Grande Cache Coal Corporation

2011 NI 43-101 Technical Report on the Grande Cache Coal Operation

Grande Cache, Alberta, Canada

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Date Submitted:	June 27, 2011
Effective Date:	March 31, 2011
Project Number:	167519

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I, Carel H. van Eendenburg, P. Eng., do hereby certify that:

I am employed as a Senior Mine Engineer of AMEC Americas Limited, Oil Sands and Mining Division.

This certificate applies to the technical report entitled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada" dated June 27, 2011

I am a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and of the Association of Professional Engineers and Geoscientists of British Columbia.

I graduated with a Mine Engineering Diploma from the Technical University of Delft, Delft, Netherlands in 1972.

I have practiced my profession for a total of 38 years since my graduation from university. I have worked in the coal industry in Canada as a mining engineer for 26 years and have been involved in all phases of mine design, planning, engineering and evaluations. For several years I was the Qualified Person responsible for the reporting of resources and reserves for an active coal mine.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Grande Cache Coal Mine between April 11 and 12, 2011.

I am responsible for the preparation of Sections 1 through 6 and Sections 17.2 through 23 of the technical report titled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada" dated June 27, 2011 with input from the Qualified Person for Geology, Mr. Ronald Parent, P. Geol., Principal Geologist, the Qualified Person for Processing, Mr Daniel Erasmus, P. Eng, Manager Mining, and Mr Ramon Mendoza, P. Eng., Principal Mining Engineer, all employed by AMEC Americas Limited.

I am independent of Grande Cache Coal Corporation as independence is described by Section 1.4 of NI 43–101.

I have been involved with the Grande Cache property that is the subject of the Technical Report as the Qualified Person for the mining related and general sections of the 2009 and 2010 AMEC Technical Reports and as Project Manager for various mine technical and strategic planning studies since 2009.

I have read National Instrument 43-101 and this Technical Report has been prepared in compliance with that instrument.

As of the date of this certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

(Signed and sealed)

Carel H. van Eendenburg, P. Eng.

Dated at Calgary this 27th Day of June, 2011.

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I, Ron R. Parent, P. Geol., do hereby certify that:

I am a employed as Principal Geologist of AMEC Americas Limited.

This certificate applies to the technical report titled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada" dated June 27, 2011.

I am a Registered Professional Geologist with the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA). I obtained a Bachelor of Science with Honours degree in Geology from the University of Alberta, Alberta, Canada in 1990.

I have practiced my profession for 21 years. I have been directly involved in working coal and metal deposits in North America including project supervision, resource estimation, surface exploration, drill program supervision and database administration.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101 *Standards of Disclosure of Mineral Projects* (NI 43-101).

I have visited the Grande Cache Coal Mine on three occasions in 2010 (June 27-July1, August 23-27, November 1-5).

I am responsible for Sections 7 to 15 and 17.0 to 17.1 of the technical report titled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada", and dated June 27, 2011.

I am independent of Grande Cache Coal Corporation as independence is described by Section 1.4 of NI 43-101.

I have read National Instrument 43-101 and this report has been prepared in compliance with that Instrument.

As of the date of this certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

(Signed and sealed)

Ron Parent, P. Geol.

Dated at Vancouver this 27th Day of June, 2011.

CERTIFICATE OF QUALIFIED PERSON

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I, Daniel E. Erasmus, P. Eng, do hereby certify that:

I am employed as Manager, Mining of AMEC Americas Ltd., Oil Sands and Mining Division.

This certificate applies to the technical report entitled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada" dated June 27, 2011.

I am a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

I graduated with a Metallurgical Engineering Degree from the University of Pretoria, South Africa in 1992.

I have practiced my profession for a total of 19 years since my graduation from university. I have worked in the coal industries in South Africa and in Canada as a process engineer. I have further worked in various capacities within the iron ore, industrial minerals and heavy mineral sands industries and have been involved in most aspects such as mineral process research and development, plant design, construction and commissioning, project management and operations management.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Grande Cache Coal Processing Plant between March 12 and 16, 2011.

I am responsible for the preparation of section 16 of the technical report titled "2011 NI 43-101 Technical Report on the Grande Cache Coal Operation, Grande Cache, AB, Canada" dated June 27, 2011.

I am independent of Grande Cache Coal Corporation as independence is described by Section 1.4 of NI 43–101.

I have read National Instrument 43-101 and this Technical Report has been prepared in compliance with that instrument.

As of the date of this certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

(Signed and sealed)

Daniel E. Erasmus

Dated at Calgary this 27th Day of June, 2011.

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1.0 SUMMARY

The following report was prepared by AMEC Americas Limited (AMEC) for Grande Cache Coal Corporation (GCC). It addresses the coal geology, resources and reserves of the coal mining and processing operations in the Smoky River Coalfield of Alberta. These coal deposits were explored and partially mined some years ago by Smoky River Coal Ltd. and McIntyre Porcupine Mines, companies which are not related to Grande Cache Coal Corporation. The previous mine operator, Smoky River Coal Ltd., was placed in receivership in the year 2000. Grande Cache Coal acquired the assets in the same year and has continued to explore, evaluate and operate the mine and facilities. Numerous studies and reports, including Technical Reports, have been completed on the operations in recent years including Technical Reports prepared by AMEC on behalf of GCC.

GCC has requested that AMEC update the AMEC 2010 Technical Report covering all of its mineable coal deposits of the Smoky River Coalfield. It includes recent drilling activity and a recent comprehensive review of the geological information, quality data and mine models, as well as new designs of the No. 2 pits and the No. 12 North pits and updated mine designs for the No. 8 pits, the No. 16 pits and the No. 12 South A surface mining areas that represent new information. The Terms of Reference for this report include an independent validation of the coal resources and reserves in compliance with the current reporting requirements of National Instrument 43-101 *Standards of Disclosure for Mineral Projects* (NI 43-101).

Location and Accessibility

The GCC property is located in West Central Alberta, approximately 400 km west of the City of Edmonton, the capital of the Province of Alberta in Canada. The property is accessed via Highway 40, a two lane, paved provincial highway which connects the town of Grande Cache to the major, east-west, provincial Highway 16. The property is also serviced by a branch line of the Canadian National Railway which connects to the main east-west rail line at the town of Hinton, approximately 145 km south of the mine.

Surface and Mineral Tenure

In Alberta, coal tenure is held through coal leases granted by the province. Surface and underground mining rights are also granted by the province first through a mine permit, then by a mine licence for each individual mining area. GCC currently has approximately 22,704 ha under coal lease.

The coal leases that contain the resources for this report are summarized in Table 4-1 and displayed on Figure 4-2.

Regional Structure and Stratigraphy

The Gates Formation is the formation within the Smoky River coal field that contains the coal seams of economic interest. The Gates Formation consists of a 320 metre stratigraphic thickness of sandstone, shale and coal, and is subdivided into three members:

- The Torrens Member is the lowermost member of the Gates Formation and is a marine sandstone and siltstone sequence approximately 30 m in thickness.
- The Grande Cache Member is composed of interbedded sandstone, siltstone, coal and mudstone. The unit is up to 150 m thick. Eight coal seams (3 Seam through 8 Seam and 10 Seam and 11 Seam) are present.
- The Mountain Park Member is the uppermost member of the Gates Formation, and consists of 150 to 180 m stratigraphic thickness of non-marine fine sandstone and siltstone with minor coal.

The Smoky River Coalfield is deformed by tectonic events of the Laramide Orogeny which created the Rocky Mountains 60 million years ago. The rock strata are complexly folded and cut by numerous thrust faults. Structural shortening is estimated to be one-third. Surface traces of these complex folds and thrust faults trend northwest-southeast. The majority of the faults are southwest-dipping thrusts, displaying ramps that cut up stratigraphic section and flats that are parallel to bedding. Asymmetric folds with relatively long, straight limbs and short, narrow hinge zones are commonly found. The folds generally have chevron or box shapes and maintain their profile over distances of up to two kilometres along the trend. These folds are conical at their tapering ends. Amplitude of the large folds is of the order of 200 m to 1,000 m. Parasitic folds on the limbs of the major anticlines and synclines are common.

Data Sources

The information used to estimate the coal resources of the Smoky River Coalfield was gathered using industry standard data acquisition techniques. With over 40 years of mining activity and coal processing, data from operations can be used to help predict coal quality from the same coal seam. Drilling was and still is the most common method used to acquire data prior to mining. Over 3,400 holes have been drilled into the coal field since the 1950s. Summaries of drillholes in the reported coal resource areas are found in Section 11.0. Also prior to mining, the development of adits was a common method to provide bulk samples for coal washability test work. A total of 129 adits have been driven across the Smoky River Coalfield

Deposit Geology

The coal seams in the Smoky River Coalfield are numbered stratigraphically from the bottom up, with No.3 seam as the lowermost coal of interest and No.11 Seam being the highest stratigraphically.

The coal seam thickness and continuity across the individual mine[1] areas is discussed in detail in Section 9.0.

Coal Quality

The majority of samples were collected and submitted for analysis by previous operators. Results have been stored electronically within GCC's mining software package and in spread sheets. For metallurgical coal, important quality parameters are:

- Ash Percent - The relative amount of non-combustible material in the coal.
- Free Swelling Index (FSI) - A measure of the amount the coal swells when heated under controlled conditions. It gives a rough indication whether the coal is suitable for metallurgical use.
- Sulphur Percent - The relative amount of sulphur in the coal.
- Volatile Matter Percent - other than moisture, the substances that are given off as gas and vapour during combustion of the coal.

The in-situ coal quality data are shown in Section 9.0.

The operation produces a prime quality, low-ash, low-volatile, hard coking coal, with an ash content of 8.5%-9% and minor quantities of high quality, soft-coking coal, with an ash content of less than 10%, that may be sold for coke oven blends or as a pulverized injection coal. The quality of GCC's coal resources is suitable for its use as metallurgical coal which has been successfully marketed over the life of the operation.

Minor quantities of oxidized coal, occurring where the coal seams daylight, is sold occasionally on the spot market for thermal coal. Fine tailings are recovered from the tailings impoundments and sold to the adjacent power station. These are by-products of the operation, which have not been included in the resources.

Coal Resources

Coal resource models are generated from the drillhole information through the use of cross sections and/or seam surface interpretation. AMEC has verified the interpretation of these elements. Computer software has been used to convert the geological interpretations to 3D block models. These models are then used to check the resource numbers reported by GCC. The coal resources are subdivided into categories based on Assurance of Existence using GSC Paper 88-21 and reported using the equivalent mineral resource categories specified in NI 43-101.

[1] Throughout this report the words 'mine', operation, mining area have been used interchangeably

The coal resources with an effective date of March 31, 2011 are shown in Table 1-1 and Table 1-2. As a result of a review and update of the geological models and the incorporation of a new, property-wide geological database, all other resources have been updated for the current estimate.

Table 1-1: Summary of Measured and Indicated In-Place Coal Resources[1]

	Measured (Mt)	Indicated (Mt)	Total (Mt)	Ash (%)	FSI
Surface Mining Areas[2]		-			
No. 2 Area	46.5	22.3	68.8	19.3	6
No. 8 Area	37.4	21.2	58.6	20.6	6
No. 12 South A Area[3]	11.1	15.1	26.2	14.8	4
No. 12 South B2 Area[4]	2.6	1.0	3.6	13.9	3
No. 12 North Area	39.1	15.6	54.7	16.6	3.5
No. 16 Area	56.0	20.2	76.6	13.9	3.5
Total Surface Mining Areas	192.7	95.4	288.1		
Underground Areas[5]					
No. 7 Underground	1.1		1.1	14.1	4.5
No. 12 South B2 Underground	8.4	3.2	11.6	14.5	3.5
Total Underground Areas	9.5	3.2	12.7		
Grand Total	**202.2**	**98.6**	**300.8**		

Table 1-2: Summary of Inferred In-place Coal Resources[(1)]

	Inferred (Mt)	Ash (%)	FSI
Surface Mining Areas[(2)]			
No. 2 Area	7.0	21.1	5
No. 8 Area	3.1	21.9	6.5
No. 12 South A Area[(3)]	9.3	14.4	4
No. 12 South B2 Area[(4)]	0.5	19.2	4
No. 12 North Area	2.6	16.4	3.5
No. 16 Area	22.0	15.6	5.5
Total Surface Mining Areas	44.5		
Underground Areas[(5)]			
No. 12 South B2 Underground	0.7	16.3	4
Total Underground Areas	0.7		
Grand Total	**45.2**		

NOTES (1) Quality of all resources classified as Low Volatile Bituminous (ASTM)
(2)Surface mining resources. Estimated by AMEC based on a 20:1 strip ratio cut-off and a 45° pit wall angle
(3) A portion of the No.12 South A resources can also be mined by underground methods
(4) No.12 South B2 surface resources are those remaining after the open pit reserves have been mined out
(5)Underground resource estimated by AMEC. Minimum depth of cover approx. 50 m. Maximum underground extraction angle 15°; 20m buffer from faulting, 50 m buffer from highwalls
(6) Coal resources are inclusive of the coal reserves.
(7) The resource estimates have been prepared under the supervision of Ron Parent, P. Geol., Principal Geologist for AMEC Americas Limited and Qualified Person

Coal Reserves

To convert coal resources to coal reserves, a number of economic and technical factors must be applied. These include but are not limited to the following:

- Estimate for the near and long term price of metallurgical coal in the domestic and international market place; a long term price of $150 per tonne has been used.
- Operating costs associated with open pit mining, underground mining, transporting and processing the coal at the mine site.
- Overhead costs associated with marketing and transporting the finished coal product to customers.
- Overhead costs associated with administrative and technical functions relative to running a mine.
- Geotechnical parameters governing the orientation of the pit slopes, haul roads, waste dumps and other parameters associated with water flow and climate.
- Estimate for the recovery of coal and addition of dilution material during the mining and coal handling process (resulting in the Run-of-Mine estimate).
- Estimate for the recovery of coal from processing – approximately 71% resulting in the Clean or Saleable estimate.

Using these and other factors, GCC engineers and their consultants used mining software to produce economic mine designs at the Grande Cache operation. AMEC has reviewed these procedures and parameters and determined that the mine designs are valid.

The parameters used for the mine designs are based on previous operating experience and the most recent geotechnical investigations (see Reference nos. 5, 6, 13 and 15 in Section 22.0 of this report).

The completion of updated pit designs for the No. 8, the No. 12 South A and the No. 16 surface pits, the recent pit designs in the No. 2 and No. 12 North areas and the subsequent update of long range plans and analysis have achieved the conversion of resources to reserves in these areas.

The reserves with the effective date of March 31, 2011 are summarized on Table 1-3 and Table 1-4.

Table 1-3: Summary of Proven and Probable Run-of-Mine Reserves *(1)*

	Proven (Mt)	Probable (Mt)	Total (Mt)(2)
Surface Mining Areas			
No. 2 Area	18.00	0.95	18.95
No. 8 Area	23.95	1.02	24.97
No. 12 South A Area(3)	9.71	1.31	11.02
No. 12 North Area	31.25	12.22	43.47
No. 16 Area	19.66	9.65	29.31
Total Surface Mining Areas	102.57	25.15	127.72
Underground Areas			
No. 7 Underground	0.95	-	0.95
No. 12 South B2 Underground	8.21	-	8.21
Total Underground Areas	9.16	-	9.16
Grand Total	**111.73**	**25.15**	**136.88**

NOTES (1) Quality of all reserves classified as Low-Volatile Bituminous (ASTM)
(2) Average ROM grade for reserves is reported in Section 9.0 under the respective mining areas
(3) Planned surface pits only

Table 1-4: Summary of Proven and Probable Saleable Coal Reserves[(1)]

	Proven (Mt)	Probable (Mt)	Total (Mt)[(2)]
Surface Mining Areas			
No. 2 Area	12.92	0.65	13.57
No. 8 Area	16.46	0.63	17.09
No. 12 South A Area[(3)]	6.94	0.91	7.85
No. 12 North Area	22.19	8.92	31.11
No. 16 Area	14.42	6.95	21.37
Total Surface Mining Areas	72.93	18.06	90.99
Underground Areas			
No. 7 Underground	0.68	-	0.68
No. 12 South B2 Underground	5.85	-	5.85
Total Underground Areas	6.53	-	6.53
Grand Total	**79.46**	**18.06**	**97.52**

NOTES (1) Quality of all reserves classified as Low-Volatile Bituminous (ASTM)
(2) Total coal will be marketed as hard coking coal
(3) ROM coal from Table 1-3 multiplied by historic average plant yield for No. 7 area coals
(4) Planned surface pits only
(5) Saleable (Clean) coal reserves are a subset of and not additive to Run-of-Mine reserves
(6) The reserve estimates have been prepared under the supervision of Carel van Eendenburg, P. Eng., Senior Mining Engineer for AMEC Americas Limited and Qualified Person.

Mine Production

The surface mines are operated by GCC as a typical truck-shovel operation, using large hydraulic shovels as the primary loading units, recently joined by a 36m^3 capacity electric cable shovel. The waste is hauled in large rear dump trucks (220 tonne capacity) to nearby waste dumps. Smaller 90 tonne haulage trucks or 50 tonne contractor units are used for the main coal hauls.

GCC is currently operating in No. 8 surface pits and the No. 7 underground operation. Preparations for the development of the No. 12 South B2 underground mining area are currently underway.

A permit amendment and licence application has been filed for the No. 12 South A surface pit (Phase 1). The timing of the No. 2, No. 16, and No. 12 North pits is currently under review by GCC. These open pit mines will all be developed with similar operating techniques, equipment, process plant and other shared facilities.

A permit amendment and licence application has been filed for the No. 12 South B2 underground mining area and GCC has received and responded to several requests for supplemental information (SIR) from the Energy Resources Conservation Board (ERCB) and Alberta Environment. Subject to regulatory approvals, this operation will commence development in the summer of 2011 taking over from the No. 7 underground mining area, which will be exhausted in 2012.

The underground operations employ the room-and-pillar mining method; activities include development and panel preparation followed by de-pillaring mining. Five-entry panels are developed with one belt conveyor system. A mining recovery of 75% to 80% is projected after de-pillaring the developed panels. GCC is in the process of implementing Mobile Roof Supports, which has the potential to increase the recovery up to 90%, although this increased recovery has not been included in the reserve estimates.

GCC plans to increase coal production from the currently budgeted level of 2.25 million clean coal tonnes in FY2012 to 3.5 million clean tonnes per annum by FY 2014. AMEC has reviewed this plan and considers it aggressive but achievable. AMEC has updated the financial analysis based on current projections.

Coal Processing and Planned Coal Production

The majority of the GCC coal washing plant circuitry is typical for the plants built around the 1970s. ROM coal is delivered by truck from the operating areas to a ROM coal stockpile. After removal of the oversize material in the breaker, the plant feed coal is conveyed to the raw coal silo. Cleaning of the coarse coal takes place in heavy media cyclones using finely ground magnetite in water as the dense medium. Fine coal is cleaned in froth flotation circuits. The coal is dewatered in centrifuges or on disc filters as well as in a fluidized bed dryer. The clean coal is transferred to a clean coal stockpile for loading on to rail cars. Fine coal refuse is dewatered and combined with the coarse refuse for disposal in the storage area at Flood Creek, or pumped in slurry form to the fine tailings facility.

GCC has instituted several circuit improvements, which have led to increased plant availability and coal recovery. In view of the age and the current circuit upgrades required, GCC is in the process of further developing options to achieve the production increase by reducing the maintenance cost and improving the efficiency and reliability of this facility.

Markets

The principal product from GCC is hard coking coal (metallurgical coal). This coal is sold on the seaborne hard coking coal market. GCC has signed contracts and completed negotiations for hard coking coal sales on 1.6 million clean tonnes for the coal year commencing April 1, 2011. Contracts are typically renewed on an annual basis with final pricing defined annually or quarterly. Sales negotiations for the 2012 coal year are ongoing with price settlements for the first quarter.

GCC has also signed a contract with Canadian National Railway for the transport of coal to a terminal on the west coast. Price and car commitment is open to negotiation on a bi-annual basis. Contracts with shipping ports are in place with Westshore Terminals located at Roberts Bank near Vancouver, B.C.

Operating and Capital Costs

Mine operating costs were provided by GCC and reviewed by AMEC. GCC has introduced a fleet of large, new mining equipment and the inherent lower operating costs have been utilized in the updated forecasts. Total cost of sales is projected to be at an average of $114 per tonne of clean coal.

AMEC has reviewed the capital forecast. The capital expenditures over the next 30 years, both initial and sustaining, are estimated at $773 million, with approximately 50% ($393 million) required during the first five years.

Financial Analysis

The project base case shows a Net Present Value at an 8% discount rate of $684 million. The sensitivity analysis shows the operation is most sensitive to selling price (in $US) and exchange rate ($CAN/$US) determining the selling price in $CAN and to the cost of sales. The project appears far less sensitive to changes in capital requirements.

Mine Life

The mine life for the combined operation as currently scheduled is approximately 35 years starting in 2011. This includes all of the current reserves. During this period GCC plans to further evaluate the known resource within the coal lease to extend the life of the underground operations.

Risk Statement

The financial results presented in this report represent forward looking information regarding future projections of mining operations and resulting cash flows. By its nature, forward-looking information involves a number of assumptions, known and unknown risks and uncertainties, which could cause actual results to differ materially from those forecasts. These risks include, but are not limited to the future price of coal, rail freight rates and availability of coal cars to transport the coal to port. There may be inflation of input costs such as diesel, steel, and labour as well as mining equipment. The high activity in the mining industry and other industries that rely on large earth moving equipment may cause delays in delivery of mining equipment. The problem of retaining and recruiting skilled personnel is an industry wide issue. There can be delays in obtaining or renewing mining permits. Concerns over greenhouse gas emissions and compliance with greenhouse gas regulations may place additional costs on a coal mining operation or negatively impact the market for coal.

There is certain risk involved in GCC's aggressive plans to increase the production rates used in the analysis. This includes the requirement for timely regulatory approvals, the practical aspects of establishing several new mining operations in a short time period and the ability to consistently maintain the required production rates from the underground operation as well as in the processing plant. This would alter the resulting cash flows, but, in AMEC's opinion, not likely to the degree to affect any of the reported coal reserves.

Critical are the timely evaluation of options and the implementation of an appropriate strategy for the ongoing disposal of the plant refuse streams.

Recommendations

Significant engineering efforts are required to obtain approval for and develop the new mining areas, and to implement the improvements required in the processing plant. This will require a considerable effort, estimated to cost approximately $200,000 - $400,000 in staff time over the coming years in addition to the capital costs included in the financial analysis.

AMEC further recommends that Grande Cache Coal Corporation:

- actively seek to obtain the necessary permits and license amendments
- commence preparations for the permitting of the No. 16 and No. 12 North area
- complete the current effort to establish geological models and the geological database
- establish and monitor operating procedures for the new No. 12 South B2 underground operation

- complete studies to determine the feasibility of the proposed plant refuse storage plan
- pursue the implementation of the options to upgrade the processing plant to improve efficiency and reliability of this facility.

2.0 INTRODUCTION

Grande Cache Coal Corp. (GCC) requested that AMEC Americas Limited (AMEC) complete an Independent Qualified Person's Review and Technical Report that covers the following areas: No. 7 underground operation, No. 2 and No. 8 surface pit areas, No. 12 South B2 underground operation, No. 12 South A surface mining area and underground deposit, No. 12 North and No. 16 surface pit areas.

The work entailed estimating coal resources and reserves in conformance with National Instrument 43-101, Standards of Disclosure for Mineral Projects ("NI 43-101"). It also involved the preparation of a Technical Report as defined in NI 43-101 and in compliance with Form 43-101F1 ("Technical Reports"). The Report was prepared to support a material change from the last disclosure in the 2010 Technical Report dated May 26, 2010 with the addition of new resources and reserves in newly modeled mining areas as well as revised pit designs related to increased coal price projections. Carel van Eendenburg, P. Eng, Senior Mine Engineer, Ron Parent, P. Geol., Principal Geologist, and Neil Erasmus, P. Eng., Mining Manager, all employees of AMEC, are the Qualified Persons responsible for preparing the 2011 Technical Report.

Information and data for the independent review were obtained from GCC personnel in Calgary, Alberta and from the mine site in Grande Cache, Alberta. The Technical Report has an effective date of March 31, 2011 and includes drilling results up to December 31, 2010. Two drillholes have been completed in 2011 prior to April 1, one of which has not been included in the resource and reserve estimates.

Pertinent geological and mine planning data were reviewed in sufficient detail to prepare this document. Carel van Eendenburg, P. Eng., Senior Mine Engineer, directed the mineral reserve estimation work and review of the mine engineering data, assisted by Ramon Mendoza, P. Eng., and Principal Mining Engineer, who reviewed the present and future underground workings. Neil Erasmus, P. Eng., Mining Manager, reviewed the coal processing aspects and Ron Parent, P. Geol., Principal Geologist reviewed the geological data. All are employees of AMEC.

Messrs van Eendenburg and Mendoza visited the mine site on the 11th and 12th of April, 2011, during which visit they toured the operations, audited selected mine engineering processes and interviewed technical and managerial staff. Mr. Erasmus visited the site in March, 2011 as part of a process plant audit to propose options for operational improvements. Mr. Parent has been to site several times in late 2010 to collect, cross-check, and review geological information.

3.0 RELIANCE ON OTHER EXPERTS

The AMEC QPs have fully relied upon and disclaim responsibility for information relating to the tenure status and surface rights, permitting requirements and permit status of the Grande Cache Coal operation, through the following document:

- Bernd Martens, P. Bio., Manager Environment, Grande Cache Coal Corporation, May 18, 2011, titled Regulatory Status, Grande Cache Coal Corporation.

This information is used in Section 4.0 of this Report.

The QPs have fully relied upon and disclaim responsibility for information relating to encumbrances regarding the Grande Cache Coal Corporation, through the following document:

- Burnet, Duckworth and Palmer, LLP, May 30, 2011, titled Grande Cache Coal Corporation, addressed to Ian Bootle, Vice President Finance and Chief Financial Officer;

This information is used in Section 4.0 of this Report.

The QPs have fully relied upon and disclaim responsibility for information relating to the environmental status and obligations of the Grande Cache Coal operation, through the following document:

- Bernd Martens, P. Biol., Manager Environment, Grande Cache Coal Corporation, May18, 2011, titled Regulatory Status, Grande Cache Coal Corporation.

This information is used in Section 19.0 of this Report.

The QPs have fully relied upon and disclaim responsibility for information relating to the royalties and tax obligations of the Grande Cache Coal operation, through the following document:

- Ian Bootle, CGA, Vice President Finance and Chief Financial Officer, Grande Cache Coal Corporation, June 17, 2011, titled Taxes and Royalties, Grande Cache Coal Corporation.

This information is used in Section 19.0 of this Report.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Location

The GCC mine and process facilities are located within GCC's coal mining lease blocks in the Grande Cache area of West Central Alberta (Figure 4-1). The mine site is approximately 20 km north of the town of Grande Cache in the Municipal District of Greenview.

The No. 7 underground operation is located within Townships 57 and 58, Ranges 8 and 9, west of the 6th Meridian covering Sections 31, 36, 1 and 6 in those two respective townships.

The No. 2 and No. 8 surface pit areas are located in a coal lease area covering portions of Sections 8, 9, 14-23, 27,28 in Township 58, Range 8, West of the 6th Meridian. This area is located in an area of rugged topography on the top and sides of the ridge between the Smoky River and Sheep Creek valleys. It lies between 120 and 550 m above the Sheep Creek valley floor.

No. 12 South area is located approximately 6.4 km west of the No. 8 pits and includes the planned No. 12 South B2 underground operation, the planned No. 12 South A surface and underground operations as well as the No. 12 North area. The coal leases cover portions of Sections 9,10,15-20, 30 in Township 58, Range 9 and Sections 2-, 8-10 in Township 58, Range 10, all West of the 6th Meridian.

No. 16 area is located within a coal lease covering portions of Sections 28-31 in Township 58, Range 9, Sections 5 and 6 in Township 59, Range 9, Section 36 in Township 58, Range 10 and 1, 2, 9-12, 15, 16 in Township 59, Range 10, all West of the 6th Meridian.

4.2 Surface and Mineral Tenure

In Alberta, coal tenure is held through coal leases granted by the province. Surface and underground mining rights are also granted by the province through a mine permit, followed by a mine licence. GCC currently has 22,704 ha under coal lease.

The coal leases that contain the resources for this report are summarized in Table 4-1 below and displayed on Figure 4-2.

Figure 4-1: General Location Map

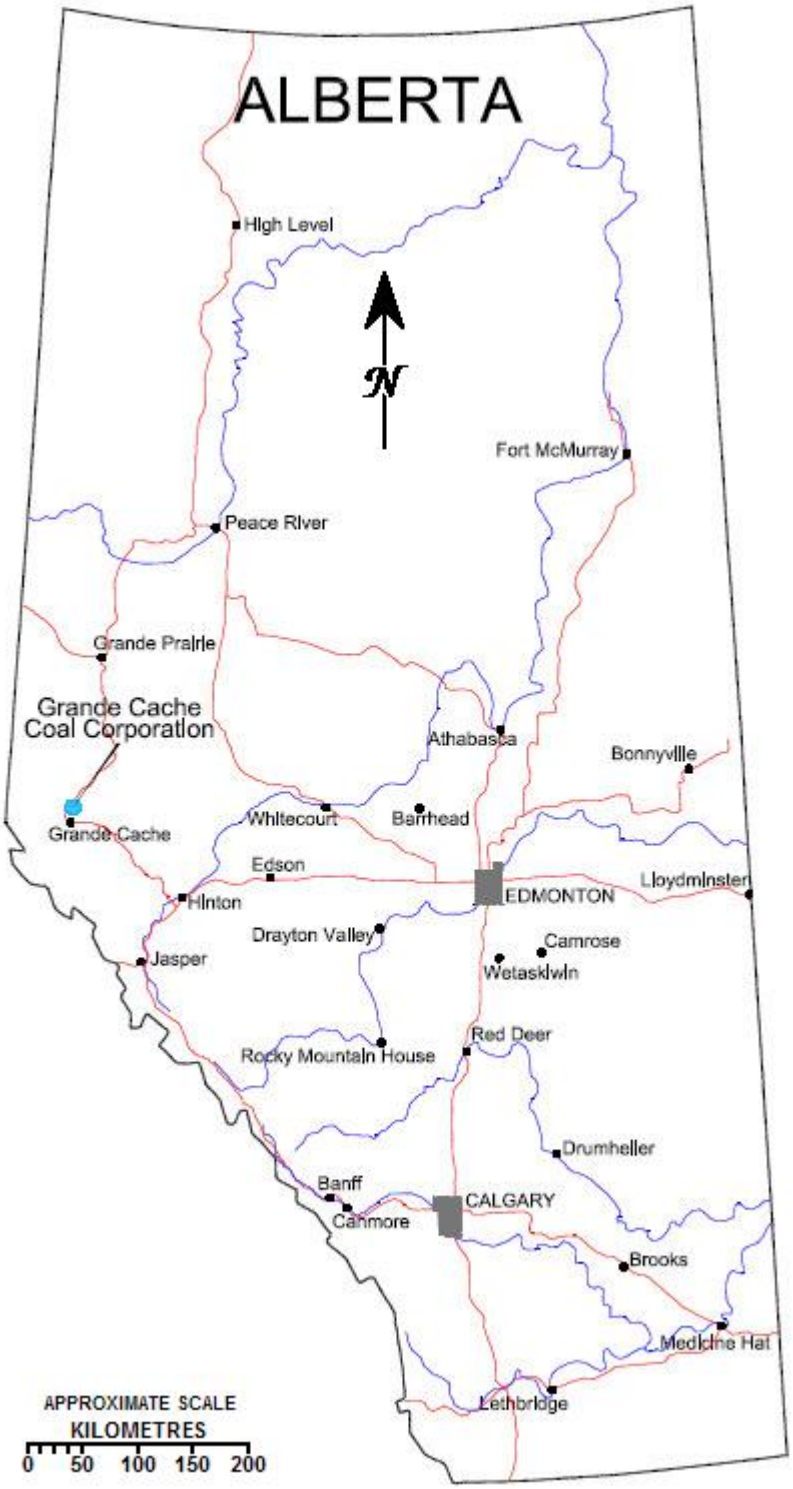


Table 4-1: Summary of Coal Lease Tenure at GCC

Lease Number	Mining Area	Area (ha)	Date Recorded
1300090001	No. 7	608	Sept. 6, 2000
1300090002	No. 8	496	Sept. 6, 2000
1303010775	No. 12 South B2	224	Jan. 31, 2003
1304020416	No. 2 and part of No. 8	1,744	Feb. 2, 2004
1304020417	No. 12 South A and No. 12 South B2	912	Feb. 2, 2004
1304020418	No.9	8,720	Feb. 2, 2004
1304020419	No. 16	2,576	Feb. 2, 2004
1304091006	No. 2	192	Sept. 1, 2004
1306020563	No. 8 East	64	Feb. 17, 2006
1306020564	No.9	416	Feb. 17, 2006
1306020565	No. 12 North and 12 South B2 Underground	2,736	Feb. 17, 2006
1306080740	No.5	1,792	Aug. 4, 2006
1306080741	No.1	1,360	Aug. 4, 2006
1306080742	No.1 North	864	Aug. 4, 2006
Total		**22,704**	

Coal leases are granted by the Provincial Government of Alberta for a period of 15 years and are renewable. Leases are granted with the following conditions:

- Payment of a royalty (currently 1 percent of Product Revenue)
- Compliance with laws
  - Mines and Minerals Act
  - Coal Conservation Act
- Indemnification of Leaser
- Lost coal provision
- Agreement not to mine, without consent, under any bridge, railway, pipeline, public road or highway
- Special provisions of the GCC leases include:
  - Cannot transfer lease without consent
  - Compliance with a plan for mining coal from the lease
  - Compliance with milestones, in some leases
  - Renewal predicated on attaining milestones, in some leases

GCC was incorporated in 2000 as a private Alberta corporation to reactivate coal mining and processing in the Grande Cache area on selected coal leases No. 1300090001 (No. 7 Lease) and 1300090002 (No. 8 Lease) issued by Alberta Energy on September 6, 2000. GCC was granted additional leases in 2003, 2004 and 2006, which, together with No. 7 and No. 8 leases, provided the basis for a longer term mine project.

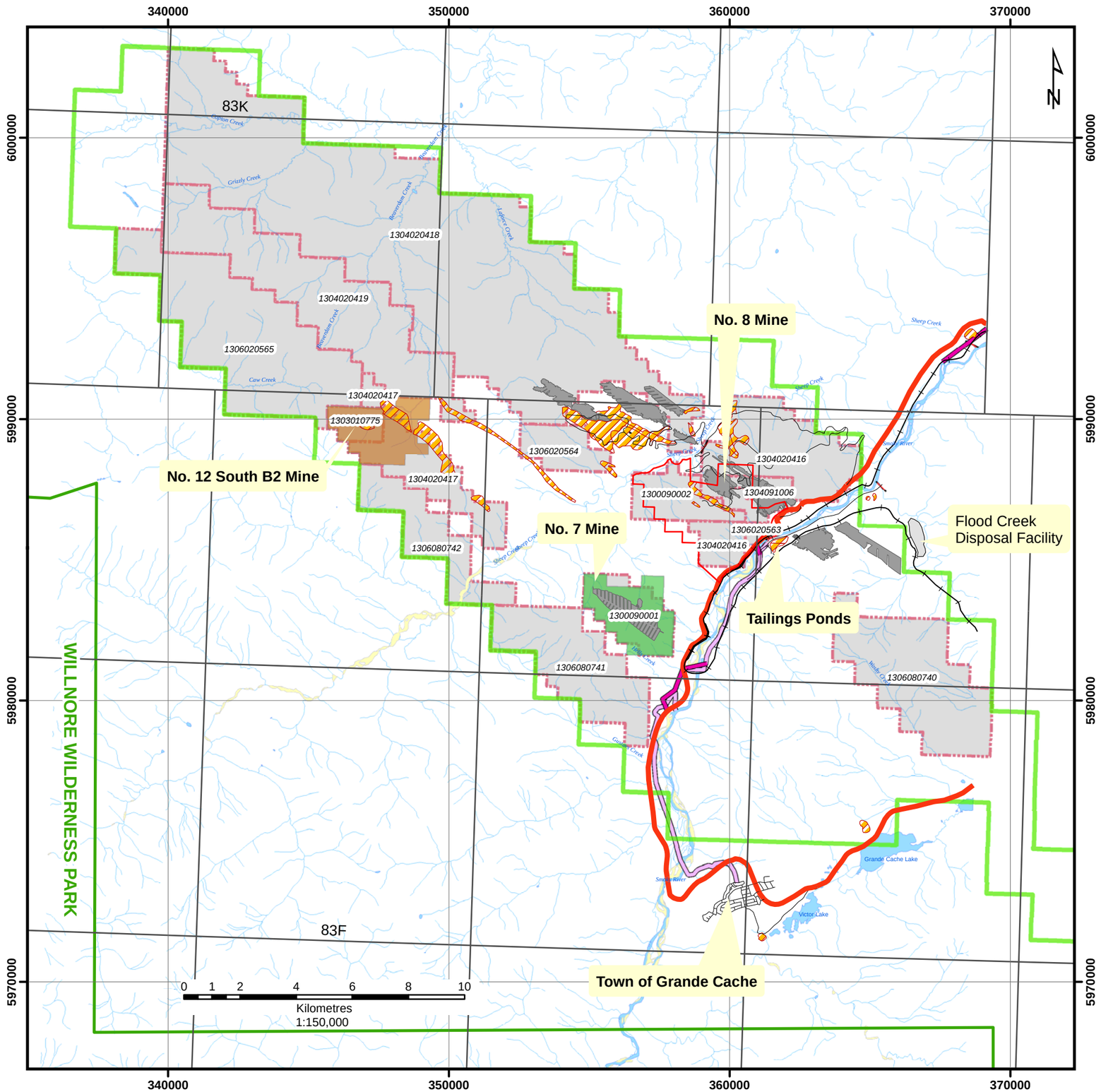
GCC received Permit No. C 2003-1 from Alberta Energy and Utilities Board (EUB) on January 31, 2003, covering the areas of activity for the Grande Cache Coal Project including the No. 7 mining area, haul road, coal processing plant and related infrastructure. Subsequently this Permit has been amended twice to encompass the No. 12 South B2 and No. 8 surface mining areas. On January 22, 2003, GCC received an Order in Council for Approval C 85-1A from the EUB to resume operations of the coal processing plant.

The Energy Resources Conservation Board (ERCB), formerly EUB, issued Mine Licences for surface mining operations in the No. 12 South B2 and the No. 8 South, Middle and North Pits. Alberta Environment (AENV) issued the corresponding EPEA Approvals as well as Approvals under the Water Act for the associated water management facilities.

In November 2009, GCC filed an application for approval of the No. 12 South B2 underground operation with the ERCB and AENV. The application for the No. 12 South A Pit (Phase 1), originally filed in 2008, was re-submitted on March 15, 2010, to the ERCB and AENV, based on revised geotechnical, mine equipment and scheduling configurations. The previous application was cancelled.

In March 2011 GCC filed an application with Alberta Energy for additional coal leases which will consolidate its presently held coal rights and enable GCC to undertake continued exploration and confirmation of coal reserves in support of its long range mine plan. This application includes a small section of the No. 2 area resources reported in this estimate.

As stated by Burnet, Duckworth & Palmer, LLP (Reference 8), there are no significant encumbrances identified regarding GCC.



