependent on the size of the pillars and the entry width and in turn how much of the remaining pillars can be extracted. Depth of overburden is one of the primary considerations for sizing pillars. The thicker the depth of the overburden, the larger the pillar and the less coal that is recovered. Typically, entries that are required to remain open for long periods of time will have larger pillars while production panels will have smaller pillars. Salamon and squat pillar formulas were used for pillar design. Pillars are 31 m and 36 m dependent on depth. A 10% mining loss was included. Secondary extraction in the Harbour Seam will not take place until mining is completed in the Hub Seam directly above the proposed Harbour Seam mining area.

To meet the quality requirements for a metallurgical coal market, the mining recoverable coal will require processing through a coal preparation plant. Ash and sulfur are the two coal quality constitutes that need to be reduced. The end result is that the quantity of coal available for marketing is reduced. The coal processing yield was set at 81%.

17.3.2 Reserves

The Probable Reserves are shown in Table 17.6, below. Figures 17.3 and 17.4 show the layouts of the mining panels that are included in the reserve estimate for the Harbour and Hub seams, respectively.

Table 17.6
Probable Reserves

Seam	Indicated Insitu Resource tonne (Mt)	Probable[1] Mineral Reserve tonne (Mt)	Probable[2] Saleable Reserve tonne (Mt)
Hub	73	28	23
Harbour	101	30	25
Total	174	58	48

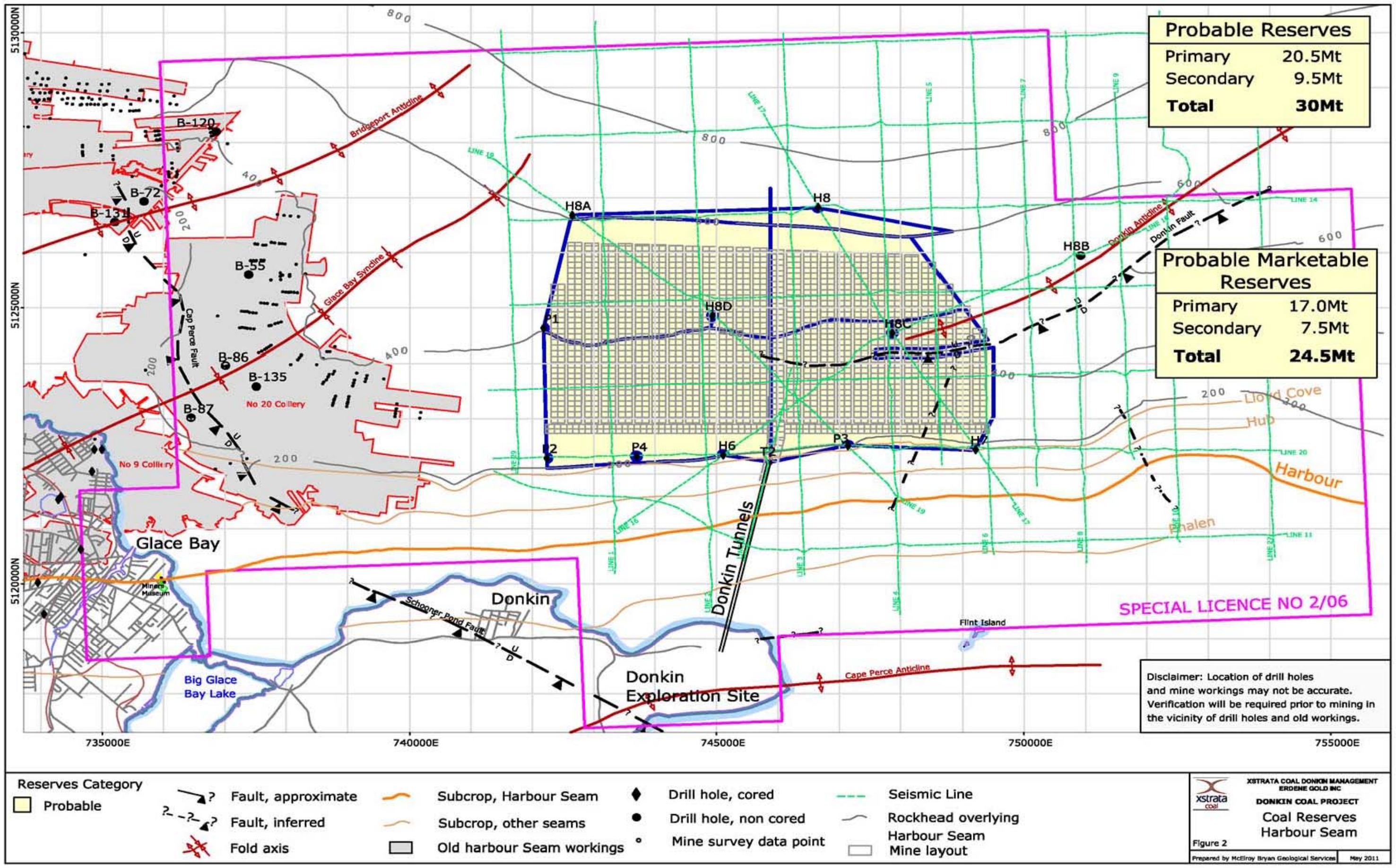
1 Extracted run-of-mine tonnes

2 Tonnes after coal preparation

Probable mineral reserves are the tonnes recovered during the mining process. Probable saleable reserves are the tonnes remaining following coal preparation.

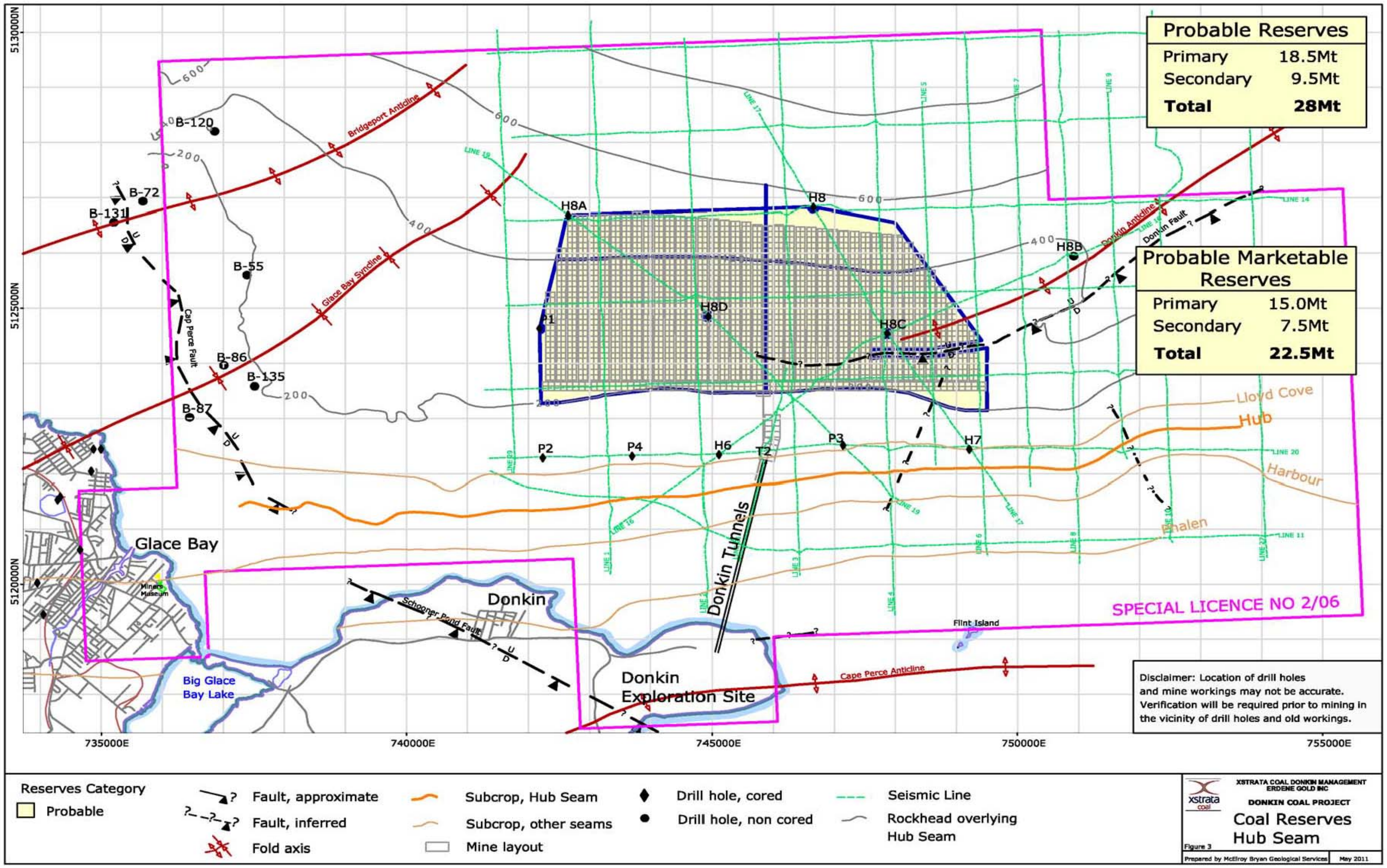
The Probable mineral reserves are a subset of the Indicated in-situ resources. The reserves are within an area that has a reasonable likelihood for receiving the necessary environmental and mining permits.

Typical washed and coking coal quality for the Harbour Seam was presented in Section 16.0. The quality represents the area at the base of the tunnel and is the quality that was the subject of the marketing study used to support the pricing structure for the PFS. Because the ROM ash and sulfur vary across the mining area, it would be expected that the wash quality will vary also but not as much as the ROM quality.



Source: XCDM

Figure 17.3
Coal Reserves - Harbour Seam



Source: XCDM

Figure 17.4
Coal Reserves - Hub Seam

The reserves are based on the assumption that the Harbour Seam coal and 50% of the Hub Seam coal are marketable as a metallurgical coal, and the other 50% of the Hub Seam Coal is marketable as a thermal product with the pricing structure projected by the marketing study prepared for the PFS. Because the Donkin coals are high sulfur coals with metallurgical coal properties (unknown for the Hub Seam), any downturn in the world metallurgical coal market has the potential to impact a Donkin or similar type of coal before impacting the more traditional metallurgical coals.

There are no environmental nor environmental permitting issues to which the estimate of mineral resources and mineral reserves may be materially affected except for the regulatory approvals presently being sought to provide nominally 2.7 Mtpa product coal suitable for the international export coking coal markets. XCDM is presently confirming the preferred transportation route for the product coal, which will then determine whether federal environmental approval will be required in addition to Provincial level environmental approval. A federal review may be required for both transportation options.

18.0 Other Relevant Data and Information – No additional data and information are provided.

19.0 Additional Requirements for Technical Reports on Development Properties and Production Properties

19.1 Mining Operations

19.1.1 General: Since the Donkin Special License was issued in May 2006, XCDM has commissioned several studies to evaluate the various options of mining, processing and marketing the coal associated with the license. For all of these studies, the primary seam of interest was the Harbour Seam. In June 2009 a Feasibility Study of the Exploration Phase of the project utilizing a single CM was approved conditional upon the exercising of a sales contract for the raw coal that would be produced. XCDM was unable to secure a domestic sales agreement for the sales of the raw coal with sole power utility Nova Scotia Power, Inc.

19.1.2 In early 2010 the project underwent a further thorough review of all available options, and it was decided to conduct a pre-feasibility study of an option whereby multiple CMs would be utilized to produce ROM coal that would subsequently be washed to produce a coal product that is suitable for export sales into the international coking coal market.

