

BC Geological Survey
Coal Assessment Report
985



COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: Coal Mountain Phase 2 Property Coal Assessment Report 2013

TOTAL COST: \$4,000,000

AUTHOR(S): M. ZRAL (P. Geo.), A. Hodgins

SIGNATURE(S):

"Signed and Stamped"

Martin Zral, P.Geo.

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): CX-5-008 (amended)

STATEMENT OF WORK EVENT NUMBER(S)/DATE(S):

YEAR OF WORK: 2013

PROJECT NAME: Coal Mountain Phase 2 Exploration

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE: DL 4589

COAL LICENSE(S) IN PROJECT AREA ON WHICH NO PHYSICAL WORK WAS DONE OVER
THE CURRENT REPORTING PERIOD:

CL# 327736, 327797, 327798, 327799, 327800, 327801, 327802, 327803

BC MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: Mine #1630133

MINING DIVISION: Fort Steele

NTS / BCGS:

LATITUDE: _____ ° _____ ' _____ "

LONGITUDE: _____ ° _____ ' _____ " (at centre of work)

UTM Zone: 11 EASTING: 654308 NORTHING: 5497244

OWNER(S): Teck Coal Limited

MAILING ADDRESS: 609 Douglas Fir Rd, Sparwood, BC, V0B 2G0

OPERATOR(S) [who paid for the work]: Same

MAILING ADDRESS: Same

REPORT KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude. **Do not use abbreviations or codes**):

Interbedded sequence of sandstones, siltstones, silty shales, mudstones, and medium to high volatile bituminous coal from the Mist Mountain Formation. The region is structurally complex, containing extensive thrust and normal faulting and some folding.

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK (in metric units)	ON WHICH TENURES
GEOLOGICAL (scale, area)			
	Ground, mapping	8000 Metres	DL 4589
	Photo interpretation		
GEOPHYSICAL (line-kilometres)			
	Ground (Specify types)		
	Airborne (Specify types)		
	Borehole		
	Gamma, Resistivity, Resistivity	8142 Metres	DL4589
	Caliper	8142 Metres	DL4589
	Deviation	7406 Metres	DL4589
	Dip	5939 Metres	DL4589
	Others (specify): Density	8142 Metres	DL4589
	Core		
	Non-core		
SAMPLING AND ANALYSES			
Total Number of Samples			
151	Proximate		DL4589

0	Ultimate		
135	Petrographic		DL4589
135	Vitrinite reflectance		DL4589
4	Coking		DL4589
149	Wash tests (lab scale)		DL4589
PROSPECTING (scale/area)			
PREPARATORY/PHYSICAL			
Line/grid (km)			
Trench (number, metres)			
Bulk sample(s)			

A portion of Section IV, Appendix C, and Appendix E remain confidential under the terms of the Coal Act Regulation, and have been removed from the public version.

http://www.bclaws.ca/civix/document/id/complete/statreg/251_2004

**Coal Mountain Phase 2 Property
Coal Assessment Report
2013 Exploration Program**

Table of Contents

I.	Introduction	8
1.	General Geography and History.....	8
2.	Access.....	10
II.	Geology	10
1.	Stratigraphy	10
2.	Structure.....	11
III.	2013 Exploration Project.....	13
1.	Objective	13
2.	Summary of Work Done	13
3.	Results	14
IV.	Conclusion.....	15

List of Illustrations

<u>Illustration No.</u>	<u>Description</u>
1	a. Property Lease Map - Coal Property Scale: 1:125,000
	b. General Geology Map and Cross Section Lines Scale: 1:15,000
2	a. 2013 Coal Mountain Phase 2 Drill-holes Scale: 1:20,000
	b. Geological Cross-Section A-A' Scale: 1:10,000
	c. Geological Cross-Section B-B' Scale: 1:10,000

List of Appendices

- A. Coal Mountain Phase 2 Coal Leases
- B. Drill-hole Logs
 - i) Hole collar survey
 - ii) Geophysical Logs
- C. Sample Analysis
 - i) EVES Proximate Analysis, Sulphur, FSI, and Reflectance
 - ii) Pearson Petrography
 - iii) Hazen LDRF Mass Balance Reports
 - iv) GWIL LDRF Clean Coal Analysis
 - v) ALS LDRF Coking Analysis
- D. Cost Statement
- E. Modeling Method and Parameters

Statements of Author's Academic and Professional Qualifications

CERTIFICATE OF QUALIFIED PERSON

Name: Martin Zral, P.Geol.

Company: Teck Coal Limited

Address: 609 Douglas Fir Road
Sparwood, BC
VOB 2G0
Phone: (250) 425-8221

I, Martin Zral, P.Geol., am employed as a Senior Geologist, Supervisor at Sparwood Operations. This certificate applies to the report titled "Coal Mountain Phase 2 Property, Coal Assessment Report, 2013". I graduated from the University of Calgary with a Bachelor of Science Degree in Geology, 1978. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (#19033). Since 1978 I have worked as a Geologist in the coal mining industry in Canada. 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).