Legend

- Grande Cache Coal Corp. Mine #1810/12 South B2
- Grande Cache Coal Corp. Mine #1810/7-4
- Grande Cache Coal License Area
- No 8. Mine Lease Area
- Coal Policy Category 4
- Open Pit Mined Out Area
- Township
- Highway 40
- Road
- Railroad
- Water Body
- Water Course
- Transmission Line

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

Coal Licenses and Mine Permits

DATE:	ANALYST:	Figure 4-2
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 10 / NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 4-2 Coal Licenses and Mine Permit.mxd

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Access and Infrastructure

Provincial Highway 40 is a paved, two-lane road that connects the project area with the local town of Grande Cache (pop. 4,500). Highway 40 connects Grande Cache with the city of Grande Prairie (pop. 47,000) 185 km to the north and the town of Hinton (pop. 10,000) 145 km to the southeast. The Project area is served by an existing branch line of Canadian National Railway (CNR). This line connects with the main east-west line of CNR, allowing access to the major coal export terminals in British Columbia and the Great Lakes.

Existing infrastructure at the mine consists of coal processing, coal loading, rail, plant refuse, storage, and office facilities. Adjacent to the GCC facilities is the H. R. Milner coal fired generating station owned by Milner Power Inc. (a subsidiary of Maxim Power Corp.).

5.2 Topography and Climate

The operations area is located in the eastern foothills of the Rocky Mountains. The general area consists of a series of northwest-southeast elongated ridges, which are cut by rivers and streams generally flowing in a north-easterly direction. Elevations range from 1050 m in the Sheep Creek valley floor to over 2000 m in the No. 12 North Area. The area is forested land categorized as sub-alpine, serving general watershed, recreational and wildlife habitat uses. Approximately one-quarter of the project area is above the elevation of the tree line. It is an area of rugged topography ranging generally above 1800 m elevation.

The climate is characterized by relatively long cold winters and moderate to warm summers. The average annual summer and winter temperatures are approximately plus 10° C and minus 15° C respectively. Frost can occur throughout the year and the snow pack often persists from late October to May at higher elevations. Precipitation ranges between 800 and 1,100 mm annually. The climate does not normally limit the mining operation.

6.0 HISTORY

The following historical overview of mining in the Grande Cache area was provided by GCC.

6.1 Ownership

McIntyre Mines Ltd. began operations in the Smoky River Coalfield in 1969. Initially, the planned production rate was two million clean coal tonnes annually. In 1985, Dome Mines (Dome) purchased McIntyre and established Smoky River Coal Limited (SRCL) as an operating company. In March 1987, a private Canadian-controlled corporation owned by Kaieteur Investments Inc., an Alberta corporation, and Dong Jin Commercial Inc., a commodity trading company based in Korea, purchased SRCL from Dome.

The McIntyre and SRCL operations in the Grande Cache area employed, on average, 400 people, although the number of employees was as high as 1,200. Most of the mine employees lived in the town of Grande Cache. The SRCL mine permit and coal leases represented a major portion of the Smoky River Coalfield. The coal leases during this ownership period covered approximately 37,475 ha.

On March 31, 2000, SRCL was placed into receivership by a group of secured lenders. This culminated a two-year period of operations under Corporate Creditor Arrangement Act. The receivership resulted from depressed market conditions and an investment in long wall mining technology, a change from SRCL's traditional room and pillar underground mine operations, commencing in 1996. Long wall mining proved to be unsuitable for the location.

In 2000, the last year of operation, SRCL operated under:

- The Environmental Protection and Enhancement Act (EPEA) Approval No. 11929-01-01
- Alberta Environmental and Utilities Board (EUB) Mine Permit No. 1765 for the No. 5B-4 Underground Mine and No. 1774 for the No. 12 Surface Mine

GCC was incorporated in 2000 as a private Alberta corporation to reactivate coal mining and processing in the Grande Cache area on selected coal leases. Contract mining at the No. 12 South B2 surface pit commenced in August 2004 with raw coal being trucked to the processing plant the same month. First rail shipments to Westshore Terminal's Roberts Bank port facility near Vancouver, British Columbia occurred in October 2004. Mining at the No. 7 underground operation commenced in November 2004.

In November, 2006, GCC ended its relationship with North American Energy Partners, who had been contracted to operate the surface pit through the initial phase. In September 2007, operations at the No. 12 South B2 pit resumed with GCC employees and equipment. Development of the No. 8 surface operation commenced in December, 2009.

6.2 Historical Resource Estimate

In 1998 SRCL prepared a report titled '15 Year Mine Plan Technical Presentation', which includes reserve estimates as at January 1, 1998. This section contains estimates for coal deposits within GCC's coal leases that have not been verified or reported in GCC's Technical Reports to date.

The report contains the criteria used to calculate these estimates, which are not compliant with GSC paper No.88-21 guidelines and do not use categories consistent with the current resource definitions and categories under the CIM Definition Standards of Mineral Resources and Mineral Reserves.

The criteria used in the historical estimate are:

Underground Mining

- Seam Thickness >2.5 metres
- Seam Dip <25 degrees
- Mining Buffer from Subcrop 60 metres
- Mining Buffer from Previous Mining 30 metres

Surface Mining

- Seam Thickness >1 metres
- Seam Overburden <10:1 BCM/tonnes ROM
- Open Pit Wall Angle <53 degrees

Confidence Levels, measured from nearest data point:

- Measured: 150m x 75 m elliptical zone around data point
- Indicated: 300m x 150 m elliptical zone around data point, less measured area
- Inferred: 1.2km x 0.6 km elliptical zone around data point, less measured and indicated areas.

Categories

- Geologic coal in-situ
- Recoverable Run-of-Mine from mine design
- Saleable product coal after processing

Using the original nomenclature, the estimates for those areas within GCC's coal lease boundaries, which are not included in the current Technical Report are presented below.

(In Million tonnes)	GEOLOGICAL RESERVE			RECOVERABLE RESERVE			SALEABLE RESERVE		
	RESERVE BASE		RESOURCES	RESERVE BASE		RESOURCES	RESERVE BASE		RESOURCES
	Measured	Indicated + Measured	Inferred + Indicated + Measured	Measured	Indicated + Measured	Inferred + Indicated + Measured	Measured	Indicated + Measured	Inferred + Indicated + Measured
Underground Areas									
No.1 Mine	0.2	0.7	5.0	0.1	0.2	1.8	0.1	0.2	1.6
No.5 Mine	8.1	15.3	29.3	3.1	4.8	5.1	2.2	3.4	3.6
No.9 Mine	45.3	86.8	171.1	8.2	16.6	38.9	5.8	11.8	27.6
Surface									
No.9 Mine WE3	3.9	3.9	3.9	0.5	0.5	0.5	0.4	0.4	0.4

It should be noted that the No.5 Mine was still active at the time of the estimate; the amount produced cannot be confirmed.

While it appears that the methodology followed was logical and consistently applied, GCC is not treating the historical estimates as current coal resources or reserves and the historical estimates should not be relied upon as if they are current.

GCC intends to review, verify and/or complement the available geological data and construct a current geological model for one or more of these areas.

6.3 Production

Annual coal production from surface and underground mines operated by SRCL during the period 1969 to 2000 ranged up to more than 3 Mt and total metallurgical coal exports over this period exceeded 50 Mt. SRCL produced the following metallurgical coal products:

- Smoky River Premium 7(PR7) – A prime quality, low-ash, low-volatile, hard coking coal, with an ash content of 7%.
- Smoky River Standard (SRS) – A high quality, soft-coking coal, with an ash content of 9.5%, used in coke oven blends or as an injection coal.

SRCL established a customer base of approximately twelve companies in eight countries on four continents.

Total mine production through calendar year 2010 in million ROM tonnes is presented below.

	Period	Surface	Underground	Total
Previous Owners	1969-2000	46.8	28.4	75.2
GCC	2004-2010	5.8	4.3	10.1
Total		**52.6**	**32.7**	**85.3**

7.0 GEOLOGICAL SETTING

7.1 Regional Geology

The Grande Cache area is situated in the Inner Foothills[2] of the Rocky Mountain fold and thrust belt. In this area, the Inner Foothills are bounded on the south-west by the Rocky Pass Thrust and on the northeast by the Muskeg Thrust. Because of a general north-westerly plunge of Palaeozoic carbonate rocks, the Inner Foothills are much wider along the Smoky River than along the Athabasca River.

The Inner Foothills in the Grande Cache area are characterized by exposures of Upper Jurassic and Cretaceous clastic rocks. The lowermost unit is the Nikanassin formation. It is overlain by the Luscar Group, which is about 550 m thick and contains ranges from medium to low volatile bituminous. The top of the succession comprises the Shaftesbury, Dunvegan, and Kaskapau formations (Langenberg et. al., 1987).

Strata in the region are complexly folded and cut by numerous thrust faults. The main deformation took place between early Campanian and late Eocene and is thought to have proceeded from southwest to northeast (Bally et al., 1966; Price, 1981). It is estimated that it reached the Grande Cache area during the Palaeocene (Kalkreuth and McMechan, 1984). The major thrusts (e.g., the Cowlick, Syncline Hills, Mason and Muskeg thrusts) are rooted in a common floor thrust at the top of the Precambrian basement, which is estimated to be a depth of 5500 m below sea level (Mountjoy, 1978). The shortening accomplished by folding and thrusting is about 30 percent, and fault-to-fold displacement transfer has been documented along the Mason Thrust (Langenberg, 1985).

The general stratigraphic sequence in the Grande Cache project area is outlined in the following paragraphs and summarized in Figure 7-1. The regional distribution of these units is presented in Figure 7-2.

The Nikanassin Formation, of Late Jurassic to Early Cretaceous age, is the oldest stratigraphic unit exposed. The Nikanassin Formation consists of more than 400 m of interbedded sandstone, shale and minor coal seams. The lower part of the Nikanassin Formation is marine in origin.

Disconformably overlying the Nikanassin is the Lower Cretaceous Cadomin Formation. This is the oldest formation in the Luscar Group. The Cadomin Formation consists of 30 to 40 m of pebble conglomerate and sandstone lenses. It is very resistant to weathering and forms prominent ridges, which make excellent stratigraphic markers throughout the Inner Foothills.

[2] The Inner Foothills are defined as that area of the foothills that has a predominance of Lower Cretaceous rocks at the surface; the Outer Foothills show a predominance of Upper Cretaceous and Paleocene outcrops.

The Gladstone Formation, which lies on top of the Cadomin Formation, is made up of 100 m of interbedded sandstone, siltstone, shale and minor coal seams. Two coal seams (No.1 and 2 Seams) are present in the Gladstone Formation over parts of the Project area, most notably in the No. 7 and No. 8 Mine areas.

Overlying the Gladstone Formation is the Moosebar Formation, which consists of 60 m of dark grey marine shale. The shale is interbedded with siltstone in the upper part of the Moosebar Formation over most of the Project area.

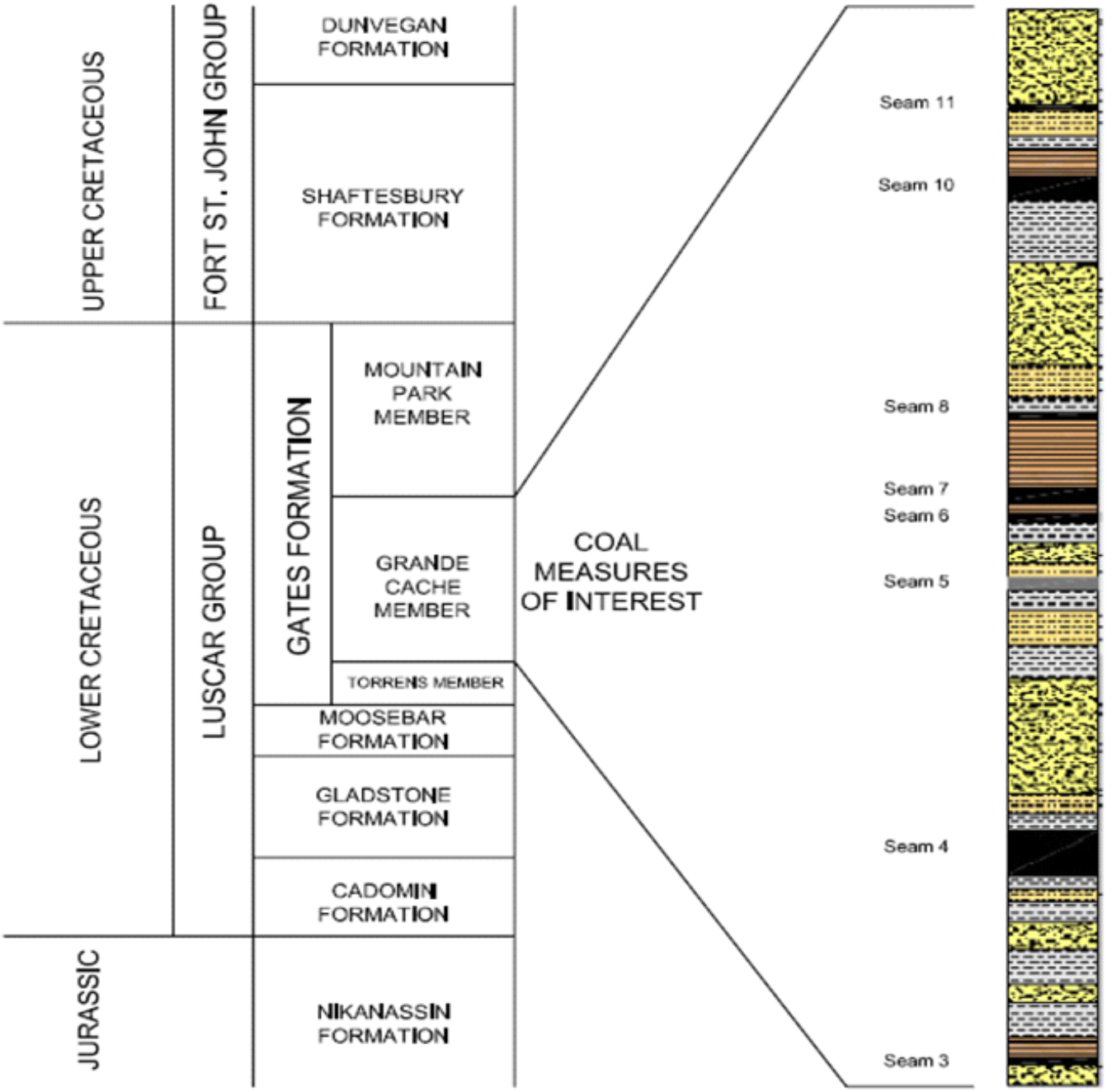
Above the Moosebar Formation is the Gates Formation, which is the uppermost unit of the Luscar Group and the formation that contains the coal seams of economic interest. The contact with the underlying Moosebar Formation is gradational. The Gates Formation consists of 320 m of sandstone, shale and coal and is subdivided into three members:

- The Torrens Member is the lowermost member of the Gates Formation and is a marine sandstone and siltstone sequence approximately 30 m in thickness. The Torrens Member is distinctive due to its weathering resistant nature and blue-grey colour. Throughout the operations area, there is an abrupt contact to the overlying No.3 Seam, the lowermost unit of the Grande Cache Member.

- The Grande Cache Member overlies the Torrens Member and is the middle member of the Gates Formation. Interbedded sandstone, siltstone, coal and mudstone units make up the 150 m thickness of the Grande Cache Member. Eight coal seams (No. 3 Seam through No. 8, No. 10 and No. 11 Seam) are present, with No. 4, 10, and 11 Seams being the dominant targets for mining at the No. 8 area. Seams 3 through 8 are the targets at the No. 12 and 16 areas.

- The Mountain Park Member is the uppermost member of the Gates Formation, and consists of 150 to 180 m of non-marine fine sandstone and siltstone. Some coal seams are present in the Mountain Park Member, although they are not laterally continuous across the area.

- Above the Gates Formation, the recessive weathering shale's of the Shaftesbury Formation make up the uppermost unit that outcrops across most of the area. The Shaftesbury Formation is primarily shale, 160 m in thickness, and is the lowermost formation in the Fort St. John Group. In the northern and eastern part of the area, the marine Dunvegan and Kaskapau Formations overlie the Shaftesbury. The Dunvegan Formation consists of approximately 50 m of interbedded sandstone and shale. The Kaskapau Formation consists of shale greater than 100 m in thickness.



LITHOLOGY

- COAL
- HIGH ASH COAL
- CARBONACEOUS SHALE
- SHALE
- SILTSTONE
- SANDSTONE

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

General Stratigraphy - Smoky River Coal

DATE:	ANALYST:	Figure 7-1
June 28, 2011	HK	
JOB No: 167519	QA/QC: CM, MV	PROJECTION: UTM Zone 10 DATUM: NAD83

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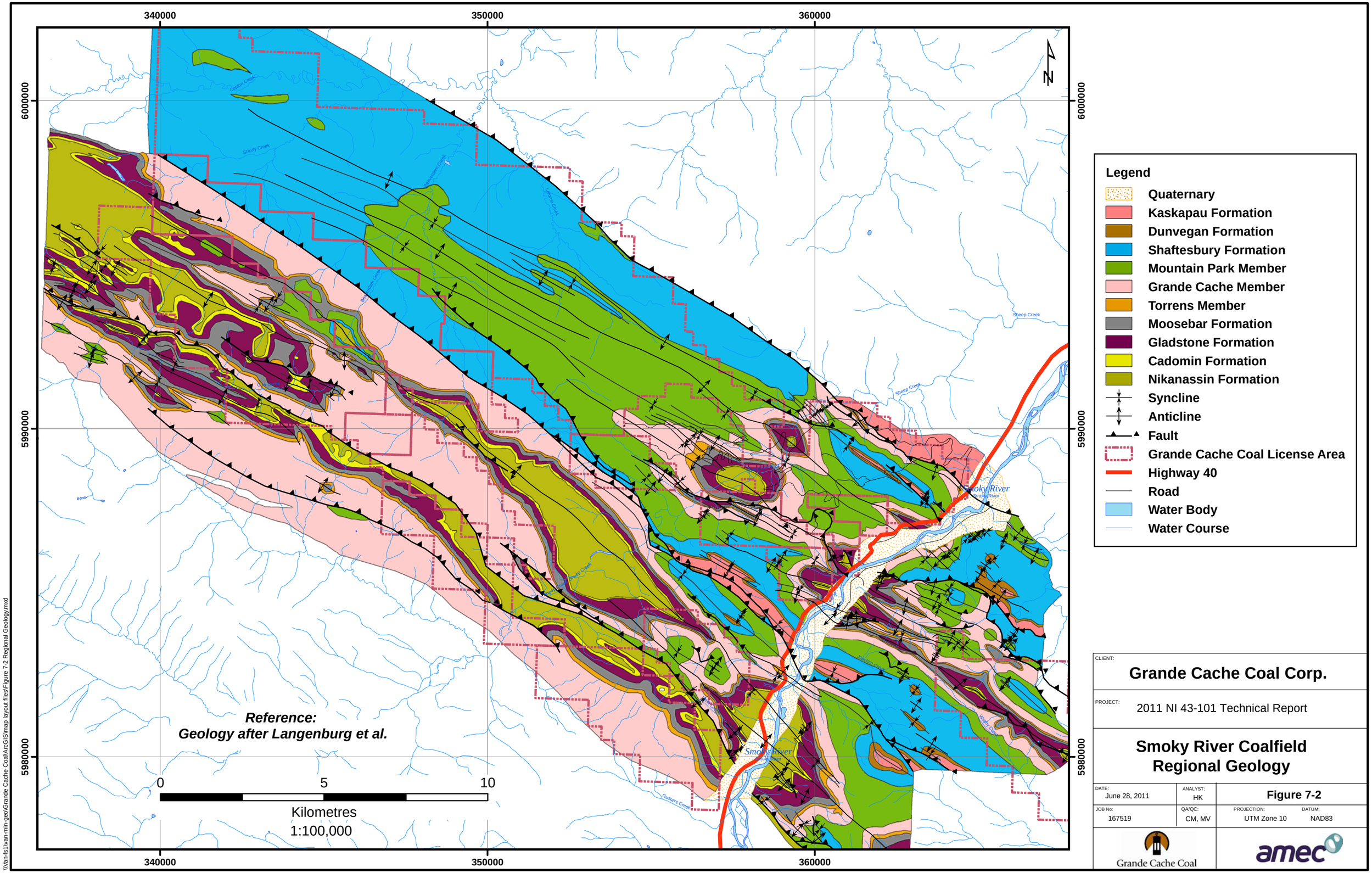
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-1 General Stratigraphy - Smoky River Coal.mxd



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Smoky River Coalfield Regional Geology

DATE:	ANALYST:	Figure 7-2	
June 28, 2011	HK		
JOB No: 167519	QA/QC: CM, MV	PROJECTION: UTM Zone 10	DATUM: NAD83

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\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-2 Regional Geology.mxd

7.2 Structural Geology

The Smoky River Coalfield is deformed by tectonic events of the Laramide Orogeny which created the Rocky Mountains 60 million years ago. The rock strata are complexly folded and cut by numerous thrust faults. Structural shortening is estimated to be one-third (Figure 7-3).

Typical structures consist of a series of northeast verging thrust sheets bound by major faults with displacements varying from several hundred to several thousand metres. The strata contained within the thrust sheets are commonly folded and cut by subsidiary faults with displacements in the order of 10 to 100 m. These thrust faults have folds produced by associated fault plane drag.

7.3 Property Geology

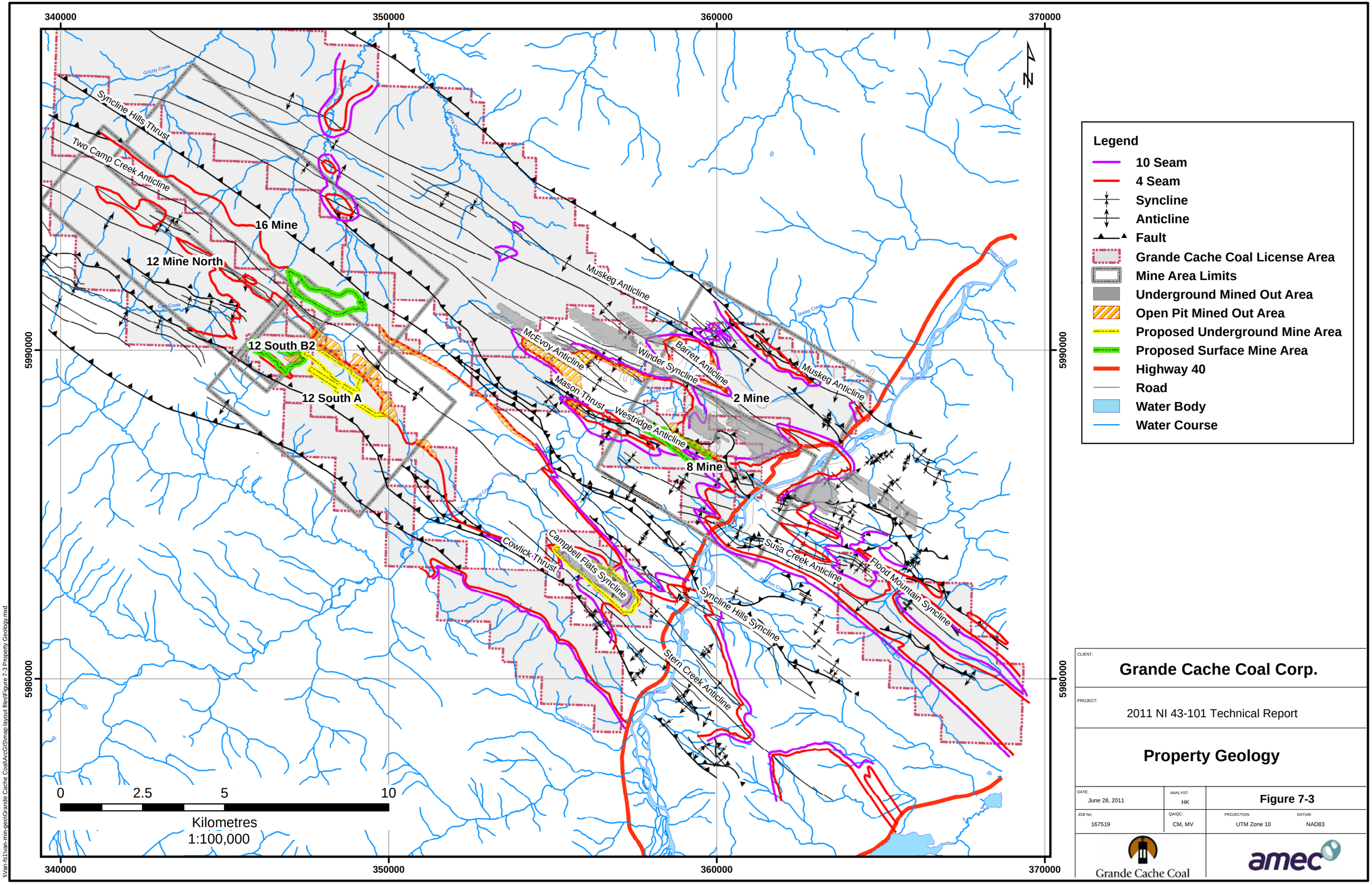
Surface traces of these complex folds and thrust faults trend northwest-southeast. The majority of the faults are southwest-dipping thrusts, displaying ramps that cut up stratigraphic section and flats that are parallel to bedding. From southwest to northeast there are four major thrust sheets in the area (Figure 7-3):

- Cowlick Thrust
- Syncline Hills Thrust
- Mason Thrust
- Muskeg Thrust

Asymmetric folds with relatively long, straight limbs and short, narrow hinge zones are commonly found throughout the Smoky River Coalfield. The folds generally have chevron or box shapes and maintain their profile over distances of up to two kilometres along the trend. These folds are conical at their tapering ends. Amplitude of the large folds is of the order of 200 m to 1,000 m. Parasitic folds on the limbs of the major anticlines and synclines are common.

Major folds from southwest to northeast are as follows:

- Sterne Creek Anticline
- Two Camp Creek Anticline
- Syncline Hills Syncline
- Westridge Anticline
- McEvoy Anticline
- Winder Syncline
- Barrett Anticline
- Muskeg Anticline.



\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-3 Property Geology.mxd

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Property Geology

DATE:	ANALYST:	Figure 7-3
June 28, 2011	HK	
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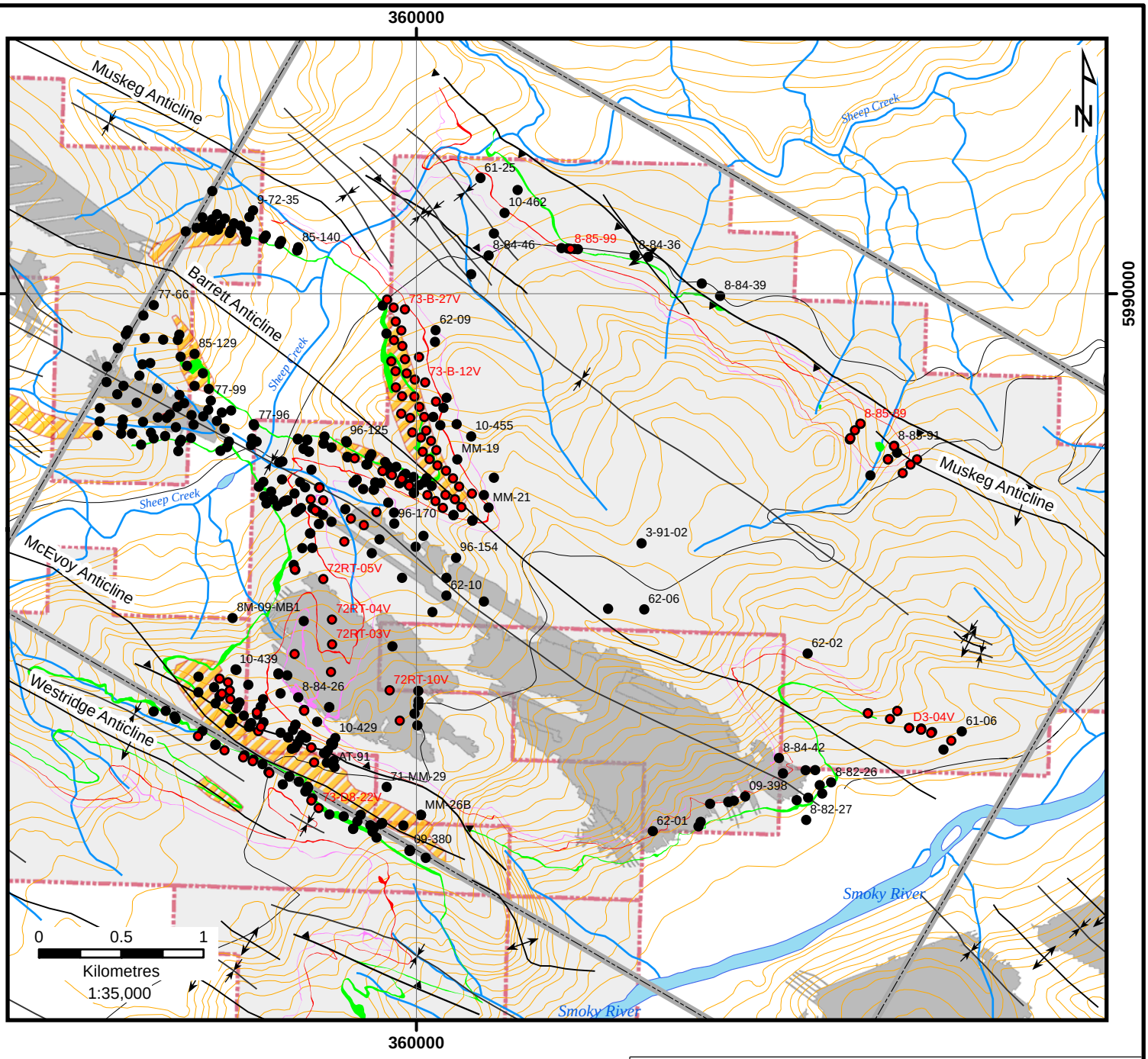
7.4 Local Geology

7.4.1 No. 2 Area

No. 2 area encompasses a large area adjacent and to the northwest of No. 8 Area. The southwest boundary is a fault associated with the McEvoy Anticline that was mined out in the original pit at 8 Mine. It includes areas previously referred to as Barrett and Reiff Terrace. Several folds occur between the McEvoy “thrust” fault and the Mason thrust including the Westridge Anticline and the Barrett Anticline. Gently dipping to nearly flat lying areas are separated by steeper dipping sections creating a homocline flexure fold type structure on either sides of the Barrett Anticline.



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 11 Seam
- 10 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Model Limits
- Underground Mined Out Area
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water Body
- Water Course

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Local Geology and Drillhole Locations No. 2 Area

DATE:	ANALYST:	Figure 7-4
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 10 / NAD83

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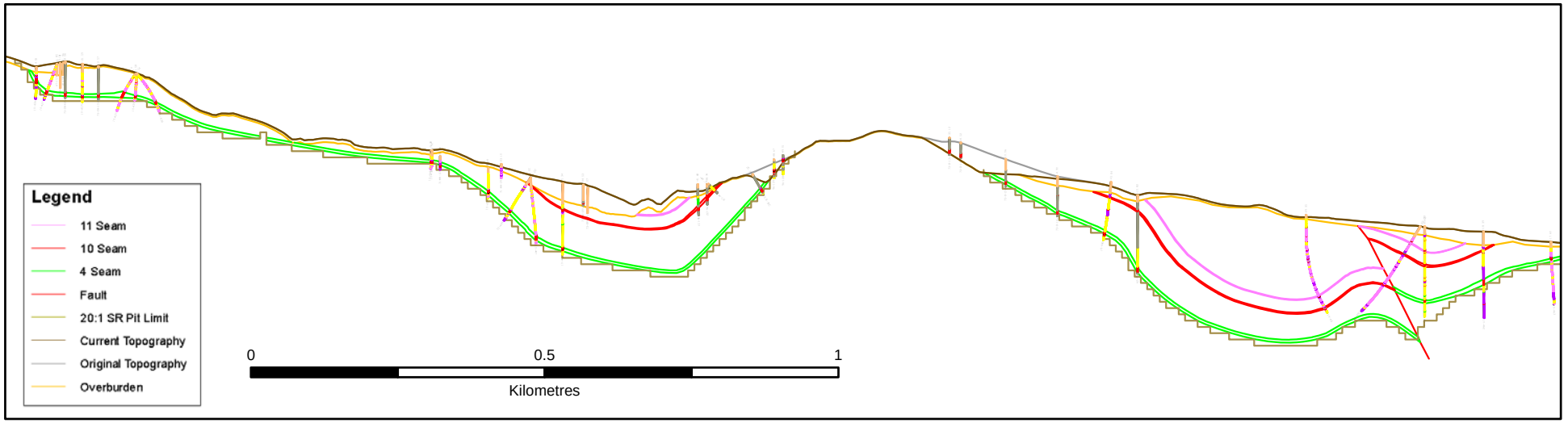
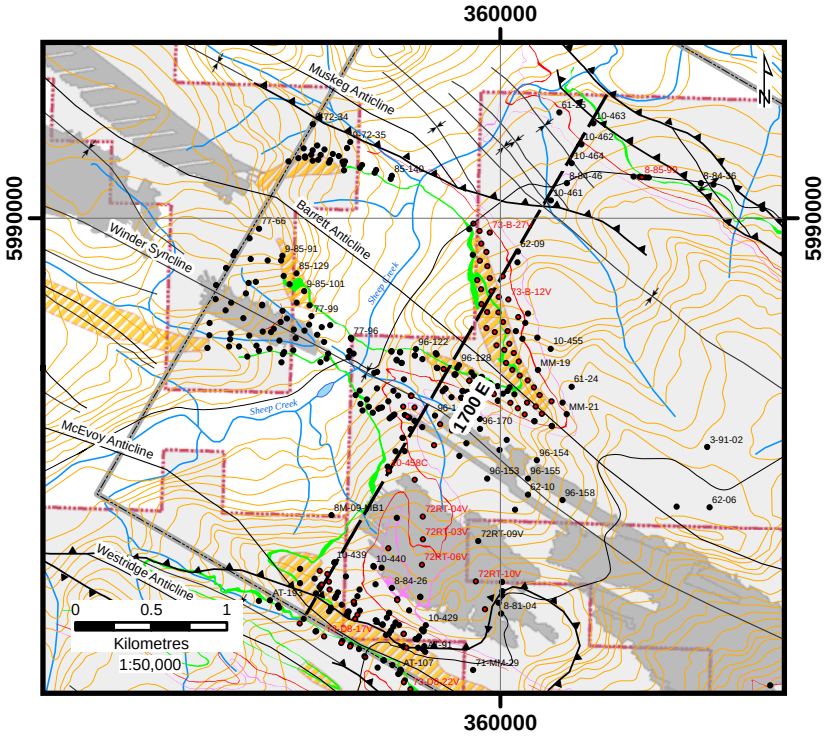
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-4 Local Geology and Drillhole Locations No. 2 Area.mxd





Legend

- Drill Hole Location - Sampled
- Drillhole Location - Not Sampled
- 11 Seam
- 10 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Cross Section Line
- Grande Cache Coal License Area
- Model Limits
- Underground Mined Out Area
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water body
- Water Course

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Geological Cross Section No. 2 Area

DATE:	ANALYST:	Figure 7-5
June 28, 2011	HK	
JOB No: 167519	QA/QC: CM, MV	PROJECTION: UTM Zone 10 DATUM: NAD83

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\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-5 geological Cross Section No. 2 Area.mxd

7.4.2 No. 7 Area

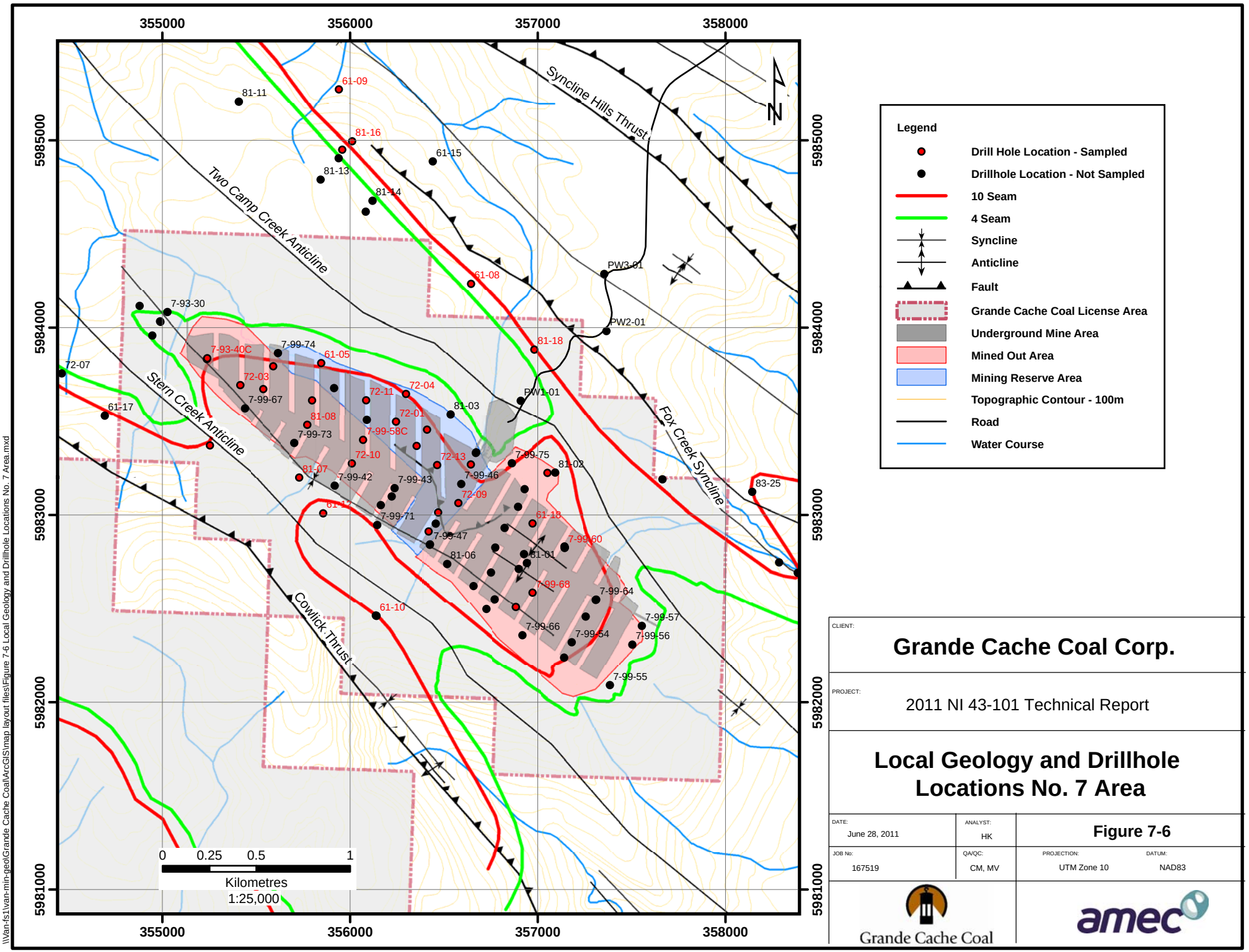
The northeast and southwest boundaries of the No. 7 Area lease are marked by surface traces of two north-easterly verging thrust faults (Figure 7-6):

- Cowlick Thrust Fault to the southwest
- Syncline Hills Thrust Fault to the northeast

The major structural feature with the No. 7 Area lease is the Campbell Flats Anticlinorium, which consists of a box fold with the following smaller anticlines on the corners of the structure:

- Sterne Creek Anticline to the southwest
- Two Camp Creek Anticline to the northeast

Between these two anticlines is the relatively flat-bottomed Campbell Flats Syncline, with dips of 0 to 10 degrees and a maximum width of 800 m. The width of the Campbell Flats Syncline decreases to the northwest and is 200 m where 4 Seam subcrops above Sheep Creek. The strike length of the Campbell Flats Syncline within the No. 7 area lease is 3,300 m, gently plunging to the northwest. Mining of 4 Seam is limited by seam subcrop to the east, west and northwest. To the north and south it is bounded by thrust faults and/or steep dips. A typical cross section is shown in Figure 7-7.