The March 2011 PFS expanded on the 2010 study by modifying the mine plans to incorporate the Hub Seam, continued refinement of the transportation options, and completing independent and internal marketing studies and evaluations. Although the transportation options are still undergoing evaluation, the marine option is the preferred alternative. The marketing study indicates that there is demand for the quantity and quality of coal that will be produced at the mine in international export metallurgical and thermal coal markets as well as domestic thermal coal markets.

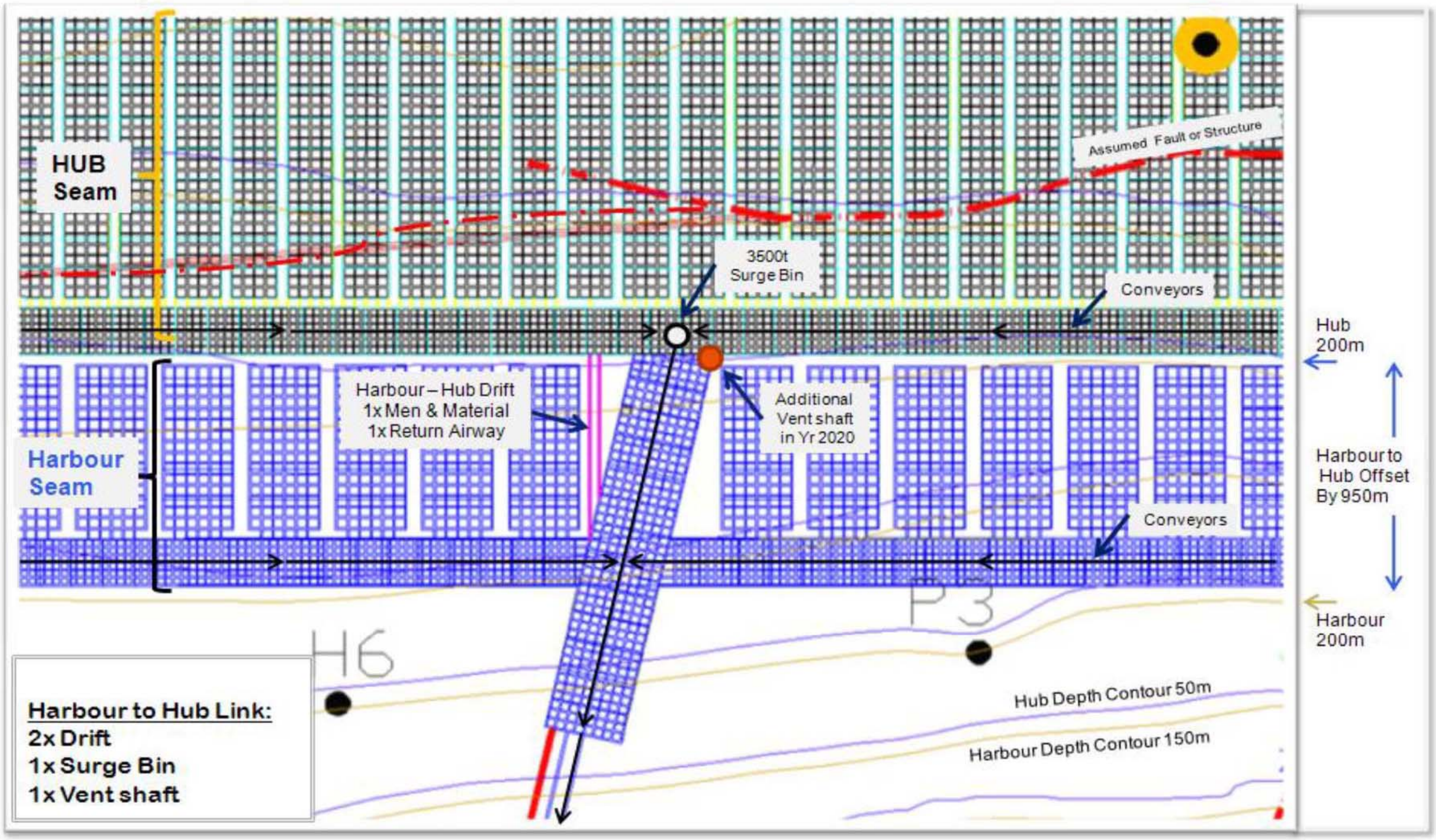
19.1.3 Mining: The Donkin Project Harbour and Hub seam resources are located off the coast of Cape Breton Island, Nova Scotia beneath the Atlantic Ocean. Only underground mining methods have been considered for extraction of the coal resource. There have been several submarine mines that have operated off the coast of Cape Breton Island adjacent to the Donkin License area, but none are currently active. Most of these mines have used the room-and-pillar or longwall mining methods or both.

In most of the previous studies, longwall mining was considered the mining method of choice with production targets ranging from 4 Mtpa to 5 Mtpa. Both ROM and processed coal sales were considered. The capital and the timing of the capital investment requirements for a longwall mine were significant, and considering the somewhat limited geological data base (Indicated and Inferred resources), the risks were considered unacceptable.

Initially, a single CM, room-and-pillar exploration option was evaluated and contingently approved based on a coal sale for the ROM product. This sale was not realized. The 2010 Study evaluated a multiple CM option with sales into the export metallurgical coal market. The 2011 Study adds the Hub Seam to the mine plan, expands the transportation options evaluation and targets export metallurgical and thermal coal markets as well as domestic thermal coal markets. The 2011 Study includes a single CM exploration phase.

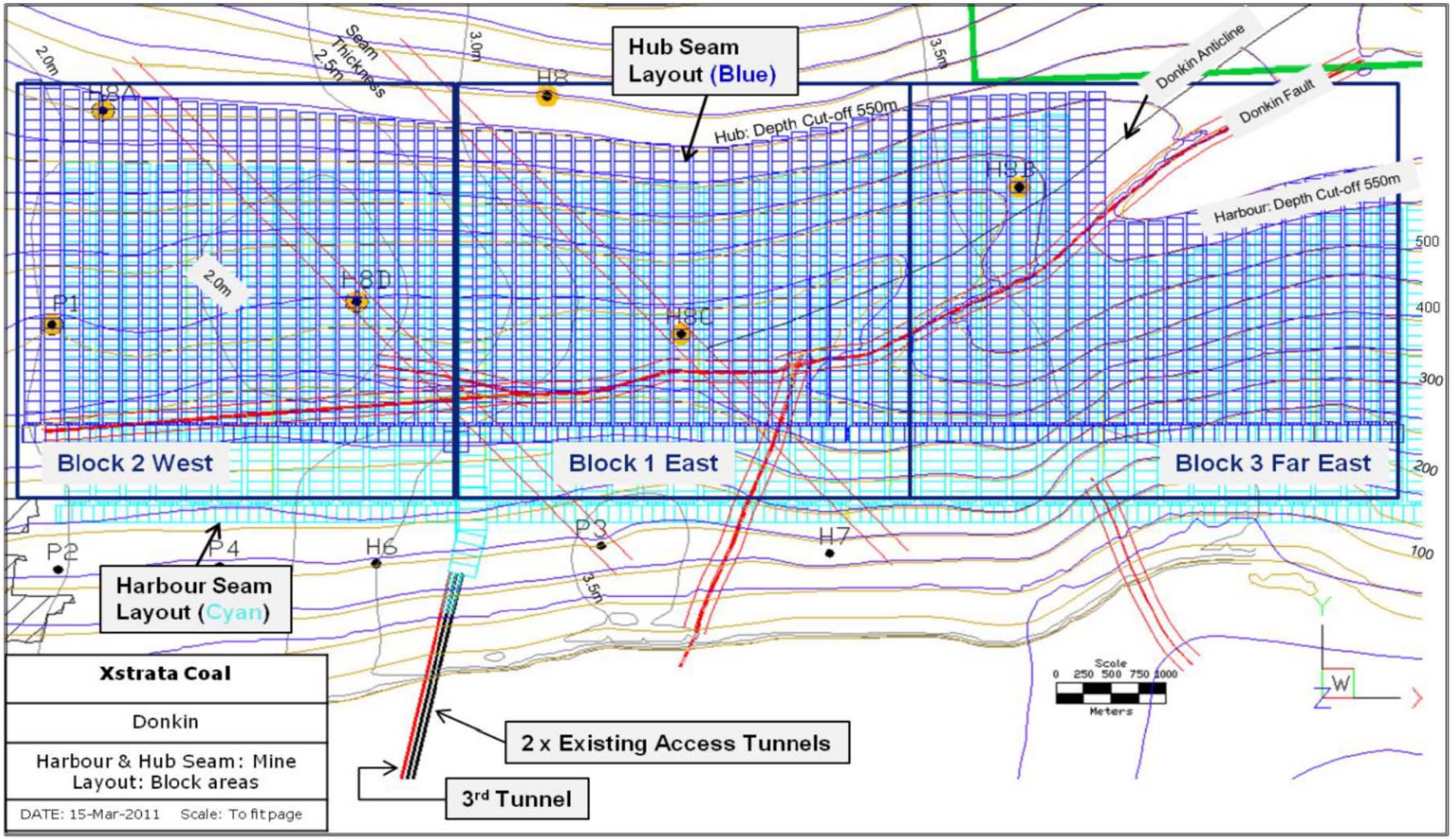
The mine proposed in the PFS is projected to produce approximately 3.5 Mtpa of ROM coal and 2.75 Mtpa of clean processed coal. The geological model provided grid information on the seam thicknesses, roof and floor elevations, and coal quality parameters of air dried ash, air dried sulfur and relative density. These grids were used as inputs along with the mine design parameters to produce a ROM coal production sequence. Along with geology, the key assumptions that form the foundation of the production estimates are the methane drainage requirements, roof support density and productivity levels that are modeled on the production systems and outputs that are currently being delivered from Xstrata Coal CM operations in South Africa.

The Harbour and Hub seams are the target seams with the Harbour Seam targeted for the initial exploration seam due to the tunnels being in place for this initial development. The Harbour Seam mine layout is designed with main development headings running east and west of the access tunnels, which are also along the strike of the seam. The main developments are situated 200 m beneath the sea floor with secondary or production panels driven downdip to a depth of 600 m. Pillar extraction is planned for both seams extracting between 50% and 70% of the pillars in the Hub and Harbour seam. Fewer pillars are extracted in the Harbour Seam due to the mains in the Hub Seam that cross over the production panels in the Harbour Seam preventing pillar extraction directly below in the Harbour Seam. To do this successfully with no loss of reserves, pillar extraction is scheduled to start in the Hub Seam (the upper seam) and continue in the Harbour Seam. Figure 19.1, Harbour and Hub Seams Layout Near Base of Slope, shows the layout of the mains and panels adjacent to the base of the slopes for both seams. Figure 19.2, Harbour and Hub Seams Mine Layout, shows the mine layout for both seams within the boundary defined by the northern drill holes. The mine layout can facilitate changing to an alternate mining method such as a longwall and insures that mining in the Hub Seam is completed prior to secondary mining in the Harbour Seam directly below the Hub Seam. The Block 3 Far East panels are located in an Inferred Resource area and are shown for planning purposes only.