"Signed and Stamped"

Martin Zral, P.Geol.

Coal Mountain Phase 2 Property Coal Assessment Report 2013

I. Introduction

1. General Geography and History

The Coal Mountain Phase 2 (CMO2), formerly Marten Wheeler, property is located approximately 10km south-east of the town of Sparwood, in the SE corner of British Columbia. The area of investigation is about 4kms north-to-south and 3kms east-to-west in dimension. It is geographically bounded by Hosmer Ridge to the west, Michel Creek to the east, Little Wheeler Creek to the north and Carbon Creek to the south. The CMO2 property is proposed to be a satellite pit for the Teck Coal Ltd., Coal Mountain Operation situated 15km to the south-east. Coal Mountain is some 1,175 kilometers, by rail, from the Vancouver, British Columbia coal ports. The climate at the property is characterized by moderate summers and cold snowy winters.

The CMO2 Property is 100% owned and managed by Teck Coal Ltd. The fee simple land was acquired from Crowsnest Resources, a subsidiary of Shell Canada, by Kaiser Resources Ltd. in 1969 as part of the Balmer Mine Operation. The BC government purchased the Balmer Mine from Kaiser in the late 1970's due to the attractiveness of high natural resource revenues. The BC Government placed the Balmer Mine within the operating jurisdiction of the Westar Group, a collection of publicly traded companies owned by the BC Government. The BC Government sold stocks of Westar Mining Ltd. on the BC Stock Exchange in an effort to spread the benefits of the profitable coal market throughout the province. The stocks were labeled as a lucrative and secure investment, and many people invested heavily. Through a series of poor financial investments in the petroleum sector, poor coal prices in the late 1980's and eventually a labour dispute in 1992, Westar Mining declared bankruptcy and the property was purchased by the Teck Corporation, in late 1992. In 2003, the property was part of an agreement to amalgamate all the coal mine operations in the Elk Valley and become Elk Valley Coal Corporation (EVCC). Teck Resources purchased majority ownership of EVCC in 2008 and the property is now managed by the Coal

Division, Teck Coal Ltd. At present time there are 1 District lot and 8 coal licenses associated with the CMO2 property, comprising 1,556 hectares.

Coal Mountain Phase 2 exploration activity dates back to the early 1970's when a joint venture was undertaken by the previous owner, Kaiser Resources Ltd. in partnership with Mitsui Mining of Japan. At that time, the focus was on Hosmer and Wheeler Ridges. Some twenty-five (25) holes were drilled and several adits driven in major coal seams. This early exploration included the Dominion Coal Block, Parcel 73 where some six (6) holes were drilled and adits were placed in 9 and 10 seams. Coal analyses, including coke tests, were done on select drill-hole and adit samples. At that time, analysis for CSR and CRI were not completed, as these two tests would not be developed until the mid-1980s. An underground mine was designed in 1974 on Hosmer and Wheeler Ridges for 3 seam, with financial costs determined, but the project never materialized. The CMO2 property lay dormant until 2003 when the newly formed Elk Valley Coal Corporation (EVCC) assumed control of the property from Teck's Elkview Operations (EVO). In 2003-04, the Coal Mountain Mine (CMO) geology group conducted an exploration campaign with the help of the EVCC Calgary corporate geology department.

No work was done in 2005. The 2006 exploration program was budgeted by CMO, with field assistance from the EVO geology group. In 2007, CMO once again managed and supervised the exploration program.

In 2008, the Teck corporate geology group (CSO) assumed control of the exploration work at CMO2. By the end of 2008, some 125 drill-holes had been completed and 36 adits existed between Hosmer, Wheeler and Marten Ridges (see fig. 6 Geology map). A geologic model had been developed via MineSight® computer software and was re-interpreted at the completion of each exploration field season. To determine the marketability of the deposit, several seventeen (17) inch, large-diameter, reverse flood (LDRF) holes were drilled to obtain sizable coal samples that could be lab processed for coking tests. Analyses results from these holes indicated the coal was of poorer quality than anticipated but in some instances, the processes for obtaining clean coal samples were deemed questionable. Until conclusive evidence could be brought forward, the coal was given a lower, more conservative market value.

~~No exploration work~~ was done in 2009 or 2010. The drilling in late 2011 gave better definition to the previously interpreted fault-thickened portions of 9 and 10-seams in Wheeler Ridge; the fault-

thickened 3-seam in the upper Wheeler Creek valley; and fault-repeated 5-seams on Marten Ridge. Better control of coal seam position and thickness and overall structural integrity was achieved throughout the project area. Due to a late start in 2011, the designed 15,000 m reverse circulation (RC) drilling campaign was subsequently completed in 2012. Geologic data from the 2011-12 exploration work was used to update the geologic model in late 2012 through early 2013. Geotechnical core drilling, in potential open-pit mining areas, for high-wall stability determinations resulted in six (6) sites being completed in 2012, for some 2,500 m drilled. Drill core geologic data was also incorporated into the 2013 model update. At the end of 2012, the CMO2 geologic data base (excluding Hosmer Ridge and Parcel 73) contained 169 exploration drill holes (148 RC and 21 core). There are 36 coal adits and 62 outcrop mapping points.