\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-6 Local Geology and Drillhole Locations No. 7 Area.mxd

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Local Geology and Drillhole Locations No. 7 Area

DATE:	ANALYST:	
June 28, 2011	HK	**Figure 7-6**
JOB No:	QA/QC:	PROJECTION: / DATUM:
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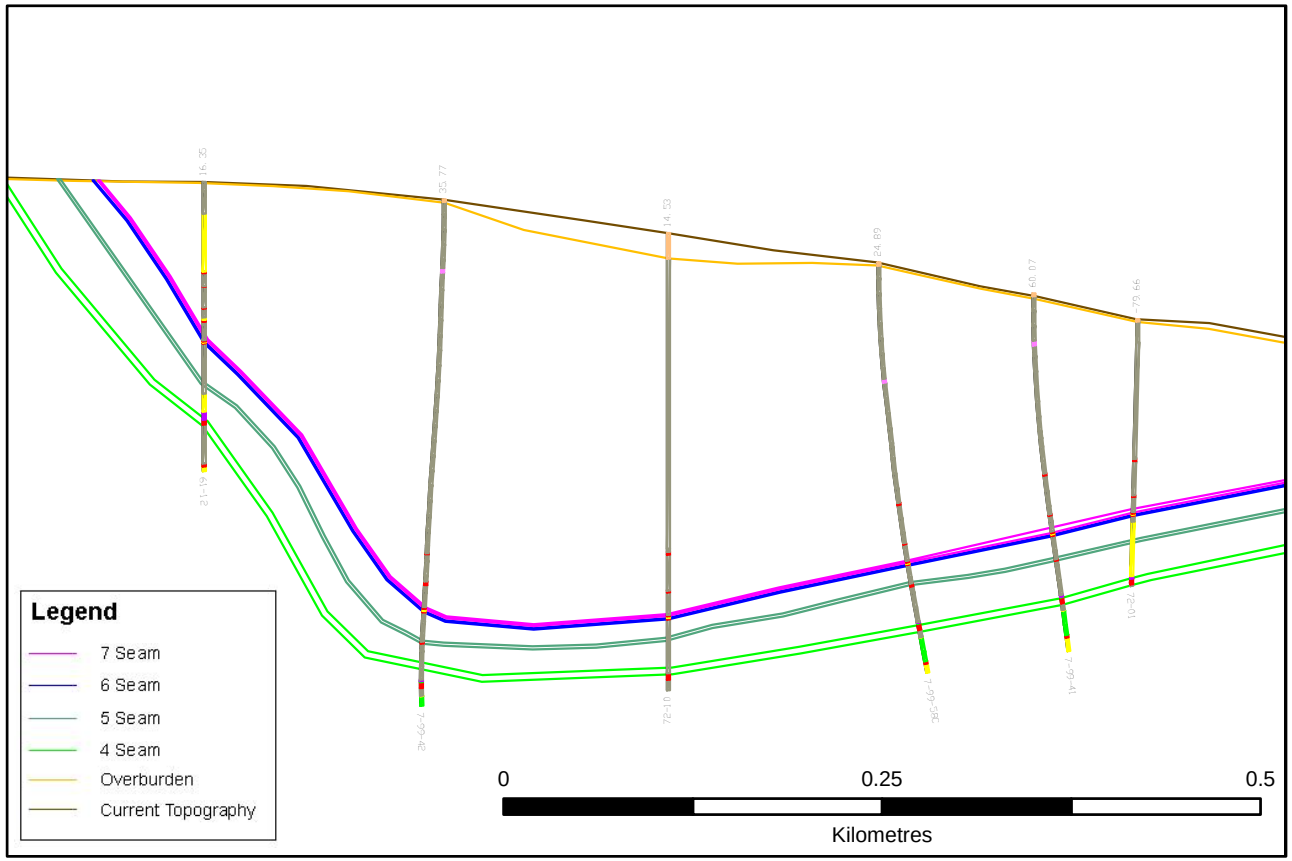
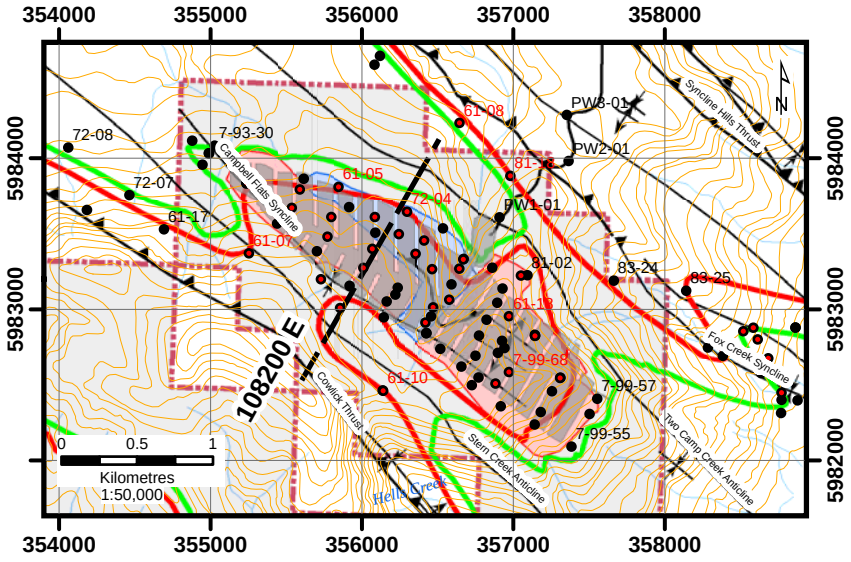


Legend

- Drill Hole Location - Sampled
- Drillhole Location - Not Sampled
- 10 Seam
- 4 Seam
- Anticline
- Syncline
- Fault
- Cross Section Line
- Grande Cache Coal License Area
- Underground Mine Area
- Mined Out Area
- Mining Reserve Area
- Topographic Contour - 100m
- Road
- Water Course



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Geological Cross Section No. 7 Area

DATE:	ANALYST:	Figure 7-7
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
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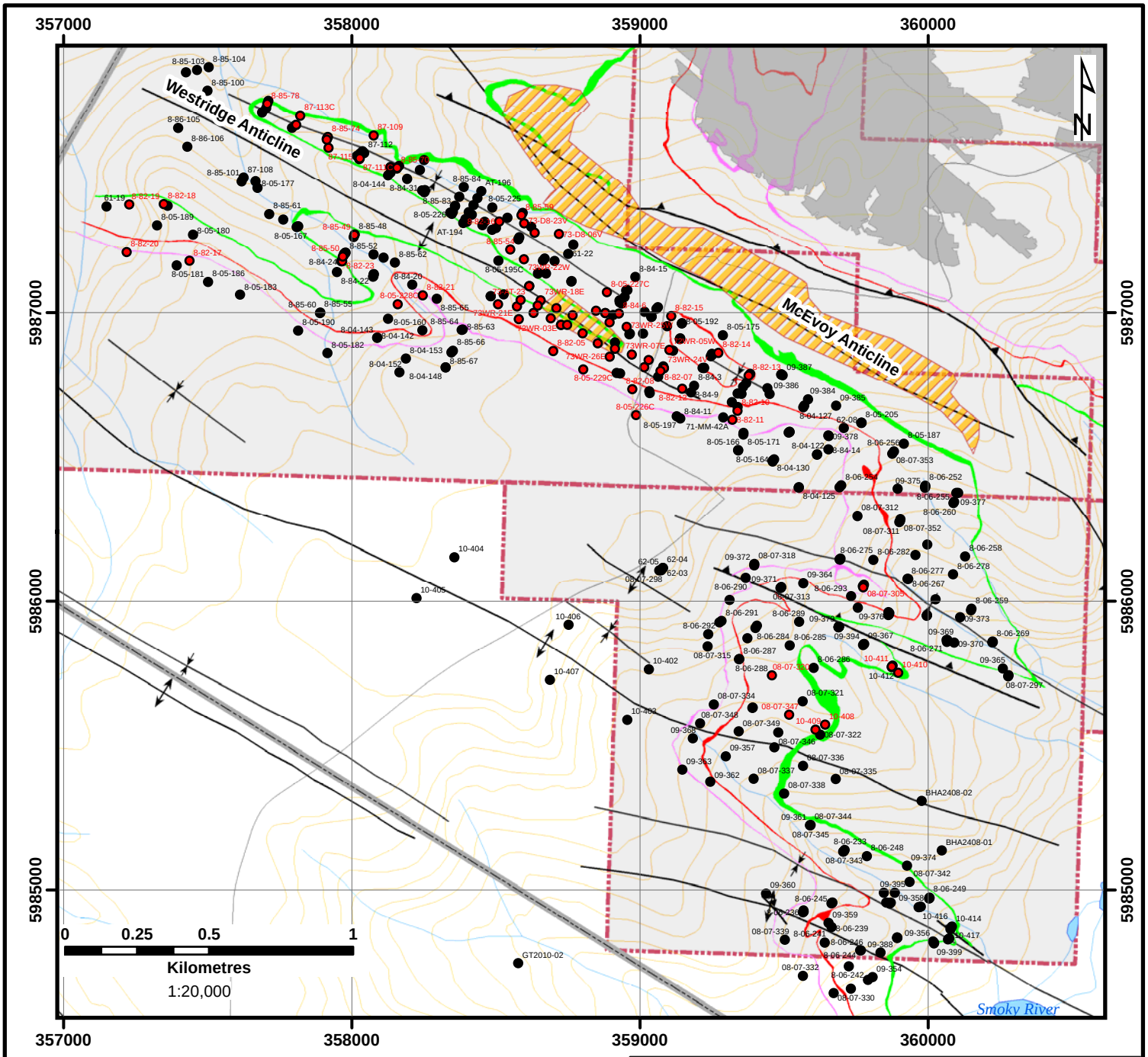
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-7 Geological Cross Section No. 7 Area.mxd

7.4.3 No. 8 Area

Structurally, the No. 8 Area is bounded to the southwest and northeast by two major northeast verging faults: Syncline Hills Thrust Fault to the southwest and Mason Thrust Fault to the northeast (Figure 7-8). Mining is limited to the north by a previous surface mine open pit, to the east by the outcrop of 4 Seam, and to the west and south by high strip ratios.

Within the No. 8 Area, folding is the dominant mode of shortening, resulting in northeast-southwest anticline/syncline pairs. The folds range in style from tight chevron to open parallel folds. The wavelength of the major folds is between 275 and 1,500 m with corresponding amplitudes of 185 m and 490 m. The anticlines are asymmetric with longer south-westerly limbs. The limbs of the synclines have dips of 30° to 80° (average 55°) on the northeast limbs and 40° to 80° (average 70°) on the southwest limbs. The fold hinges plunge to the northwest at 11°. The proposed No. 8 mining Area is in the north-eastern most syncline, known as the Westridge North Syncline. The orientation of the seams and structural nature of the area can be seen on the cross sections shown in Figure 7-9.



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 11 Seam
- 10 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Model Limits
- Underground Mined Out Area
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water Body
- Water Course

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Local Geology and Drillhole Locations No. 8 Area

DATE:	ANALYST:	Figure 7-8
June 28, 2011	HK	
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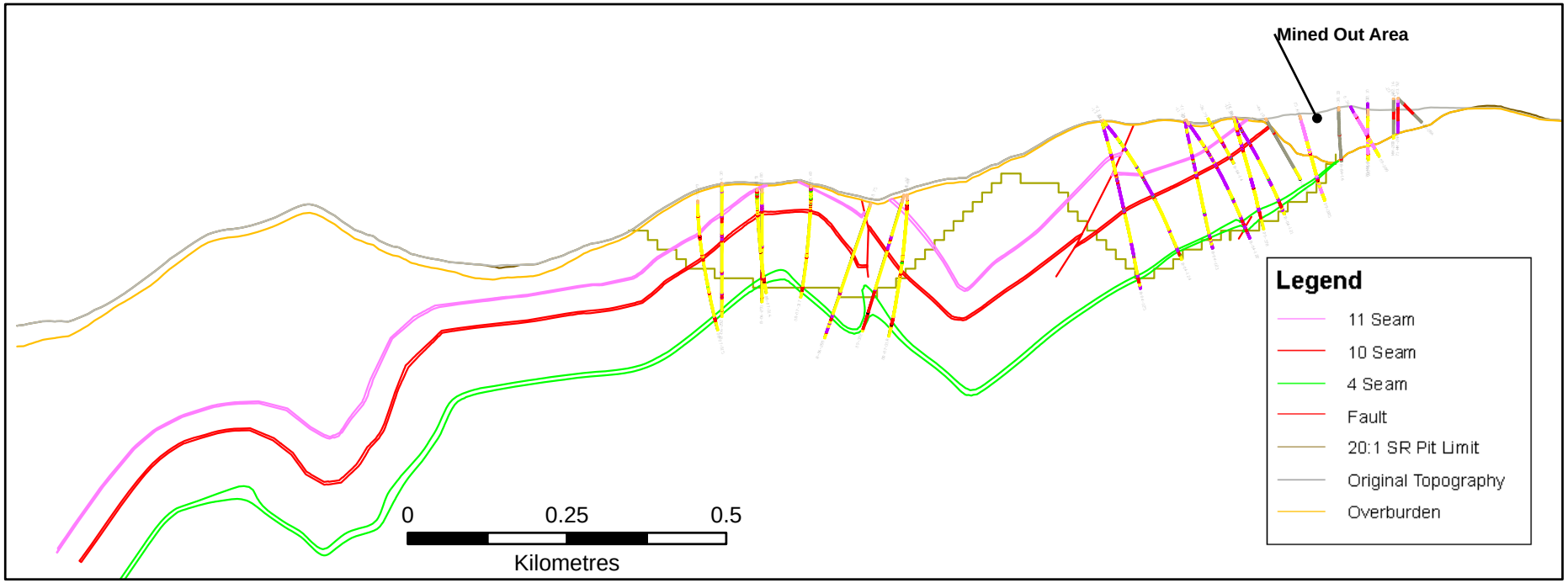
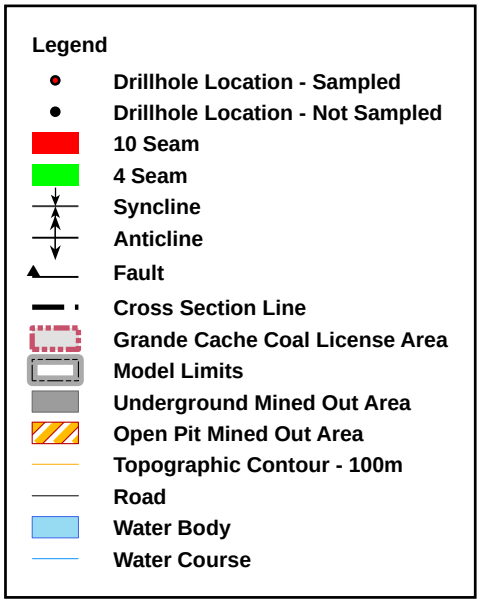
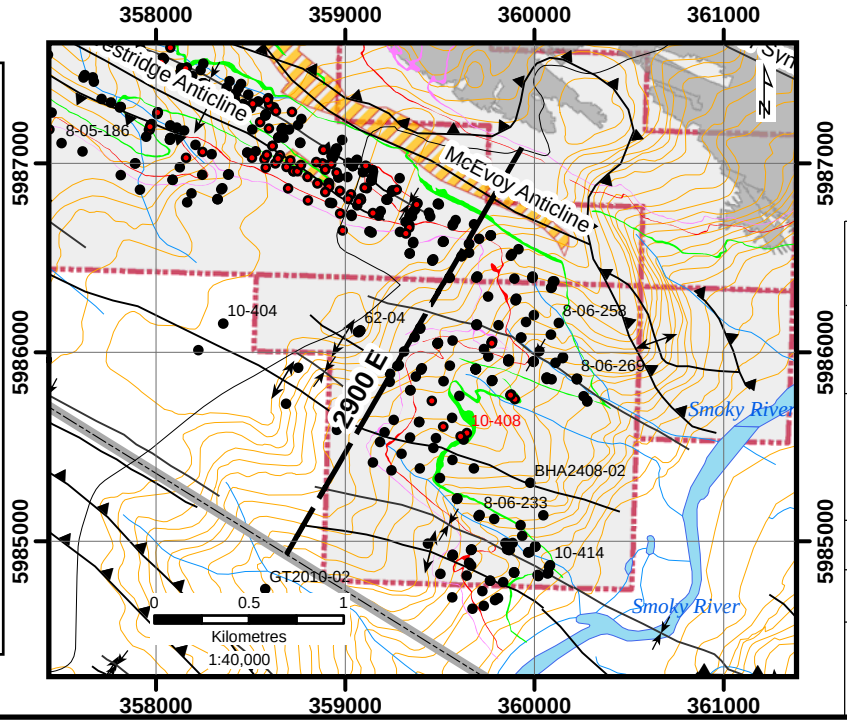
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-8 Local Geology and Drillhole Locations No. 8 Area.mxd







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Geological Cross Section No. 8 Area

DATE:	ANALYST:	Figure 7-9
June 28, 2011	HK	
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\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-9 Geological Cross section No. 8 Area.mxd

7.4.4 No. 12 South Area

The No. 12 South area is contained in the Syncline Hills Thrust Sheet and lies on the south limb of the Two Camp Creek Anticline. The Two Camp Creek Anticline is a regional structure with a fold axis trending southeast/northwest for 10 km on either side of the mining area. In No. 12 South, the fold axis has a plunge of about 5°. The amplitude of the Two Camp Creek Anticline is approximately 800 m.

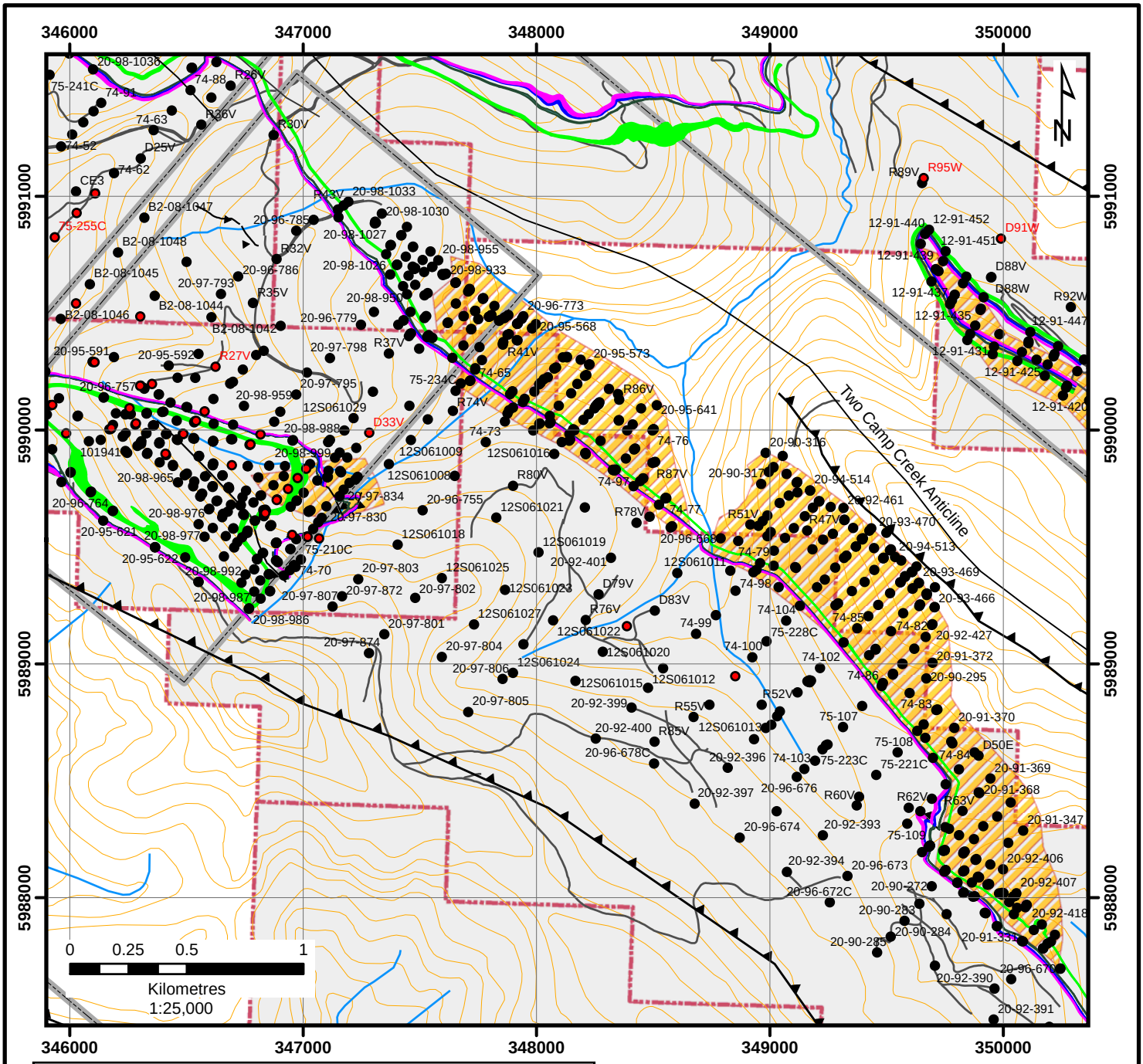
The seams are folded into two syncline-anticline pairs. These are parasitic folds on the south limb of the Two Camp Creek Anticline. (Figure 7-10)

In Area No. 12 South A the seams are part of a potential underground mineable area where dips are less than 15 degrees between faults. They steepen up towards the northeast where they are exposed in the No.12 South B2 Area pits. (Figure 7-11)

The B2 Extension Pit is situated in strata of the southern syncline, with pit bottom following the axes of the folds. The axis of the southern syncline has a plunge of approximately 5° within the area.

The footwall dips range from horizontal to overturned in the No.12 South B2 Pit area. Dips up to 65° are present in the western portion of the pit in the south limb of the south syncline. They increase to near 80° in the vicinity of the pit bottom along the south limb of the anticline in the central part of the pit. In the eastern part of the pit the footwall strata are overturned. Most strata dip at less than 15° within northern highwall part of the pit area, as shown on the cross-section (Figure 7-12). Coal seams generally retain their normal stratigraphic thickness throughout most of the mining area, except where thickened pods of coal occur in the hinge area of the south syncline.

A number of thrust faults have been identified within the No.12 South B2 Extension Pit. The two major thrusts are interpreted as north verging. The first fault is a steeply dipping fault, while the second fault is shallow dipping. Structures have throws of 2 m to 20 m.



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Model Limit
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water Course

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Local Geology and Drillhole Locations No. 12 Area

DATE:	ANALYST:	Figure 7-10
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
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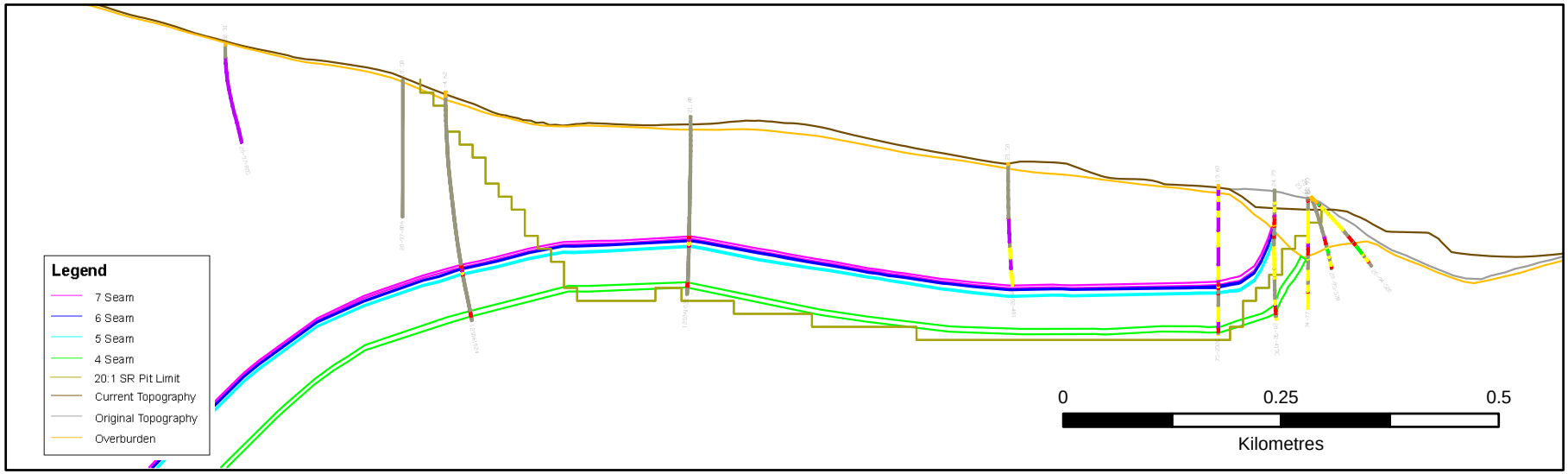
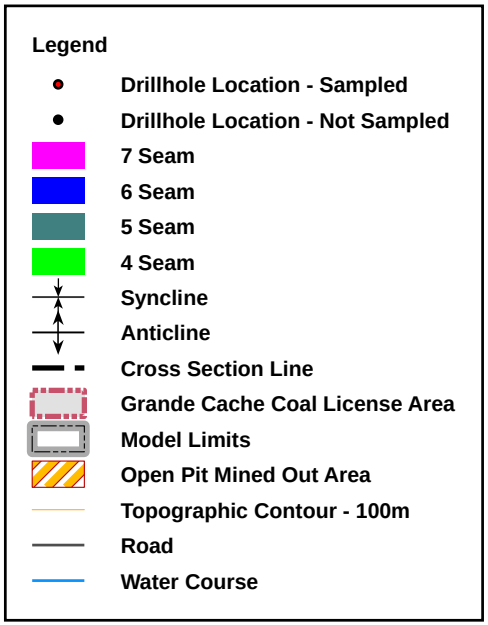
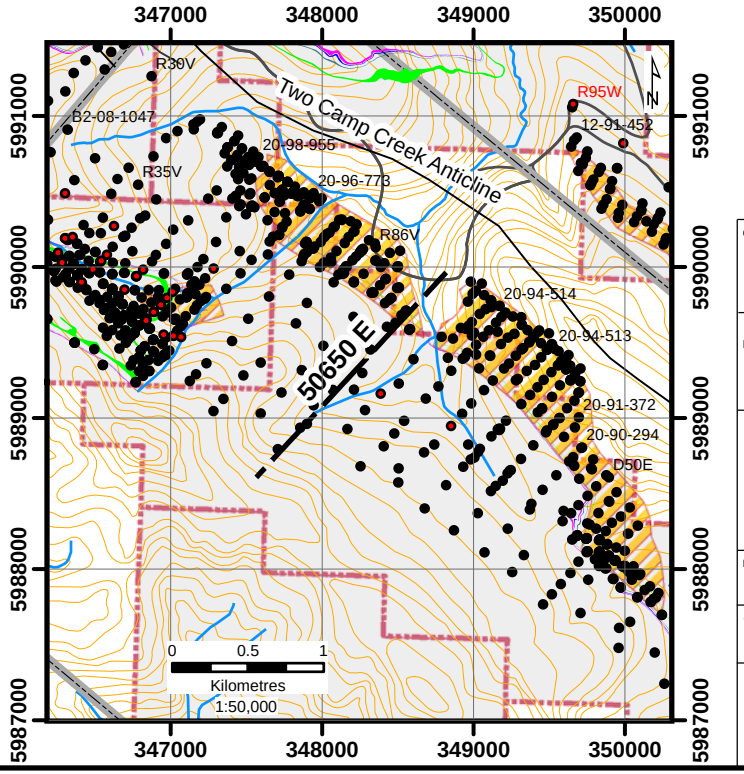
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-10 Local Geology and Drillhole Locations No. 12 Area.mxd







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Geological Cross Section No. 12 South A Area

DATE:	ANALYST:	
June 28, 2011	HK	**Figure 7-11**
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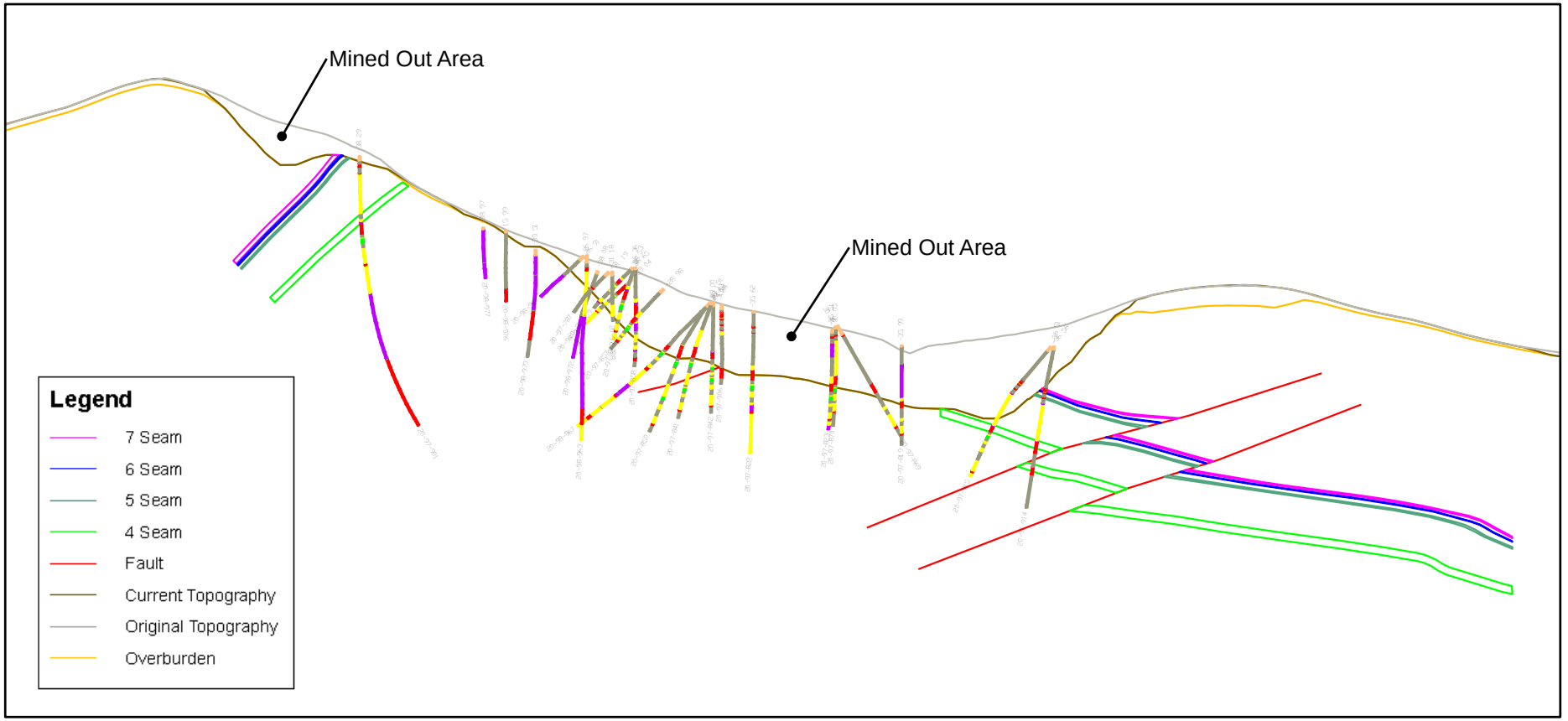
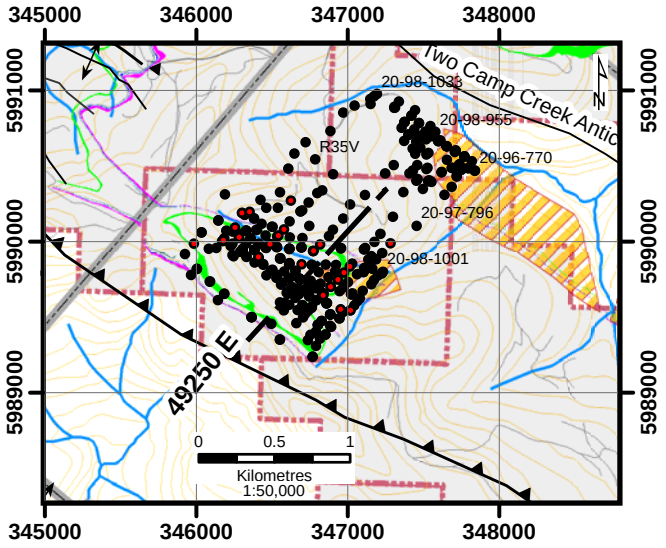
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-11 Geological Cross Section No. 12 South A Area.mxd



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Cross Section Line
- Grande Cache Coal License Area
- Model Limits
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water Course



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Geological Cross Section No. 12 South B2 Area

DATE:	ANALYST:	Figure 7-12
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
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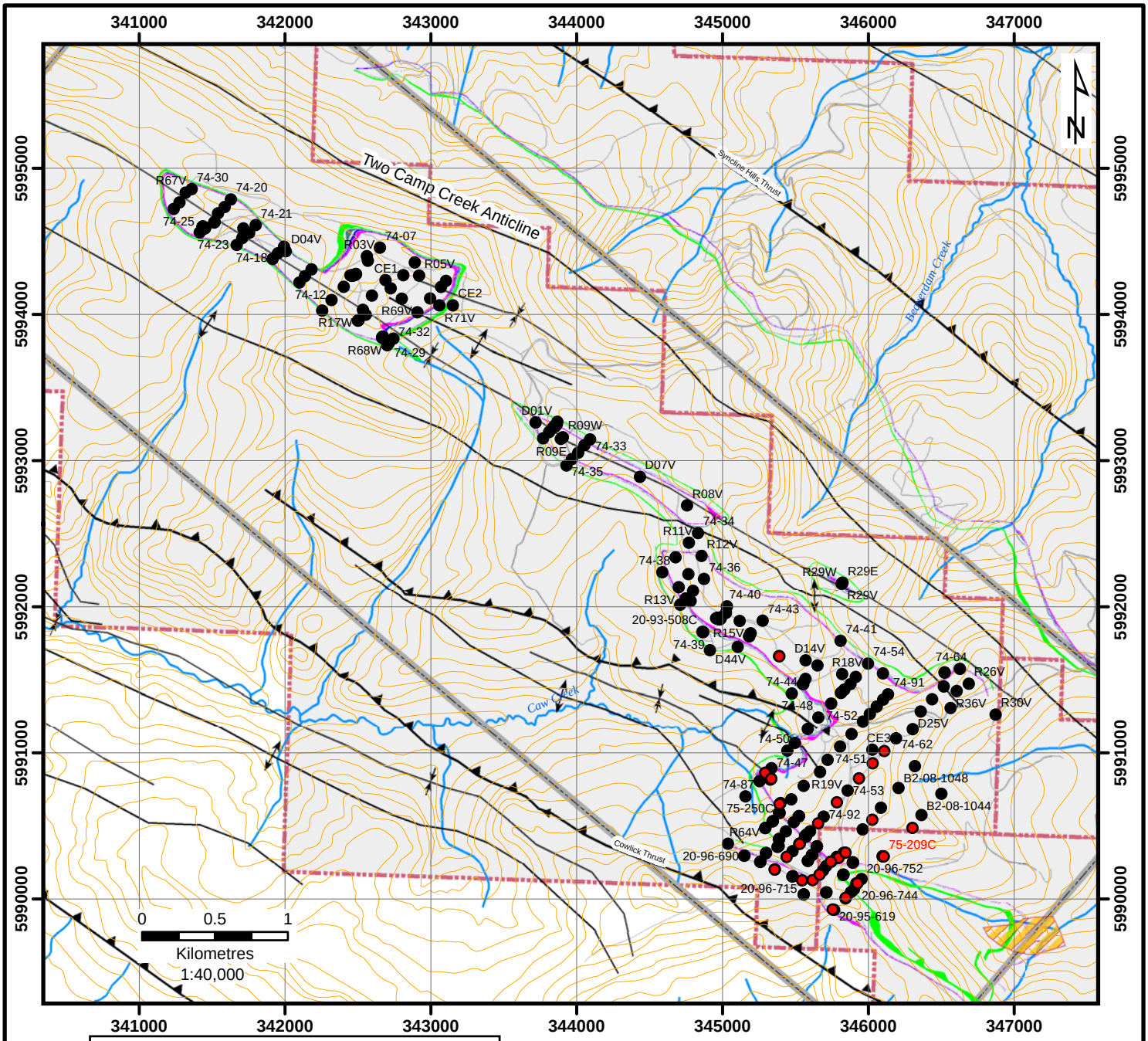
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-12 Geological Cross Section No. 12 South B2 Area.mxd

7.4.1 No. 12 North Area

Abundant folding has resulted in the expression of 3 anticline-syncline pairs that expose seams 4 through 8 in favourable mining geometries (Figure 7-13 and Figure 7-14).