Source: 2011 PFS

Figure 19.1
Harbour and Hub Seams Layout near Base of Slope



Source: 2011 PFS

Figure 19.2
Harbour and Hub Seams Mine Layout

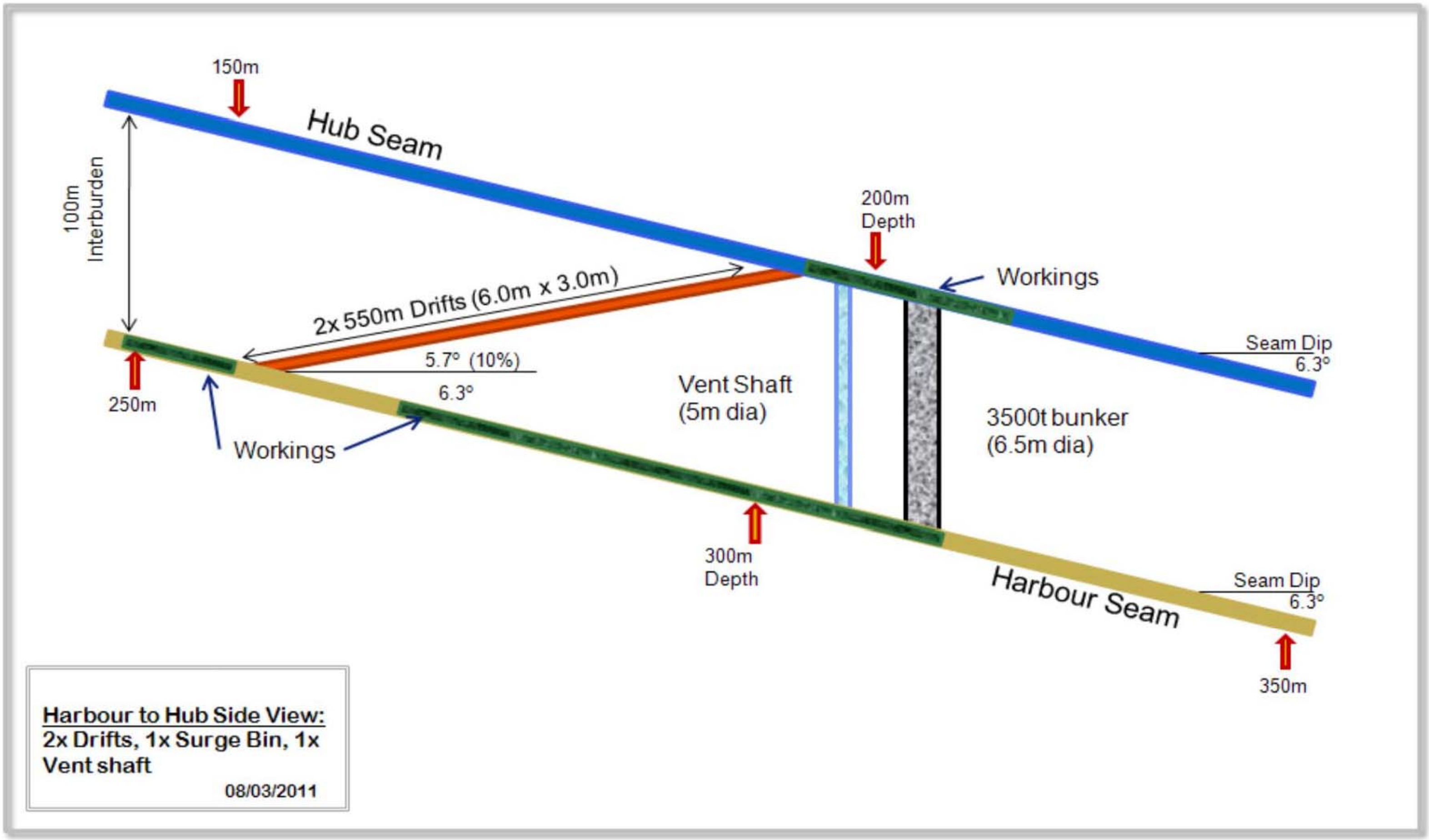
The mine design and mining operation is based on the utilization of standard CM sections. A section consists of one CM, one double headed roof bolter and three shuttle cars. A total of four sections is planned with two CM sections in each of the seams. Depending on the roof conditions, the CM advances the entry or crosscut face on average 6 m and then moves to the next place to be cut. If the roof conditions allow, extended cuts up to 12 m could be taken. The roof bolter then moves into the recently mined place and installs the roof bolts and other secondary supports that make up the immediate roof support.

The Hub Seam will be accessed through a 550-m drift developed from the Harbour Seam, at a gradient less than 1 in 10, to intersect the Hub Seam above at a depth of approximately 200 m. Due to the dip of the seams, the Hub Seam is offset by about 950 m to the Harbour Seam. A second drift will need to be developed for a return airway with an additional ventilation shaft being required in 2020 as mining extends further from the drifts. Coal transport from the Hub Seam will be via a surge bin between the two seams with a capacity of 3,500 tonnes feeding the main conveyor in the Harbour Seam. A plan view of the Harbour and Hub seams layout configuration is shown in Figure 19.1. Figure 19.3, Graphic of Harbour and Hub Seams Connection, is a cross-sectional graphic of the drifts and shafts connecting the two seams.

Production panels in both seams have been oriented in a northerly direction downdip. The panels will be mined in a combination of advance and retreat mining, meaning that on the advance, pillars will be defined by the mining of entries and crosscuts. Once the extent of the panel has been reached, the pillars will be reduced in size systematically by doing pillar extraction in a retreating line back towards the main entries from where the panel started. Given the overburden depth of the reserves at Donkin, only limited pillar recovery will be attempted. Large pillars must be left during advance mining under the deeper overburden of a significant portion of the reserve. Retreat mining and partial extraction of the pillars will utilize the methodology that is practiced in Xstrata's South African operations known as "X-mas tree" pattern or Nevid pillar extraction.

The panels are generally 150-m to 230-m wide with a conveyor belt running down the center entry of the panel. During advance mining, ventilation air courses from the main intake into the panel intakes across the advancing faces, and then back to the main returns via the panel returns. The panel intakes will be entries 2, 3, 5 and 6. The panel returns will be entries 1 and 7. Entry 4 is the belt entry and can be used for intake air. A barrier pillar, equal width to the pillar size, is left between adjacent panels to protect the subsequent panel from the abutment pressures associated with the caved area created when pillars are recovered. Artificial barriers such as drill holes and lease boundaries resulted in some panels reduced in width. General mining assumptions are summarized by the following bullet points.

- Production Panels
  - Harbour Seam: seven road headings with two or three returns and four or five intakes (dependent on gas drainage requirements), averaging 3,100 m to 3,900 m in length.
  - Hub Seam: Five road headings with two return airways and three intake airways, averaging 3,000 m and 3,800 m in length.
- Bord - 5.5-m wide x seam height (Harbour - East Block1: Av 3.22 m, West block 2: Av 2.19 m, Far East block 3: Av 3.17 m) (Hub" East Block1: Av 2.85 m, West Block 2: Av 2.34 m, Far East Block 3: Av 2.93 m). (Figure 49_Block areas)
- Development: rates at 14,500 tpw at 3 x 5.5 m equates to about 630 m linear per week.
- Pillar Extraction: rates at 16,820 tpw at 3 x 5.5 m equates to about 730 m linear per week.
- Mining stops at a height of 2.0 m on the western side in Block 2.
- Panel pillars are between 31 m or 36 m dependent on depth of cover. Pillar extraction fraction of 38% in 31-m pillar sizes at depths 200 m to 450 m and 30% in 36-m pillars of 450 m and deeper, average of 35%.
- Mining depth of 550 m will not be exceeded as a precaution against outbursts.



Source: 2011 PFS

Figure 19.3
Graphic of Harbour and Hub Seams Connection

- In the Harbour Seam, the extraction percentage is reduced to 50% due to the Hub Seam being mined and pillars extracted. The additional geotechnical work that will be done on multi-seam mining during the Feasibility stage will confirm if a higher extraction is achievable in the Harbour Seam.

The initial phase of mining is referred to as the exploration phase. The intent is to deploy one CM section in the Harbour Seam one year after securing an off-take agreement for the ROM coal. The exploration phase will provide the opportunity to collect multiple Harbour Seam bulk samples for testing, geotechnical information on the roof, floor and coal, data on both the Donkin and unnamed fault, data on gas desorption, and Hub Seam data in all categories. Figure 19.4, Harbour Seam Exploration Phase, shows the location of the planned exploration in relationship to the base of the tunnels. Although a schedule is shown, the schedule is dependent on an off-take agreement.

Initial mine development and production will only have the two existing tunnels available for access, ventilation and transport of coal out of the mine. A risk review has determined that utilization of the eastern existing tunnel as a return airway and conveyor drift during the initial mining phase would allow final use of that tunnel as the return airway following the construction of a third tunnel that is required prior to the commencement of the third CM section.

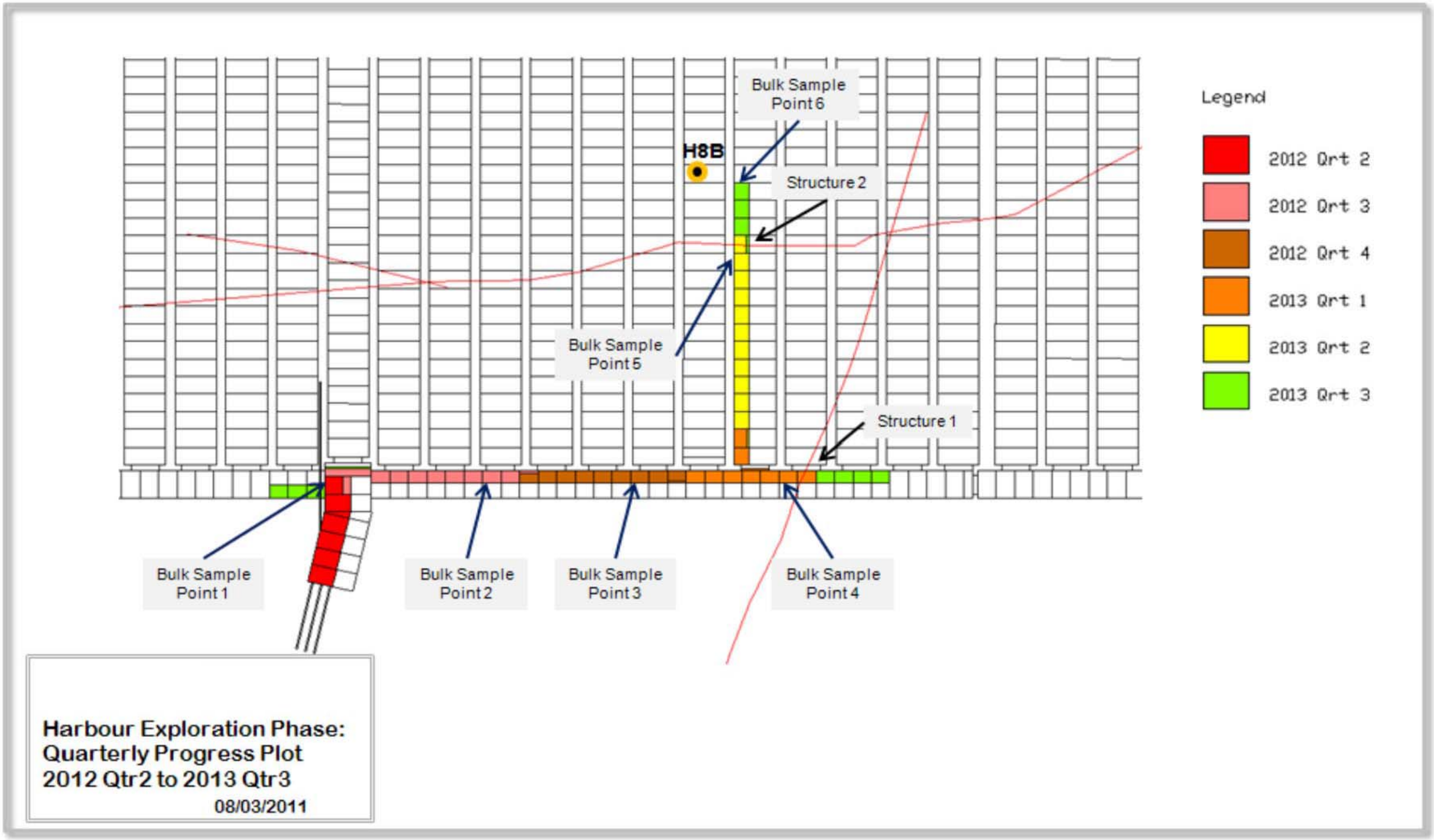
The roof is expected to be good with the exception of the immediate area around drill holes H7 and H8C where the roof is likely to be poor to fair. The proposed bolting pattern includes 6 by 2.1 m long X grade bolts per meter plus mesh panels at depths less than 500 m and increasing to eight bolts per meter at greater depths. The floor is expected to be good.