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Model Limits
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Road
- Water Course

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Local Geology and Drillhole Locations No. 12 North Area

DATE:	ANALYST:	Figure 7-13
June 28, 2011	HK	
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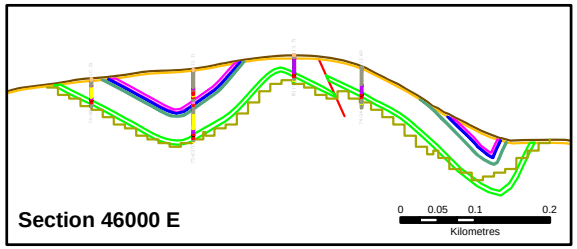
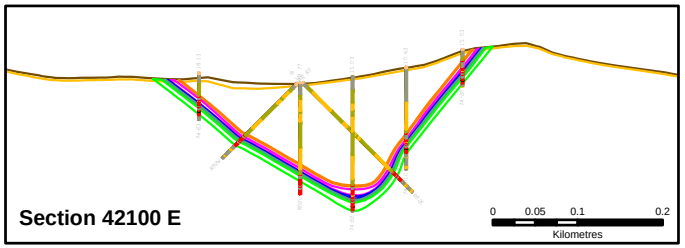
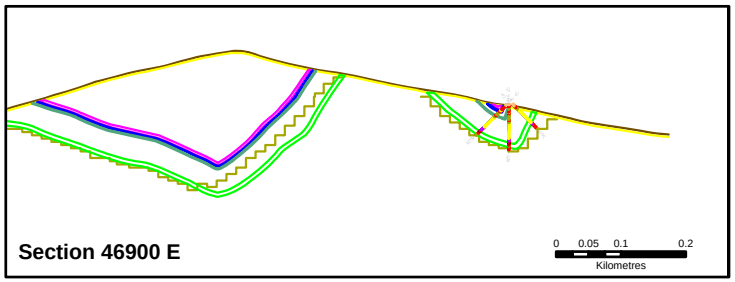
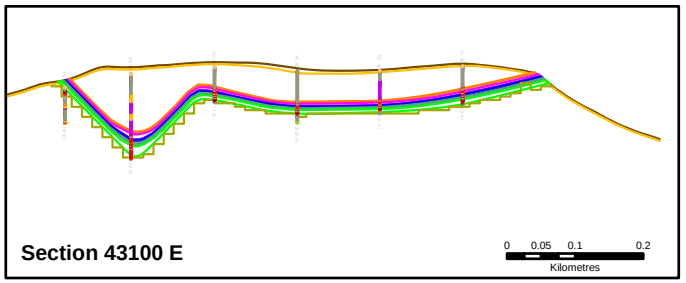
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-13 Local Geology and Drillhole Locations No. 12 North Area.mxd



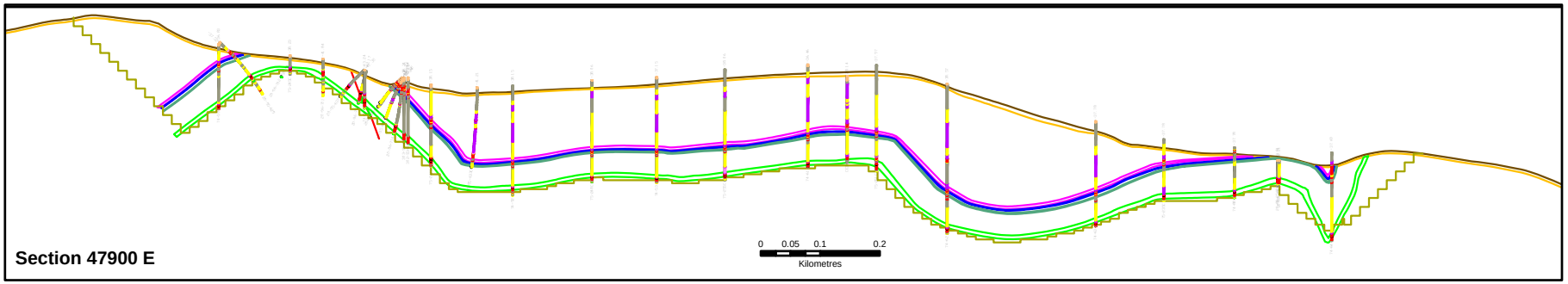






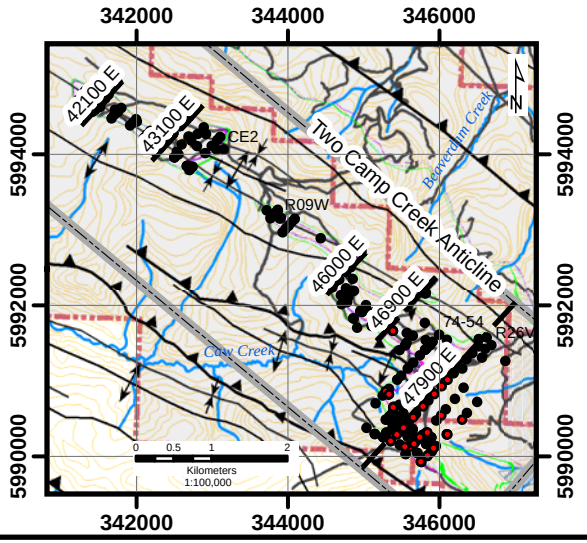
Legend

- 8 Seam
- 7 Sean
- 6 Seam
- 5 Seam
- 4 Seam
- Fault
- 20:1 SR Pit Limit
- Current Topography
- Overburden



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Cross Section Line
- Grande Cache Coal License Area
- Model Limits
- Topographic Contour - 100m
- Road
- Water Body
- Water Course



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Geological Cross Sections No. 12 North Area

DATE:	ANALYST:	Figure 7-14
June 28, 2011	HK	
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\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-4 Geological Cross Sections No. 12 North Area.mxd

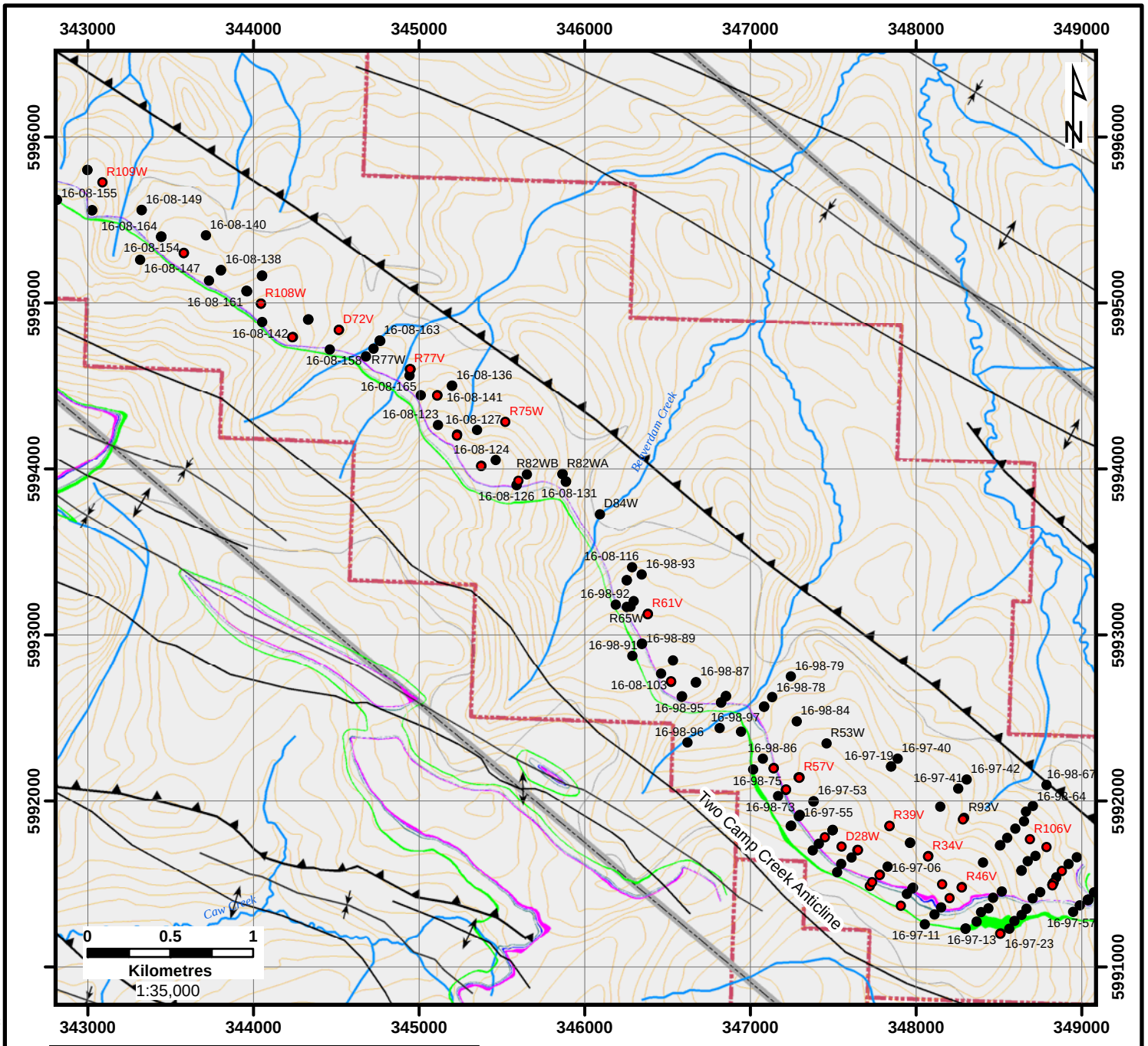
7.4.2 No. 16 Area

Within the No. 16 Area the structure parallels that in the No. 12 Area, but is separated by the Two Camp Creek Anticline. The coal measures of the Grande Cache Member are eroded from the top of this anticline. The No. 16 mining area lies on the northeast limb of the Two Camp Creek Anticline. To the southeast of the No. 16 Area, SRCL mined out the coal from the northeast limb of the Two Camp Creek Anticline in areas known as No. 12 East Mine and No. 12 West Mine.

The No. 16 Area is divided in two by a northeast drainage which joins Beaverdam Creek. Southeast of the drainage is No. 16 East mining area and northwest of the drainage is the No. 16 West mining area.

In No. 16 East, the dip of the northeast limb of the Two Camp Creek Anticline ranges from 35° to 60°. The slope of topography closely follows the dip of the bedding, resulting in a dip slope mining configuration. The local structure is a relatively simple monocline. The coal measures are truncated at depth by the Syncline Hills Thrust Fault, which marks the northeast boundary of the No. 16 East Area.

An exception to the monocline structure is found in the southeast part of No. 16 East. The strata are folded into a syncline down dip. In the hinge area of this syncline the typical structural thickening of the coal seams is found. Figure 7-15 shows the location and outline of the proposed No. 16 mining area. Figure 7-16 illustrates a typical cross section view.



Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Model Limits
- Topographic Contour - 100m
- Road
- Water course

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

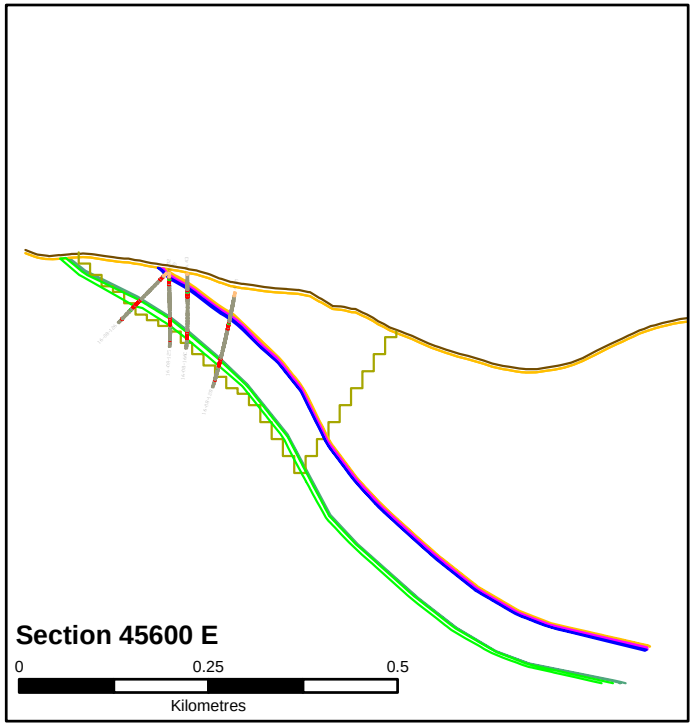
Local Geology and Drillhole Locations No. 16 Area

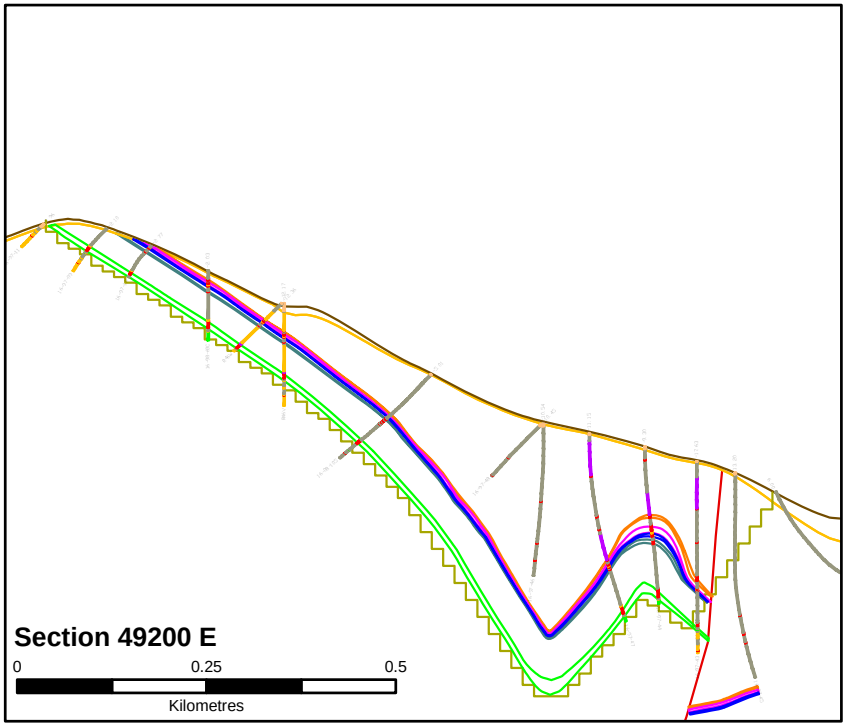
DATE:	ANALYST:	
June 28, 2011	HK	**Figure 7-15**
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 10 / NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-15 Local Geology and Drillhole Locations No. 16 Area.mxd



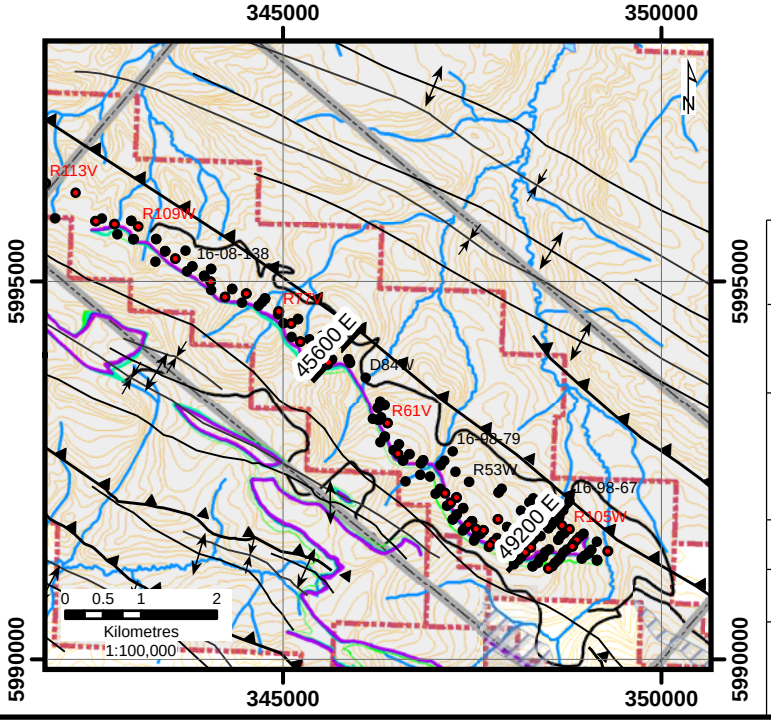


Legend

- 8 Seam
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Fault
- 20:1 SR Pit Limit
- Current Topography
- Overburden

Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 8 Seam
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Anticline
- Syncline
- Fault
- Cross Section Line
- Grande Cache Coal License Area
- Model Limits
- Topographic Contour - 100m
- Road
- Water Course



CLIENT:

Grande Cache Coal Corp.

PROJECT:

2011 NI 43-101 Technical Report

Geological Cross Sections No. 16 Area

DATE:	ANALYST:	Figure 7-16
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 10 / NAD83

Grande Cache Coal

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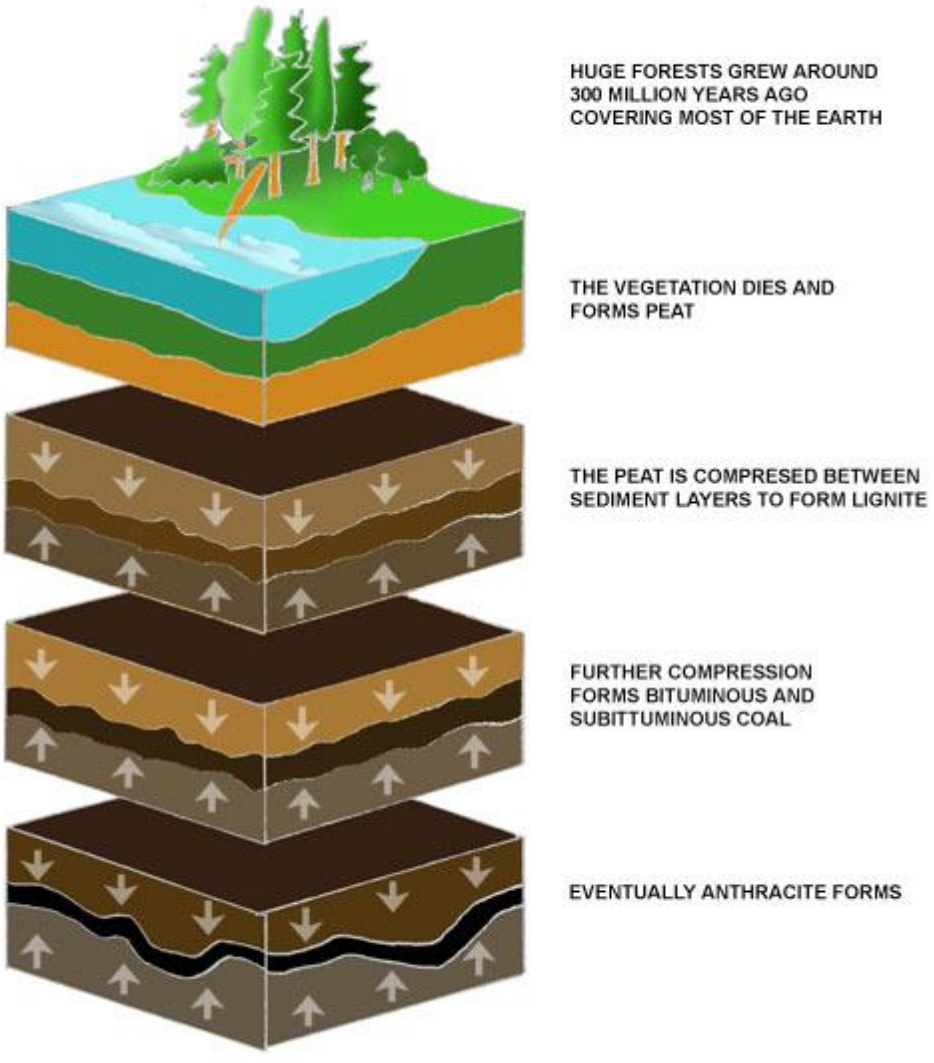
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 7-16 Geological Cross Sections No. 16 Area.mxd

8.0 DEPOSIT TYPES

The BC Geological survey has established a series of mineral deposit profiles that cover a wide variety of mineral deposits. The deposit type A04 – Bituminous Coal, matches the characteristics of the coal seams found in the Smoky River Coalfield (Ryan, Barry, 1995).

In their description of this deposit type, a description of the geological characteristics, exploration guides and economic factors is presented. The following is taken verbatim from this document.

Figure 8-1: Coal Formation http://www.stovesonline.co.uk/how-coal-formed.html



8.1 Geological Characteristics

CAPSULE DESCRIPTION: Seams of black coal hosted by clastic sedimentary rocks. Coal is banded bright and dull. Generally hard with well developed cleats.

TECTONIC SETTINGS: Stable continental basins; shelves on the trailing edge of continents; foreland (molasse) basins; back-arc basins.

DEPOSITIONAL ENVIRONMENT/GEOLOGICAL SETTING: An area of slow sedimentation in fresh water with few or no marine incursions. Can be produced by fault blocks associated with strike-slip movement to limit sediment influx. Delta; shoreline swamp; raised swamp; lake; floating vegetation mats.

AGE OF MINERALIZATION: Generally older than Tertiary; major deposits are Cretaceous, Permian or Carboniferous in age.

ASSOCIATED ROCK TYPES: Sedimentary rocks exhibiting evidence of non-marine deposition; carbonaceous mudstones; siltstones and sandstones often with cross-stratification and other sedimentary structures of fluvial/alluvial or deltaic origin.

DEPOSIT FORM: Coal seams generally conform to regional bedding; sometimes seams are deposited in areas of local subsidence, such as fault-controlled blocks. Seams may be thickened / deformed by faulting, folding and shearing. Seams may pinch- out or split on a local or regional scale.

TEXTURE/STRUCTURE: Bituminous coal is usually composed mostly of clarain and vitrain. Footwall sediments are often penetrated by roots or weathered to clay (seatearth).

COAL SEAMS/ASSOCIATED MINERAL MATTER: Bituminous coal has Rmax values in the range of 0.5 to 2.0%. In outcrop it can contain up to 15% moisture. It usually contains a high percentage of the maceral vitrinite; at higher ranks liptinite is difficult to detect; the amount of fusinite is variable. Mineral matter is in the coal seams as rock bands, as finely intermixed material of authogenic or detrital origin (inherent mineral matter) and as secondary material deposited in fractures and open spaces. Inherent mineral matter includes pyrite, siderite and kaolinite. It may be dissimilar to that of the surrounding rocks.

WEATHERING: Weathering of the bituminous coal reduces the calorific value by oxidizing the carbon-hydrogen complexes. It also destroys the agglomerating (coke making) properties. Minerals such as pyrite oxidize to sulphates. Secondary carbonates are formed. These transformations may further damage the coking properties.

ORE CONTROLS: The geometry of the seam/seams is controlled by sedimentary features, such as extent of the delta, trend of the shoreline, and trend of sand-filled river channels. Deformation (faulting and folding) is also important.

COMMENTS: Bituminous coal is widely used for coke making by the steel industry because of its agglomerating properties.

8.2 Exploration Guides

GEOCHEMICAL SIGNATURE: Geochemistry is generally not used as a prospecting tool for coal.

GEOPHYSICAL SIGNATURE: Bituminous coal has a low density. Resistivity is variable to high. Surface techniques include direct-current profiling, refraction and reflection seismic, and gravity. Subsurface or bore-hole techniques include gamma logs, neutron logs, gamma-gamma density logs, sonic logs, resistivity logs and caliper logs.

OTHER EXPLORATION GUIDES: Presence of: a down-slope coal bloom; nonmarine sediments; coal spar. Presence of methane escaping through the surrounding sediments.

8.3 Economic Factors

TYPICAL GRADE AND TONNAGE: Numerous tests quantify the coking ability of bituminous coal; they measure rheology, melting and petrographic properties of the coal as well as the chemistry of the ash. The gross heating value of bituminous coal is 27 to 33 MJ/kg on an ash-free moist basis. Net useable heat will be lower because of the presence of ash. Mine tonnages generally range from 10 to 1000 Mt.

ECONOMIC LIMITATIONS: Coal is a bulk commodity which is expensive to transport. Bituminous coal has a high market value because of its coking properties and high heating value. The ratio of tonnage to useable heat is good so that there is a lower proportion of waste material (such as water, fly ash and slag) generated than for other ranks of coals.

END USES: Coke; steam generation in turbines for electrical generation.

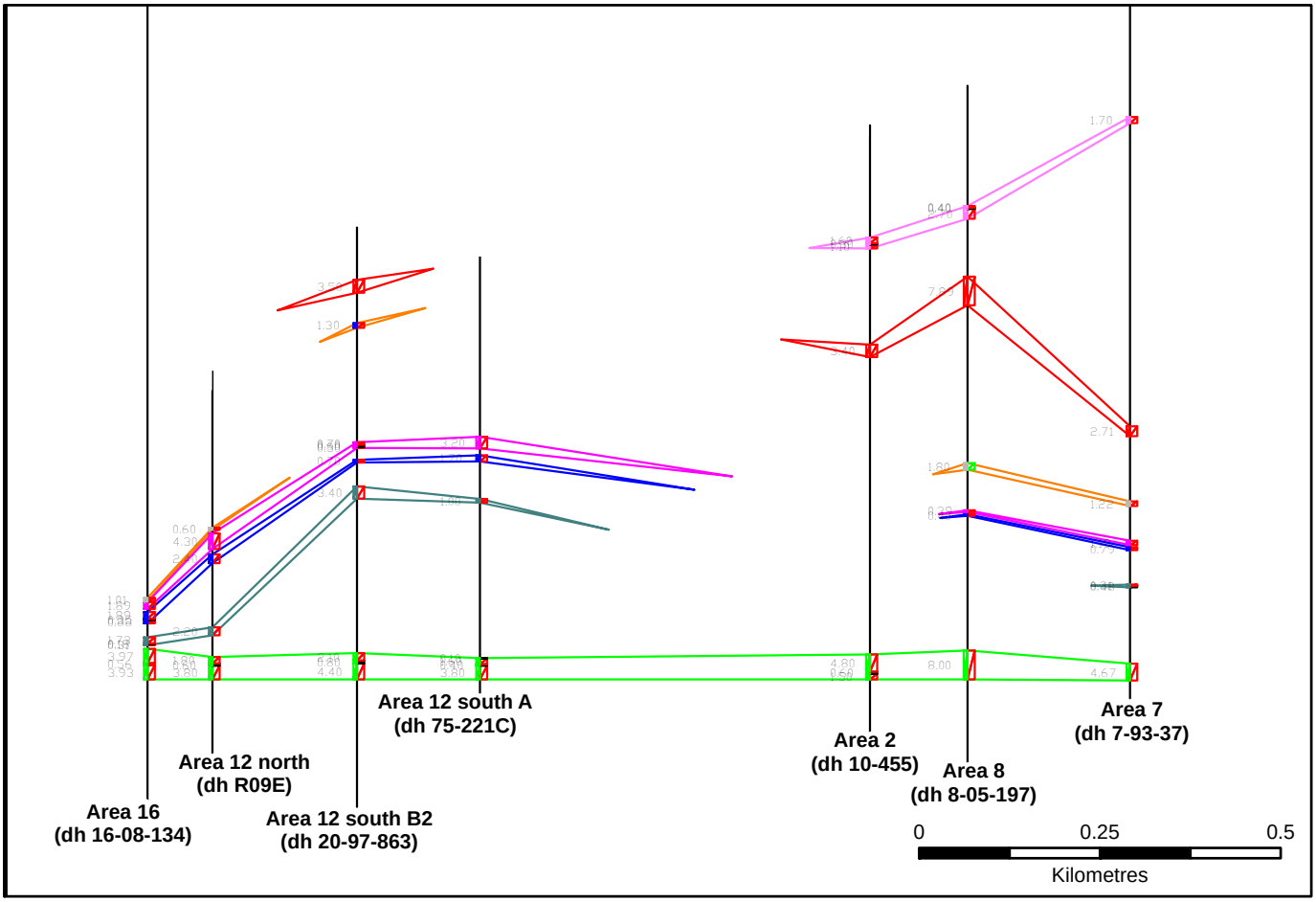
IMPORTANCE: Generally bituminous coal is used for coke making; weathered and non-agglomerating bituminous coal is utilized for power generation. Only source for coke used in the steel industry.

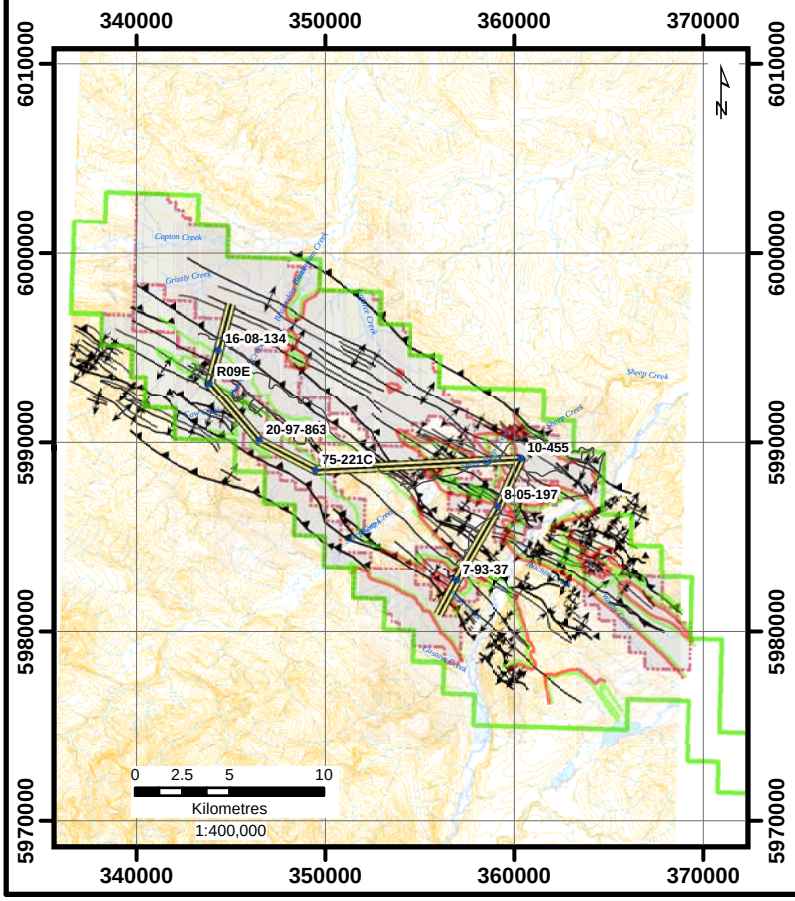
9.0 MINERALIZATION

A coal deposit is a distinct entity whose characteristics are not defined in mineralization and grade. The characteristics that result in a coal seam or seams being classified as a deposit include seam thickness, continuity and coal quality. Table 9-1 is a summary of the seam thickness data for the areas included in this report. A detailed stratigraphic section of coal seams 4 through 11 is presented in Figure 9-1, using the base of seam 4 as a datum.

Table 9-1: Seam Thickness Data from Drillhole Composites

Seam thickness (m)		No.7 area	No.2 and No.8	No.12 South	No.12 North	No.16 area
11 Seam	Min.		0.0			
	Max.		8.7			
	Avg.		2.3			
10 Seam	Min.		0.2			
	Max.		9.9			
	Avg.	1.7	2.6			
8 Seam	Min.				0.3	0.3
	Max.				15.6	15.6
	Avg.				5.9	5.9
7 Seam	Min.			0.5	0.2	0.3
	Max.			4.8	8.4	8.4
	Avg.			3.0	2.7	2.7
6 Seam	Min.			0.4	0.3	0.3
	Max.			4.6	10.4	10.4
	Avg.			1.2	1.7	1.7
5 Seam	Min.			0.2	0.3	0.3
	Max.			3.4	5.5	5.5
	Avg.			1.6	1.6	1.6
4 Seam	Min.	0.7	0.2	0.3	0.3	4.6
	Max.	5.7	25.4	24.6	21.0	21.0
	Avg.	4.3	6.0	7.0	6.8	6.8
3 Seam	Min.				<0.5	
	Max.				4.7	
	Avg.				1.3	





Legend

- Drillhole Location
- 11 Seam
- 10 Seam
- 8 Seam
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Stratigraphic Section Line
- Grande Cache Coal License Area
- Coal Policy Category 4
- Topographic Contour - 100m
- Road
- water body
- Water Course

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PROJECT: 2011 NI 43-101 Technical Report

Stratigraphic Cross Section

DATE:	ANALYST:	Figure 9-1
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 10 / NAD83

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\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 9-1 Stratigraphic Cross Section.mxd

9.1 General Coal Quality of the Smoky River Coalfield

Coal quality trends within the Smoky River Coalfield have been modelled from an extensive database of exploration drillhole cores, reverse circulation drill samples and adits. Within the Smoky River Coalfield, coal rank has the greatest impact on the value of the product. Coal rank is indicated by the volatile matter and FSI tests, which both decrease as coal rank increases. While product ash can be controlled by processing, coal rank can only be controlled by blending coals from different mine areas. Coal rank is the primary determinant of the coking properties and coke yield of the product. These properties are rated by customers based on the volatile matter and FSI. In general, the coal rank can be categorized as low-volatile bituminous coal based on the ASTM coal classification system. It follows the same trend across the GCC mining areas for all seams. The overall trend is an increase in coal rank to the northwest.

9.2 No. 2 Area

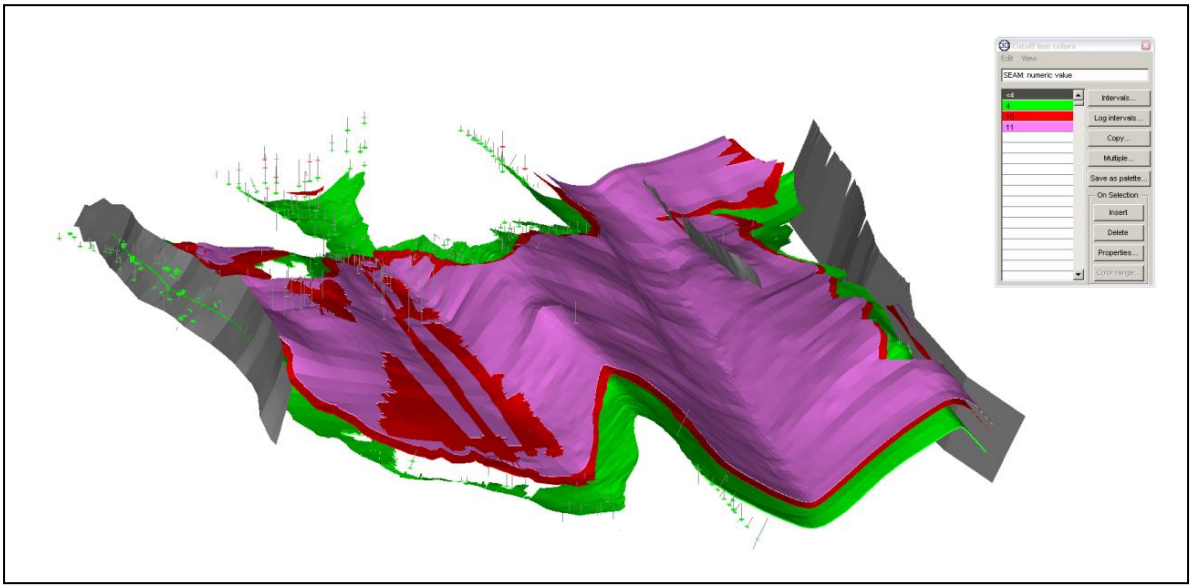
Seams 4, 10 and 11 are of interest in this area. Seam 10 is 70 m up section from seam 4 and seam 11 is 33 m above 10 seam. This area is similar to No. 8 Area in terms of stratigraphy and coal quality. Underground mining has taken place within seams 4 and 11.

Table 9-2: Average Seam Quality from Drillhole Composites for No. 2 Area

Seam	Ash (adb)	FSI	VM (adb)(1)
4	17.7	7	17.8
10	16.4	4	20.1
11	28.6	3.5	16.2

(1) Average default value, not currently modeled

Figure 9-2: 3D Isometric View (NW) of No. 2 Area Coal Seams, Faults and Drillholes



LEGEND: green – 4 seam; red – 10 seam; pink – 11 seam; grey - faults

9.3 No. 7 Area

In 4 Seam the ash is highest (15%) in the upper quarter of the seam. The lower three-quarters of the seam is lower in ash (9%). The roof consists of approximately 1.0 metre of carbonaceous shale overlain by thick, bedded to massive, silty sandstone and siltstone. The carbonaceous shale thickens to the west.

Table 9-3: Average Seam Quality for No. 7 Area

Seam	Ash (adb)	FSI	VM (adb)
4	11.5	5.5	19.0

Source: GCC, 2006 Yields and Quality Spreadsheet

9.4 No. 8 Area

Within the No. 8 Area there are eight coal seams. No. 4, 10 and 11 seams are of economic interest. The other seams, 3 Seam and Seams 5 to 8 are generally too thin and of poor quality to be considered for resources.

4 Seam occurs approximately 20 m above the Torrens Member and varies in thickness and geometry along and across strike, but primarily across the strike. The coal seam thins along the limbs of folds and thickens through the hinges of folds. The tighter the fold, the greater is the thickening. In the syncline hinge zones, the thickness of 4 Seam is up to 40 m.

4 Seam can be divided into an upper high ash zone and a lower low ash zone. A shaley horizon approximately 0.6 to 1.0 metre thick occurs 1.5 to 1.8 m above the base of 4 Seam. 4 Seam has the largest area extent of the three mineable seams and contains the majority of coal resources for the No. 8 Area.

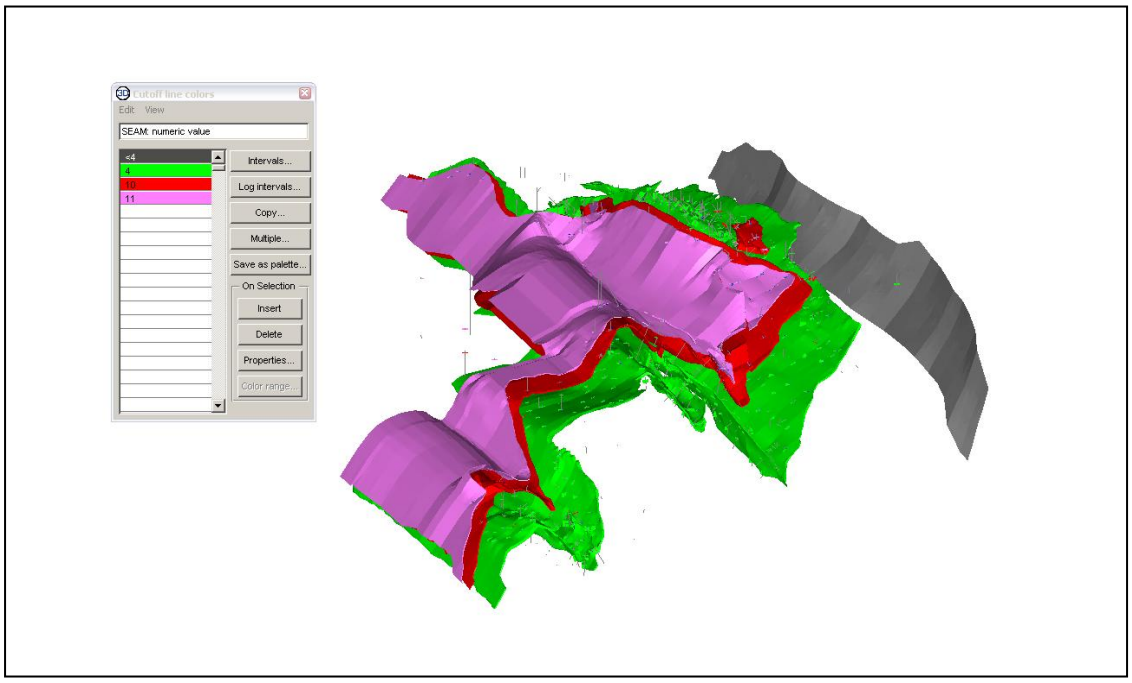
10 Seam occurs an approximately 100 m above 4 Seam. In the No. 8 Area, 10 Seam consists of 1.2 m of very high ash coal (approximately 45%) above 2.2 m of low ash coal (approximately 11%). 10 Seam also varies in thickness across strike, although not as pronounced as for 4 Seam.

11 Seam occurs approximately 34 m above 10 Seam. The aerial extent available for mining is the least of the 3 economic seams.

Table 9-4: Average Raw Coal Quality by Seam from Drillhole Composites for No. 8 Area

Seam	Ash (adb)	FSI	VM (adb)
4	14.9	5.5	17.6
10	17.9	5	20.4
11	21.3	7	n/a

Figure 9-3: 3D Isometric View (NW) of No. 8 Area Coal Seams, Faults and Drillholes



LEGEND: green – 4 seam; red – 10 seam; pink – 11 seam; grey - faults

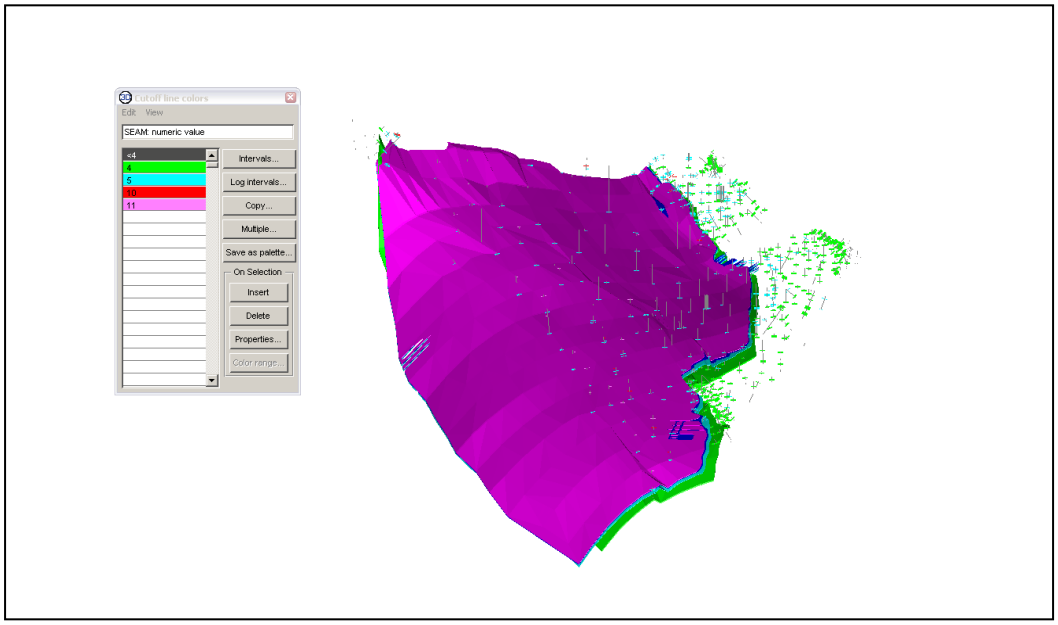
9.5 No. 12 South A Area

In No. 12 South A (12SA) there are 4 seams in the sequence that are of economic interest which are seams 4, 5, 6 and 7/8. This area is directly south of the South B2 pit and the stratigraphy and coal quality are similar to the No. 12 South B2 Area described below.

Table 9-5: Average Raw Coal Quality by Seam from Drillhole Composites for No. 12SA Area

Seam	Ash (adb)	FSI	VM (adb)
4	12.3	4	17.0
5	13.4	4.5	17.0
6	18.3	5	19.0
7	15.3	4	18.0

Figure 9-4: 3D Isometric View (NW) of No. 12 South A Coal Seams and Drillholes



LEGEND: green – 4 seam; light blue – 5 seam; red – 10 seam; pink – 11 seam

9.6 No. 12 South B2 Area

In No. 12 South B2 (12SB2), the sequence includes Seams 3, 4, 5, 6 and 7/8.

3 Seam is located directly above the Torrens Member and is in turn overlain by a distinct fossiliferous "Clam Zone". Although 3 Seam maintains a thickness of only 1 metre throughout No. 12 South B2 Pit Area, it is used as an important stratigraphic marker.

For seam No. 4, the average in-seam ash content is 10.6% (dry basis). There is a zone of higher ash (15% to 20%) that is 0.3 to 1.6 m thick, near the top of the seam. Typical in-seam ash values below this high ash zone range between 4% and 8%. Above the high ash zone, typical in-seam ash values range between 8% and 11%. The immediate roof and floor of 4 Seam is shale. A marker seam 0.3 to 0.5 m thick is located 1.0 m below the bottom of 4 Seam. Drilling indicates that 4 Seam is located about 22 m above the Torrens Member.

Seam No. 5's stratigraphic position averages 36 m above 4 Seam. Geophysical logs indicate that a high ash band is often found in the lower half of the seam with other minor ash bands occasionally appearing at variable locations within it. In-seam ash content, estimated from four No. 12 Mine South B2 Pit cores drilled in 1992, is 11.2%. 5 Seam, as well as 6 and 7/8 Seams, has soft mudstone footwalls and hanging walls.

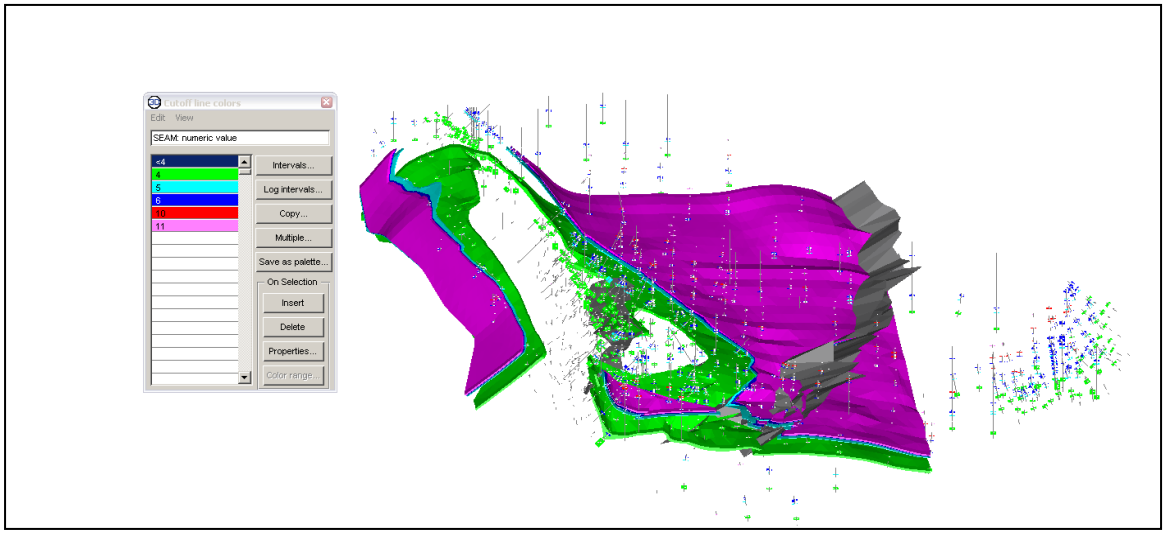
Seam 6 generally consists of a lower clean portion and an upper higher ash zone. The clean portion of the seam is generally 0.9 m thick and the higher ash zone is usually about 0.3 m thick. The average in-seam ash content of 6 Seam is estimated to be 16.8%. The interburden thickness between 5 and 6 Seam averages 5 m and consists of shale with some interbedded siltstone.

The interval from the top of 8 Seam to the bottom of 7 Seam averages 4.5 m. This interval generally consists of 0.6 m of 8 Seam and 3.3 m of 7 Seam separated by 0.6 m of carbonaceous mudstone. In-seam ash content of this entire interval is 22.1%. The lower half of 7 Seam typically contains a high ash zone 0.3 m thick. The interburden between 6 and 7 Seam averages 1.2 m thick and consists of carbonaceous mudstone and a 0.2 m thick coal marker seam.

Table 9-6: Average Raw Coal Quality by Seam from Drillhole Composites for No. 12SB2

Seam	Ash (adb)	FSI	VM (adb)
4	12.4	3	n/a
5	14.4	5	n/a
6	23.3	4.5	n/a
7	18.0	3.7	n/a

Figure 9-5: 3D Isometric View (NW) of No. 12 South B2 Coal Seams, Faults and Drillholes



LEGEND: green – 4 seam; light blue – 5 seam; red – 10 seam; pink – 11 seam; grey - faults

9.7 No. 12 North Area

In No. 12 North (12N), the seams of interest include 3 Seam through 8 Seam. As in No. 12 South, the 3 seam is located just above the basal Torrens Member. Its average thickness is 1.3 m.

4 Seam is again the thickest seam in the area. The seam reaches a maximum thickness of 28.3 m in a structurally thickened zone in drillhole 74-14. The seam thins out to non-mineable thicknesses in a few areas of No. 12 North. 4 Seam is located about 30 m above 3 Seam.

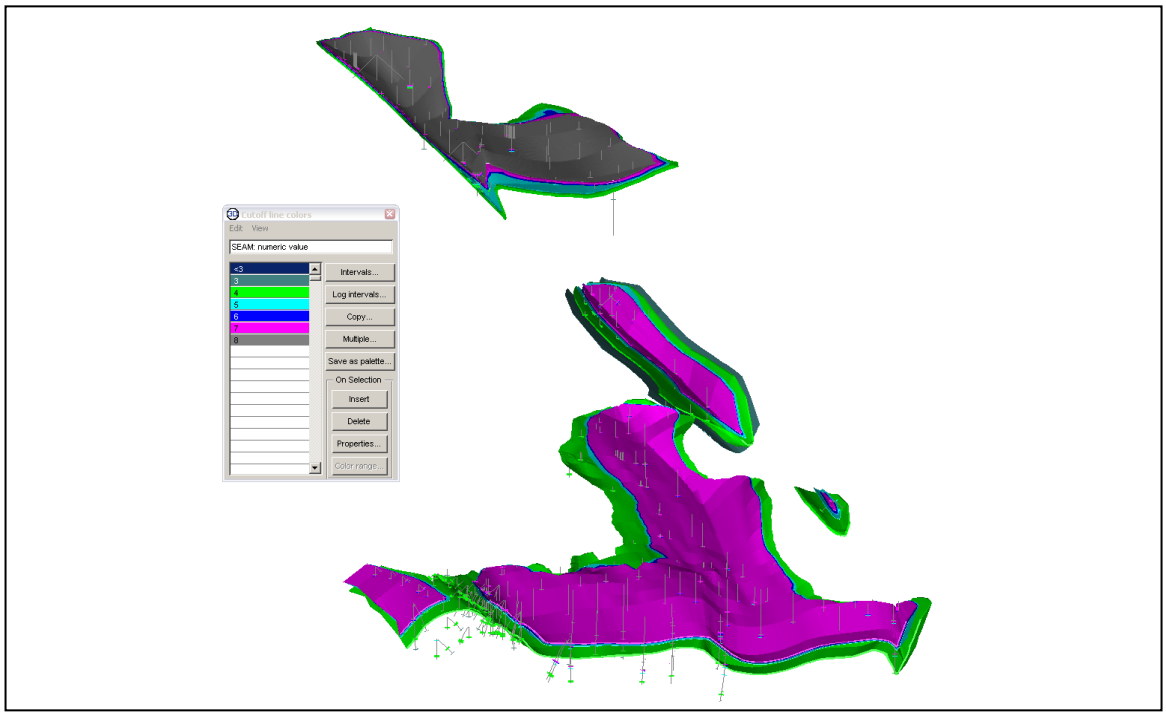
5 Seam is approximately 30 m above 4 Seam. 6 Seam thickens to 6.5 m in areas where the coal has been structurally thickened. The interburden thickness between No. 5 Seam and No. 6 Seam averages 8 m.

7 Seam is more than 15 m in thickness in hole 74-14 in a structurally thickened synclinal axis. The seam is located approximately 5 m above 6 Seam. 8 Seam is approximately 6.5 m above 7 Seam.

Table 9-7: Average Raw Coal Quality by Seam from Drillhole composites for No. 12 North

Seam	Ash (adb)	FSI	VM (adb)
4	13.8	3	16.3
5	14.6	3.5	17.7
6	34.2	1	15.7
7	16.8	5	17.4
8	15.6	5.5	19.0

Figure 9-6: 3D Isometric view (NW) of No. 12 North Coal Seams, Faults and Drillholes



LEGEND: green – 4 seam; light blue – 5 seam; dark blue – 6 seam; magenta – 7 seam; grey – 8 seam.

9.8 No. 16 Area

In No. 16 Area the coal seams that are of economic interest are Seams 4, 5, 6, 7 and 8. Combined coal thickness of these five seams is 14.4 m in the south-eastern part of the area.

As in most areas, 4 Seam occurs 22 m above the Torrens Member. It is the thickest seam in the south-eastern portion of the area. 4 Seam is generally characterized by an upper low ash zone, a middle medium ash zone and a lower low ash zone. These zones generally comprise 30%, 20% and 50% of the seam, respectively. All three zones are consistent in their geophysical log signature throughout the southeast portion of the area. Directly overlying 4 Seam is approximately 3.0 m of interbedded carbonaceous shale and siltstone. The strata below 4 Seam consist of 1.0 m of shale overlying a 1.0 to 1.5 m sandstone interval.

5 Seam has a consistent stratigraphic thickness and occurs approximately 39.0 m above Seam 4. A shale parting between 0.2 and 0.3 m in thickness is typically encountered near the bottom of 5 Seam. The immediate roof and floor of 5 Seam are comprised primarily of shale.

The thickness of 6 Seam is more variable than 5 Seam. 6 Seam occurs approximately 8.0 m above 5 Seam. It consists of a lower low ash zone, and an upper, high-ash zone, and typically has a carbonaceous shale roof and floor.

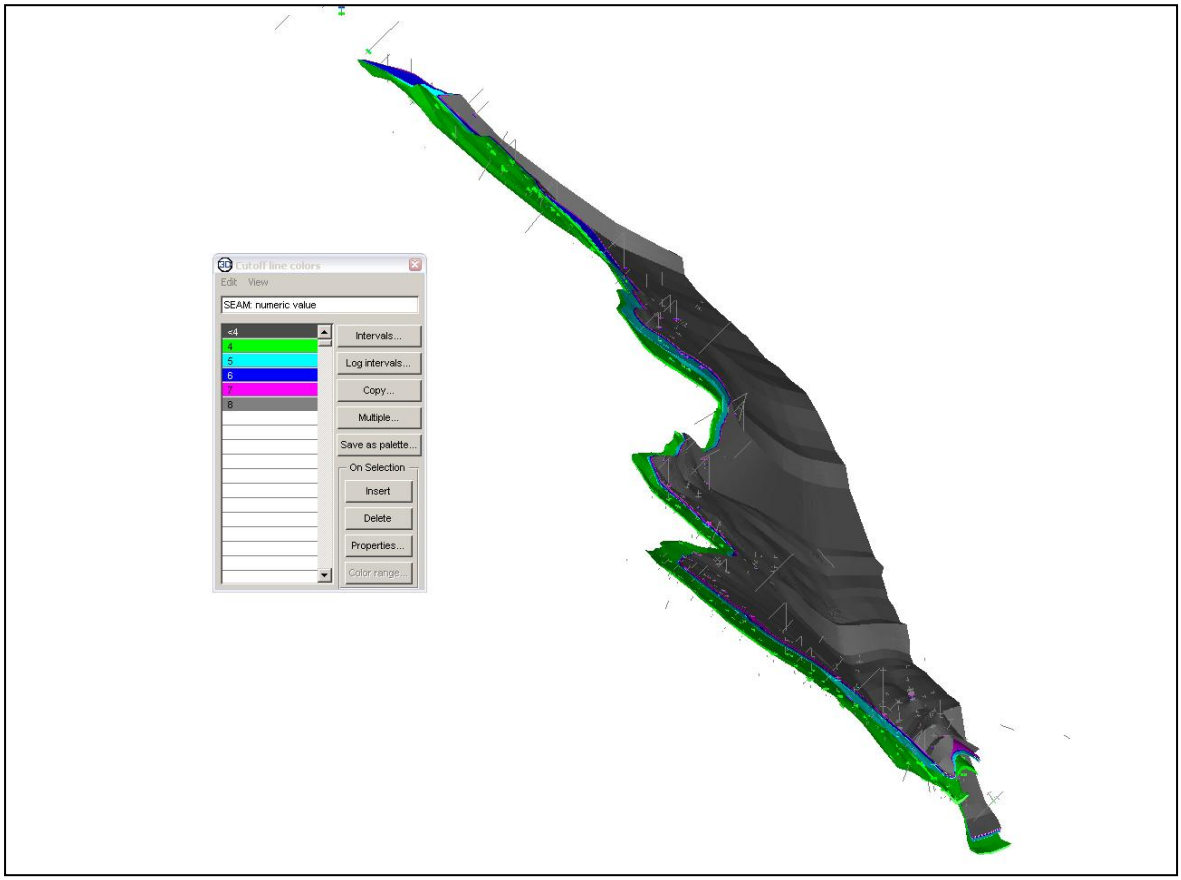
7 Seam contains a band of higher ash coal near the middle of the seam. The interval between 6 Seam and 7 Seam is approximately 1.7 m and consists of carbonaceous shale and coal partings. 7 Seam is overlain by 0.6 to 1.0 m of carbonaceous shale.

Seam 8 occurs 0.4 to 2.2 m above Seam 7. Where the interburden is thinner it is very carbonaceous.

Table 9-8: Average Raw Coal Quality by Seam from Drillhole Composites for No. 16 Area

Seam	Ash (adb)	FSI	VM (adb)
4	13.2	2.8	18.0
5	15.3	4.5	17.0
6	22.3	3	17.0
7	16.4	3.5	18.0
8	15.6	5.5	19.0

Figure 9-7: 3D Isometric View (NW) of No. 16 Area Coal Seams and Drillholes



LEGEND: green – 4 seam; light blue – 5 seam; dark blue – 6 seam; magenta – 7 seam; grey – 8 seam.

Modeling of volatile matter in the Smoky River Coalfield has established predictable project-wide trends. In general, there is a consistent increase in volatile matter upward in the stratigraphic section from 4 Seam to 11 Seam. This is consistent with the trend of increasing rank with increasing depth of burial in coal bearing strata. The lateral change in volatile matter within the Smoky River Coalfield can be summarized in general as increasing volatile matter and decreasing rank to the southeast.

Ash is the most variable of the key in-situ coal quality parameters. In general, the thicker coal seams are lower ash, reflecting that a more stable depositional environment is required for larger accumulations of organic material. Lower variability of ash is also apparent in thicker coal seams. 4 Seam has the overall lowest average ash and also the lowest variability in ash. 4 Seam ash is lowest in the south-western mine areas.

Most of the sulphur in the coal seams of the Smoky River Coalfield is organically bound as opposed to pyritic or mineral bound. Washing the coal generally results in only a marginal increase in the sulphur content from the in-situ level. The thickest coal seam, 4 Seam, generally has the lowest average in-situ sulphur. Unlike volatile matter, sulphur does not follow regional trends but varies by mining area and within each area.

10.0 EXPLORATION

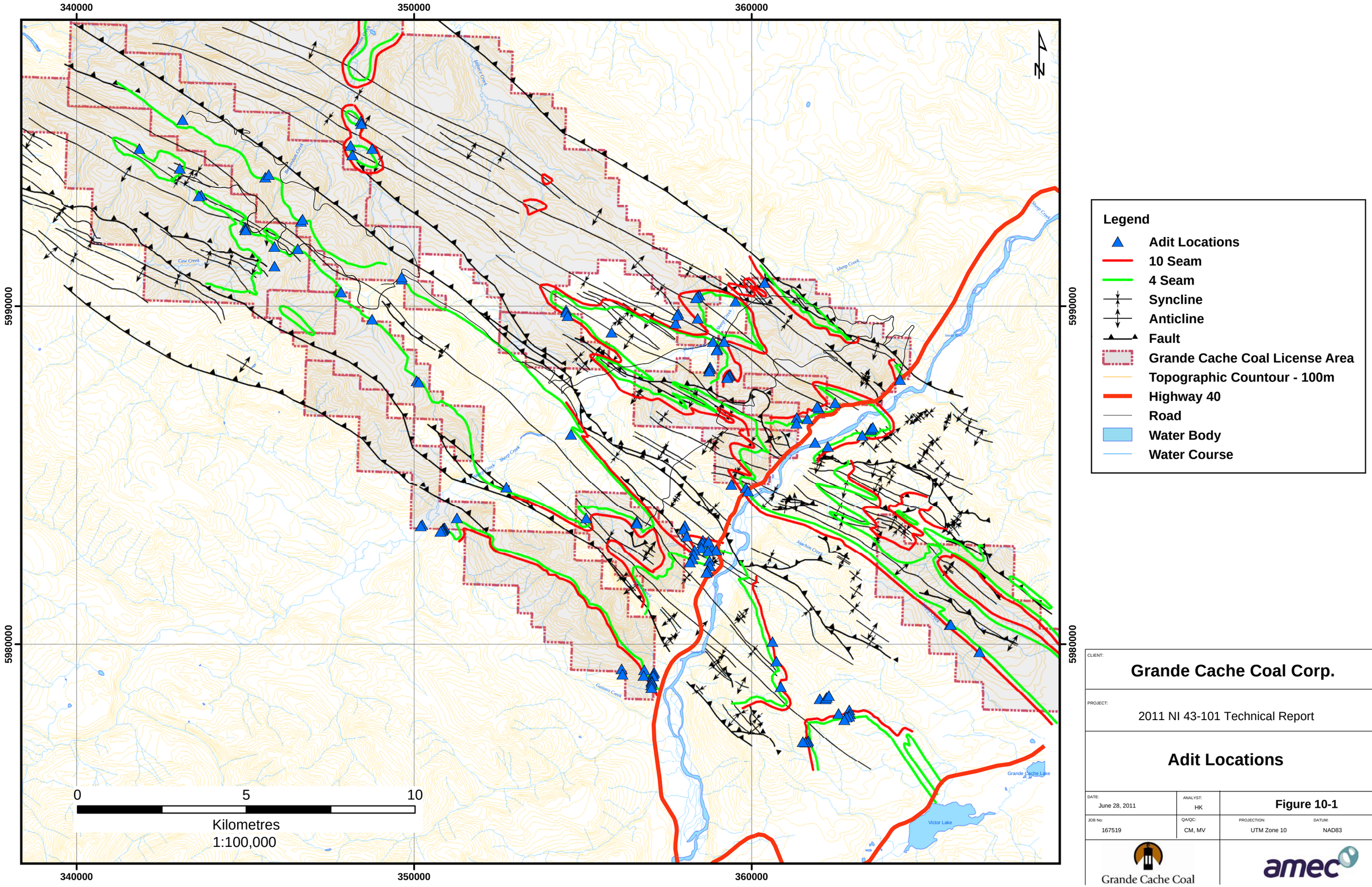
Exploration commenced in the Smoky River Coalfield in the late 1950s and a substantial amount of work has been carried out over the years. The amount of work completed to date consists of:

- 129 adits that have been driven across the Smoky River Coalfield to provide bulk samples for coal washability test work. Additionally, GCC has carried out re-mapping of accessible adits where possible. Adit locations are shown in Figure 10-1.

- outcrop mapping in areas of natural exposure and exposures created by the construction of access roads for drilling was carried out on a periodic basis since the 1970s. A large amount of rock outcrops were logged during this time for lithology and bedding orientation.

- surface trenches used to determine seam positions and thickness.

It was determined in previous audits that former mine operators used industry standard techniques gathering coal data on the Smoky River Coalfield. Drilling was the most common method used for data acquisition (see Section 11.0).



CLIENT:

Grande Cache Coal Corp.

PROJECT:

2011 NI 43-101 Technical Report

Adit Locations

DATE:	ANALYST:	Figure 10-1	
June 28, 2011	HK		
JOB No:	QA/QC:	PROJECTION:	DATUM:
167519	CM, MV	UTM Zone 10	NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 10-1 Adit Locations.mxd

11.0 DRILLING

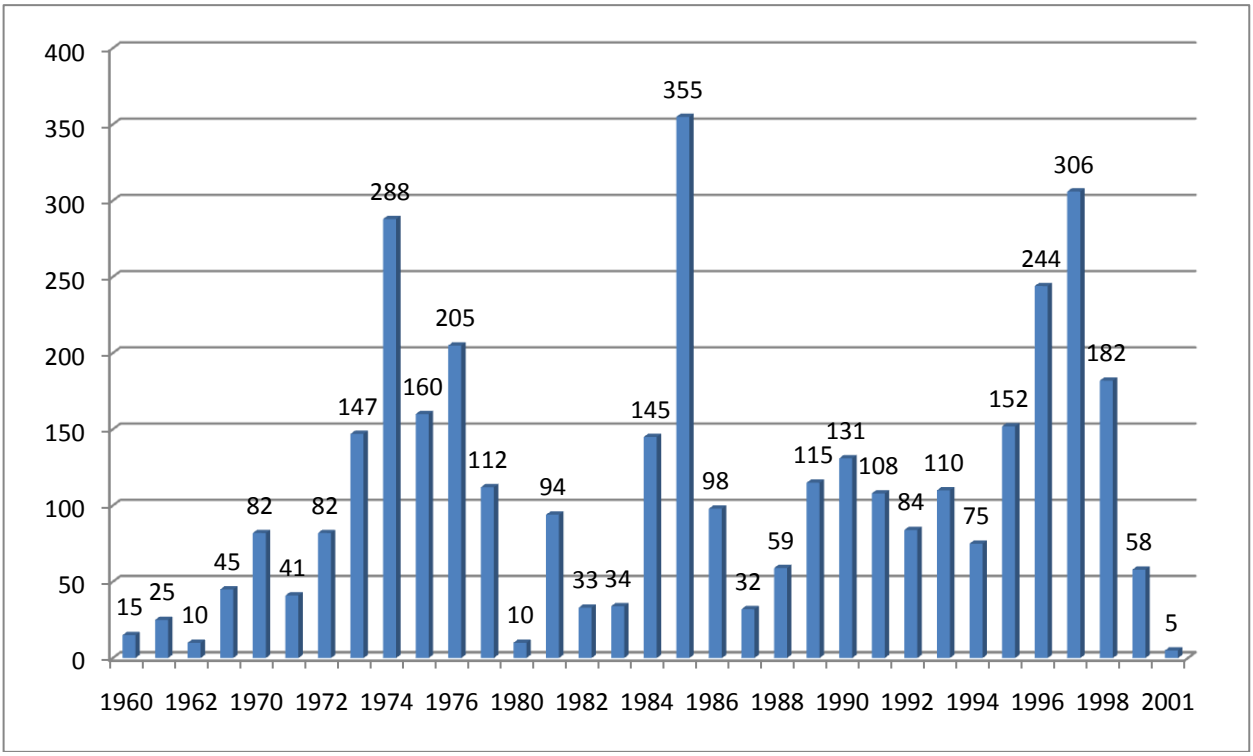
11.1 Previous Operators

All exploration drillholes completed since 1970 have been geophysically logged with gamma, density, resistivity, calliper (GRDC), and hole deviation tools where conditions permitted. Drillholes completed since 1990 were also logged with dip-metres tools in addition to the standard suite of logs. Additionally, sonic logging was carried out on selected holes between 1990 and 1999 to assist in rock strength estimation. Cores of the coal seams and immediate roof sections were recovered from approximately 10% of the pre-2004 drillholes. In 2001, during receivership, a drilling program consisting of one exploration hole and 4 water wells in the No. 7 Area was conducted for due diligence and regulatory requirements.

Table 11-1: Historical Drilling

	Period	No. Holes	Total Metres
Columbia Iron Mining Co.	1960-62	50	7,137
McIntyre Mines	1969-1984	1,478	146,928
Smoky River Coal	1985-1999	2,109	238,713
Receiver	2001	5	595

Figure 11-1: Exploration Drilling by Year (Previous Operators)



340000
350000
360000
5990000
5980000
Grizzly Creek
Syncline Hills Thrust
Beaverdam Creek
Ladyfern Creek
Caw Creek
Cowlick Thrust
Mason Thrust
Sheep Creek
Smoky River
Joachim Creek
Gustaws Creek
Grande Cache Lake
Victor Lake
N
0 2.5 5 10
Kilometres
1:100,000

Legend

- Price Waterhouse Cooper (Receiver, 2001)
- Smoky River Coal (1985-1999)
- McIntyre Mines (1969-1984)
- Columbia Iron Mining Co. Drilling (1960-1962)
- 10 Seam
- 4 Seam
- Syncline
- Anticline
- Fault
- Grande Cache Coal License Area
- Underground Mined Out Area
- Open Pit Mined Out Area
- Topographic Contour - 100m
- Highway 40
- Road
- Water Body
- Water Course

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

Pre-GCC (2004) Drillhole Locations

DATE:	ANALYST:	Figure 11-2
June 28, 2011	HK	
JOB No: 167519	QA/QC: CM, MV	PROJECTION: UTM Zone 10 DATUM: NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 11-2 Pre-GCC (2004) Drillhole Locations.mxd

11.2 GCC Drilling

Since acquiring the site in 2004, GCC has conducted extensive yearly drilling campaigns in several areas. A summary of the distribution of holes and types is presented in Table 11-2 and Table 11-3. Drillhole spacing varied depending on structural complexity (Figure 11-3). Areas evaluated for surface mining have commonly been evaluated at a close drill spacing to better define these more structurally complex areas.

Table 11-4 summarizes additional drilling which was carried out in 2010 in areas 2, 8, 12SB2 and 12 East (East of No.12 South). Two drillholes have been completed in 2011 prior to April 1, one of which has not been included in the resource and reserve estimates.

Table 11-2: GCC Drilling Summary by Year and Area

Location	Year	No. Holes	Total Metres
No. 8 Area	2004	41	6,311
	2005	69	10,683
	2006	64	10,507
	2007	57	7,889
	2009	36	4,796
	2010	19	3,425
Sub Total No. 8 Area		**286**	**43,611**
No. 2 Area	2004	2	197
	2005	3	292
	2007	4	245
	2009	10	618
	2010	50	6,461
Sub Total No. 2 Area		**69**	**7,813**
No. 16 Area	**2008**	**70**	**10,884**
No. 12 South B2	2006	1	318
	2008	6	1,420
	2010	3	396
Sub Total No. 12 South B2		**10**	**2,134**
No. 12 South A	**2006**	**22**	**4,845**
No. 12 North	**2008**	**8**	**2,117**
No. 12 East	**2010**	**2**	**323**
Total GCC Drilling 2004 - 2010		**467**	**71,727**

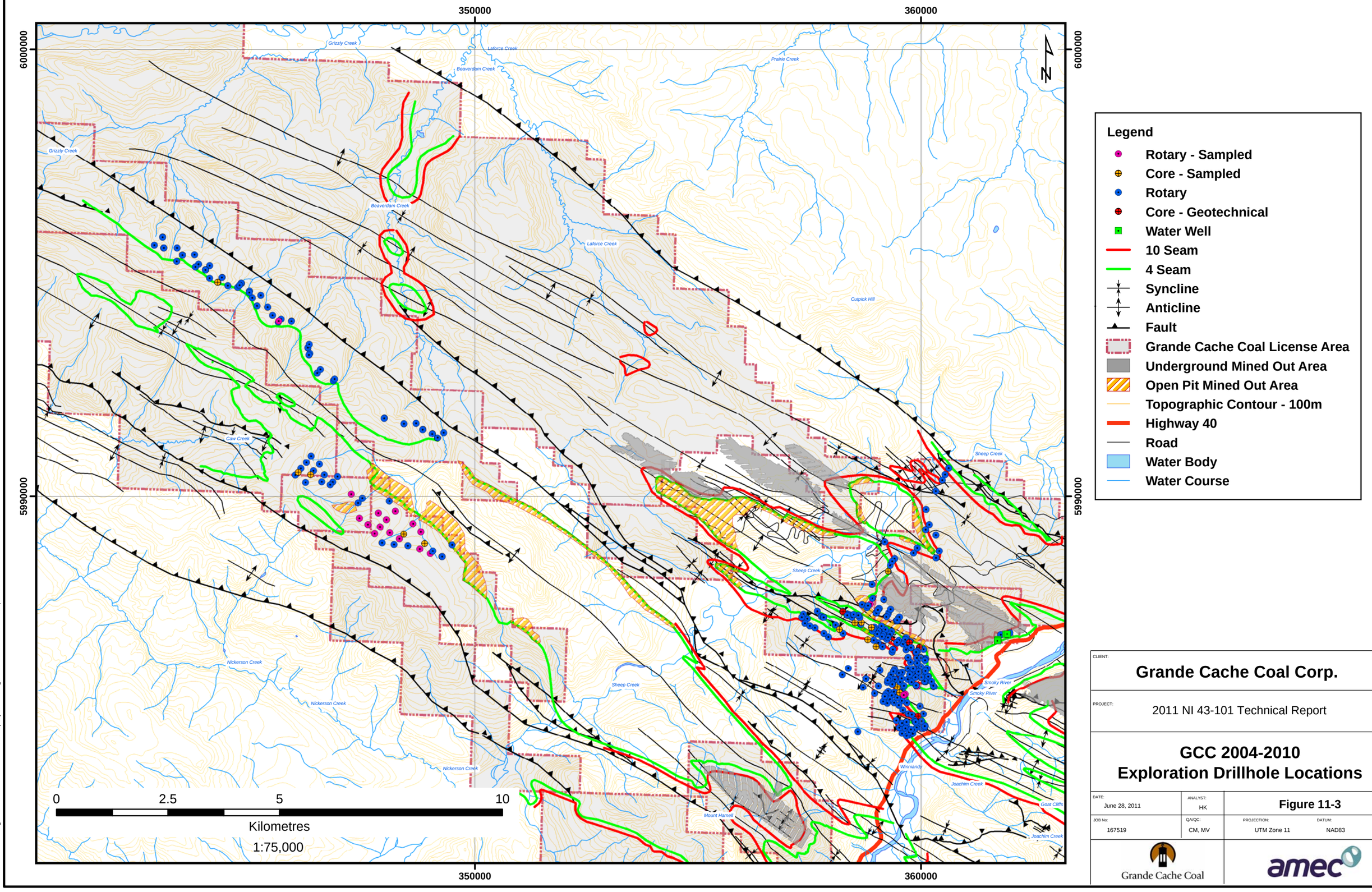
Table 11-3: GCC Drilling by Hole Type and Year

Year	Drill Type	No. Holes	Sampled[(1)]	Total Metres
2004	Rotary	43	0	6,508
2005	DDH[(2)]	7	6	1,048
	Rotary	65	0	9,927
2006	DDH	2	2	303
	Rotary	85	14	15,367
2007	DDH	2	0	136
	Rotary	59	1	7,998
2008	DDH	3	0	659
	Rotary	81	1	13,762
2009	DDH	5	0	416
	Rotary	41	0	4,998
2010	DDH	3	0	339
	Rotary	71	5	10,463
Rotary		445	21	69,023
Core		22	8	2,900
Total GCC drilling		**467**	**29**	**71,727**

(1) "Sampled" – Coal samples collected for laboratory analysis
(2) DDH – Diamond Drillhole

Table 11-4: 2010 Drilling by Area

Area	No. Holes	Total Metres
No. 2 Area	50	6,461
No. 8 Area	19	3,425
No. 12 Area South A	3	396
No. 12 Area East	2	323
Total	**74**	**10,604**



CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

GCC 2004-2010 Exploration Drillhole Locations

DATE:	ANALYST:	
June 28, 2011	HK	**Figure 11-3**
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 11 / NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 11-3 GCC 2004-2010Exploration Drillhole Locations.mxd

11.3 No. 2 Area Drilling

This area was the primary focus of drilling activities during the course of 2010. Drilling was concentrated on the Reiff-Terrace and Barrett Pit areas. A summary of the total drilling in this area is summarized in Table 11-5. The locations of all drillholes in No. 2 Area are shown in Figure 7-4.

Table 11-5: Summary of Drilling in No. 2 Area

Year	DDH		DDH - Geotech		Rotary		Rotary-sampled		Water Well		Totals	
	#	m	#	m	#	m	#	m	#	m	#	m
1961	3	660			3	378					6	1,038
1962	4	745			2	490					6	1,235
1969					1	95					1	95
1970					22	1,331	1	82			23	1,413
1971	1	27			29	2,194					30	2,220
1972	5	308			12	1,450	7	1,109			24	2,867
1973	57	3,345			39	634	18	1,705			114	5,684
1974	8	463			15	454					23	917
1976					14	1,277					14	1,277
1977					14	1,164					14	1,164
1981	4	867			9	1,387					13	2,254
1982	3	287			7	370					10	657
1983					2	72					2	72
1984	1	31			27	1,773					28	1,804
1985	4	260			34	1,950	6	387			44	2,597
1989					1	188					1	188
1991	1	326			1	305					2	631
1993					16	1,613					16	1,613
1994					4	340					4	340
1995					7	430					7	430
1996					46	5,565					46	5,565
1999					8	439					8	439
2004					2	197					2	197
2005					3	292					3	292
2007					4	245					4	245
2009			2	152	4	270			4	196	10	618
2010	3	339			46	6,031	1	91			50	6,461
Grand Total	**94**	**7,658**	**2**	**152**	**357**	**30,479**	**33**	**3,374**	**4**	**196**	**505**	**42,313**

11.4 No. 7 Area Drilling

No additional drilling has been completed in the No. 7 area since 2007. Table 11-6 summarizes the drilling completed in the No. 7 area since 1961. Drillhole locations are shown in Figure 7-6.

Table 11-6: Summary of Drilling in No. 7 Area

Year	DDH		Rotary		Rotary-sampled		Totals	
	#	m	#	m	#	m	#	m
1960			5	577			5	577
1961			6	1,207	8	1,665	14	2,872
1972	1	132	2	75	10	1,657	13	1,864
1975			1	54	6	262	7	315
1981			14	2,075	6	1,109	20	3,184
1983			5	681			5	681
1993	3	271	11	1,704	1	94	15	2,069
1999	5	936	25	4,415	5	1,098	35	6,449
2001			5	595			5	595
Grand Total	**9**	**1,339**	**74**	**11,383**	**36**	**5,884**	**119**	**18,606**

Exploration in 1960 and 1961 consisted of diamond drillholes drilled by Columbian Iron Ore Company. In 1972, 1981 and 1983, rotary drilling was completed by McIntyre. In 1993 and 1999 SRCL carried out drilling programs as well. In 2001, Norwest Mine Services Ltd. under contract to the receiver drilled one test hole near the center of the No. 7 Area as part of a feasibility study.

Except for the 1960-61 drilling, all drillholes were geophysically logged for density, gamma and resistivity. The last two SRCL drilling programs (1993 and 1999) also included sonic and dip-meter logging.

11.5 No. 8 Area Drilling

Drilling in the No. 8 Area began in the 1960s and continued intermittently until 1987. In 2004, GCC began drilling in the No. 8 Area. Most of the drilling penetrated to the Torrens sandstone below No. 3 seam. All drillholes were geophysically logged.

The focus of the 2004 drill program was to establish seam position and thickness, and conventional rotary drill methods were selected as a more cost effective method to complete the drilling and obtain down hole geophysical logs. No samples were taken of the coal in this program. In the 2005 and 2006 phases of this program, seam samples were collected from core or reverse circulation drilling methods. GCC also carried out drill programs in 2007, 2009 and 2010. A summary of all drilling in this area is presented in Table 11-7 with drillhole locations shown in Figure 7-8.

Table 11-7: Summary of Drilling in No. 8 Area

Year	Air Track		DDH		DDH - Geotech		Rotary		Rotary-sampled		Totals	
	#	m	#	m	#	m	#	m	#	m	#	m
1961							2	327			2	327
1962			2	599			2	413			4	1,013
1970							4	267			4	267
1971							9	714			9	714
1972			8	994							8	994
1973	1	30	23	1,458			1	44	4	158	29	1,691
1974	5	171									5	171
1982			3	214			7	658	13	1,017	23	1,889
1984							26	3,013	1	108	27	3,121
1985							32	2,539	11	568	43	3,106
1986							2	92			2	92
1987			2	80			14	844	2	116	18	1,041
2001							1	61			1	61
2004							41	6,311			41	6,311
2005			6	899	1	149	62	9,635			69	10,683
2006							64	10,507			64	10,507
2007			2	136			54	7,509	1	244	57	7,889
2009					3	264	33	4,532			36	4,796
2010							15	3,318	4	107	19	3,425
Grand Total	**6**	**201**	**46**	**4,380**	**4**	**413**	**369**	**50,785**	**36**	**2,318**	**461**	**58,097**

11.6 No. 12 South Area Drilling

11.6.1 12 South A Area

A summary of the drilling completed in the No. 12 South A Area is located in Table 11-8. All of the drilling that has been undertaken is consistent with the requirements of coal exploration, and includes diamond core drilling and rotary drilling. Coal samples were obtained from all core holes and one rotary drillhole. The hole locations are shown in Figure 7-10.

Table 11-8: Summary of Drilling in No. 12 South A Area

Year	DDH		Rotary		Rotary-sampled		Totals	
	#	m	#	m	#	m	#	m
1974	7	704	48	4,951	1	149	56	5,804
1975	20	2,267	5	516			25	2,783
1976			14	1,310			14	1,310
1989	3	230	8	2,321			11	2,551
1990	1	80	51	4,091			52	4,171
1991			55	3,570			55	3,570
1992	18	1,195	59	5,397			77	6,592
1993	4	334	7	331			11	665
1994	2	173	31	2,827			33	3,000
1995	3	324	32	2,906			35	3,230
1996	4	933	37	4,940			41	5,873
1997			11	2,426			11	2,426
1998			1	171			1	171
2006	2	303	7	1,440	13	3,102	22	4,845
2010			3	396			3	396
Grand Total	**64**	**6,543**	**369**	**37,593**	**14**	**3,251**	**447**	**47,386**

GCC performed exploration drilling in 2006 and 2010 in the No. 12 South A Area which is the south east strike extension of the B2 Pit Area. It is expected the coal in this area will be extracted using both surface and underground mining methods. Two of the 25 holes drilled were cored to yield geotechnical information concerning roof and floor rock conditions.

11.6.2 12 South B2 Area

Drilling in the No. 12 South B2 Area began in 1969 and continued intermittently until 1998 under previous operators (Table 11-9). Many of these exploration holes are now mined out with the No. 12 South B2 Pit. GCC also carried out a small program in 2008. Hole locations are in Figure 7-12.