When driving along strike and depending on the orientation of coal cleats, the ribs will be exposed to wedge and toppling failures. The design of any bolter miner or mobile bolter should include rib shields so that the bolting crews are not exposed to this hazard. In addition, both ribs will need to be systematically bolted with either one or two bolts per meter with strapping between. There may also be a need for secondary support at the panel corners during pillar extraction at depths greater than 500 m.

The Donkin Fault could be a source of increased gas and water inflow. Horizontal drilling ahead of development should occur so that mitigation procedures and equipment can be positioned and appropriate work force training provided prior to fault intersection.

The Donkin Mine is expected to produce relatively large quantities of methane gas. In very general terms, the amount of methane released is a function of the rate of mining. As mining advances from the mains at the beginning of the panel toward the bleeder connection at the end of the panel, methane will be allowed to bleed off from the pillar areas into the main returns.

A nominal ventilation capacity of 500 cubic meters per second (m^3/s) should be provided for life-of-mine (LOM) requirements. It is the velocity of the single intake tunnel that determines the limiting ventilation capacity prior to the third tunnel being developed. With respect to the capacity of the two existing tunnels and the need for a third, it is important to recognize that there is some margin incorporated in the provision of 95 m^3 per mining panel (section). However, even if this were to be reduced, to say 65 m^3/s with low gas emission, total mine ventilation requirements would result in a high tunnel velocity for three CMs but still exceed a realistic capacity of a single tunnel (250 to 300 m^3/s) with four CMs working. Overall this means that it is a robust plan to employ two CMs with two tunnels, and it may be possible to use three CMs with two tunnels. It is not a realistic plan to employ four CMs with only two tunnels available for ventilation capacity.



Source: 2011 PFS

Figure 19.4
Harbour Seam Exploration Phase

Gas management requirements have been determined from a review of operational experience in the Phalen and Harbour seams of adjacent mines, published gas reservoir characteristics, anecdotal evidence from previous mine management together with results of the 2008 - 2009 pit bottom drilling program. A summary of conclusions drawn from this assessment of the Donkin Project is as follows.

- Working section gas contents will be 7.0 to 10.0 cubic meters per tonne (m^3/t) dry ash free (DAF) in shallower horizons, increasing to between 12 and 14 m^3/t DAF at depth.
- It is assumed that all seam fluid pressures are a function of depth BSL and that the degree of under saturation in each seam will be similar. This means that the gas content of roof and floor seams can be estimated from the stratigraphic sections for various working section depths.
- The gas content of porous interburden will be a function of fluid pressure and unsaturated porosity. Actual values can only be estimated from these factors combined with the thickness of these strata members over the lease area. Calculated values are, however, consistent with a limited number of observed data points using 20% to 30% porosity.
- Historically, seams in the locality were not pre-drained for control of rib emission even when at depths of 700 m BSL. It is anticipated that pre-drainage, certainly in the shallower horizons, will not be required in the Donkin Project for control of rib emission but may serve to reduce gas emission during pillar extraction at depth. In any event, an ongoing program of test drilling will be undertaken for exploration, gas drainage and outburst assessment purposes.
- Gas emission during extraction of pillars will be dependent on the degree of relaxation that occurs in the roof and floor of the working section. The predicted specific gas emission rate is 5 m^3/t in shallower horizons, increasing to about 12 m^3/t at 700 m, assuming a similar degree of relaxation as that in full extraction panels. This approach is therefore likely to err on the side of caution.
- The principal source of gas will be Hub and possibly Lloyd Cove roof seams together with porous roof interburden although there is also anecdotal evidence of floor gas “blowers” where coaly material is present in close proximity to the working section, i.e., closer than the Bouthillier Seam.
- The presence of strong roof members will lead to relatively high peak emission rates (day maximum compared to day average) together with periodic hang ups within the goaf. Peak versus day average gas emission factor values in the Phalen Mine are reported to have been 1.5 to 2.0. It is understood that there is no history of classic windblast events in the locality, but significant flushing of active goaves can be expected.
- Outbursts of sandstone strata have occurred at depths of approximately 700 m and should be expected in similar stress and gas content regimes in the Donkin Project unless management strategies are put in place, i.e., if these events are in fact stress and gas content related then they may not necessarily occur at the same depth in all areas of the Donkin workings. The proposed strategy is to use directional holes ahead of workings at about 500 m depth of cover for pressure relief.
- Although mines in the locality have previously operated bleeder systems with retreat and advancing faces, spontaneous combustion of pillars or goaves is not reported to have been problematic. The design assumption is that the seam has a low to medium propensity for spontaneous combustion and will be monitored and controlled as it would be under a Queensland-style management plans, hence provision for a tube bundle system and gas chromatograph in the mine’s monitoring systems.

19.1.4 Processing and Transportation

The coal handling and preparation plant (CHPP) utilized in the PFS is of a design and construction that is similar to many such plants that are in current operation at existing Xstrata Coal sites throughout Australia and South Africa, and as such provides for a high degree of certainty and confidence in the capital cost and operating cost estimates that are included in the study.

In 2008 Sedgman completed a concept study with the objective of selecting an appropriate process for the production of a coking coal product based on evaluation of available data. The scope at that time was limited to the provision of a ± 30% estimate for the washing plant and a rejects handling system only. Raw and product coal handling was to be addressed by others.

For the PFS, Xstrata requested Sedgman to expand the above scope to include the raw coal and product handling areas and to revise the plant capacity requirement from 4.5 to 3.5 Mtpa of raw coal washing to a coking coal specification based on 6,000 hours of operation per year. The study accuracy is now based on a +/-15% cost estimate.

The proposed CHPP system involves the following items.

- A raw coal stockpile, reclaim and sizing system to prepare a minus 50 mm raw coal feed to the CPP.
- A 650 tonnes per hour (tph) processing plant featuring a single stage large diameter dense medium cyclone to process coal, spirals to process the mid-size material and flotation to beneficiate the fine coal.
- A product sampling and reclaim system to prepare product coal ready for loading onto a barge or rail.
- A dry disposal reject handling system.

The Sedgman design has been based on Harbour Seam coal quality information supplied by A&B Mylec. There is no Hub Seam washability data available.

Two further Harbour Seam channel samples were obtained by Xstrata in August 2006. The first was from the tunnel near the T2 bulk sample location, and the second was at the Museum Site, approximately 5 km west at Glace Bay. Unlike the previous channel samples, these underwent intensive pre-treatment, thus making them suitable for coal preparation plant (CPP) design purposes. These samples form the basis of the coal quality data used to develop the CPP design for the PFS.

The channel ply samples (including roof and floor components) were subjected to drop-shatter and wet tumbling pre-treatment at a nominal top size of 32 mm. The working sections with roof and floor dilution are considered to represent the potential range of ROM quality that will represent the CPP feed.

The washability characteristics of the Donkin coal channel samples are considered to be excellent. There are relatively large proportions of material in the low density fractions (>70% mass at F1.30), little near gravity material and relatively low proportions of high density material (<3% mass at S2.00).

The selected process is focused on the production of a single product suitable for marketing as a coking coal but that is also marketable as a thermal coal. Review of historical and recent washability data showed the Harbour Seam coal has excellent coking coal properties including:

- Low ash;
- Low phosphorus; and
- High CSN fluidity.

Sulfur levels, however, are high, and the selected process must attempt to maximize the removal of sulfur to improve the marketability of the coal. Sedgman indicated that approximately 44% of the sulfur occurs as pyritic sulfur, and therefore, processing is expected to exert some influence on its removal. The pyritic sulfur in channel sample SS1 was 62%. Unfortunately, the sulfur appears to be finely distributed throughout the size distribution; thus, no advantage is expected to be derived from preferential screening.

The washability and sizing data suggests sulfur reduction is possible by employing a lower (DM-based) cut point with only a relatively low loss of yield. Therefore, water-based gravity processing units which employ higher cut points; for example, jigs have been eliminated from further consideration.

Based on the above, the most appropriate selection and the one which represents least risk will be a plant with the following configuration:

- single stage DMC coarse coal circuit;
- spirals mid-size coal circuit; and,
- flotation fine coal circuit.

Only proven conventional technologies were considered for the CPP. In recognition of the cold weather operating environment for the Donkin site, and the preference to keep as much as possible of the CPP processing equipment indoors, the choice of flotation technology has been limited to Jameson Cells (Xstrata participated in the development of this technology).

Similarly, a screen bowl centrifuge has been selected as the dewatering method for the flotation product. This unit requires considerably less space than a horizontal belt filter, hence less capital and heating cost and produces a lower moisture product. Lost yield from the discard of the minus 45 micron material in the effluent is likely to be small due to the relatively coarse size distribution of the coal and may in fact contribute to further sulfur removal.

It is believed that the project would have difficulty gaining approval for a conventional tailings dam. This is due to the proximity of the proposed site to neighboring townships as well as concerns with the acid leaching potential of tailings into groundwater. In light of this, a full dry disposal system for CPP reject is proposed. A dry disposal system in this sense is understood to mean disposing of the combined streams of dewatered tailings and coarse reject. This combined stream will be conveyed from the CPP by a fixed stacking conveyor and discharged onto a conical stockpile. Dozers will be employed to push the stockpiled rejects to an adjacent void. It is recommended that further investigations on any possible environmental issues regarding potential acid leaching from the rejects stockpile be implemented at the next phase of the project. Note that it is standard practice within the industry to provide an emergency emplacement area that can receive the thickener underflow and allow the CPP to continue operating if there are problems with the tailings processing circuit.

The CHPP will process 3.50 Mtpa (as) ROM of Donkin coal and incorporate the following major components in the design.

- A raw coal stockpile reclaim system incorporating three coal feeders onto a reclaim conveyor located in a tunnel
- A two-stage reduction crushing station
- A plant feed system comprising a plant feed conveyor with associated weigher and primary sampling facilities
- A CPP consisting of a single DMC module for coarse coal processing, spirals for mid-size coal processing and flotation for the finer fraction

- Belt filters to dewater the tailings for combining with the coarse and fine reject prior to conveying to a rejects stockpile
- A product handling system comprising product conveyors, radial stacker and stockpile
- Product reclaim by dozer push to reclaim feeders and onto a reclaim conveyor located in a tunnel. Conveying of reclaimed product coal to a transfer station for transfer to a barge or rail loading facility.
- Fire protection system
- Raw coal dust suppression
- Distribution from the output side of the high voltage transformer on the main substation of the electrical site supply
- Fully integrated control system and communications
- Offices, workshop, laboratory, crib rooms and ablutions required directly for operation and control of the CHPP

There are two transportation cases that have been evaluated within this PFS. These cases are common up until the point at which the product coal is reclaimed from the product coal stockpile; the variation in cases as such only applies to the methodology by which the product coal is transported to the point at which coal is loaded into ocean-going vessels.

Case 1: Rail Option – product coal is reclaimed to a rail loadout bin that loads coal wagons for transportation of the coal by rail to Sydney Port. The rail option has been assessed on the basis of a rail link being constructed from Donkin Mine to the existing Sydney Coal Rail Line at Victoria Junction to transport coal to the former Sydney Steel Corporation (Sysco) dock at Sydney Harbour. However, due to higher capital and operating costs, rail transportation is not the preferred option.

Case 2: Marine Option – product coal is reclaimed to an overland conveyor that traverses the onshore section from the product stockpile to accommodate the direct loading of 3,000-tonne coastal barges. A barge will then be moved to a near shore transshipment location where the barge grab crane will load the product coal to Capesize ocean-going vessels. This transshipment area is located southwest of the Cape Morien headland and is approximately 4.5 nautical miles from the direct loading area. After studying 10 different marine options, this option was considered as the most favorable and is recommended for detailed evaluation.

The transportation options are still being evaluated. Capital cost estimates have been developed for both options.

19.1.5 Production

Full production on a ROM bases is projected to be approximately 3.5 Mtpa. Exploration phase production with one CM section commences in 2012 at 375,000 ROM tonnes and continues through 2013 with 373,000 ROM tonnes produced. Both years' production is from the Harbour Seam. In 2014 estimated production is 642,000 ROM tonnes, of which 68,000 tonnes are from the Hub Seam. Four CM sections are producing in 2015, and production steadily increases until full production is achieved in 2018. This means that a commensurate increase in ventilation capacity will be required during this period in addition to the completion of the third tunnel prior to the third miner section starting production. It should be noted that the start of production is dependent on the receipt of all necessary permits and plans and the availability of contactors to complete the pre-production construction. Table 19.1, Production Schedule, shows the ROM production for the first 11 years of mining. The table shows production that includes Inferred resources. The Inferred production was not included in the economic analysis.

Table 19.1
Production Schedule

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total 2040
Production - ROM tonnes (x 000)	375	373	642	1,419	2,648	3,129	3,259	3,350	3,641	3,303	3,700	78,715
Yield	100%	100%	100%	86%	81%	81%	81%	81%	81%	81%	81%	81%
Production - Clean tonnes (x 000)	**375**	**373**	**642**	**1,216**	**2,145**	**2,534**	**2,640**	**2,714**	**2,949**	**2,675**	**2,997**	**63,759**
Hub Seam												
CM1												
Primary				464	115	459	516	359	512	487	306	10,175
Secondary					514	258	229	492	294	344	593	9,591
Total CM1	0	0	0	464	629	717	745	851	806	831	899	19,766
CM2												
Primary				357	246	480	435	305	314	468	520	9,770
Secondary					398	247	330	548	567	376	317	9,592
Total CM2	0	0	0	357	644	727	765	853	881	844	837	19,362
Harbour Seam												
CM3												
Primary				301	541	438	460	680	345	810	284	11,293
Secondary					175	416	435	151	632		696	7,636
Total CM3	0	0	0	301	716	854	895	831	977	810	980	18,929
CM4												
Primary				297	486	394	485	686	378	742	394	11,679
Secondary					173	437	369	129	599	76	590	7,589
Total CM4	0	0	0	297	659	831	854	815	977	818	984	19,268
CM5 - Exploration												
Primary - Harbour	375	373	574									1,322
Primary - Hub			68									68
Total CM4 - Exploration	375	373	642	0	0	0	0	0	0	0	0	1,390
Total Harbour (ROM tonnes x 000)	**375**	**373**	**574**	**598**	**1,375**	**1,685**	**1,749**	**1,646**	**1,954**	**1,628**	**1,964**	**39,519**
Total Hub (ROM tonnes x 000)	**0**	**0**	**68**	**821**	**1,273**	**1,444**	**1,510**	**1,704**	**1,687**	**1,675**	**1,736**	**39,196**

Figure 19.5, Harbour Seam Production Schedule, shows the primary mining production schedule in the Harbour Seam from 2012 through 2048. Some mining in 2037 through 2048 is located in Inferred resource areas, and the tonnage is not included in the economic evaluation or reserve statement. Secondary mining in the Harbour Seam and primary and secondary mining in the Hub Seam have similar schedules and are not shown. No Inferred tonnages are included in the economic analysis or reserve estimate.

At the proposed rate of production, the mine exhausts the Harbour Seam reserves in 2041 and the Hub Seam reserves in approximately 2046. There are Inferred Resources to the east, north and west of the proposed mine that can be accessed from the proposed mine. Additional data on the suitability of these resources for mining will be collected during mining of the reserve area. The mine plan shows mining extending into the Inferred resource area to the east.

19.1.6 Recoverability: Recoverability includes both mining extraction of the coal and coal preparation of the ROM extracted coal. Both have been discussed in various sections within this Technical Report but will be summarized in this section.

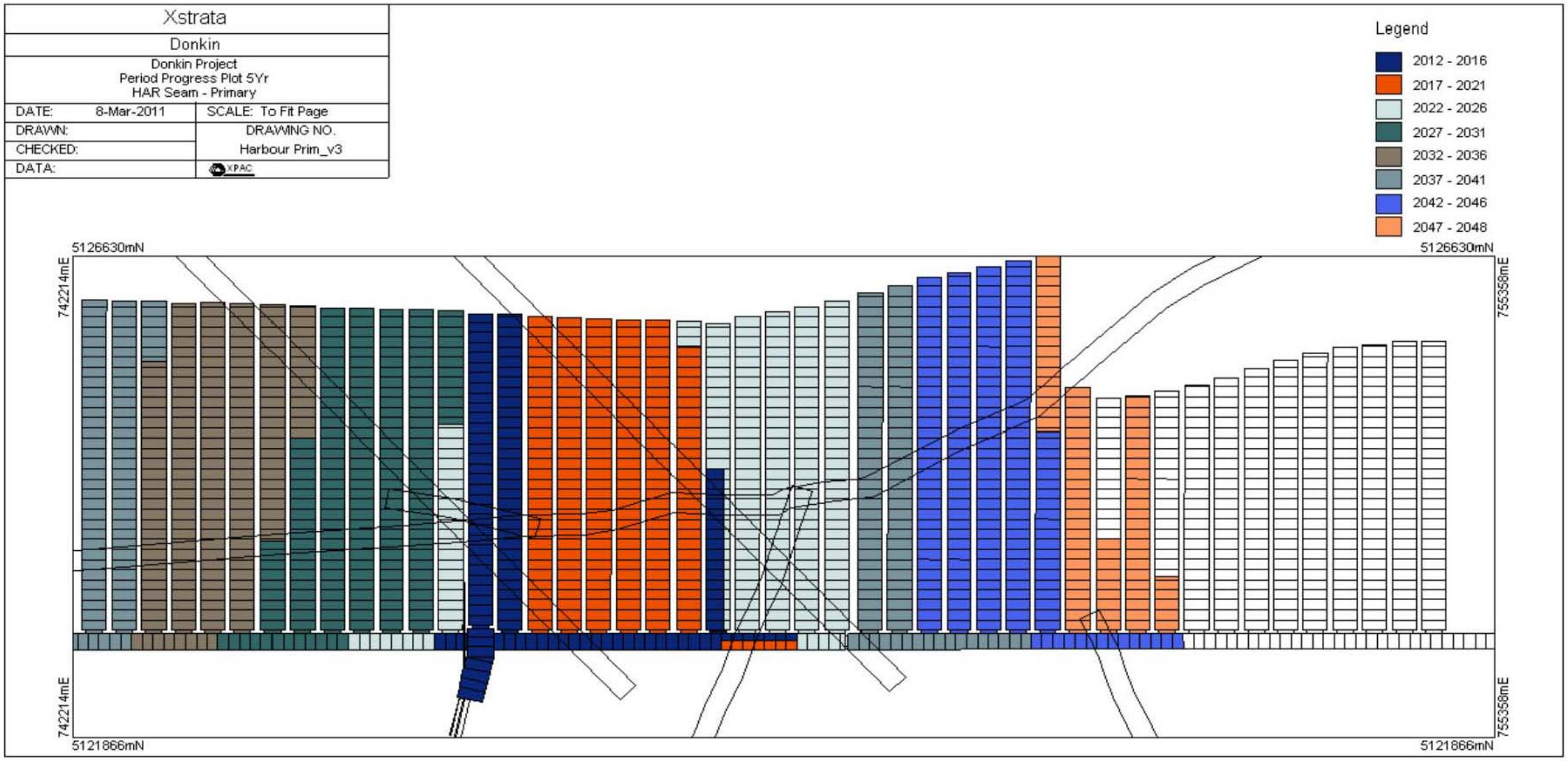
19.1.7 Mining: Access to the Donkin Project Harbour and Hub seam reserves will be through the two existing tunnels and eventually a third tunnel. The Hub Seam will be accessed through two incline drifts driven from the Harbour Seam. The coal will be extracted using the room-and-pillar (bord-and-pillar) mining method using CMs. Secondary extraction of the pillars is proposed. At full production, four CM sections will be in operation. ROM production ranges from 2.4 Mtpa to 3.8 Mtpa with an average of approximately 3.5 Mtpa. There are 101 million in-situ tonnes of Harbour Seam resource and 73 million in-situ tonnes of Hub Seam resource within the indicated boundary. The proposed mine will recover approximately 33% of these ROM tonnes (58 Mt), of which approximately 48 Mt are saleable.

At the proposed rate of production, the mine exhausts the Harbour Seam reserves in 2041 and the Hub Seam reserves in approximately 2046. There are Inferred resources to the east, north and west of the proposed mine that can be accessed from the proposed mine. Additional data on the suitability of these resources for mining will be collected during mining of the reserve area. The mine plan shows mining extending into the Inferred resource area to the east.

19.1.8 Coal Preparation: The CHPP includes all of the material handling, coal processing equipment and stockpiles necessary to process the 3.5 Mtpa ROM extracted by the mine and produce approximately 2.75 Mtpa of clean saleable coal with quality parameters suitable for sale into international coking and thermal coal market and domestic thermal coal markets. Based on testing of samples mostly collected from the Harbour Seam at the base of the two tunnels, the nominal overall CPP yield based on modeling simulations is 84%, and the yield ranged from 76% to 92%. The processing yield selected for the PFS study and this Technical Report is 81%, which includes consideration for OSD. The PFS target product specification is shown in Table 25.2, below. CSN and calorific value appear to be at the upper end of the range of expected quality parameters.

Table 19.2
Assumed Product Target Specifications

Quality Parameter	Specification
Total Moisture %	8.0
Ash % (ad)	4.0
CSN	8.5
Total Sulfur % (ad)	3.0
Calorific Value (Btu/lb ar)	13,250



Source: 2011 PFS

Figure 19.5
Harbour Seam Production Schedule

To meet the requirements of the project, a 650 tph processing plant featuring a single stage large diameter dense medium cyclone to process coarse coal, spirals to process the mid-size material and flotation to beneficiate the fine coal has been designed.