Table 11-9: Summary of Drilling in No. 12 South B2 Area

Year	DDH		Rotary		Rotary-sampled		Totals	
	#	m	#	m	#	m	#	m
1970			1	49			1	49
1974	4	496	6	939	7	789	17	2,223
1975	5	434					5	434
1976			4	321			4	321
1993	11	967					11	967
1994	1	140	11	1,271			12	1,411
1995	3	227	31	4,024			34	4,251
1996			48	5,711			48	5,711
1997	2	148	118	15,482			120	15,629
1998			116	16,679			116	16,679
2006					1	318	1	318
2008			6	1,420			6	1,420
Grand Total	**26**	**2,412**	**341**	**45,895**	**8**	**1,107**	**375**	**49,413**

11.7 No. 12 North Area Drilling

McIntyre Mines completed drilling in this area from 1969-1976. Between 1988 and 1998 SRCL drilling included both core holes and reverse circulation rotary holes (Figure 7-13). In 2008 GCC completed a limited program of core and rotary drilling in this area (Table 11-10).

Table 11-10: Summary of Drilling in No. 12 North Area

Year	DDH		Rotary		Rotary-sampled		Totals	
	#	m	#	m	#	m	#	m
1969			3	432			3	432
1973	1	88					1	88
1974	15	1,733	94	8,475	8	842	117	11,050
1975	26	2,709					26	2,709
1976	1	70	36	2,873			37	2,943
1988			3	138			3	138
1993	20	1,233					20	1,233
1995	2	262	14	1,695			16	1,957
1996	1	130	49	4,189			50	4,319
1998			3	375			3	375
2008	2	566	6	1,551			8	2,117
Grand Total	**68**	**6,792**	**208**	**19,727**	**8**	**842**	**284**	**27,361**

11.8 No. 16 Area Drilling

Previous exploration drilling was conducted in 1974 by McIntyre Mines and SRCL in 1997/98 (Table 11-11). The hole locations are displayed in Figure 7-15.

GCC completed additional drilling during 2008.

Table 11-11: Summary of Drilling in No. 16 Area

Year	DDH		Rotary		Rotary-sampled		Totals	
	#	Metres	#	Metres	#	Metres	#	Metres
1974	18	2,360	9	1,801	28	3,934	55	8,094
1997	5	332	51	6,640	4	434	60	7,406
1998	4	350	33	4,813			37	5,163
2008	1	93	68	10,692	1	99	70	10,884
Grand Total	**28**	**3,134**	**161**	**23,946**	**33**	**4,467**	**222**	**31,546**

12.0 SAMPLING METHOD AND APPROACH

Sampling methods for drilling prior to 2007 were previously reviewed by AMEC in the 2006 and 2007 Technical Reports and are summarized here. All previous bulk samples and core samples collected and submitted for analysis were handled using methods that are still standard for the coal industry. AMEC considered these methods appropriate procedures for sampling coal.

Bulk samples were collected up to the mid-1970s and were transported by truck from the field to independent laboratories for bulk coal sample testing.

Trench samples were tested by the SRCL laboratory which was ISO certified.

The standard method of coal core handling is for the drilling personnel to place the core in core boxes of the appropriate size. The drill core size is commonly 3 inches in diameters, but in some early programs diamond drill core of smaller diameters was collected.

Drill core samples were mainly tested by independent laboratories, including Birtley Coal and Minerals Testing and Loring Laboratories in Calgary and Commercial Testing in Vancouver.

Some of the geological staff of GCC participated in activities and were able to provide information related to the collection or administration of the historic core or bulk samples while they were employed by the former lease holder.

12.1 Reverse Circulation Samples

Sampling of coal from reverse circulation drillholes by the previous owners followed industry standard methods; these procedures were continued by GCC during its drilling programs. This includes sample collection, bagging, preservation and identification procedures.

12.2 Core Collection and Handling

Procedures for the collection and handling of core samples by previous owners and GCC are well established and follow accepted industry practice.

13.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

AMEC previously reviewed the sample preparation, analysis and security for the drilling prior to the 2007 audit. The majority of the coal quality data are from samples collected by previous operators. AMEC concluded the procedures were appropriate and generally the procedures are still employed by the coal industry today.

13.1 Core Samples

Drilling personnel collected drill core and placed the core in core boxes. The core was transported to logging facilities by geologists where the core was measured, logged for geology and coal intervals were identified and sampled.

The sampling protocol for coal core was to bag the complete core for each ply. Sampling requirements were for each coal ply to be no less than 15 cm in length and each rock ply must not be less than 5 cm in length. Rock plies were analyzed for the ash content and the content of waste components.

Each ply was bagged and tagged and multiple bags were used if the ply was large. The samples were then dispatched by ground transportation to a commercial coal laboratory (see Section 12.0 Sampling Method and Approach).

Core plies were typically analyzed for in-place ash and free swelling index ("FSI"). Seam composites of cores were analyzed for sulphur, ash chemistry, proximate analysis and petrographic data. In some cases, the full suite of testing was applied to subsections of coal seams (high-ash or low-ash zones) where there was considered potential to mine and blend these subsections. Specifically, the upper 3 metres and the lower 4.5 metres of No. 4 Seam were sampled and analyzed separately for proximate and petrographic parameters.

Coal samples were analyzed for As-Received Moisture and air-dried moisture. The quality values are commonly presented on a “Dry Basis” by making adjustments for the measured moisture content, permitting the direct comparison of coal quality between coal seams.

Washability analyses of cores typically consisted of float/sink tests at one specific gravity (commonly between and SG of 1.40 to 1.50), that is dependent on the coal seam being analyzed.

13.2 Adit Samples

Adit samples were subjected to extensive float/sink testing of the plus 28 mesh (0.5 millimetre) coal fraction. The float/sink testing was commonly applied to three or four size fractions at four or five specific gravities for floating each size fraction. The minus 28 mesh fraction was subjected to froth testing commonly for three time intervals.

SRCL and predecessors assembled an extensive database on the coking properties and washability characteristics of the different coal seams in the Smoky River Coalfield between 1969 and 2000. Most coking tests were conducted by CANMET, the federal government laboratory in Ottawa. These data now form part of the GCC quality data base.

GCC has assembled additional coal quality data primarily from product sampling prior to shipping to ensure that the coal product meets customer specifications. Samples from the operating No. 12 South B2 Surface and No. 7 Underground operations come from trenches and stockpiles. All these samples are analysed at the GCC mine laboratory.

14.0 DATA VERIFICATION

14.1 Prior Years' Verification

AMEC completed a verification of the GCC data for the 2007 Technical Report which is summarized here. AMEC has confirmed at that time that the procedures and data continue to be adequately maintained.

AMEC independently checked the exploration results from the open pit mining areas by reviewing geophysical logs. This information was compared to the equivalent seam information recorded by GCC. A third check was made to ensure what was reported on the cross sections used for geological interpretation matched the information.

The results of this verification show that GCC geology and engineering technical staff have followed coal industry standard methods of recording, storing, analysing, and interpretation of drillhole data. With a few minor variations, the results of the AMEC evaluation were the same as the GCC data analysis and interpretation. AMEC has concluded that information used from geological records has been verified, recorded, stored and used appropriately and accurately for geological interpretation on the GCC open pit coal mine areas.

Mine operations have also validated the sampling and testing data with coal deliveries meeting client specifications for quality.

GCC completed drilling programs in 2007 and 2008 in the No. 8, No. 12, and No. 16 Areas. AMEC reviewed the collar coordinates and geophysical picks for the 2009 Technical Report and observed no data errors. AMEC also reviewed the limited coal quality data obtained from core and observed no errors.

GCC completed additional reverse circulation drilling in 2009 in the No. 8 Area. AMEC reviewed 5% of the drill data (collars and seam picks) and observed no errors.

GCC maintains the historic data in binders and filing cabinets at the GCC mine office. The data contain driller's logs, geophysical logs, geological logs and deviation survey information data. AMEC observed this information was well maintained.

GCC drill data are stored in metal filing cabinets and are also maintained as electronic files on a secure central server. Access to the server is controlled by GCC Information Technology personnel.

14.2 2010 Drillhole Database Creation and Verification

AMEC was requested by GCC to compile a detailed MS Access database of all drillhole data for the property. AMEC reviewed all of the digital and paper logs available at the mine site. To ensure the integrity of the database all data were cross-checked and corrected, where required. This work included:

- Normalization of the hole identification and numbering system.
- Confirmation of the drillhole collar locations and translation from the various historical grid coordinate systems into UTM NAD83.Ensuring that there is no duplication of drillholes between adjacent areas.
- Assigning a consistent lithology and seam code to each of the individual codes in the original data set, which were created in the obsolete Lynx software. A total of 194 distinct “horizon” codes were cross referenced and assigned to one of 9 lithology codes (see Table 14-1) with associated seam codes reflecting the seam number (4, 5, 6 etc.). An example of this conversion methodology is shown in Table 14-2.
- Reconciliation of differences in borehole logs and recording methods across the various owners.
- Ensuring consistency in the downhole survey data as a result of azimuth translations from local grids to UTM north and other “true north” grids used on the property over the years.
- Collecting coal quality data from a wide variety of sources.

Table 14-1: Lithological Codes in GCC database

LITH	DESCRIPTION
C	Coal
P	Parting
SHC	Shaley Coal/Carbonaceous Shale
SH	Shale
SLT	Siltstone/Shaley Sandstone
SST	Sandstone
RX	Unidentified Bedrock
FLT	Faulted Zone
OVB	Unconsolidated Overburden

Table 14-2: Example of Conversion of Lynx Horizon Codes to ACCESS Database Interval Codes

Hole	Depth	Length (m)	Lynx Code	Lynx Code Description	From	To	Interval Lithology Code	Interval Seam Code	Interval Description
EX98-001	9.5	1.2	9	Depth to the top of 9 seam	9.5	10.7	C	9	No. 9 seam
EX98-001	10.7	0.5	9a	Top of high-ash zone within No. 9 seam	10.7	11.2	P	9	No. 9 seam parting
EX98-001	11.2	1.0	9s	Top of low-ash zone within No.9 seam	11.2	12.2	C	9	No. 9 seam low ash
EX98-001	12.2	10	91	Bottom of No.9 seam	12.2	22.2	RX		Interburden between No. 8 and 9 seams

The review followed a strict protocol to record who checked the various pieces of information, what changes were made to the database when, etc. As of the date of this report 4,092 drillholes have been entered. Verification of collar coordinates, drillhole surveys, samples, lithology and geophysics is in progress.

Additionally, downhole geophysical data available digitally in .las format files were checked, filtered and uploaded to the database. Data uploaded to the database were limited to gamma, density, resistivity, calliper and neutron as well as formation dip direction and dip where available.

15.0 ADJACENT PROPERTIES

The majority of the coal properties adjacent to GCC's mining areas are already held by GCC in various forms of land tenure or belong to the Province of Alberta.

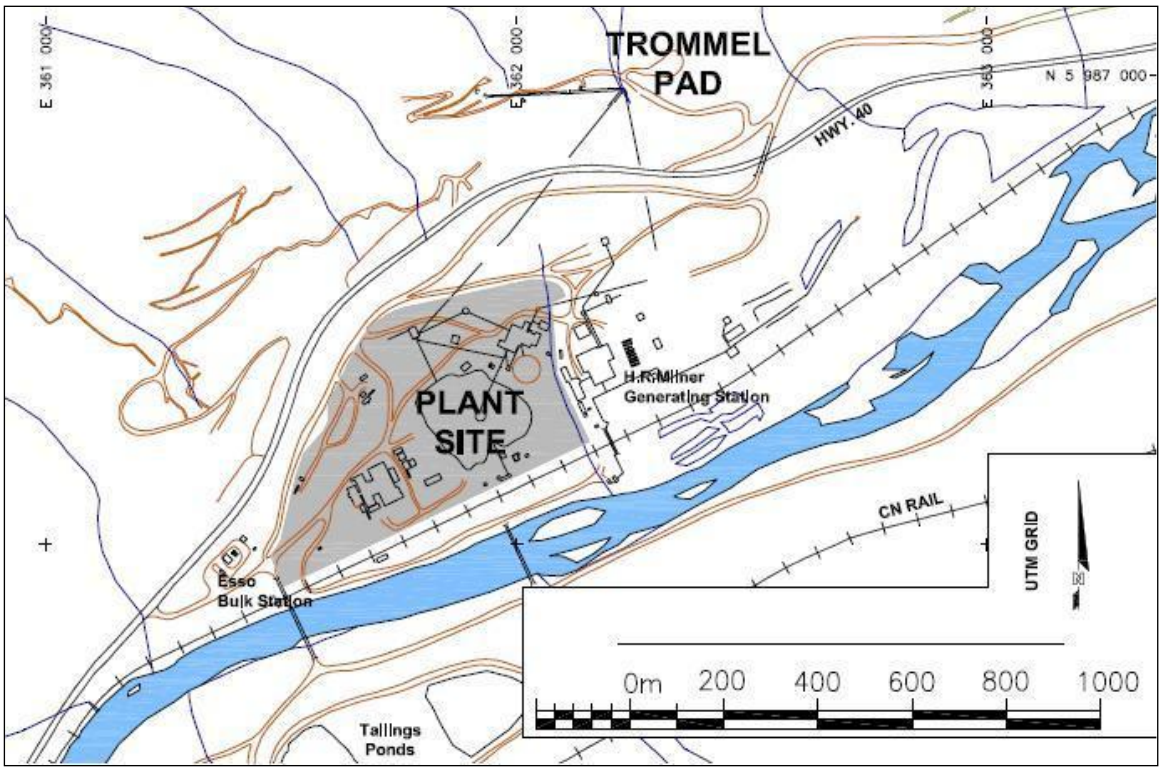
Milner Power Inc. owns a coal lease, originally called the 14 Mine lease, on the east side of the Smoky River and Highway 40 nearer to the town of Grande Cache. These leases do not affect the operations of GCC.

16.0 MINERAL PROCESSING AND METALLURGICAL TESTING

16.1 Process Plant and Production History

The coal preparation plant, located in the Smoky River valley next to Highway 40 and the CN railway, is currently processing coal from the No. 7 underground operation and the No. 8 area surface operations. The plant area and facilities include ROM coal stockpiles and reclaim platform, a screening and crushing station, a coal washing plant, a clean coal thermal drying station, clean coal stockpiles, reject storage area at Flood Creek, fine refuse ponds (currently used mostly for water clarification), mine-dry and administration buildings, pump stations, roads and conveyors as well as a train load-out system. Refer to the Figure 16-1.

Figure 16-1: Grande Cache Coal – Plant Site Plan



The coal processing plant started up in 1969. Under previous owners it has produced at rates up to 3 million tonnes of clean coal (MTCC) per year. Products were, and still are, low-volatile hard coking coal, containing 8.5% ash. Clean coal product moisture content is targeted at 7%. Since GCC commenced operations the processing plant has produced at levels of up to 1.7 MTCC, largely constrained by the capacity of the mining operations. For FY 2011, the budgeted production will be 2.2 to 2.4 MTCC.

The processing facility described in more detail in section 16.3 is generally typical for Western Canadian metallurgical coal. Stockpiled ROM coal is first processed through a rotary breaker where approximately 8% of the feed is rejected as lump refuse which would include dilution rock and parting material that does not break down smaller than 38 mm. The breaker product (smaller than 38 mm) material is transferred to the main washing plant for wet desliming. The coarser fraction reports to the heavy medium cyclone circuit for separation and the finer coal reports to the froth flotation banks for cleaning. The lighter cyclone overflow goes to clean coal which, if required, is dried to reduce moisture content to product specifications, and the heavier cyclone underflow goes to rejects.

GCC has a bypass facility at its pre-screening circuit (rotary breaker station) for the size fraction smaller than 3 mm (1/8 inch). This size fraction is normally at 9.5% ash and can be blended with the clean coal product from the plant without a need for washing and drying, which reduces dewatering and drying costs and increase the plant throughput. In addition the installed mechanical dewatering system for the fine rejects allows it to be combined with the coarse rejects, minimizing the need for fine refuse storage facilities in the restricted area available near the river valley.

16.2 Coal Production, Yield and Quality Forecast

GCC provided AMEC a set of historical coal washability testing data which covers various seam and plant composite samples tested. These indicate that it ranges from very-easy-to wash to easy-to-wash category based on the amount of near-density material. The data also indicate that the coal presents a tendency of degradation during material handling as the fine size fraction of -28 mesh coal is usually greater than 22%. AMEC recommends evaluating an increase in the aperture size of the rotary breaker to -65 mm to mitigate fine coal generation and equipment wear, with consideration of the downstream effects.

Projected processing plant yields take into account dilution, processing plant efficiency and coal losses at each stage of production, including mining, breaker separation, screening and plant processing. Table 16-1 shows the average expected coal yields at 8.5% clean coal ash for the various coal seams at each mine location.

Table 16-1: Clean Coal Yield by Seam

Area	Seam	ROM Ash (%)	Breaker Reject[1] (%)	Reject Ash[1] (%)	Feed Ash[1] (%)	Plant Yield[1] (%)	Overall Yield[2] (%)
Underground areas[3]							
No.7	4						71.3
No.12 South B2	7/8						71.3
	4						71.3
Surface areas							
No.8	4	22.8	5	70	20.3	72.8	69.2
	10	23.5	10	60	19.4	74.6	67.1
	11	27.0	10	60	23.3	67.1	60.4
No.12 South A	4	15.9	5	70	13.1	88.5	84.1
	5	30.2	10	60	26.9	59.2	53.3
	6	36.2	10	60	33.6	45.0	40.5
	7	25.6	7	65	22.6	68.0	63.2
No.2	4	20.1	5	70	17.5	79.1	75.1
	10	23.1	10	60	19.0	76.1	68.5
	11	33.9	10	60	31.0	46.2	41.6
No.16	4	16.1	5	70	13.3	88.1	83.7
	5	30.1	10	60	26.8	59.6	53.6
	6	37.5	10	60	35.0	41.8	37.6
	7	20.0	7	65	16.6	81.1	75.4
	8	39.5	10	60	37.2	36.9	33.2
No.12 North	4	16.6	5	70	13.8	86.9	82.6
	5	28.2	10	60	24.7	63.2	56.9
	6	46.6	10	60	45.1	21.0	18.9
	7	21.8	5	65	19.5	75.2	71.4
	8	38.7	10	60	36.3	39.1	35.2

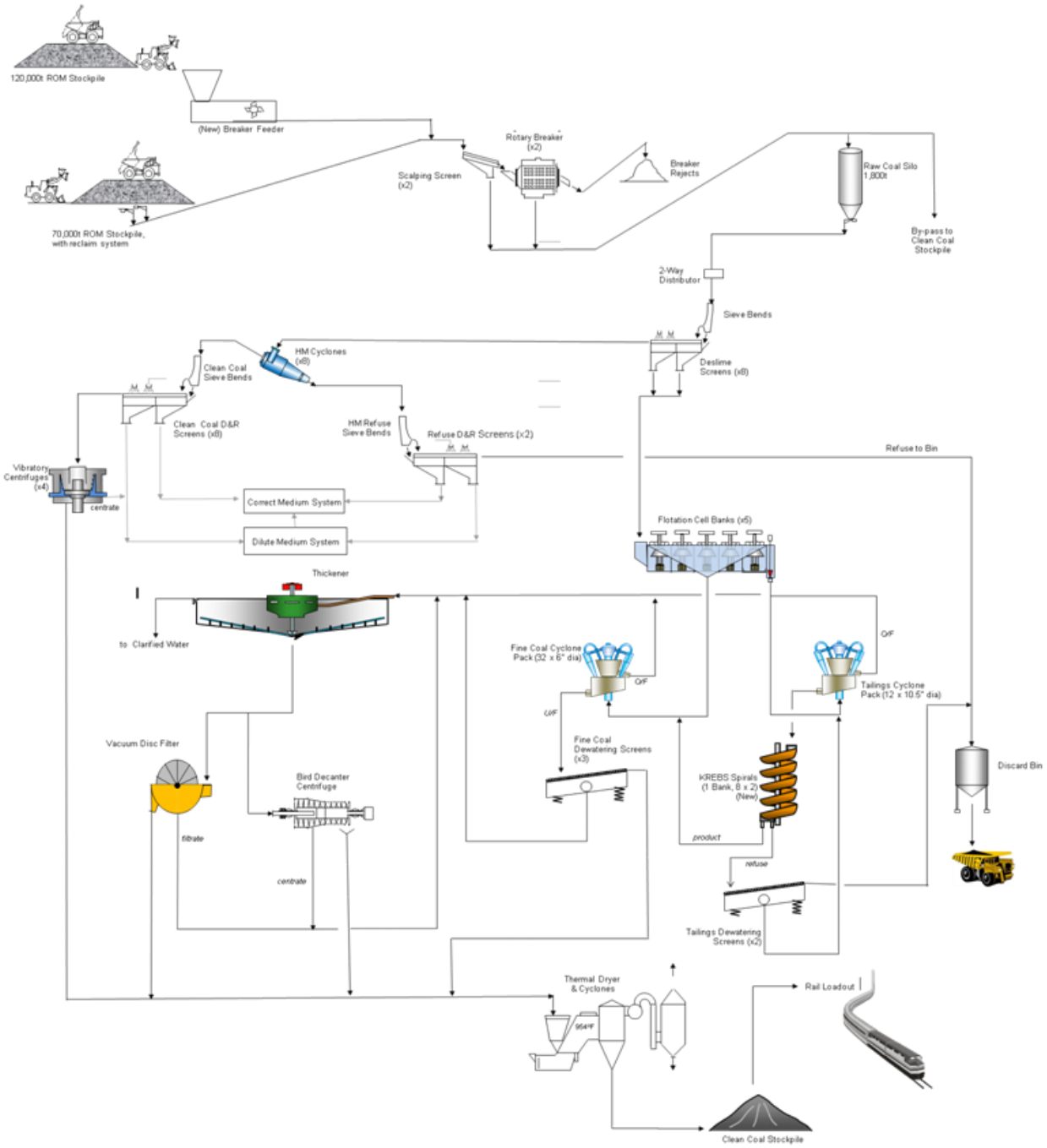
(1) Indicative
(2) Predicted yield based on ash balance
(3) Underground coal average historic yield from GCC Manager Technical Services

16.3 Coal Processing Description

The schematic process flow diagram of the coal preparation plant is shown in Figure 16-2.

ROM coal is delivered by truck from the No. 7 and No. 8 Areas to a 75,000 t ROM coal stockpile. The coal is reclaimed using vibratory feeders, located in a reclaim tunnel. The feeders load the ROM coal onto a reclaim conveyor that transfers the coal into the breaker station. In addition, a new feeder and conveyor system has been installed, comprising a120,000 t ROM stockpile, from where ROM coal is fed into an 80 t feed bin and then extracted with a feeder breaker system that feeds a new overland conveyor to the breaker station.

Figure 16-2: GCC Coal Preparation Plant Process Flow



At the breaker station, two double deck vibratory screens size the coal with the -3 mm screen underflow being directed to the raw coal silo feed conveyor, or by-passed to clean coal stockpile as dry product. The +3 mm screen overflow reports to one of two rotary breakers that break the more friable coarse coal and reject the harder, higher ash coarse material.

The rotary breakers are fitted with 38 mm aperture panels, which allow -38 mm raw coal to pass through onto the raw coal silo feed conveyor. Oversize material is conveyed to an open storage pile and then trucked to on-site mine construction projects.

After removal of the oversize material in the breaker, the -38 mm plant feed is conveyed to the 1,800 tonne capacity raw coal silo. Raw coal is reclaimed from the silo by four vibratory feeders onto the coal processing plant feed conveyor, equipped with a tramp iron magnet and a belt scale, and conveyed to the desliming circuit of the processing plant.

The raw coal feed is wetted with process water in a two-way splitter box and discharged into two of four-way distributors that distribute the flow evenly over eight sieve bends and directly to the eight desliming screens fitted with 0.5 mm aperture panels. The deslimed coarse coal (38 mm x 0.5 mm) then passes to a mixing box where it is mixed with correct magnetite medium and fed to eight 600 mm diameters heavy media cyclones. The fine coal (-0.5 mm) screen undersize is pumped to a distribution box and then fed to the froth flotation circuit.

The heavy media cyclones separate the raw coal into clean coal and rejects at a separation density of 1.50 to 1.55. The correct magnetite media is recovered from each product on eight clean coal and two reject drain-and-rinse screens and then re-circulated back to the mixing box directly for re-use. The dilute media underflow from these screens is passed through four primary and two secondary magnetic separators for recovering the magnetite. The recovered dense magnetite is returned to the media circuit for making the correct media.

The non-magnetic materials are removed from the circuit to prevent a build-up of fines. The drained coarse clean coal is dewatered in four centrifuges and discharged to the clean coal conveyor. The drained coarse reject material is conveyed to the discard bin for removal by truck to be utilized in construction projects or alternatively hauled to the Flood Creek disposal facility.

The 0.5 x 0 mm raw coal slurry is fed into five rougher Wemco mechanical flotation banks, with each bank containing 4 x 8.5 m^3 cells. Nalco 21 promoter and Nalco 28 collector reagents are dosed to the flotation process in which fine clean coal and refuse is separated. The flotation concentrate is thickened using a new fine cyclone pack and the cyclone underflow is dewatered on three high frequency dewatering screens and discharged onto the clean coal conveyor for transfer to the thermal fluid bed dryer system.

The flotation tailings are pumped to a cyclone pack of 12 tailings cyclones for densification, with the underflow being dewatered on two high frequency dewatering screens. The dewatered screen overs are discharged onto the tailings rejects conveyor. Due to the presence of non-floating material, there are losses of good quality coal to the flotation tailings and for this reason GCC is testing the use of newly installed spirals to recover this material. A bank of eight twin-start Krebs spirals have been installed to treat the tailings cyclone underflow and produces a clean coal and refuse product, with no middlings recirculation. This spirals circuit is currently being evaluated and optimized.

The tailings cyclone overflow is directed to a 54 m diameter tailings thickener for settling and dewatering. The tailings thickener underflow is pumped to a vacuum disc filter and a Bird screen bowl centrifuge with the centrifuged solids and filter cake being discharged onto the clean coal conveyor containing both coarse and fine clean coal, centrate and filtrate water are directed back to the tailings thickener.

Clarified water is recycled to the plant as process water. The fluidized bed thermal dryer is located in a separate building adjoining the coal processing plant and has a maximum rated capacity of 41 cubic metres per hour of water evaporation. The clean coal from the dryer has a moisture content of up to 7% and is conveyed to the 150,000 t capacity clean coal stockpile.

Clean coal is reclaimed using a bulldozer and two Cogar flat back feeders, rated at 3,000 TPH, located in the reclaim tunnel under the stockpile, and then transferred by conveyor to a load-out bin for loading into rail cars. After loading, the top surface of the coal is sprayed with a latex solution to inhibit dusting and coal losses during rail transport.

16.4 Plant Capacity and Operation

Since restarting operations, GCC has spent considerable time and money in rehabilitating the existing processing facility to ensure clean coal yields are closer to optimum and to improve the plant availability. Modifications completed include installing a by-pass circuit for the 3mm x 0 size fraction directing 100-200 t/h of low ash coal from the scalping screens to the clean coal stockpile, reducing the load to the plant and thermal dryer[3].

GCC has also added a screen bowl centrifuge to recover fine coal from the tailings thickener underflow and a fine tailings screen to dewater the cyclone underflow and direct the fine tailings into the coarse refuse stockpile. A newly installed spirals circuit treating flotation tailings is currently also being evaluated to increase recoveries. These modifications will aid the plant to achieve the FY2012 budget requirement.

[3] *In future, a number of the coal seams planned to be mined contain higher ash levels. Most of this is caused by interburden and/or dilution, which generally does not report to the fine size fractions. Should higher ash be encountered in the bypass coal, this can be directed to a PCI product, which has a specification of 9.5% ash.*

The GCC Plant has further increased their plant utilization to about 65 - 70% by going to a 14-day in operation and 4-day shutdown. AMEC recommends that GCC consider a shorter maintenance shutdown period of up to a day and doing a plant module at a time, without shutting down the complete plant. A major shutdown period of 5 days can be scheduled every 6 months to a year. GCC has also appointed additional maintenance personnel as well as two plant metallurgists very recently.

AMEC recommends that the plant maintenance strategy be reviewed and that a dedicated plant maintenance supervisor be appointed, together with a plant training coordinator who must ensure all plant operator knowledge levels are on par with industry standards. This will aid in increasing plant availability and utilization.

AMEC has also recommended some modification to the tailings thickener circuit and flocculent dosing systems to reduce down time due to “black water” events in addition to the magnetite recovery system during a recent plant operational improvement study.

In order to further raise the plant production to 3.5 MTCC per year, GCC short term strategy focuses on increases in plant utilization and availability by additional operating personnel, installing a central plant control system as well as upgrading electrical systems during 2011. Medium term focus is on improving and adding new capacity to the desliming and heavy media circuits, to cater for the higher throughput rates. GCC will launch a separate engineering study to consider alternatives and also to model the impact of varying ROM feed grades to the plant with recommended circuit upgrades. All existing and newly installed materials handling systems, including the rail load-out station, should be capable of handling the increased throughput rates and no modifications are envisaged. The FY2012 capital budget includes the estimated cost for these modifications.

17.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES

The coal resource estimates for this report were generated by AMEC with input from GCC staff geologists and have been checked and reviewed by AMEC. Coal reserves were also checked by AMEC after confirmation of economic pit plans and expected mining costs by mining engineering staff. Underground coal reserves for No. 7 operation were checked and estimated by AMEC. The underground coal resources and coal reserves for the planned No. 12 South B2 underground operation were estimated by AMEC based on the layout provided by GCC. AMEC updated 3D block models for No. 2, No. 8, No. 12 North, No. 12 South A, No. 12 South B2, and No. 16 areas including drillholes completed to the end of 2010 and determined coal resources and reserve estimates. GCC personnel provided the seam interpretations for all areas, which were checked and approved by AMEC.

17.1 Coal Resources

17.1.1 Reporting Coal Resources in Canada - Background Information

National Instrument 43-101 is the law that establishes scientific and technical disclosure standards for mineral projects in Canada that states how mineral resources and reserves must be reported. This instrument was updated on December 30, 2005. The areas affecting resource and reserve reporting for coal properties was amended. The section of the Companion Policy 43-101CP, Part 1, Section 1.5(b) states:

"A qualified person estimating mineral resources or mineral reserves for coal may follow the guidelines of Paper 88-21 of the Geological Survey of Canada: A Standardized Coal Resource/Reserve Reporting System for Canada, as amended ("Paper 88-21"). However, for all disclosure of mineral resources or mineral reserves for coal, issuers are required by section 2.2 of the Instrument to use the equivalent mineral resource or mineral reserve categories set out in the CIM Definition Standards and not the categories set out in Paper 88-21…."

17.1.2 Assurance of Existence

Assurance of Existence classes divide the total resource based on the level of certainty known about the quantities of coal. The amount of certainty is based on the distance of a resource block from a valid data point which provides the locations of the top and/or bottom of the coal seam. A valid data point is defined as a position that wholly or partially exposes a coal seam or any marker horizon that indicates the structure and/or proximity of the coal seam of interest. These can be obtained from any of the following:

- Surface outcrop
- Surface trench
- Adit driven
- Drillhole intersection

The more complex the stratigraphic and structural regime of the coal deposit, the greater the number of data points are required to assign the coal resource to a measured, indicated or inferred resource category. Table 17-1 below outlines the criteria used for this resource estimate.

Table 17-1: Distance from Nearest Data Point for Resource Classification

Geology Type	Confidence class		
	Measured	Indicated	Inferred
Moderate	0-300 m	300-600 m	600-2000 m
Complex	0-100 m	100-200 m	200-400 m

A ***moderate geology*** type consists of deposits which have been subject to a moderate amount of tectonic deformation. Structural characteristics of these types of deposits include homoclines or broad open folds with seam dips less than 30°. Faults may be present with displacements less than 10 m. The No. 2 and No.7 Areas are the only deposits that fit this classification.

A ***complex geology*** type consists of deposits which have been subject to a high amount of tectonic deformation. Structural characteristics of these types of deposits include numerous anticline/syncline pairs, both symmetric and overturned, associated with large scale thrust faulting.

17.1.3 Probable Method of Extraction

Coal can be extracted using a variety of mining methods. For the purposes of resource estimation a simplified division is made such that resources are classified as surface or underground. *Surface resources* are considered to be non-underground mineable resources that exist within a conceptual open pit design (pit shell) that meets a 20:1 (bcm waste:tonne coal) cut-off strip ratio. *Underground resources* are considered as such where they are contained in seams with a dip of less than 15 degrees and a minimum and maximum depth from surface of 50 and 600 m, respectively.

17.1.4 Seam Thickness Criteria

Seam thickness parameters are also a factor in determining whether a coal seam becomes part of a resource. This includes the concept of separable partings, which are rock bands between seams that can be removed during mining activities. For surface resources, minimum coal ply thickness of 0.5 m was used as a cut-off for inclusion of a seam in the resources. Partings were included where they were less than 0.5 m, with an overall coal to rock ratio of 1.5 or greater.

For underground resources, the minimum seam thickness used to determine whether a seam is included in the resource was 2.0 m. This corresponds to the minimum rated thickness for underground mining equipment used at the mine.

17.1.5 Density

GSC 88-21 refers to coal bulk density as:

…"the inherent specific gravities of the coal (including empty pores) and included non-coal material (ash), and of the fluid -filled porosity within the coal."

An empirical formula for density calculations has been developed for the Smoky River Coalfield using experiential data obtained over a period of 35 years. These data have been obtained from drill holes, bulk samples as well as operating mines. These have been used to develop an empirical formula relating density to in-situ ash values. The density formula is:

Density (metric tonne per cubic meter) = -206.2 / (ash %(adb) – 163.2)

Ash%(adb) – ash content in the coal on an air dry basis

Density values for each block in the resource model were assigned based on the interpolated ash content. Previously, resources were calculated using a default value based upon the average ash content for the seam overall for a particular area.

17.1.6 Geological Interpretation and Block Modelling

The modeling methodology used for resource estimation for all areas consisted of the following steps:

- Prepare data including database error checking within an area subset.
- Import of the drillhole data to the mining software package (Minesight®)
- Use the drillhole data to create 3D wire frame solids from cross sectional polygons for each seam
- Create of a wire frame model representing the surface topography and the bedrock topography.
- Create of a 3D block model using blocks measuring 15x15x15 m (except for No. 12SA and 16, which are only 5 m in height). The relative percentages of each seam are then coded to the blocks, along with the percentage of the block that exists below topography.
- Interpolate of coal quality using inverse distance squared (ID^2) from drillhole composites of sampled holes.
- Determine of oxidized coal as a function of depth from topographic or bedrock surface (8 m was the value used for all areas except No. 16, where past experiences indicate that a more appropriate value of 24 m should be applied)

- Classify of a block's confidence class based upon its distance to the nearest drillhole intersection of the most abundant seam in the block.
- Prepare of surface resource pit shells using the Lersch Grossman at 20:1 cut-off incremental strip ratio (bank cubic metres waste to tonnes in-situ coal) with a 45 degree wall angle, following guidelines set out in GSC paper 88-21.
- Determine of underground resource limits for areas with shallowly dipping coal meeting thickness, dip and depth from surface criteria.
- Calculate of surface and underground resources from the block model, including estimation of the resulting in-situ coal quality.

AMEC and GCC completed a Lerchs-Grossman analysis using the updated resource models.

Oxidized coal is a by-product at GCC's operation and not included in these resources.

17.1.7 Resource Summary

The coal resources with an effective date of March 31, 2011, are shown in Table 17-2 and Table 17-3. Figure 17-1 illustrates the distribution of the coal resources.

Table 17-2: Summary of Measured and Indicated In-Place Coal Resources[1]

	Measured (Mt)	Indicated (Mt)	Total (Mt)	Ash (%)	FSI
Surface Mining Areas[2]		-			
No. 2 Area	46.5	22.3	68.8	19.3	6
No. 8 Area	37.4	21.2	58.6	20.6	6
No. 12 South A Area[3]	11.1	15.1	26.2	14.8	4
No. 12 South B2 Area[4]	2.6	1.0	3.6	13.9	3
No. 12 North Area	39.1	15.6	54.7	16.6	3.5
No. 16 Area	56.0	20.2	76.6	13.9	3.5
Total Surface Mining Areas	192.7	95.4	288.1		
Underground Areas[5]					
No. 7 Underground	1.1		1.1	14.1	4.5
No. 12 South B2 Underground	8.4	3.2	11.6	14.5	3.5
Total Underground Areas	9.5	3.2	12.7		
Grand Total	**202.2**	**98.6**	**300.8**		

Table 17-3: Summary of Inferred In-Place Coal Resources

	Inferred (Mt)	Ash (%)	FSI
Surface Mining Areas[2]			
No. 2 Area	7.0	21.1	5
No. 8 Area	3.1	21.9	6.5
No. 12 South A Area[3]	9.3	14.4	4
No. 12 South B2 Area[4]	0.5	19.2	4
No. 12 North Area	1.6	16.4	3.5
No. 16 Area	22.0	15.6	5.5
Total Surface Mining Areas	44.5		
Underground Areas[5]			
No. 7 Underground	-		
No. 12 South B2 Underground	0.7	16.3	4
Total Underground Areas	0.7		
Grand Total	**45.2**		

NOTES (1) Quality of all resources classified as Low Volatile Bituminous (ASTM)
(2)Surface mining resources. estimated by AMEC based on a 20:1 strip ratio cut-off and a 45° pit wall angle
(3) A portion of the No.12 South A resources can also be mined by underground methods
(4) No.12 South B2 surface resources are those remaining after the open pit reserves have been mined out
(5)Underground resource estimated by AMEC. Minimum depth of cover approx. 50 m. Maximum underground extraction angle 15°; 20m buffer from faulting, 50 m buffer from highwalls
(6) Coal resources are inclusive of the coal reserves.
(7) The resource estimates have been prepared under supervision of Ron Parent, P. Geol., Principal Geologist for AMEC Americas Limited and Qualified Person

350000

360000

5990000

No. 16 Mine

No. 12 Mine North

No. 12 Mine South B2

No. 12 Mine South A

No. 2 Mine

No 8 Mine

East Pit

Pit

0 2.5 5 10

Kilometres

1:75,000

N

Legend

- Drillhole Location - Sampled
- Drillhole Location - Not Sampled
- 11 Seam
- 10 Seam
- 8 Seam
- 7 Seam
- 6 Seam
- 5 Seam
- 4 Seam
- Grande Cache Coal License Area
- Mine Area Limit
- Topographic Contour - 100m
- Highway 40
- Road
- Water Body
- Water Course

Resource Catagory

- Measured
- Indicated
- Inferred

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

Resource Catagories

DATE:	ANALYST:	Figure 17-1
June 28, 2011	HK	
JOB No: 167519	QA/QC: CM, MV	PROJECTION: UTM Zone 11 / DATUM: NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 17-1 Resource Catagories.mxd

17.2 Reserve Estimation

To convert coal resources to coal reserves, a number of economic and technical factors must be applied. These include but are not limited to the following.

Revenue and Cost Factors

These include:

- The estimate for the near and long term price of metallurgical coal in the domestic and international market place.
- The operating costs associated with mining, transporting and processing the coal at the mine site.
- Overhead costs associated with marketing and transporting the finished coal product to customers.
- Overhead costs associated with administrative and technical functions relative to running a mine.

AMEC has reviewed these economic factors as supplied by GCC, and used them to verify the economic viability of the individual mining areas. These also form the basis of the economic analysis summarized in Section 19.11.

Geotechnical Parameters

Geotechnical parameters governing the orientation of the pit slopes, haul roads, waste dumps and other parameters associated with water flow and climate have been reviewed.

For the underground operations, the parameters governing the stability of the excavations and ground control practices have been reviewed, specifically, recent geotechnical investigations to assess ground conditions[4] and ground control aspects of the proposed design[5]. AMEC considers that these studies have been prepared following accepted industry practice and finds the recommendations to be reasonable.

Due to the complex geology in the surface mining areas, the final design parameter for the pit walls and some of the access road cuts can only be determined once detailed field investigations of each area have been completed. GCC plans to perform this work in advance of mining. For the design of the long range pits approximate design parameters have been used, based on experience gained at the mine site.