19.2 Markets

The coal quality of Donkin's two target seams, the Harbour and Hub seams, are characterized by low ash, high energy, high vitrinite content, high fluidity, high swell and elevated levels of sulfur. Subject to further coal testing to be carried out during the exploration phase of the project, approximately 75% of product coal from Donkin is targeted to be marketed as a coking coal into international coking coal markets. Coal quality testing and further market assessment are planned to be undertaken during the exploration phase to confirm the product quality and marketability. The marketing objectives of the exploration phase are to fully assess the washed quality of Donkin coal and to produce bulk samples for supply to potential customers. This undertaking will enable a full assessment of product marketability during the subsequent operational phase.

During the exploration phase, coal will be marketed as a ROM thermal coal product. Discussions with Nova Scotia Power, Inc., a local power utility, have taken place over the last three years with the most recent meeting in Second Quarter 2011. Nova Scotia Power, Inc. has expressed its willingness to take up to 0.5 Mtpa for a three-year period. First coal availability has been indicated as being during 2012. The pricing principle discussed with Nova Scotia Power, Inc. has been relative to Colombian thermal coal (Calenturitas / Cerrejon) with adjustments to reflect freight costs to Canada as well as quality characteristics including sulfur and ash.

Nova Scotia Power, Inc. intends to or is proceedinging with the installation of bag house filtration and sulfur scrubbers; however, scrubbers will not be installed before receipt of Donkin coal. The emissions envelope within which Nova Scotia Power, Inc. operates allows it to average its emissions across its electricity generation fleet. The averaging mechanism currently supports the combustion of very high sulfur (up to 7%) pet coke at PT Aconi Power Station and from time-to-time also at Lingan Power Station. Through maintenance of imports of lower sulfur Colombian and U.S. thermal coals and the emissions envelope, combustion of Donkin coal would not breach their emissions limitations.

Subject to the coal quality testing during the exploration phase, 75% of Donkin product coal is targeted to be marketed as a coking coal into international markets with the balance being sold as thermal coal to domestic and export customers. The geographic location of Donkin make Europe and Brazil the most likely target markets.

Based on data currently available, the following are the key features of the Donkin coking coal product.

- **Low Ash** - the expected level of 4% ad is well below the typical range for hard coking coal of 7%- 10.5% and would attract a pricing premium.
- **Caking Properties** - the expected CSN of 8.5 places it within the range for premium hard coking coals of 8-9.
- **Plasticity** - Donkin is a high fluidity coal with an expected maximum fluidity of greater than 10,000 ddpm. This characteristic enables its use as a coke blend component with lower fluidity coals and enhances its marketability.
- **Sulfur** - the expected product sulfur content of 3% ad is above the typical range for hard coking coal which ranges to a maximum of 0.8% ad. While the sulfur content will attract a pricing penalty, which has been incorporated to the valuation model, it does not preclude the use of this coal in coking coal blends for the manufacturing of coke.
- **Contracts:** There are no contracts in place at this point related to the mining, coal preparation, transportation, handling or sales of coal from the Donkin Project.

19.3 Environmental Considerations

The Donkin Mine has an existing environmental permit which allows for development works to prepare an unwashed thermal coal product at the mine both on the surface and underground, and the use of a CM system for a period of up to two years to remove an average of 2,000 tonnes of coal per day (approximately 0.5 Mtpa), load it onto trucks and transport the product offsite to a Nova Scotia Power, Inc. utility, only during the times of 0600 hours and 2000 hours, Monday to Saturday. There are no current requirements regarding bond posting, remediation and reclamation other than those typical of an operation which are covered under the site's Environmental Management System, presently being enhanced to address regulatory requirements including Environmental Management, Environmental Protection and Contingency Plan requirements.

As this approval does not suit the needs of the Export Coking Coal Project, a new EA is required to obtain the necessary permit. It has been advised that the environmental approval process pathway and timing depends upon the decision on the two product coal transportation cases evaluated in this study, the Rail Option and the Marine Option, i.e., deciding on the Rail Option, the Marine Option or to continue considering both options. This is because there are different perceived environmental impacts associated with each option.

For the Rail Transport Option, it is advised that a Nova Scotia Provincial-only EA will be required, as the potential environmental impacts are confined to a route that is largely an existing railway easement and its associated waterway crossings. This approval pathway is expected to take approximately 14 months (five months of preparatory application work and then nine months of EA process which includes the statutory within 50 days of receiving submission timeline for Environment Minister's decision on the EA). If a full comprehensive study is required then the time frame will be similar to the marine transport option discussed below.

For the Marine Transport option, it is expected that authorization will be required from both Federal and Provincial regulatory agencies, and it will be in the form of a full comprehensive study, due to the new nature of works at the proposed sites and the regulatory sensitivities associated with activities in marine areas. This approval pathway is considered the most rigorous EA process in this part of the world; hence, it is expected to take nearly two years to complete from its initiation.

19.4 Taxes

19.4.1 Net Federal Tax Rate on Resource Income – 15% (effective from 2012)

19.4.2 Nova Scotia Income Tax Rate – 16%

19.4.3 Capital Tax Rate Nova Scotia – 0.05%

19.5 Royalties & Lease Costs

19.5.1 Special Lease - $1.00/year for the first four years of the lease (April 2013) then $136,192

19.5.2 Royalty - $1.09/short ton, CAD$1.22/tonne, in accordance with written notice from the Minister excluding coal mining from the standard mining royalty. The standard royalty is levied on the greater of.

19.5.2.1 1st Tier – 2% of Net Revenue

19.5.2.2 2nd Tier – 15% of Net Income

19.5.3 Total Mining Tax is > of 1st or 2nd Tier

19.5.4 Carbon Tax – CAD$2.00 Contingency

19.6 Capital and Operating Cost Estimates

19.6.1 Capital: Tables 19.3 and 19.4 outline the estimated capital cost rail and marine transport cases, respectively, that were evaluated in the PFS. Both tables provide initial capital estimates. Sustaining and replacement capital is estimated at $4.50/tonne. The author considers both estimates as reasonable for the proposed projects as defined in the PFS.

19.6.2 Operating Cost

19.6.2.1 Tables 19.5 and 19.6 tabulate the operating cost estimates for the rail and marine transportation options, respectively. The first 10 years of the project are based on actual estimates while the remaining project life is based on an average figure.

19.7 Economic Analysis

The marketing study prepared by AME indicates that the Donkin Project Harbour Seam high sulfur coal can be marketed as a semi-hard or standard hard coking coal discounted for its relatively high sulfur content to international markets in Europe, Brazil and to some extent in Asia and at volumes of near 2.1 Mtpa and as a thermal coal in similar markets at volumes of approximately 0.65 Mtpa. The forecast for long-term realization is projected at US$159/tonne for standard hard coking coal, US$151/tonne for semi-hard coking coal and US$90/tonne for thermal coal.

Xstrata Coal on behalf of XCDM also completed an analysis of the potential realization for the Donkin coal. Xstrata's long-term realization for the coking coal product is US$156.7/tonne and for the thermal product is US$122.2/tonne. The coking coal product realization is consistent with the AME study while the thermal product realization is significantly higher. The thermal product realization reflects a transportation advantage into local markets. The economic analysis is based on Xstrata Coal's pricing estimates.

Tables 19.7 and 19.8 show the net cash position for the rail and marine options, respectively. Table 19.9, below, summarizes the economic analyses for the rail and marine options. Peak funding is the maximum negative cumulative undiscounted cash flow of the project.

Table 19.9
Project Valuation

Financial Parameters	Marine Case (@ LT)	Rail Case (@LT)
NPV @ 8% (CND$ M)	1,060	952
Internal Rate of Return (%)	36.0%	32.5
Payback Period (years)	7	7
Peak Funding (CND$ M)	331	374

19.8 Mine Life

The project evaluation mine life was limited to the area defined by the Indicated resource boundary. The mine plans show production panels extending to the east into Inferred resources. Additional resource delineation will take place during the feasibility exploration phase. Other Inferred resources are located to the north and west of the Indicated resource boundary and will also be explored.

Table 19.3
Project Capital Expenditure – Rail Option

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Onwards	Total
Capital - Rail Option (real) CDN$ (x 000)														
Mining Equipment & Infrastructure														
Tunnel Remediation	6,000		3,000	3,000										12,000
Trunk belt	2,000	1,000		12,000	5,000									20,000
Drift to Hub Seam			3,500	6,500										10,000
UG Surge Bin				3,000	2,000									5,000
Outbye Equipment			3,000	6,000	6,000									15,000
Mining Equipment CM1			7,000	16,500										23,500
Mining Equipment CM2				7,000	16,500									23,500
Mining Equipment CM3				7,000	16,500									23,500
Mining Equipment CM4				7,000	16,500									23,500
Mining Equjipment CM5 (Feasibility)	7,000	10,000												17,000
Sub-total	**15,000**	**11,000**	**16,500**	**68,000**	**62,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	173,000
Surface Infrastructure														
ROM stockpile				12,800										12,800
CPP			10,900	34,300	9,000									54,200
Product Stockpile				5,000	3,000									8,000
Product reclaim				9,000	3,000									12,000
Bulk Earthworks			1,667	3,333										5,000
Sub-total	**0**	**0**	**12,567**	**64,433**	**15,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	92,000
Distribution - Rail Option														
Rail Loadout and Line Construction			11,216	56,081	15,703									83,000
Sub-total	**0**	**0**	**11,216**	**56,081**	**15,703**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	83,000
Other														
Administration Building		1,000	4,000											5,000
IT and Systems		250	500	500										1,250
Mine/Fire water (incl pump station)	500	1,000												1,500
Warehouse/store/workshop	100	100	4,000	4,000										8,200
Site Roads & Carp;ark	250	250	1,000											1,500
Donkin Provincial Road Upgrade	7,500													7,500
Electrical Supply	2,000	500		2,500										5,000
Third Tunnel			10,000	25,000										35,000
Underground Services (incl vent)	500	500	2,000	5,000	5,000									13,000
Safety Equipment		500	1,500											2,000
Commissioning				250	250									500
Methane capture/Utilisation			2,000	6,000										8,000
Equipment Approval Fees	150	150	150											450
Land acquisition		500	1,000	500										2,000
Sub-total	**11,000**	**4,750**	**26,150**	**43,750**	**5,250**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	90,900
Project Management														
Feasibility Study (incl Approvals & Design)	3,000	9,000	9,000											21,000
FEED Phase			18,000											18,000
Contingency	4,350	3,713	14,015	34,840	14,768									71,686
Sustaining & Replacement Capital ($4.50/tonne)	0	0	0	2,891	5,477	9,653	11,403	11,881	12,213	13,269	12,038	13,491	206,632	298,948
Sub-total	**7,350**	**12,713**	**41,015**	**37,731**	**20,245**	**9,653**	**11,403**	**11,881**	**12,213**	**13,269**	**12,038**	**13,491**	**206,632**	409,634
Total CDN$ (x 000)	**33,350**	**28,463**	**107,448**	**269,995**	**118,698**	**9,653**	**11,403**	**11,881**	**12,213**	**13,269**	**12,038**	**13,491**	**206,632**	**848,534**

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Table 19.4
Project Capital Expenditure – Marine Option

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Onwards	Total
Capital - Marine Option (real) CDN$ (x 000)														
Mining Equipment & Infrastructure														
Tunnel Remediation	6,000		3,000	3,000										12,000
Trunk belt	2,000	1,000		12,000	5,000									20,000
Drift to Hub Seam			3,500	6,500										10,000
UG Surge Bin				3,000	2,000									5,000
Outbye Equipment			3,000	6,000	6,000									15,000
Mining Equipment CM1			7,000	16,500										23,500
Mining Equipment CM2				7,000	16,500									23,500
Mining Equipment CM3				7,000	16,500									23,500
Mining Equipment CM4				7,000	16,500									23,500
Mining Equjipment CM5 (Feasibility)	7,000	10,000												17,000
Sub-total	**15,000**	**11,000**	**16,500**	**68,000**	**62,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	173,000
Surface Infrastructure														
ROM stockpile				12,800										12,800
CPP			10,900	34,300	9,000									54,200
Product Stockpile				5,000	3,000									8,000
Product reclaim				9,000	3,000									12,000
Bulk Earthworks			1,667	3,333										5,000
Sub-total	**0**	**0**	**12,567**	**64,433**	**15,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	92,000
Distribution - Marine Option														
Barge Loadout Facility			5,000	25,000	7,000									37,000
Sub-total	**0**	**0**	**5,000**	**25,000**	**7,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	37,000
Other														
Administration Building		1,000	4,000											5,000
IT and Systems		250	500	500										1,250
Mine/Fire water (incl pump station)	500	1,000												1,500
Warehouse/store/workshop	100	100	4,000	4,000										8,200
Site Roads & Carp;ark	250	250	1,000											1,500
Donkin Provincial Road Upgrade	7,500													7,500
Electrical Supply	2,000	500		2,500										5,000
Third Tunnel			10,000	25,000										35,000
Underground Services (incl vent)	500	500	2,000	5,000	5,000									13,000
Safety Equipment		500	1,500											2,000
Commissioning				250	250									500
Methane capture/Utilisation			2,000	6,000										8,000
Equipment Approval Fees	150	150	150											450
Bio-diversity Offset				8,000										
Land acquisition		500	1,000	500										2,000
Sub-total	11,000	4,750	26,150	51,750	5,250	0	0	0	0	0	0	0	0	98,900
Project Management														
Feasibility Study (incl Approvals & Design)	3,000	20,000	7,000											30,000
FEED Phase			9,000											9,000
Contingency	4,350	5,363	11,433	22,178	13,463									56,787
Sustaining & Replacement Capital ($4.50/tonne)	0	0	0	2,891	5,477	9,653	11,403	11,881	12,213	13,269	12,038	13,491	206,632	298,948
Sub-total	**7,350**	**25,363**	**27,433**	**25,069**	**18,940**	**9,653**	**11,403**	**11,881**	**12,213**	**13,269**	**12,038**	**13,491**	**206,632**	**394,735**
Total CDN$ (x 000)	**33,350**	**41,113**	**87,650**	**234,252**	**108,690**	**9,653**	**11,403**	**11,881**	**12,213**	**13,269**	**12,038**	**13,491**	**206,632**	**795,635**

Table 19.5
Project Operating Expenditure – Rail Option

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Onwards	Total
Operating Costs Rail (CDN$ x 000)														
FOR Cash Costs (CDN$ x 000)														
Total Pit Top Costs		28,565	31,110	17,751	46,514	69,536	77,304	79,425	80,896	85,586	80,121	86,569	1,424,262	**2,107,639**
CHPP		2,250	2,782	3,855	7,483	12,603	14,355	14,834	15,166	16,224	14,991	16,445	262,705	**383,693**
Overheads		4,802	5,426	6,711	11,629	17,973	20,431	21,102	21,568	23,052	21,323	23,363	374,103	**551,483**
Sub-total FOR Cash Costs (CAD$ x 000)		**35,617**	**39,318**	**28,317**	**65,626**	**100,112**	**112,090**	**115,361**	**117,630**	**124,862**	**116,435**	**126,377**	**2,061,070**	**3,042,815**
Other Cash Costs (CDN$ x 000)														
DSEs					10,181	25,325	29,917	31,171	32,040	34,812	31,582	35,393	542,113	**772,534**
Royalty		458	566	784	1,486	2,619	3,094	3,223	3,313	3,600	3,266	3,660	56,057	**82,126**
Sub-total Other Cash Costs (CDN$ (x 000)		**458**	**566**	**784**	**11,667**	**27,944**	**33,011**	**34,394**	**35,353**	**38,412**	**34,848**	**39,053**	**598,170**	**854,660**
Total Cash Cost (CDN$ x 000)		**36,075**	**39,884**	**29,101**	**77,293**	**128,056**	**145,101**	**149,755**	**152,983**	**163,274**	**151,283**	**165,430**	**2,659,240**	**3,897,475**
Operating Costs (CAD$/sales tonne)														
FOR Cash Costs (CDN$ x 000)														
Total Pit Top Costs		76.2	83.4	27.6	38.2	32.4	30.5	30.1	29.8	29.0	29.9	28.9	31.0	**31.4**
CHPP		6.0	7.5	6.0	6.1	5.9	5.7	5.6	5.6	5.5	5.6	5.5	5.7	**5.7**
Overheads		12.8	14.5	10.5	9.6	8.4	8.1	8.0	7.9	7.8	8.0	7.8	8.1	**8.2**
Sub-total FOR Cash Costs (CAD$ x 000)		**95.0**	**105.4**	**44.1**	**53.9**	**46.7**	**44.2**	**43.7**	**43.3**	**42.3**	**43.5**	**42.2**	**44.9**	**45.3**
Other Cash Costs (CDN$ x 000)														
DSEs		0.0	0.0	0.0	8.4	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	**11.5**
Royalty		1.2	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	**1.2**
Sub-total Other Cash Costs (CDN$ (x 000)		**1.2**	**1.5**	**1.2**	**9.6**	**13.0**	**13.0**	**13.0**	**13.0**	**13.0**	**13.0**	**13.0**	**13.0**	**12.7**
Total Cash Cost (CDN$ x 000)		**96.2**	**106.9**	**45.3**	**63.5**	**59.7**	**57.3**	**56.7**	**56.4**	**55.4**	**56.5**	**55.2**	**57.9**	**58.0**

Table 19.6
Project Operating Expenditure – Marine Option

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Onwards	Total
Operating Costs Marine (CDN$ x 000)														
FOR Cash Costs (CDN$ x 000)														
Total Pit Top Costs		28,565	31,110	17,751	46,514	69,536	77,304	79,425	80,896	85,586	80,121	86,569	1,424,262	**2,107,639**
CHPP		2,250	2,782	3,855	7,483	12,603	14,355	14,834	15,166	16,224	14,991	16,445	262,705	**383,693**
Overheads		4,802	5,426	6,711	11,629	17,973	20,431	21,102	21,568	23,052	21,323	23,363	374,103	**551,483**
Sub-total FOR Cash Costs (CAD$ x 000)		**35,617**	**39,318**	**28,317**	**65,626**	**100,112**	**112,090**	**115,361**	**117,630**	**124,862**	**116,435**	**126,377**	**2,061,070**	**3,042,815**
Other Cash Costs (CDN$ x 000)														
DSEs					4,688	11,661	13,775	14,353	14,753	16,029	14,542	16,297	249,614	**355,712**
Royalty		458	566	784	1,486	2,619	3,094	3,223	3,313	3,600	3,266	3,660	56,057	**82,126**
Sub-total Other Cash Costs (CDN$ (x 000)		**458**	**566**	**784**	**6,174**	**14,280**	**16,869**	**17,576**	**18,066**	**19,629**	**17,808**	**19,957**	**305,671**	**437,838**
Total Cash Cost (CDN$ x 000)		**36,075**	**39,884**	**29,101**	**71,800**	**114,392**	**128,959**	**132,937**	**135,696**	**144,491**	**134,243**	**146,334**	**2,366,741**	**3,480,653**
Operating Costs (CAD$/sales tonne)														
FOR Cash Costs (CDN$ x 000)														
Total Pit Top Costs		76.2	83.4	27.6	38.2	32.4	30.5	30.1	29.8	29.0	29.9	28.9	31.0	**31.4**
CHPP		6.0	7.5	6.0	6.1	5.9	5.7	5.6	5.6	5.5	5.6	5.5	5.7	**5.7**
Overheads		12.8	14.5	10.5	9.6	8.4	8.1	8.0	7.9	7.8	8.0	7.8	8.1	**8.2**
Sub-total FOR Cash Costs (CAD$ x 000)		**95.0**	**105.4**	**44.1**	**53.9**	**46.7**	**44.2**	**43.7**	**43.3**	**42.3**	**43.5**	**42.2**	**44.9**	**45.3**
Other Cash Costs (CDN$ x 000)														
DSEs		0.0	0.0	0.0	3.9	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	**5.3**
Royalty		1.2	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	**1.2**
Sub-total Other Cash Costs (CDN$ (x 000)		**1.2**	**1.5**	**1.2**	**5.1**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.5**
Total Cash Cost (CDN$ x 000)		**96.2**	**106.9**	**45.3**	**59.0**	**53.3**	**50.9**	**50.3**	**50.0**	**49.0**	**50.2**	**48.8**	**51.5**	**51.8**

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Table 19.7
Rail Option - Cash Flow

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Onwards**
Rail Option (CDN$ x 000)													
Revenue		43,682	55,765	78,820	211,116	408,455	414,286	431,614	441,328	482,122	435,183	489,893	7,473,484
Total Pit Top Cost	1,672	28,565	31,110	17,751	46,514	69,536	77,304	79,425	80,896	85,586	80,121	86,569	1,424,262
CHPP		2,250	2,782	3,855	7,483	12,603	14,355	14,834	15,166	16,224	14,991	16,445	262,705
Overheads	2,481	4,802	5,426	6,711	11,629	17,973	20,431	21,102	21,568	23,052	21,323	23,363	374,103
FOR Cash Cost	4,153	35,617	39,318	28,317	65,626	100,112	112,090	115,361	117,630	124,862	116,435	126,377	2,061,070
DSE's					10,181	25,325	29,917	31,171	32,040	34,812	31,582	35,393	542,113
Royalty		458	566	784	1,486	2,619	3,094	3,223	3,313	3,600	3,266	3,660	56,057
FOB Cash Cost	4,153	36,075	39,884	29,101	77,293	128,056	145,101	149,755	152,983	163,274	151,283	165,430	2,659,240
EBITDA	-4,153	7,607	15,881	49,719	133,823	280,399	269,185	281,859	288,345	318,848	283,900	324,463	4,814,244
Less: CAPEX	33,350	28,463	107,448	269,995	118,698	9,653	11,403	11,881	12,213	13,269	12,038	13,491	206,632
Less: Marketing Fee		874	1,115	1,576	4,222	8,169	8,286	8,632	8,827	9,642	8,704	9,798	149,470
Less: Tax						56,686	54,041	60,009	62,679	76,053	76,934	93,828	1,380,795
Net Cash Flow After Tax	**-37,503**	**-21,730**	**-92,682**	**-221,852**	**10,903**	**205,891**	**195,455**	**201,337**	**204,626**	**219,884**	**186,224**	**207,346**	**3,077,347**
Cumm. Net Cash Flow After Tax	**-37,503**	**-59,233**	**-151,915**	**-373,767**	**-362,864**	**-156,973**	**38,482**	**239,819**	**444,445**	**664,329**	**850,553**	**1,057,899**	**4,135,246**