[4] 12SB2 Underground, Geotechnical Drilling and Assessment of CMRR, Golder Associates, March 2010
[5] Geotechnical Assessment of Grande Cache Coal #12 Underground Mine, Golder Associates, April 2010

Coal Recovery Parameters Surface Mining

The Run-of-Mine (ROM) tonnage estimates for the open pit mines are determined using estimates for the recovery of coal and addition of dilution material during the mining and coal handling process. AMEC has reviewed the factors supplied by GCC. These are specific to each seam and operating area as follows:

Table 17-4: Coal Recovery Parameters – Surface Mining

(in meters)	No.8 and No.2 Area			No.12 Area			No.16 Area		
	Thickness*	Dilution	Loss	Thickness*	Dilution	Loss	Thickness*	Dilution	Loss
4 Seam	6.0	0.15	0.50	6.1	0.15	0.45	7.0	0.15	0.45
5 Seam				1.6	0.15	0.75	1.6	0.15	0.75
6 Seam				1.2	0.15	0.55	1.5	0.15	0.55
7 Seam				2.9	0.15	0.55	2.6	0.15	0.55
8 Seam				1.0	0.15	0.55	1.0	0.15	0.55
10 Seam	3.3	0.15	0.80						
11 Seam	2.1	0.15	0.70						

* Thickness indicative or used as default

For the Clean or Saleable tonnage estimate the following formula is used for the recovery of coal from processing - generally referred to as cleaning or washing the coal:

Yield= (ROM Ash%- Plant Reject Ash %)/ Clean Coal Ash%- Plant Reject Ash%),

where the Plant Reject Ash is 55% and the Clean Coal Ash is 8.5%.

For the Run-of-Mine (ROM) tonnage estimates for the underground mines, the mining limits were adjusted based on the revised geological model as follows:

- seam gradient equal or less than 15 degrees
- a minimum overburden cover of 50 metres from top of seam to surface
- a buffer zone of 20 metres to major faults
- a buffer zone of 50 metres from the open pit highwall.

Coal Recovery Parameters Underground Mining

The reserve estimates for the underground mines are determined using estimates for the recovery of coal and addition of dilution material during the mining and coal handling process. AMEC has estimated these factors based on field observations of the current underground mining operation and the interpretation of the coal seam structures and ground conditions for the projected 12SB2 underground mine.

Recoverable coal tonnages were estimated using the following overall recovery factors considering coal thickness, maximum mining height and coal seam dip: 78% for Zone 7 and 80% for Seam 4. Out of seam dilution material was estimated in 60 cm of rock for Zone 7 and 30 cm of rock for Seam 4.

For estimating Clean or Saleable tonnage for the underground operations, AMEC used the weighted average historical resource yield of 71.3% achieved for No. 7 underground coal for the period between February 2006 and March 2011.

Using these and other factors, GCC engineers, assisted by their consultants, used mining software and digital models to produce a series of economic pits for all the open pit mines at Grande Cache, and underground development and extraction plans for No. 7 and No. 12 South B2 underground mines. AMEC has reviewed these procedures and parameters and determined that the mine designs are valid. AMEC examined the procedures related to the underground mines and determined they were at a level that reserves could be reported. This review is outlined in Section 19.0 Additional Requirements for Technical Reports on Development Properties and Production Properties of this report.

Summary of Coal Reserves

The results are summarized in Table 17-5 and Table 17-6. To comply with NI 43-101, the reserve tables only report Proven and Probable reserves. For coal, it is normal practice to report a Run-of-Mine Coal Reserve and/or a Clean Coal Reserve (Saleable reserve in GSC Paper 88-21). These categories are explained in point form at the start of this section.

Reserves are that part of Resources that have had application of modifying factors and where economic viability has been demonstrated. Because coal resources are inclusive of the coal reserves, the reported ***Reserves and Resources are not additive***. This applies to the Run-of-Mine quantities as well as the Clean Coal quantities.

Table 17-5: Summary of Proven and Probable Run-of-Mine Coal Reserves[1]

	Proven (Mt)	Probable (Mt)	Total (Mt)[2]
Surface Mining Areas			
No. 2 Area	18.00	0.95	18.95
No. 8 Area	23.95	1.02	24.97
No. 12 South A Area[3]	9.71	1.31	11.02
No. 12 North Area	31.25	12.22	43.47
No. 16 Area	19.66	9.65	29.31
Total Surface Mining Areas	102.57	25.15	127.72
Underground Areas			
No. 7 Underground	0.95	-	0.95
No. 12 South B2 Underground	8.21	-	8.21
Total Underground Areas	9.16	-	9.16
Grand Total	**111.73**	**25.15**	**136.88**

NOTES (1) Quality of all reserves classified as Low-Volatile Bituminous (ASTM)
(2) Average ROM quality for reserves is reported in Section 9.0 under the respective mining areas
(3) Planned surface pits only

Table 17-6: Summary of Proven and Probable Saleable Reserves

	Proven (Mt)	Probable (Mt)	Total (Mt)[2]
Surface Mining Areas			
No. 2 Area	12.92	0.65	13.57
No. 8 Area	16.46	0.63	17.09
No. 12 South A Area[3]	6.94	0.91	7.85
No. 12 North Area	22.19	8.92	31.11
No. 16 Area	14.42	6.95	21.37
Total Surface Mining Areas	72.93	18.06	90.99
Underground Areas			
No. 7 Underground	0.68	-	0.68
No. 12 South B2 Underground	5.85	-	5.85
Total Underground Areas	6.53	-	6.53
Grand Total	**79.46**	**18.06**	**97.52**

NOTES (1) Quality of all reserves classified as Low-Volatile Bituminous (ASTM)
(2) Total coal will be marketed as hard coking coal
(3) ROM coal from Table 1-3 multiplied by historic average plant yield for No. 7 area coal
(4) Planned surface pits only
(5) Saleable (Clean) coal reserves are a subset of and not additive to Run-of-Mine reserves
(6) The reserve estimates have been prepared under the supervision of Carel van Eendenburg, P. Eng., Senior Mining Engineer for AMEC Americas Limited and Qualified Person.

18.0 OTHER RELEVANT DATA AND INFORMATION

18.1 Application for Permit Amendment

Some coal reserves and resources are contingent on GCC successfully obtaining the required amendments to the Mine Permit from government regulators. GCC has already successfully obtained the original Mine Permit and subsequent amendments thereto. The methodology and procedure for obtaining amendments is well known by GCC.

The economic analysis and ultimately the total coal reserve estimate for these mining areas assume the successful and timely receipt of the necessary amendments to the permit. If these permit amendments are not received or, if the amendments would contain stringent conditions, then this coal materially affect the economic analysis and possibly the reserve estimate.

It should also be noted that, while the permit amendment for the No. 8 open pit has been issued in December 2009, mine licences for the phases of this development beyond the immediate pit subdivisions are conditional on GCC fulfilling an agreed schedule of commitments. AMEC has no reason to belief that GCC is not capable of meeting this schedule.

18.1.1 No. 12 South B2 Underground Operation

Upon a review of the available options, the No. 12 South B2 deposit adjacent to the current open pit has been selected as the successor of the No. 7 operation for underground development. Access to this deposit can be readily gained from the current highwall; platforms to support this operation have been constructed using waste rock from the adjacent surface pit. Preparations are under way to provide the required infrastructure for the mining operation: water supply, electric power, ventilation and heating infrastructure and communications.

An application for this development was submitted in November 2009. Several requests for supplemental technical information ('SIRs') from the ERCB and AENV have been received and responded to by GCC. Approvals are expected in the near future.

18.1.2 No. 12 South A Surface Area

In order to assure continuous coal availability and quality, the No. 12 South A surface pit was designed as a continuation of prior mining activity in this area and in advance of the planned future underground development. This development is made economically viable by virtue of the recent higher coal prices.

An application to amend the mine permit and mine licence to cover Phase 1 of the No. 12 South A surface pit was submitted in August 2008. An ERCB/Alberta Environment request for additional technical information was received in October 2008. An updated application has been filed in March 2010, which also addressed the supplemental information. Further SIRs have been received and will be addressed in an upcoming application update.

18.1.3 Future Planned Mining Areas

The No. 2, No. 16, and No. 12 North surface pits are planned to supplement or succeed the No. 8 and No. 12 South A surface pits. The No. 16 and No. 12 North pits are located in an environmentally sensitive area, which will necessitate a rigorous approach to the permitting process expected to take several years.

At present, future underground mining is planned to take place in the lower, shallower portion of the No. 12 South A deposit. No definite plans for this development have been established yet.

18.2 Plant Rejects Disposition

In response to the limited availability of storage room for the fine plant rejects, GCC is now dewatering the majority of the fine coal refuse and co-disposing this with the coarse rejects. This material is currently being hauled to the Flood Creek facility, which will be filled to capacity in the next two years. For future tailings disposal GCC is currently investigating the option of using the No. 8 open pit waste dumps to store the mixed rejects.

Reserve estimates for GCC are based on the assumption that there will be a suitable disposition system for the plant rejects, allowing coal processing to continue as planned in the medium and long term.

19.0 ADDITIONAL REQUIREMENTS FOR TECHNICAL REPORTS ON DEVELOPMENT PROPERTIES AND PRODUCTION PROPERTIES

19.1 Mining Operations

As of the date of this report, GCC is producing coal from the No. 7 underground operation and the No. 8 surface operation. Development of the No. 8 East pits commenced in December 2009. Current status and associated material volumes are referenced to April 1, 2011 as this is the beginning of GCC's fiscal year (FY2012).

The development of the No. 12 South A surface pit has been delayed as the application for this mining area is still under regulatory review and is now scheduled for the start of FY2013. The No. 2 pits, essentially continuations of previously mined outcrop pits, lie adjacent to the No. 8 pits and are planned to be brought into production in FY2014. The No. 16 pits are scheduled to commence operations in 2019 once the No. 12 South A pits are nearing completion. The No. 12 North area will be developed last.

The No. 7 underground operation will be completed in 2012 and GCC plans to develop the No. 12 South B2 underground operation starting in August 2011, gaining access to the coal seams from the open pit highwall. Plans are to continue underground operations in the remaining shallow dipping coal seams of the No. 12 South A area.

19.1.1 Mining Method

The surface mines employ the truck and shovel operation generally employed in mountainous areas. The overlaying waste rock is drilled and blasted and then removed in benches. Bench height is 10 or 15 metres, depending on the size of loading units used. The waste is trucked to designated waste storage areas, located within prior disturbed areas wherever practical.

The last layer of waste is then cleaned off coal seams using tracked dozers and smaller backhoe units, and the coal loaded onto coal haulage units for transport to the washing plant. Usually coal from more than one source is produced at the same time to enable a proper coal blend designed to meet customer specifications.

The underground mines utilize the room-and-pillar mining method. The mining activities include development and panel preparation followed by de-pillaring mining. Five-entry panels are usually developed with one belt conveyor system. Mining recovery ranges from 75 to 80% for the different seam thicknesses after de-pillaring the developed panels.

19.1.2 Mine Equipment

Surface Mines

GCC has recently updated its surface mining fleet to enable the planned increase in production rates. A large (27 m^3) hydraulic shovel has joined the existing 21 m^3 unit and a 36 m^3 capacity electric cable shovel was recently commissioned to complete the primary waste loading fleet.

The waste is hauled in large rear dump trucks (220 tonne capacity). The fleet currently consists of eighteen units; further haul truck acquisitions are planned as needed. For coal haulage smaller 90 tonne trucks or contracted 60 tonne tractor-trailer units are used. Two new blast hole drills (35 cm diameter), one electrical and one diesel driven unit, form the primary drilling fleet. The other support equipment in use includes:

- tracked dozers for coal cleaning, shovel support, as well as road and waste dump construction and maintenance;
- road graders for haul road construction and maintenance;
- two 20 m^3 front-end loaders for coal loading and shovel backup;
- backhoes for coal cleaning and recovery, and ditching for water control;
- miscellaneous equipment to support a 24/7 operation.

Underground Mines

The main equipment fleet consists of:

- 5 continuous miners
- 6 shuttle cars
- 6 LHD's (Load-Haul-Dump units)
- 6 roof bolters, and
- 3 feeder-breakers

In order to increase safety and improve coal recovery, GCC is planning to acquire and implement the use of mobile roof supports (MRS) in the depillaring sections later this year. AMEC concurs with this application but emphasizes the need to establish a thorough training program in order to obtain the intended benefits.

19.1.3 Mine Designs

General

All previously designed surface mining areas have been subjected to review in consideration of the increased revenue levels currently expected as well as the extensive upgrade of the geological and mining models. In general this has resulted in larger pits with higher coal volumes at increased strip ratios. In addition, pit, access and waste dumps designs have now been completed in the newly modeled No. 2 and No. 12 North Areas. These have been added to the mining schedule and incorporated in the economic evaluation, supporting the viability of these pit areas at the Pre-Feasibility level.

Figure 19-1 shows the location of the respective mining areas.

No. 8 Pits

No. 8 surface mining area is in the early stages of development. It consists of a series of pits following the synclines and anticlines crossing the Horse Mountain Ridge in a SE-NW direction. Mining commenced in the eastern pits with waste dumps being developed in the draws above Highway 40 and along the top of the ridge. As mining progresses, mined-out areas will be used for waste backfill. Accessing these pits in the steep terrain requires a considerable effort. The pit subdivisions, main access roads and external dumping areas are shown in Figure 19-2

No. 2 Pits

These are basically continuations of the previously mined Reiff Terrace and Barrett pits. The pit designs, access and waste dump designs have been completed and are shown in Figure 19-3.

No. 12 South A Open Pit

This pit is a continuation of a pit developed under previous owners. It is adjacent to the recently mined out No. 12 South B pit and the vast majority of waste will be disposed of in previously disturbed terrain. Figure 19-4 shows the three pit phases and the dump areas.

No. 16 Pit

The No. 16 pit consists of two main areas (East and West Pit) which follow the same syncline system in a SE-NW direction. The area involves a large vertical relief and access is a substantial undertaking. The pit phases, planned access roads and external waste dumps are shown in Figure 19-5.

No. 12 North Pits

This area is the extension of the No. 12 South surface and underground mining areas. Mine designs, including access roads and waste dumps have been completed for the No. 12 North area (Figure 19-6).

No. 7 Underground Operation

GCC has operated this mine since 2004, and it will be mined out by mid-2012. The current status and final configuration of this operation is shown in Figure 19-7.

No. 12 South B2 Underground Operation

This operation will extract the continuation of the major coal seams to the NE of the No. 12 South B2 open pit. During the first six years, a combination of No. 7 and No. 8 seam will be mined; the underlying No.4 seam will be produced from years 4 to 12. The layouts for each of these are shown in Figure 19-8 and Figure 19-9.

The concept for this area is to continue utilizing the underground know-how and equipment to extract the deeper, shallow dipping portions of the No. 12 South A deposit. No designs have been completed for this area, thus this area is categorized as coal resources only.

N

No.16 Area West Pit
No.12N Area West Pit
No.16 Area East Pit
No.12N Area East Pit
No.12SB2 Area Underground
No.12SA Area Pit
No.2 Area Middle Pit
No.2 Area East Pit
No.2 Area West Pit
No.8 Area North Pit
No.8 Area Middle Pit
No.8 Area South Pit
To No.7 Area Underground

0 1000 2000 4000
METRES

Legend

- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

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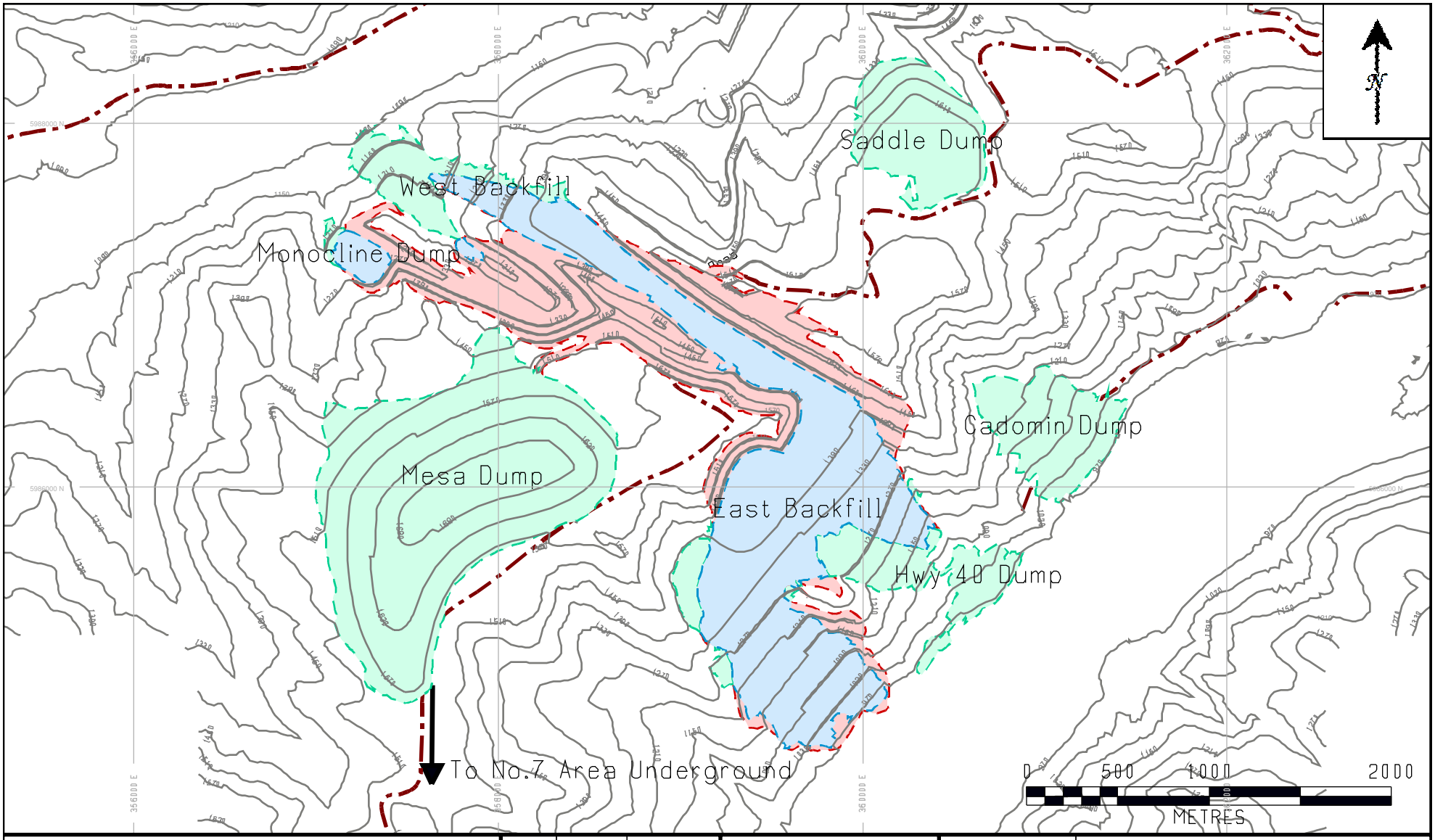
Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-1
	MINE PLAN LAYOUT
	LIFE OF MINE
DRAWING NO.	167519-GCC-170-0001R00



Legend

- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

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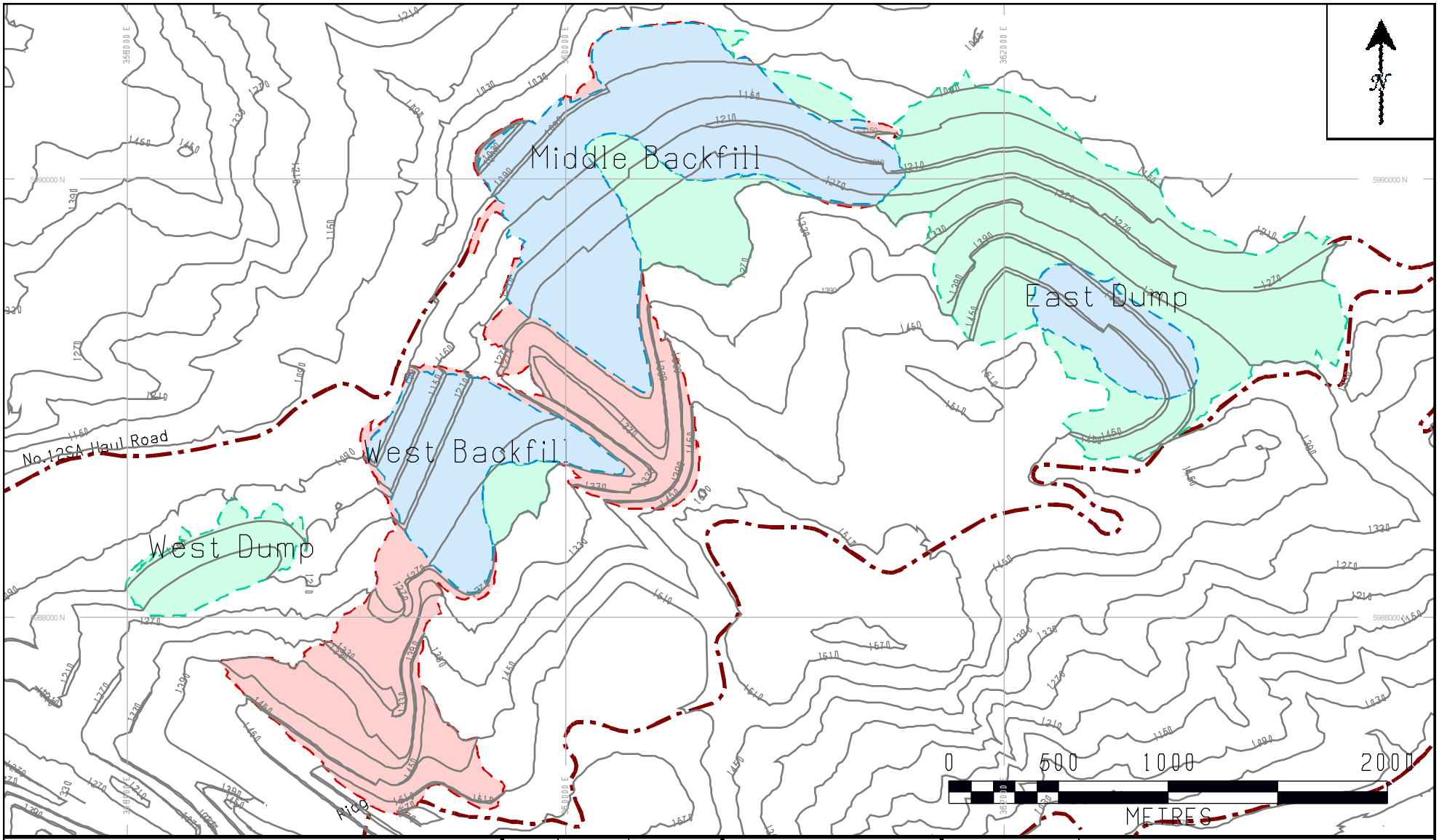
Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-2
	MINE PLAN LAYOUT
	LIFE OF MINE
	No.8 AREA
DRAWING NO.	167519-GCC-170-0003R00



Legend

- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

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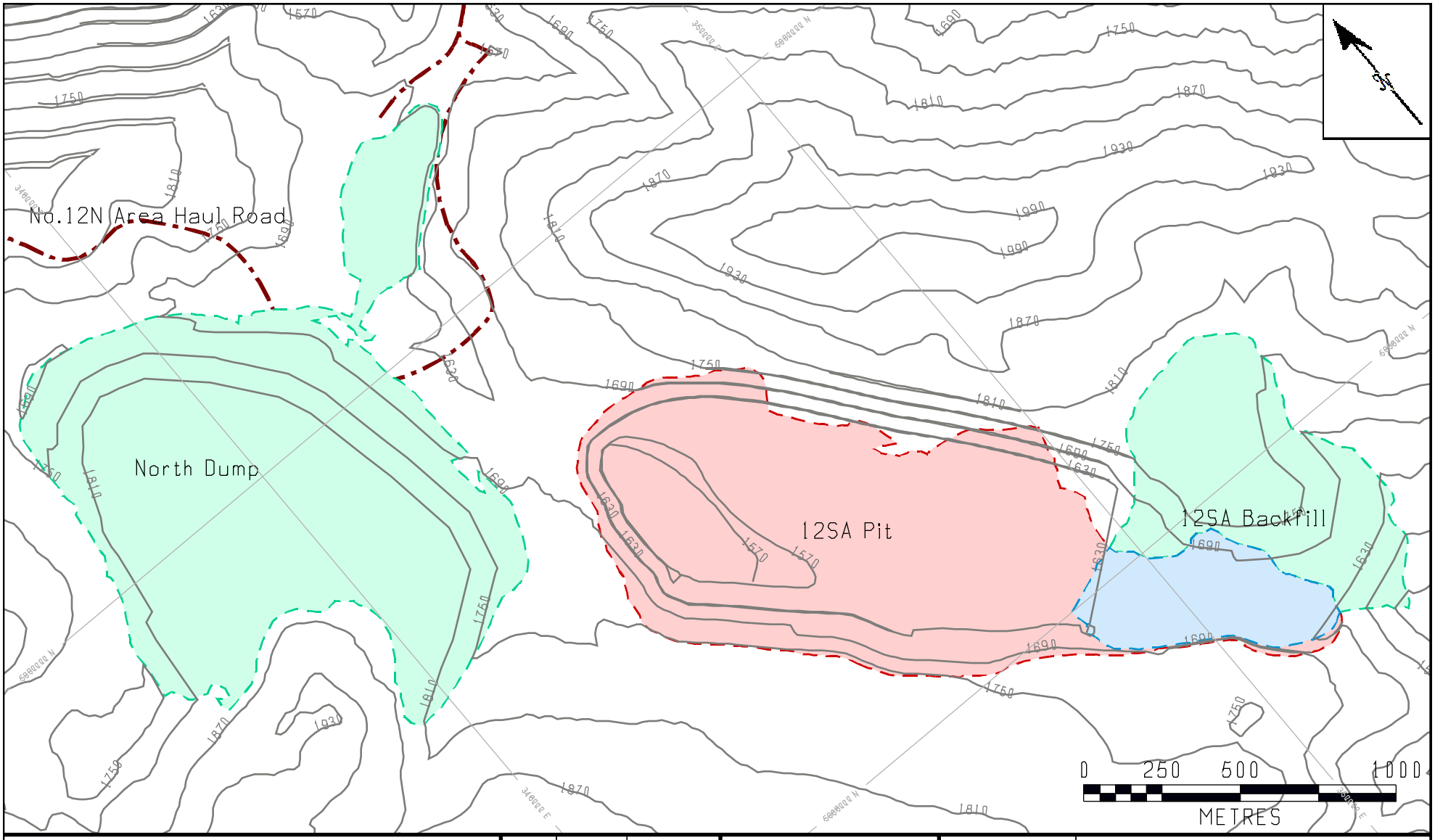
Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-3
	MINE PLAN LAYOUT
	LIFE OF MINE
	No.2 AREA
DRAWING NO.	167519-GCC-170-0004R00



Legend

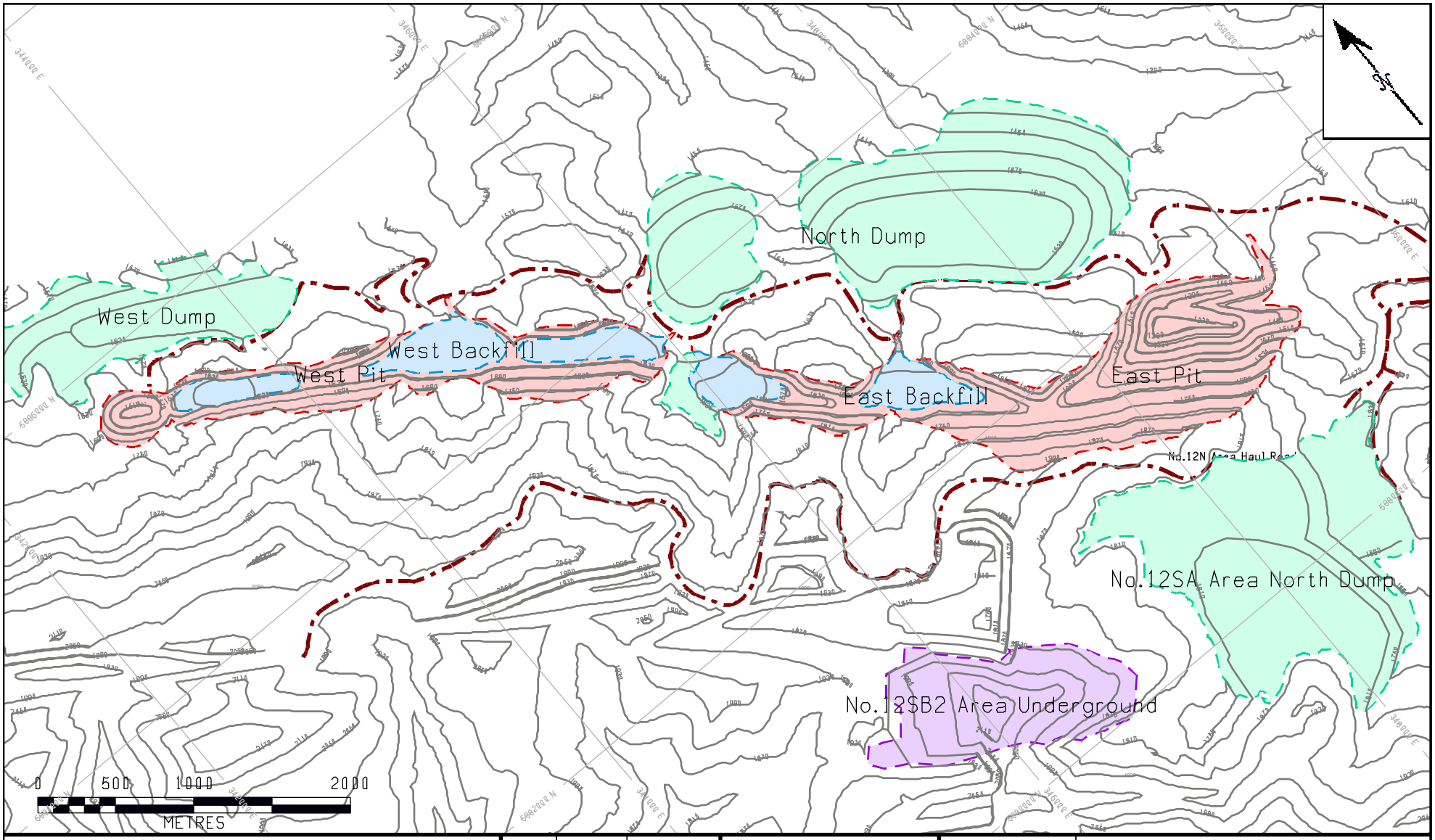
- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

amec

Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-4
	MINE PLAN LAYOUT
	LIFE OF MINE
	No.12SA AREA
DRAWING NO.	167519-GCC-170-0005R00



Legend

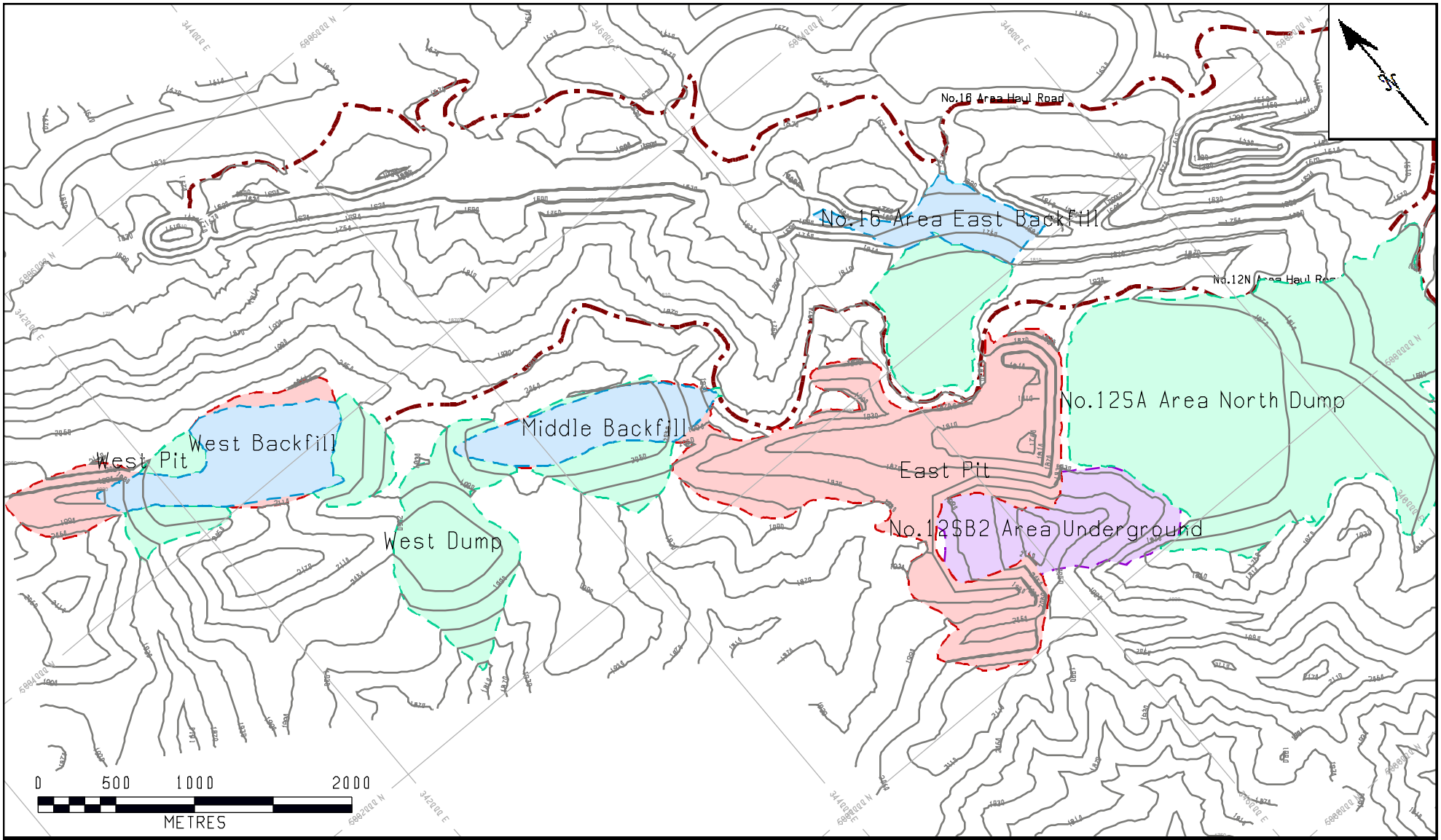
- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

amec

Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-5
	MINE PLAN LAYOUT
	LIFE OF MINE
	No.16 AREA
DRAWING NO.	167519-GCC-170-0006R00



Legend

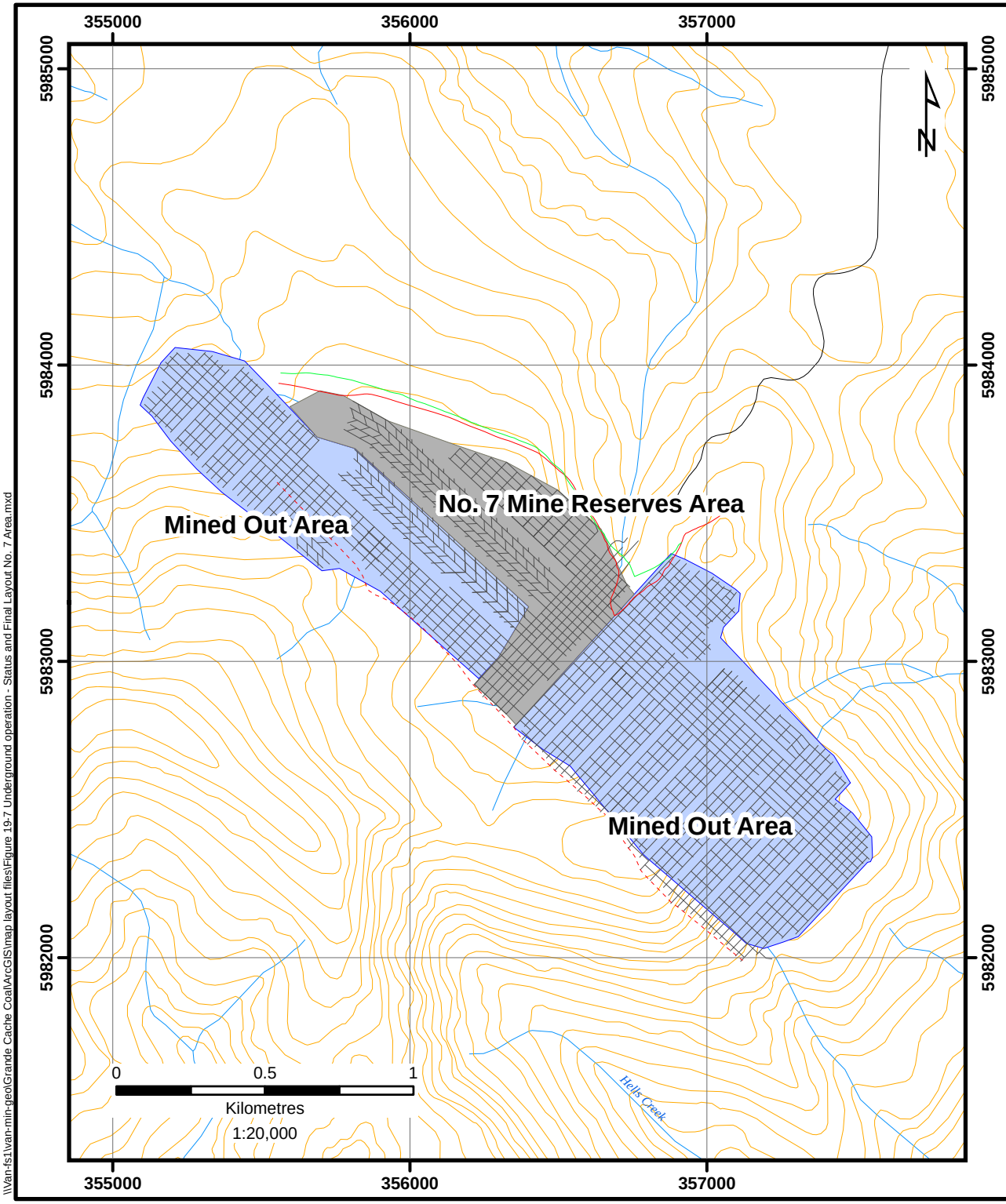
- Contour - 60m
- Pit Area
- External Dump Area
- Backfill Dump Area
- Underground Area
- Road

	BY	YY/MM/DD
DSN		
DRN	TPL	11/06/06
CHK	CvE	

amec

Grande Cache Coal Corporation

AREA	GRANDE CACHE COAL CORPORATION
	NAD83 COORDINATE SYSTEM
PROJECT NO.	167519
SUBJECT	FIGURE 19-6
	MINE PLAN LAYOUT
	LIFE OF MINE
	No.12N AREA
DRAWING NO.	167519-GCC-170-0007R00



Legend

- Mined Out Area
- Mining Reserve Area
- Minimum Overburden - 50m
- Minimum Outcrop - 50m
- Measured Trend
- Underground Workings
- Topographic Contour - 100m
- Road
- Water Course