Table 19.8
Marine Option - Cash Flow

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Onwards
Marine Option (CDN$ x 000)													
Revenue		43,682	55,765	78,820	211,116	408,455	414,286	431,614	441,328	482,122	435,183	489,893	7,473,484
Total Pit Top Cost	1,672	28,565	31,110	17,751	46,514	69,536	77,304	79,425	80,896	85,586	80,121	86,569	1,424,262
CHPP		2,250	2,782	3,855	7,483	12,603	14,355	14,834	15,166	16,224	14,991	16,445	262,705
Overheads	2,481	4,802	5,426	6,711	11,629	17,973	20,431	21,102	21,568	23,052	21,323	23,363	374,103
FOR Cash Cost	4,153	35,617	39,318	28,317	65,626	100,112	112,090	115,361	117,630	124,862	116,435	126,377	2,061,070
DSE's					4,688	11,661	13,775	14,353	14,753	16,029	14,542	16,297	249,614
Royalty		458	566	784	1,486	2,619	3,094	3,223	3,313	3,600	3,266	3,660	56,057
FOB Cash Cost	4,153	36,075	39,884	29,101	71,800	114,392	128,959	132,937	135,696	144,491	134,243	146,334	2,366,741
EBITDA	-4,153	7,607	15,881	49,719	139,316	294,063	285,327	298,677	305,632	337,631	300,940	343,559	5,106,743
Less: CAPEX	33,350	41,113	87,650	234,252	108,690	9,653	11,403	11,881	12,213	13,269	12,038	13,491	206,632
Less: Marketing Fee		874	1,115	1,576	4,222	8,169	8,286	8,632	8,827	9,642	8,704	9,798	149,470
Less: Tax					4,328	64,638	61,388	67,565	70,941	83,902	82,660	99,748	1,471,470
Net Cash Flow After Tax	**-37,503**	**-34,380**	**-72,884**	**-186,109**	**22,076**	**211,603**	**204,250**	**210,599**	**213,651**	**230,818**	**197,538**	**220,522**	**3,279,171**
Cumm. Net Cash Flow After Tax	**-37,503**	**-71,883**	**-144,767**	**-330,876**	**-308,800**	**-97,197**	**107,053**	**317,652**	**531,303**	**762,121**	**959,659**	**1,180,181**	**4,459,352**

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20.0 Interpretation and Conclusions

Although limited, the data that is available is suitable for mine planning. The PFS and all of the previous studies are based on a limited quantity of data that was collected by various organizations over a period of 30 years and culminated in the extraction of a strip sample (DCH01) from the intersection of the Harbour Seam within the two dewatered access tunnels. Data was also available from adjacent mines that are no longer active or accessible. Because the Donkin Project will be located within coal seams that are located beneath the Atlantic Ocean, data collection is difficult and an expensive process. Offshore drilling, although feasible, sterilizes a boundary around each drill hole and can significantly impact the layout of mining panels. As such, additional exploration data is not likely until actual mining within the resource takes place.

Uncertainties associated with data limitations include coal quality variability; no Hub Seam washability and metallurgical quality data; methane liberation; roof control; impact of the Donkin Fault; and, marketability of the product. Mitigation measures incorporated into mine planning and project economics include drilling from the Harbour Seam into the Hub Seam, exploration in the Harbour Seam, a coal preparation plant, the construction of a third tunnel and conservative roof control procedures.

Based on the drilling, percent ash and sulfur are the two Harbour Seam coal quality parameters that vary across the proposed mining area. The inclusion of a coal preparation plant should reduce this variability and at the same time improve the marketability of the product. The bulk and strip samples collected at the intersection of the two tunnels with the Harbour Seam are an excellent source of data and are the basis for coal processing design. Although this data cannot be considered representative of the property as a whole, it is reasonable to assume that the liberation of ash and sulfur will be representative. Data collected from the drill hole samples supports this assumption. The ash associated with the coal and any OSD appears to separate relatively easily dependent on the SG of separation. The pyritic sulfur is finely distributed in the coal and does not separate as readily. A 3% dry ash and 3% dry sulfur are achievable at a separation SG of approximately 1.5 – 1.6. A plant yield of 81% has been assumed to account for the higher ash in the drill holes to the north and western part of the reserve and OSD. Although there is no Hub Seam washability data, it is a reasonable assumption that the Hub Seam will have wash characteristics similar to the Harbour Seam.

Gas or methane liberation has been an integral part of mining with most seams in the Donkin area, and all data indicates that the Donkin Project Harbour and Hub seams will be no different. Good ventilation is the primary means of managing methane, and the ability to move air into and out of the mine is the foundation of good ventilation. Managing air at the working faces and collecting methane from the mined-out goaf areas is critical. Dr. Roy Moreby has analyzed the ventilation requirements for a similar mine layout to the proposed mine layout based on a four CM section mine plan and also for a longwall mine plan. Common to both analyses is the requirement for three tunnels to provide enough air to safely ventilate the mine at near full production capacity. Currently, there are two tunnels, and after rehabilitation, they can provide adequate ventilation for the operation of two CM sections and possibly three CM sections depending on actual methane liberation. The mine plan and economic analysis assume that the third tunnel will be constructed and in operation prior to the addition of the third CM section.

Roof control is critical to the success of any underground mining operation, and even with the best data available, the roof control plans will change as mining occurs. Although the limited data at Donkin indicates that the roof should be reasonable in most areas of the mine, a conservative roof control plan has been assumed and included in the economic analysis.

The Flint Flexure (Donkin Fault and Anticline) was identified by the Sparker Survey. A high resolution seismic survey provided additional data on the Donkin Fault. The Donkin Fault potentially crosses the mine panels, approximately 1,000 m from the base of the tunnels. The fault could be a source of gas and water and adverse roof conditions, and could require drifting up to intersect the coal seam. Mitigation will require drilling in advance of mining and then the development of plans to cross the structure. The PFS did not include additional cost for the potential mitigation measures.

The marketing study prepared by AME indicates that the Donkin Project Harbour Seam high sulfur coal can be marketed as a semi-hard or standard hard coking coal discounted for its relatively high sulfur content to international markets in Europe, Brazil and to some extent in Asia and at volumes of near 2.1 Mtpa and as a thermal coal in similar markets at volumes of approximately 0.65 Mtpa. The forecast for long-term realization is projected at US$159/tonne for standard hard coking coal, US$151/tonne for semi-hard coking coal and US$90/tonne for thermal coal.

Xstrata Coal on behalf of XCDM also completed an analysis of the potential realization for the Donkin coal. Xstrata's long-term realization for the coking coal product is US$156.7/tonne and for the thermal product is US$122.2/tonne. The coking coal product realization is consistent with the AME study while the thermal product realization is significantly higher. The thermal product realization reflects a transportation advantage into local markets.

Because the Harbour and Hub seams are high sulfur coals, they have the potential to be displaced by more traditional metallurgical coals during down turning trends in world demand.

The selection of a transportation option is not data dependent but depends on the mitigation of any identified environmental issues and permitting. Both options are currently under evaluation although the marine option is the preferred option. Adequate capital funds and operating costs for both options have been included in the financial evaluation alternatives.

20.1 Conclusions

The Donkin Project has been progressing through the stages of study and assessment prescribed by Xstrata Coal's internal project Management system. In June 2009 a feasibility study of the exploration phase of the project, utilizing a single CM, was approved conditional upon the exercising of a sales contract for the raw coal that would be produced. At that time, XCDM was unable to secure a domestic sales agreement for the sale of the raw coal with the sole power utility Nova Scotia Power, Inc.

In early 2010 the project underwent a further thorough review of all available options, and it was decided to conduct a pre-feasibility study of an option whereby multiple CMs would be utilized to produce ROM coal that would subsequently be washed to produce a coal product that is suitable for export sales into the international coking coal market. The PFS was complete with the exception of the selection of a transportation option, and it concluded that the multiple CM option was a reasonable method of extracting the reserve, and there were sufficient reserves within the Indicated resource boundary to support the development of a mine. A marketing study was not completed to support the finalization of this PFS. The March 2011 PFS expanded on the 2010 Study by modifying the mine plans to incorporate the Hub Seam, continued refinement of the transportation options, and completing independent and internal marketing studies and evaluations. The modified mine plans incorporating the Hub Seam are reasonable and supplement additional reserves to the project. The Hub Seam quality data is limited, and additional data will need to be collected during the exploration phase of the feasibility study. Although the transportation options are still undergoing evaluation, the marine option is the preferred alternative. The marketing study indicates that there is demand for the quantity and quality of coal that will be produced at the mine in international export metallurgical and thermal coal markets as well as domestic thermal coal markets. The economic analysis provides a reasonable return for the investment. The PFS is considered to have achieved its goals.

The transportation options will continue to be evaluated with a decision on which option to pursue during the feasibility study.

21.0 Recommendations

As recommended in the PFS and considered reasonable by the author, it is recommended that the Donkin Project proceed into the feasibility stage of Xstrata Coal's internal project management system to further assess the viability of a multiple CM underground operation, producing approximately 3.5 Mtpa ROM coal that is subsequently washed to provide 2.75 Mtpa of product coal that is suitable for the international export coking and thermal coal markets and domestic thermal coal markets. Included in this study would be contacting the customers in the regions identified in the marketing study, providing detailed coal quality specifications of the Harbour Seam coal, limited Hub Seam quality and querying the potential customers as to reasonable sales volumes. Also included in this study would be continued work on the studies, plans, permits and licenses necessary to start construction and operate the mine.

The feasibility study is estimated to cost CDN$94.211million and is forecast to be conducted over a 24-month period, with the commencement of a single CM development unit 12 months after securing a coal off-take agreement for exploration coal. The estimated cost includes tunnel rehabilitation, exploration mining along with the cost of the mining equipment and the study.

Development of the mine will be based on the outcome of the feasibility study.

22.0 References

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23.0 Date and Signature Page

Title of Report

Technical Report Donkin Coal Project – Cape Breton, Nova Scotia, Canada

Project Location

Cape Breton, Nova Scotia, Canada

Author

Marston & Marston, Inc.

Qualified Person

Lynn R. Partington, P.E. (Kentucky, USA); P.Eng. (Alberta, Canada)

Effective Date of Report

May 2011

24.0 Certificate of Competent/Qualified Person

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CERTIFICATE of AUTHOR

I, Lynn R. Partington, do hereby certify that:

1. I am an Executive Mining Consultant of:

   Marston and Marston, Inc.
   13515 Barrett Parkway Drive
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   Ballwin, Missouri 63021

2. I graduated with Bachelor and Master of Science degrees - Mining Engineering, from the University of Utah, in 1981 and a Bachelor of Science – Geology, from Utah State University, in 1967.

3. I am licensed as a professional engineer in Kentucky, USA and Alberta, Canada and am a practicing member of the Kentucky Society of Professional Engineers and the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

4. I have worked as a mining engineer for a total of 30 years including involvement in mine design and planning, mine management, reserve estimation, property acquisitions and consulting since graduation from the University of Utah.

5. I have read the definition of "qualified person" as defined in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I am responsible for the preparation of Sections 1 through 25 of the technical report titled *Technical Report Donkin Coal Project – Cape Breton, Nova Scotia, Canada* (Technical Report). I visited this property in 2008. During this visit, I discussed and observed the plans/operations and toured the mine facilities.

7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

8. The sources of information are noted and referenced in the report. The information provided by the various parties is to the best of my knowledge and experience correct.

9. I am independent of the issuer applying all of the tests in section 1.4 of NI 43-101. Prior involvement with the Donkin Project as an independent consultant was limited to mine planning and mine estimations, geomechanical evaluations, reserve estimation, equipment selection, and production sequencing.

10. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

11. At the request of Morien Resources Corp. ("Morien"), the author has readdressed and redated this technical report to Morien to facilitate filing on its SEDAR profile. The effective date of June, 2011 to the original technical report entitled "Technical Report: Donkin Coal Project, Cape Breton, Nova Scotia, Canada" dated June, 2011, remains in effect, and this report does not contain any new information.

Dated this 9th day of November, 2012.

[signature]

Signature of Qualified Person

Lynn R. Partington

Print name of Qualified Person