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

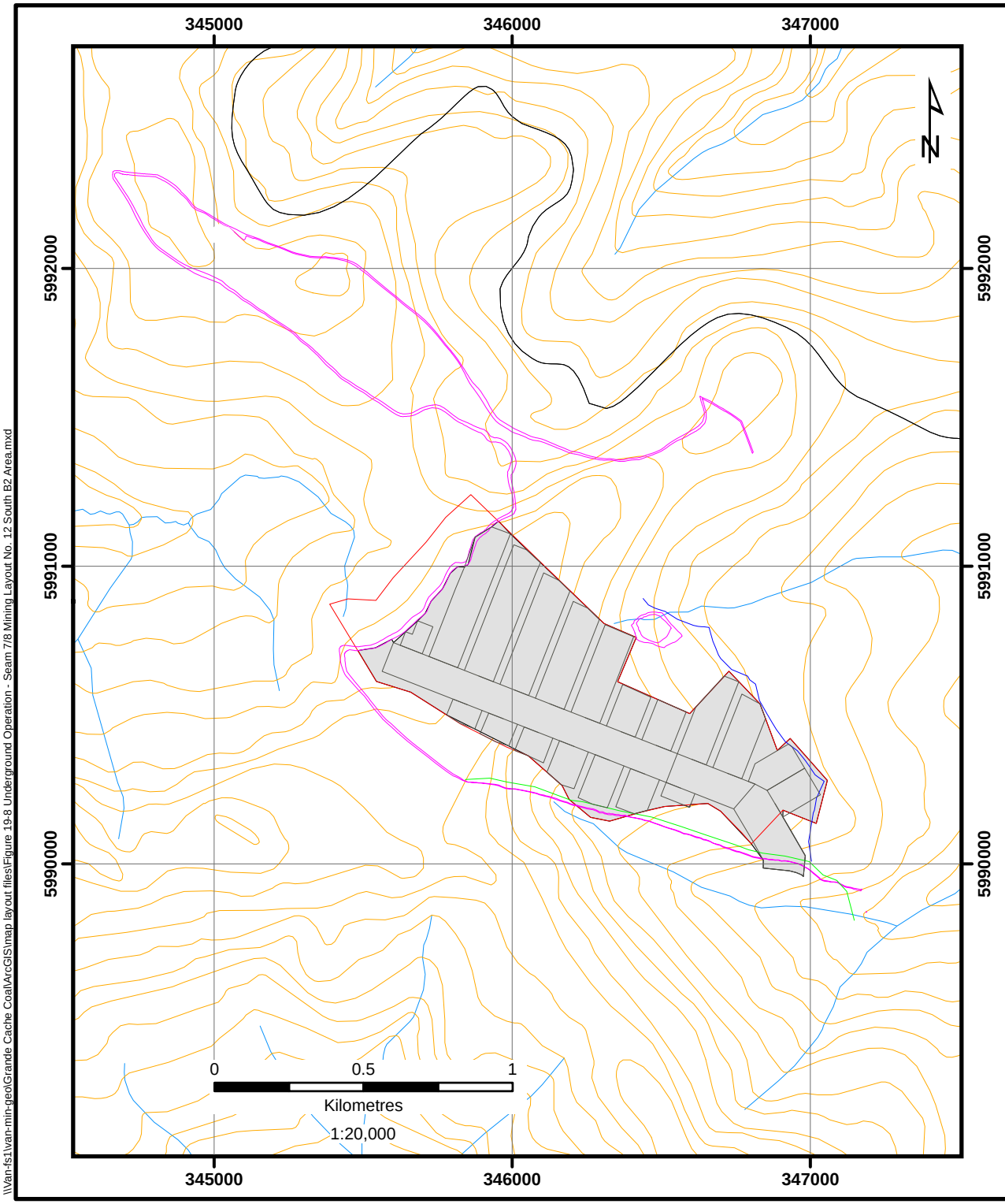
Underground operation - Status and Final Layout No. 7 Area

DATE:	ANALYST:	
June 28, 2011	HK	**Figure 19-7**
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 11 / NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 19-7 Underground operation - Status and Final Layout No. 7 Area.mxd



Legend

- Minimum Overburden cover - 50m
- Buffer Zone to OP Hangwall - 50m
- Limit to Faulted Zones - 20m
- 7 Seam Resource Area
- Lower Gradient Area <15°
- Mining Reserve Area
- Topographic Contour - 100m
- Road
- Water Course

CLIENT: **Grande Cache Coal Corp.**

PROJECT: 2011 NI 43-101 Technical Report

Underground Operation - Seam 7/8 Mining Layout No. 12 South B2 Area

DATE:	ANALYST:	Figure 19-8
June 28, 2011	HK	
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 11 / NAD83

Grande Cache Coal

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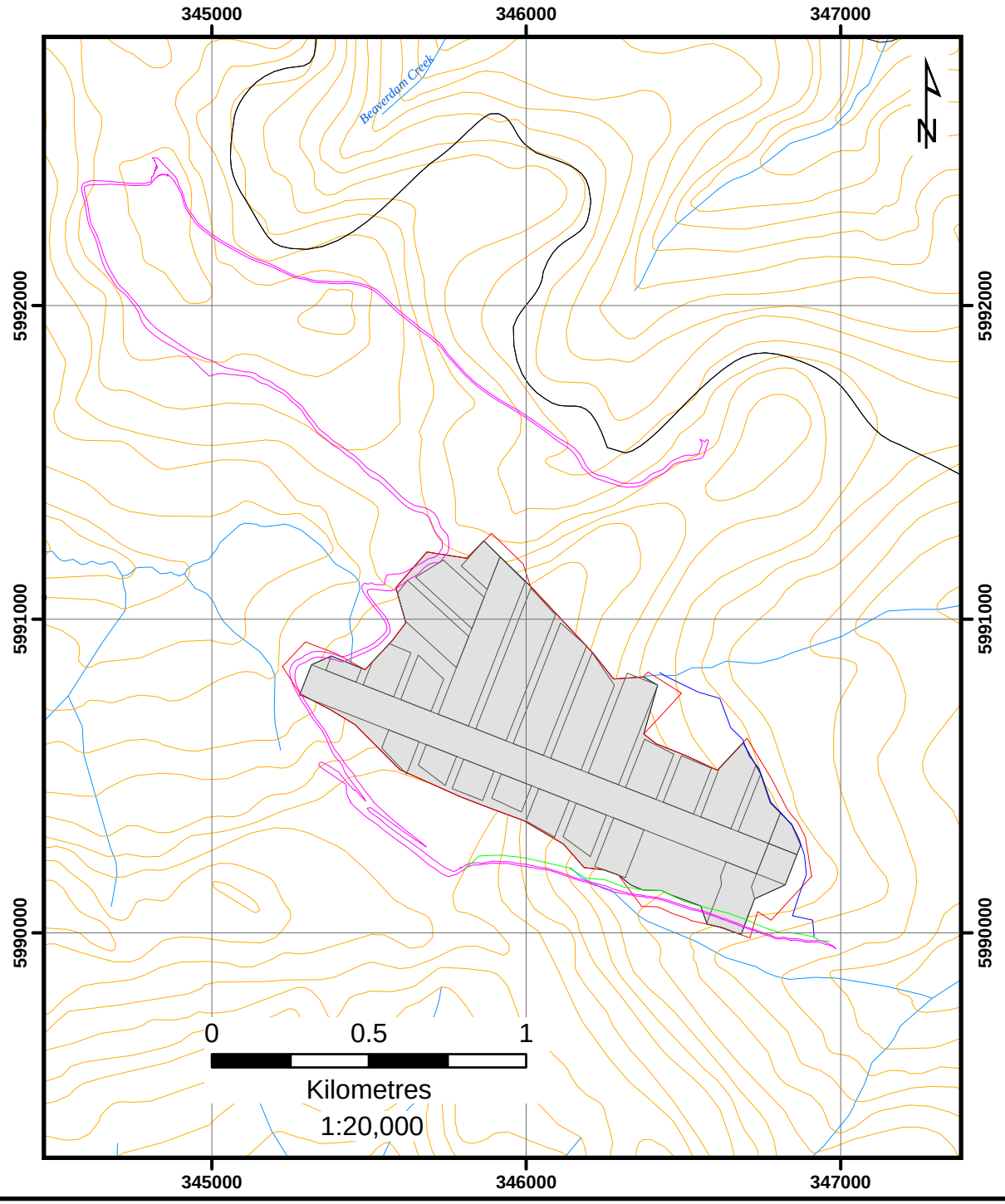
\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 19-8 Underground Operation - Seam 7/8 Mining Layout No. 12 South B2 Area.mxd



Legend

- Minimum Overburden cover - 50m
- Buffer Zone to OP Hangwall - 50m
- Limit to Faulted Zones - 20m
- 4 Seam Resource Area
- Lower Gradient Area <15°
- Mining Reserve Area
- Topographic Contour - 100m
- Road
- Water Course

CLIENT:

Grande Cache Coal Corp.

PROJECT:

2011 NI 43-101 Technical Report

Operation - Seam 4 Mining Layout No. 12 South B2 Underground Area

DATE:	ANALYST:	
June 28, 2011	HK	**Figure 19-9**
JOB No:	QA/QC:	PROJECTION: / DATUM:
167519	CM, MV	UTM Zone 11 / NAD83

Grande Cache Coal

amec

\\Van-fs1\van-min-geo\Grande Cache Coal\ArcGIS\map layout files\Figure 19-9 Operation - Seam 4 Mining Layout No. 12 South B2 Underground Area.mxd

19.1.4 Production Plans

Since GCC resumed operations at the property, production has gradually increased to a level of approximately 1.5 million clean tonnes of coal (MTCC) per year. Supported by the current favourable market for metallurgical coal, GCC is in the process of increasing its production rates. The budget for Fiscal Year 2012 is 2.25 million tonnes and production is planned to increase to the rated plant capacity of 3.5 MTCC annually by FY2014. AMEC has reviewed these plans and considers these production levels achievable with the planned major equipment, based on industry-standard productivity levels.

There is some risk associated with the planned rate of production increase as it will require a considerable effort such that the proposed schedule could potentially slip by a year. If this would occur, there is a risk of a material change to the reported project economics but, in AMEC's opinion, not likely to the point of affecting the viability of any of the reserves.

Table 19-1 shows the current production plan for the first 30 years in more detail:

Table 19-1: Grande Cache Coal Production Plan

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY2022-26	FY2027-31	FY2032-36	FY2037-41
Total Waste (kbcm)	24,414	32,307	36,764	43,985	44,015	42,329	37,365	42,005	38,196	37,377	148,779	156,398	151,867	150,652
Run-of-Mine (ktROM)														
Surface Areas No.8	1,958	2,319	2,613	3,242	2,801	2,229	1,946	2,157	912	421	4,532	529	577	0
No.12 South A	0	50	1,420	198	786	1,464	1,904	1,327	1,321	1,079	1,585	0	0	0
No.2	0	0	274	724	267	35	45	54	618	0	1,479	3,742	3,738	2,899
No.16	0	0	0	0	0	0	0	309	1,059	1,974	6,722	9,545	8,780	1,012
No.12 North	0	0	0	0	0	0	0	0	0	0	3,759	6,185	6,424	15,823
Total O/P	1,958	2,369	4,308	4,165	3,854	3,728	3,895	3,846	3,911	3,474	18,078	20,002	19,519	19,734
Underground No.7	718	255	0	0	0	0	0	0	0	0	0	0	0	0
No.12 South B2	203	739	979	986	1,000	1,048	610	610	611	610	710	0	0	0
Total U/G	921	994	979	986	1,000	1,048	610	610	611	610	710	0	0	0
Grand Total	2,879	3,363	5,287	5,151	4,854	4,776	4,505	4,456	4,522	4,084	18,788	20,002	19,519	19,734
Clean Met. Coal (ktcc)	1,987	2,496	3,412	3,330	3,377	3,396	3,392	2,944	3,163	3,088	13,776	14,180	13,972	14,474
Clean Thermal (ktcc)	268	169	109	120	126	84	105	532	331	337	1,989	1,089	1,254	814
Total Clean Coal (ktcc)	2,255	2,665	3,521	3,450	3,503	3,479	3,497	3,476	3,494	3,426	15,765	15,269	15,227	15,288
Strip Ratio (bcm/tcc)	16.7	16.8	13.2	16.2	16.0	15.7	12.3	13.9	12.6	12.6	9.8	10.2	10.0	9.9

19.1.5 Coal Processing and Recoverability

Coal processing and coal recovery has been described in Section 16.0.

19.2 Site Infrastructure

Provincial Highway 40 is a paved, two-lane road that connects the property with the town of Grande Cache and with the communities of Grande Prairie to the north and Hinton to the southeast. The area is served by an existing branch line of Canadian National Railway (CN), which connects with the main lines, allowing access to the three major coal export terminals in British Columbia and the Great Lakes.

The operation uses the existing coal processing, coal loading, rail and waste storage infrastructure previously owned and operated by Smoky River Coal Limited (SRCL) and predecessor companies over a period of approximately 30 years. A new main pit access road has been constructed on the east slopes of Horse Mountain Ridge to support the development of the No. 8 pits.

Electrical power is available at the plant site from the Alberta Interconnected Electrical grid system and the nearby Milner Power station. A transmission line currently runs across the east side of the No. 8 mining area from the plant site to the No. 7 underground operation. A new transmission line to supply electrical power to the No. 12 South B2 underground and No. 12 South A surface areas is near completion.

19.3 Coal Refuse Facilities

Three existing ponds have been used for the storage of fine coal refuse. Recent reviews indicated no immediate stability concerns with any of the impoundment dykes. GCC monitors stability and groundwater conditions.

As has been done historically, GCC has budgeted for FY2012 to dredge the fine coal refuse and sell it as fuel to the adjacent power station.

GCC has installed a dewatering circuit for the fine rejects and combines most of this material with the coarse rejects using truck haulage. Currently the operation uses a storage facility at Flood Creek which has an estimated remaining life of two years. GCC is planning to back-haul this material with the coal haulage fleet for co-disposal on the active waste dumps. T he timely evaluation of the geotechnical and practical feasibility of this method for the management of the plant refuse is a critical factor to ensure the continued operation of GCC.

19.4 Water Management

All surface water that passes through the various mining areas must be collected and channelled to settling ponds to ensure total suspended solids and other water quality parameters meet the limits set forth in the regulations and GCC's EPEA approval before discharge to the environment. Likewise, groundwater collected in-pit must meet water quality guidelines before discharge to the environment. The EPEA approval amendment process details the necessary steps and safeguards required for water management at the No. 12 South A surface and the No. 12 South B2 underground sites, which will be the same as those currently in operation at the No. 8 and No. 7 operations at GCC.

19.5 Markets

The principal product from GCC is a low-volatile hard coking coal ("Metallurgical coal"), a term used to describe coal products suitable for making steel in the integrated steel mill process. Oxide coal, a secondary product at GCC, may be sold as export coal or to the adjacent H.R. Milner generating station.

The principal market for GCC's coal is the seaborne hard coking coal market, where GCC currently competes primarily with coal producers from Canada, Australia and the United States. As the demand for seaborne hard coking coal continues to outstrip supply, prices have improved substantially from the stagnant levels prior to 2004. Current pricing is a multiple of the historic levels, due to a combination of high demand and limited supply, particularly related to the recent flooding in Queensland, Australia.

The sale of seaborne coking coal has typically been governed under contracts that fix the coal price (in US dollars) for one year and require annual price negotiations. Since 2010, a change in the annual pricing to a quarterly price negotiation has been established to reflect the continuing changes in demand from quarter to quarter.

19.6 Contracts

GCC has signed contracts and completed negotiations for hard coking coal sales on approximately 1.6 million clean tonnes for the coal year commencing April 1, 2011. Contracts are renewed predominantly on an annual basis with price commitments for the coal year defined on both a quarterly and annual basis. Sales negotiations for the 2011 coal year are ongoing with price settlements for the first quarter.

GCC is currently selling coal into the Asia Pacific Rim and Mainland, North America and Europe. Trial cargos are planned into other parts of the world including Europe, Turkey, China and Brazil to further accommodate future production growth.

GCC has a contract with Canadian National Railway for the transport of coal to a terminal on the west coast. Price and car commitment is open to negotiation on a bi-annual basis. A contract is in place with Westshore Terminals located at Roberts Bank near Vancouver, B.C.

GCC is planning a staged expansion of metallurgical coal production to 3.5 million tonnes of product per year (combined open pit and underground production). The marketing plan with rail, port and customers reflects this expansion.

19.7 Environmental Considerations

Mine sites in Alberta require numerous permits, licences and approvals in order to operate, and various regulatory authorities supervise mining operations to ensure that the conditions and standards, which apply to mining activities, are adhered to. Operation of GCC properties will require regular and open communication between management and regulatory authorities as existing permits, licences and approvals require periodic updating and renewal.

New applications will be filed from time to time in order to commence and expand mining operations. In this regard, the No. 8 mining area is currently permitted for mining by Energy Resources Conservation Board (ERCB) and Alberta Environment (AENV). Permitted areas require a Mine Licence from ERCB and a concurrent Alberta Environmental Protection and Enhancement Act (EPEA) approval and Water Act approval from AENV before work commences. These approvals ensure that regulators are satisfied that the mining area can be developed safely, with an acceptable level of effect on the environment through approved environmental management programs, and also detail the reclamation required at the end of the mine life. Similar data and reports will be required prior to mining for the No. 12 South B2 underground, the No. 12 South A, No. 2, No. 12 North and No. 16 surface mining areas.

GCC's area of operations will be contained within the boundaries of the mine permit designated by ERCB. The EPEA approval requires that land disturbed in connection with mining operations be reclaimed by GCC.

GCC's operations in Alberta are also subject to the Fisheries Act (Canada) which prohibits the deposit of a toxic substance into waters that are inhabited by fish and the destruction of fish habitat. Provisions of the Fisheries Act (Canada) require that a permit be obtained to allow new activities or discharges that may impact aquatic habitats, including new operations at river and stream crossings. Further, new operations at rivers, streams or other bodies of water may require an approval under the Navigable Waters Protection Act (Canada). Other federal statutes that apply to GCC's operations include the Canadian Environmental Protection Act, 1999, which regulates the use of substances that are considered to be toxic, and the Explosives Act (Canada), which regulates the use of explosives.

GCC has stated that it is not aware of any matters that would hinder its ability through the normal approval process to obtain or amend the Mine Permit, the mine licences and environmental approvals under which it is required to operate. The applications for the proposed No. 12 South B2 underground operation and the No. 12 South A Pit have addressed the environmental sensitivities; these applications are currently under review by the regulatory agencies.

Concerns from public stakeholders must also be addressed. The time required obtaining the permit and approved amendments for the projects under application is difficult to predict with certainty. Approvals for new mining projects are subject to provisions for public hearings, which could extend the approval process by a number of months.

19.7.1 Releases

Federal and provincial environmental legislation regulates the discharge or release of substances into the environment. Generally, these regulations prohibit unauthorized releases that have an adverse effect or potentially adverse effect on or otherwise impair the environment. GCC has provision for an Environmental Management System ("EMS") that incorporates measures to prevent unauthorized releases and appropriate emergency response procedures and training programs to minimize any environmental impact from its operations. GCC has the elements of an EMS in place in accordance with EPEA Approval 155804-00-03. The EPEA Approval is very prescriptive in monitoring, reporting and data control requirements. GCC has a mine site based Environmental department to carry out the responsibilities, terms and conditions outlined under the EPEA Approval.

19.7.2 Reclamation Activities

GCC has an approved reclamation plan for land disturbed as a result of mining. Reclamation to date has been confined to seeding of road fill areas and erosion control activities, as well as salvage and stockpile of soil materials that will be used later for capping of reclaimed sites. In Alberta, reclamation activities are governed by the approval issued under the EPEA. GCC's EPEA approval requires an additional approval for a Decommissioning and Land Reclamation Plan to reflect "as-built" conditions at the cessation of mining, as well as Mine Abandonment Approval from the ERCB.

Mine operators are required to submit an annual report to the ERCB and Alberta Environment that includes a report on reclamation activities. Inspectors from Alberta Environment regularly inspect sites to confirm compliance with approved reclamation plans. GCC has a reclamation database of over thirty years of revegetation research and monitoring conducted by the Alberta Research Council. The original No. 8 surface mining area was one of the first reclaimed mountain areas in Alberta that has received a Reclamation Certificate under provincial approval. This demonstrates that reclamation in the Grande Cache mining area is achievable.

19.7.3 Reclamation Security

The Alberta Government requires security to be posted for reclamation obligations based on estimated costs to reclaim sites disturbed by mining. This requirement for security is often satisfied by posting letters of credit issued by a Canadian chartered bank. To date GCC has fulfilled their obligations in this manner.

19.7.4 Aboriginal Rights Claims

Canadian courts have recognized that aboriginal peoples may continue to have certain rights at law in respect of land used or occupied by their ancestors where treaties have not been concluded which extinguish those rights. These rights may vary from limited rights of use for traditional purposes to a right of aboriginal title and will depend upon, among other things, the nature and extent of prior aboriginal use and occupation. The courts have encouraged the federal and provincial governments and aboriginal peoples to resolve rights claims through negotiation of treaties.

The Aseniwuche Winewak Nation of Canada has identified a traditional land use area that encompasses a broad area of west central Alberta, including GCC's lease areas. The Aseniwuche Winewak Nation of Canada strives to achieve economic enhancement for its constituents. GCC and the Aseniwuche Winewak Nation signed a joint agreement in February 2005 covering areas of mutual support and environmental monitoring.

In December 2009, GCC and the Aseniwuche Nation of Canada entered into a Memorandum of Understanding, which serves as a “bridging document” to completion of a longer Impact Benefit Agreement (IBA) between the two parties. The IBA is currently being negotiated. In addition, to facilitate effective community and operations level communication, GCC deals with the house holders of the nearest community (Wanyandie Flats) directly with concerns and actions identified through an Action Plan process.

GCC and the Métis Nation of Alberta Association Local Council #1994 signed a Memorandum of Understanding (MOU) on December 22, 2008, regarding mutual support and agreement on goals relating to community relations, business opportunities, employment opportunities and training, and respect for traditional land uses and environmental protection. This MOU is scheduled for renewal in 2011. Both parties have indicated interest in this extension.

19.8 Taxes

The real property holdings of GCC are held through Alberta Crown coal leases. Alberta Crown coal leases are granted, under the Mines & Minerals Act (Alberta). Annual lease rental rates are $3.50 per hectare. Bituminous coal under Crown coal lease is subject to royalties which are levied based on revenue generated by the sale of the coal resource net of the related transportation costs of the marketable coal. Royalties are based on a two-tiered system with an initial rate of one percent of the net revenue of marketable coal produced from the Crown coal leases per month. Following the date when the cumulative net revenue of the coal mine equals or exceeds the aggregate of the allowed cumulative project costs and a 10% return allowance of the project, an additional royalty on bituminous coal is payable to the Crown, the value of which is equivalent to 13% of the net cash flow earned from Crown leases for a calendar year.

19.9 Capital and Operating Costs Estimates

The predicted site operating cost parameters provided by GCC have been reviewed and tested against benchmark costs and available data from similar operations. GCC has acquired new, larger surface mining equipment for use at the No. 8 and No. 12 South A open pits. This will allow the smaller trucks to be used to haul the coal to a conveyor feeding arrangement located near the existing plant, reducing the requirement for contract coal haulage. AMEC recognizes the potential that the future operating cost would improve as the workforce stabilizes and the mine becomes established at the higher production rates.

The current plant operating cost is in the upper quartile of costs in the industry. This is related to the high cost of operating supplies – notably magnetite - and maintenance (parts and labour) due to the fact that the plant has to run so many aged, less efficient components to reach its capacity. The projected unit cost takes into account higher plant throughput rates and more efficient operation related to the planned upgrades.

The acquisition of the new mining equipment fleets, combined with the cost of developing the new mining areas and associated infrastructure require a high level of capital expenditure during the next few years. Ongoing capital will be required for additions to the equipment fleet, planned equipment replacements as well as a reasonable level of sustaining capital.

19.10 Economic Analysis

AMEC performed an economic analysis on a non-inflated pre-tax basis over a 30 year period. The applied operating costs include all on-site costs (mining, haulage, processing and general and administration), the off-site costs (rail haulage, port charges and quality assurance) as well as all overhead costs.

The analysis uses the following sale price assumptions for metallurgical coal (CAN$/tonne FOB Vancouver), considered conservative under current coal market conditions:

FY2012	FY2013	FY2014	FY2015 - on
$200	$185	$165	$150

The results of this analysis are shown in Table 19-2.

Table 19-2: Summary of Economic Analysis

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY2022-26	FY2027-31	FY2032-36	FY2037-41	TOTAL
Met. Coal Sales (Mtcc)	2.0	2.5	3.4	3.3	3.4	3.4	3.4	2.9	3.2	3.1	13.8	14.2	14.0	14.5	87.0
Revenue (M$)	397	462	563	500	507	509	509	442	475	463	2,066	2,127	2,096	2,171	13,286
On-Site Cost (M$)	220	259	324	351	379	368	309	351	287	275	1,051	1,127	1,046	1,039	7,385
Off-Site Cost (M$)	57	79	104	98	100	100	100	87	93	91	406	418	412	427	2,573
Cost of Sales (M$)	276	337	428	449	478	468	409	438	381	366	1,458	1,546	1,459	1,466	9,958
Capital Cost (M$)	80	121	87	77	27	31	29	15	18	23	116	93	46	9	773
Net Cash Flow (M$)	41	4	48	-26	1	10	71	-12	76	74	493	488	591	697	2,556
Cumulative DCF @ 8%															684

The base case shows a pre-tax NPV at an 8% discount rate of $598 million. The sensitivity analysis is shown in Table 19-3. The project is most sensitive to the selling price in $CAN. The project appears far less sensitive to changes in capital requirements.

Table 19-3: Sensitivity Analysis

Variable	Base Less 10%	Base Case	Base plus 10%
Cost of Sales	1,101	684	267
Capital Cost	732	684	636
Revenue	156	684	1,184

Considering the current volatility in metallurgical coal prices, the following shows the Net Present Value of the property at larger revenue increments:

Revenue (CND/tonne FOB, FY2013 on)	$120	$150	$180	$210	$240
Net Present Value @ 8% (M$)	-285	648	1,565	2,482	3,415

19.11 Risk Statement

The financial results presented in this report represent forward looking information regarding future projections of mining operations and resulting cash flows. By its nature, forward-looking information involves a number of assumptions, known and unknown risks and uncertainties, which could cause actual results to differ materially from those forecasted. These risks include, but are not limited to the future price of coal, rail freight rates and availability of coal cars to transport the coal to port. There may be inflation of input costs such as diesel, steel, magnetite and labour as well as mining equipment. The high activity in the mining industry and other industries that rely on large earth moving equipment may cause delays in delivery of mining equipment. Shortage of skilled personnel is an industry wide issue. There can be delays in obtaining or renewing mining permits. Concerns over greenhouse gas emissions and associated legislation may place additional costs on coal mining operations or negatively impact the market for coal.

GCC proposes an aggressive schedule to increase the production rates to 3.5 million tonnes per annum, which involves rapid development of new mining areas and ramp-up of the plant production from recent levels of 1.7 MTCC/y. There is a risk of being unable to achieve these rates within the projected two-year period; however this should not affect the viability of the coal reserves.

Critical to achieving these plans is the requirement to obtain the necessary regulatory approvals in a timely manner as well as a successful strategy to dispose of the plant refuse streams.

19.12 Payback and Mine Life

Payback of initial capital is not relevant as this is an operating mine.

The mine life for the combined operation as currently scheduled is approximately 35 years starting in April 2011 (GCC's FY 2012). This includes all designed mining areas previously discussed.

20.0 INTERPRETATION AND CONCLUSIONS

AMEC has the following conclusions regarding the mining operations at Grande Cache Coal Corporation:

- it is reasonable to expect that the coal in the combined open pit and underground operations can be mined, processed, and shipped to market at a profit given the processes described and the estimated prices for the final saleable products;

- the costs and assumptions for coal recovery, mining, and processing are reasonable;

- it will take a considerable effort to increase coal production at the rate projected by GCC; however, delays in the order of a few years will not likely deteriorate the cash flows to the point where any of the reserves are not viable;

- future drilling programs require the retrieval of coal for sample analysis purposes. The current data base for the open pit deposits consists predominantly of data from previous mine operations along with some calculated quality from down hole geophysical logs. GCC is in the process of upgrading this data base with new sample data from coring;

- the capital cost applied in the economic analysis includes the cost for developing new underground and open pit deposits, the necessary plant upgrades and sustaining capital for the operation. This also includes an allowance for regular exploration drilling programs to continue to provide coal samples for analysis. The remaining recommendations would be performed by GCC engineering personnel at an estimated cost of $200,000 - $400,000 for staff time.

21.0 RECOMMENDATIONS

AMEC recommends that Grande Cache Coal Corporation:

- continue their efforts to obtain the mining permit and licence amendment for the new mining areas - No. 12 South A surface and No. 12 South B2 underground;
- establish operating procedures and design guidelines at the proposed No. 12 South B2 underground operation to reduce the effect of dynamic loads and stress transfer to the operation in the 4 seam caused by the mining of upper seams 7 and 8;
- establish monitoring procedures to assess the effect on surface subsidence at the proposed No. 12 South B2 underground operation by the cumulative effect of mining 7 and 8 seams followed by the mining of 4 seam;
- commence the process to seek regulatory approvals to mine the remaining phases of No. 12 South A surface mining area;
- start the necessary data acquisition and analysis in the No. 2 and No. 16 mining areas in preparation for the permit application for this operation;
- perform a reconciliation between the exploration quality data and the operational quality data. Run-of-mine coal samples should be compared to calculated values in the data base to determine if the calculation formula continues to be accurate. Based on spread sheet data reviewed by AMEC for 2008 production, the ash % values for the operational coal samples appeared to be close to the estimates, but this should be confirmed for current operations;
- acquire additional coal quality data from drilling programs to augment the historical data;
- determine on a priority basis, the feasibility of the proposed method of co-disposal of the plant refuse streams with mine waste material, in terms of geotechnical requirements and operational considerations;
- complete the study to evaluate upgrade options to the plant circuitry, in order to improve the throughput rate, reliability and efficiency of the facility and establish an implementation plan.

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22.1 Definitions

"adit"	a horizontal opening to access a coal seam;
"anticline"	a fold, generally convex upward, whose core contains the stratigraphically older rocks;
"ash"	ash forming constituents which may be subdivided into two basic classes: those that are structurally a part of the coal and hence inseparably mixed with it and segregated impurities that can be eliminated to a greater or lesser extent by ordinary cleaning methods;
"as-received"	represents an analysis of a sample as received at a laboratory
"ASTM"	the American Society for Testing Materials;
"BCM"	bank cubic metre, which represents one cubic metre of material measured prior to disturbance;
"bedrock"	consolidated rock underlying the Earth's surface
"bituminous coal"	a class of coal having heat values, calculated on an ash-free basis, typically ranging from 24,400 to 32,600 KJ/kg, commonly used for utility and industrial steam purposes and in the steel-making industry, for making coke or for pulverized coal injection into the blast furnace;
"BTU"	British thermal unit; the amount of heat needed to raise the temperature of one pound of water by one degree Fahrenheit;
"BTU/lb"	BTUs per pound, an imperial unit of measure used to describe the amount of heat released on combustion of a pound of material, such as coal, under specific conditions;
"clean coal"	Coal that has been processed to meet metallurgical coal market specifications.
"climate"	the statistical description of the weather of a region averaged over a period of, typically, 30 years
"coal"	readily combustible rock containing more than 50% by weight and more than 70% by volume of carbonaceous material, including inherent moisture, formed from compaction and alteration of various plant remains
"coal field"	region in which deposits of coal occur
"coal processing plant"	a facility for crushing, sizing, or washing coal to prepare it for sale;
"coal rank"	the qualitative classification of coal from lignite to anthracite based on calorific content and other qualitative and quantitative characteristics;
"coal washability"	the analysis of the specific gravity distribution of chemical and physical characteristics of coal;
"coke"	a hard, dry carbon substance produced by heating coal to a very high temperature in the absence of air, used primarily in the manufacture of iron and steel;

"coking coal"	metallurgical coal that exhibits the physical and chemical properties that are necessary to form coke;
"continuous miner"	a mining machine designed to remove coal from the face and to load that coal into cars or conveyors without the use of cutting machines, drills or explosives;
"cross-section"	diagram of a vertical section through a volume of the Earth's subsurface generally drawn normal to the strike direction
"depillar"	the retreat mining of pillars left in place during development;
"dip"	the angle at which a stratum is inclined from the horizontal, measured perpendicular to the strike and in the vertical-plane;
"drainage basin"	area that gathers water which contributes to a body of water
"drillhole"	a circular hole made by drilling either to explore for minerals or to obtain geological information;
"dry basis"	coal that has moisture removed by prescribed laboratory procedure or excluded by calculation;
"excavator"	see "shovel"
"fault"	a fracture in rock along which the adjacent rock surfaces are differentially displaced
"fixed carbon"	the solid residue, other than ash, remaining after the volatile matter has been liberated from coal during combustion;
"float/sink"	a laboratory procedure which measures the floating and sinking of particles of material of various size fractions in heavy liquids at various specific gravities;
"free swelling index" or "FSI"	a number assigned to particular coal used in determining its suitability for coke making or other uses. The index, from one to nine, is determined by tests established by ASTM standards;
"front end loader"	a wheel loader with a digging bucket mounted on the front end that dumps;
"froth flotation"	a process for recovering particles of coal or other minerals, in which the particles adhere to bubbles and can be removed as part of the froth;
"geophysical log"	a graphic record of the measured or computed physical characteristics of the rock section encountered in a borehole, plotted as a continuous function of depth;
"groundwater"	water present below the surface of the Earth
"highwall"	the unexcavated face of exposed overburden and coal or ore in an open-cast mine or the face or bank of the uphill side of a contour strip-mine excavation;
"interburden"	the waste material located between economically recoverable resources;
"ISO"	International Organization for Standardization, a worldwide federation of national standards bodies;

"isopach"	the a real extent and thickness variation of a stratigraphic unit in geology;
"KJ/kg"	kilojoules per kilogram, a metric unit of measure used to describe the amount of heat released on combustion of a kilogram of combustible material, such as coal, under specific conditions;
"lease"	a contract between a landowner and a lessee, granting the lessee the right to search for and produce coal upon payment of an agreed rental, bonus and/or royalty;
"LOM Plan"	Life of Mine Plan, referred to the production schedule for the entire mine as designed;
"MBCM"	million BCM;
"metallurgical coal"	the various grades of coal suitable for making steel and includes coking coal and PCI coal;
"mineable"	capable of being mined under current mining technology and environmental and legal restrictions, rules and regulations;
"out-of-seam dilution" or "OSD"	the contamination of mined coal with rock outside of the coal seam being mined;
"outcrop"	coal which appears at the surface; the intersection of a coal seam with the surface;
"overburden"	materials that overlie a mineral deposit;
“parting”	layer of non-coal material between separate coal seams
"PCI"	pulverized coal injection, a process in which coal is pulverized and injected into a blast furnace. Those grades of coal used in the PCI process are generally non-coking. However, since such grades are utilized by the metallurgical industry, they are considered to be a metallurgical coal. PCI grade coal is used primarily as a heat source in the steel making process in partial replacement of high quality coking coals which are typically more expensive;
"pit"	an open excavation from which the raw mineral being mined is extracted;
"portal"	the surface entrance to an underground mine;
"processing plant"	a facility where coal is prepared for market or other usage. It consists of equipment that separates coal from impurities. Coal is washed, thermally or mechanically dried, sized, stored and loaded for shipment or conveyed to use point;
"proximate analysis"	a laboratory analysis to determine the percentage by prescribed methods of moisture, volatile matter, fixed carbon and ash;
"raw coal"	coal from the breaker that has not been processed in a processing plant;
"reclamation"	the rehabilitation of land at a mining site after the coal is extracted to a standard of land capability as existed before mining. Reclamation operations are usually conducted as production operations are taking place elsewhere at the site. This process commonly includes re-

	contouring or reshaping the land to its approximate original appearance, restoring topsoil and planting native grasses, trees and ground covers;
"Rmax" or "RoMax"	the mean maximum reflectance, an index of the coke making potential of the coal
"room-and-pillar mining"	a system of mining in which the coal is mined in rooms separated by pillars, which are subsequently mined;
"rotary drill"	a drill machine that rotates a rigid, tubular string of rods to which is attached a bit for cutting rock to produce boreholes;
"royalty"	a share of the product or profit reserved by the owner for permitting another to use the property;
"run of mine coal" or "ROM"	the coal produced from the mine before it is processed;
"saleable coal"	the shippable product of a coal mine or processing plant. Depending on customer specifications, saleable coal may be ROM, crushed-and-screened (sized) coal, or the clean coal from a processing plant;
"seaborne metallurgical coal"	metallurgical coal that is exported by ocean going ship from the producing country to the consuming country;
"seam"	large deposit or layer of coal
"shovel"	a large electric or diesel powered machine used in the open pit mining process to remove and load overburden or coal;
"shuttle car"	self-discharging underground equipment used for receiving coal from the mining machine and transferring it to an underground loading point or belt conveyor system;
"strike"	the course or bearing of an inclined bed, vein or fault plane on a level surface; the direction of a horizontal line perpendicular to the direction of the dip;
"strip ratio"	the ratio of the volume of overburden moved to the tonnage of coal produced, measured in terms of BCM of overburden per tonne of coal produced. A lower strip ratio is an operational advantage because less overburden has to be removed in order to expose the raw coal;
"surface mine"	a mine in which the mineral deposit lies sufficiently near the surface to be extracted by removing the overburden;
"syncline"	a series of flat-lying rock strata that has been folded into a trough-like geological structure;
"thrust fault"	a fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall;
"tonne"	a metric tonne, which is approximately 2,205 pounds, as compared to a "short" ton, which is 2,000 pounds, or a "long" ton, which is 2,240 pounds. Unless expressly stated otherwise, the metric tonne is the unit of measure used in this document;
"tunnel way"	a long, narrow, horizontal or nearly horizontal underground passage that is open to the atmosphere at both ends;

"underground mine"	a mine that is located below the earth's surface. Coal is removed mechanically and transferred by shuttle car or conveyor to the surface;
"volatile matter"	those products, exclusive of moisture, given off by a material such as gas or vapour, determined by definite prescribed methods, which may vary according to the nature of the material; and
"yield"	the ratio of the clean coal product to the raw coal plant feed, expressed as a percentage.

22.2 Abbreviations, Symbols, and Acronyms

Above mean sea level	amsl
Annum (year)	a
Billion years ago	Ga
British thermal unit	Btu
Centimetre	cm
Cubic centimetre	cm^3
Cubic metre	m^3
Day	d
Days per week	d/wk
Days per year (annum)	d/a
Degree	°
Degrees Celsius	°C
Diameters	ø
Dry metric ton	dmt
Gigajoule	GJ
Gram	g
Grams per litre	g/L
Grams per tonne	g/t
Greater than	>
Hectare (10,000 m^2)	ha
Hertz	Hz
Horsepower	hp
Hour	h
Hours per day	h/d
Hours per week	h/wk
Hours per year	h/a
Kilo (thousand)	k
Kilocalorie	kcal
Kilogram	kg
Kilograms per cubic metre	kg/m^3
Kilograms per hour	kg/h
Kilograms per square metre	kg/m^2
Kilometre	km
Kilometres per hour	km/h
Kilonewton	kN
Kilopascal	kPa
Kilovolt	kV
Kilovolt-ampere	kVA
Kilovolts	kV
Kilowatt	kW
Kilowatt hour	kWh
Kilowatt hours per tonne (metric ton)	kWh/t
Kilowatt hours per year	kWh/a
Less than	<
Litre	L
Litres per minute	L/m
Megavolt-ampere	MVA
Megawatt	MW
Metre	m
Metres above sea level	masl

Metres per minute	m/min
Metres per second	m/s
Metric ton (tonne)	t
Micrometre (micron)	µm
Milliamperes	mA
Milligram	mg
Milligrams per litre	mg/L
Millilitre	mL
Millimetre	mm
Million	M
Million tonnes	Mt
Minute (plane angle)	'
Minute (time)	min
Percent	%
Second (plane angle)	"
Specific gravity	SG
Square centimetre	cm2
Square kilometre	km2
Square metre	m2
Thousand tonnes	kt
Tonne	t
Tonnes per day	t/d
Tonnes per hour	t/h
Tonnes per year	t/a
Year (annum)	a