2. Access

The CMO2 property is accessed by road and is located 15 km south of Sparwood, B.C. Entrance is via the Wheeler Creek Forestry Road which is located 8 km south, along the Corbin Road, from BC Provincial Highway 3.

Reference:

- i) Illustration No. 1A: Index Map – Coal Property

II. Geology

1. Stratigraphy

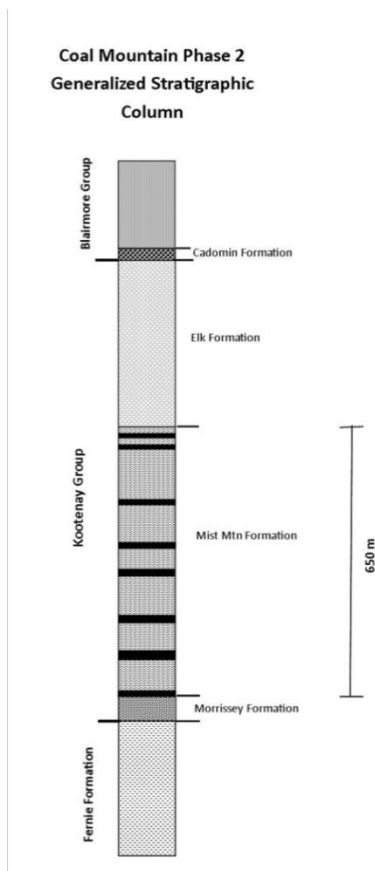
The Mist Mountain Formation of the Kootenay Group of Jurassic-Cretaceous age consists of inter-bedded sandstones, siltstones, mudstones and coal seams of economic interest. On the CMO2 property, the Mist Mountain Formation averages 650 metres in thickness and contains some 15 major coal seams, ranging from 1m to 8m thick. Seams are ordered in a top-down sequence, the uppermost seams below the Elk Formation are identified as the 1 seam package, and the lowermost is the 12 series on top of the Moose Mountain sandstone. The primary mineable zones of thick, continuous coals are seams 3, 5, 7, 8, 9 and 10. Through depositional processes, these

major seams can appear as a zone of multiple, sub-seam splits that are greater than 1.0m in thickness. Due to this lenticular nature of the seams, cumulative coal thickness, on average, is 75 metres, with individual mineable seams ranging from 1 to 10 metres thick. Seams range in rank from medium to high volatile bituminous (from stratigraphic bottom to top).

The Mist Mountain Fm is conformably overlain by the Elk Formation; a 600m thick sequence of inter-bedded sandstones, siltstones, mudstones and sporadic, very thin, uneconomic coal seams.

The Elk Fm is conformably overlain by the Blairmore Group; a sequence of sandstones and siltstones with a basal cliff-forming conglomerate, Cadomin Formation, which dominates the landscape at the southern edge of the Marten Wheeler property.

Table 1 - CMO2 Stratigraphy



1. Structure

The area of interest is structurally bound in an up-thrust block of Kootenay Group sediments which have been folded about a north-south trending and south plunging syncline axis, lying between Wheeler and Hosmer Ridges. The northern half of the east limb of the syncline dips gently, less than 20 degrees, to the west-southwest and is contained within Wheeler Ridge. The southern half of the east limb, within both Marten and Carbon Ridges, dips more steeply to the west, generally 25 to 30 degrees. Hosmer Ridge comprises the west limb of the syncline, where the strata dip south-east to easterly. Within the CMO2 project area, the syncline structure is further complicated by several small, west dipping, thrust faults. The thrust faults caused thickening coal strata by overlapping and drag folding. The thrust faults generally dip west to southwest at inclinations of 20 to 50 degrees. Further, Wheeler and Marten Ridges are structurally separated by the Wheeler normal fault; trending N-S with a westerly dip of 65 degrees and a western down-dropped, vertical displacement of some 225 metres. The vertical movement along the Wheeler normal fault adds to the complexity by creating disjointed blocks of coal. Generally, the geologic structure is more complex than previously interpreted, with areas of rapidly changing seam orientations and thicknesses. This is most evident on the western flank of Marten Ridge, in the Wheeler Fault zone. These characteristics imply that the CMO2 deposit should be categorized as “complex” to reflect its type and geological complexity according to GSC Paper 88-21.

A key criterion for defining resources is the classification of the deposit and geology type. The classification of a coal deposit and geology will determine the search criteria and methodology to be applied during the calculations of resources.

Reference:

- i) Illustration No. 1B: General Geology Map



III. 2013 Exploration Project

1. Objective

The objective of the 2013 CM02 RC drilling program was to evaluate the 5 and 7 seam thrust overlap on Marten Ridge and refine the delineation of faulting in both Wheeler Creek drainage and the eastern flank of Wheeler Ridge.

As well, six (6) large diameter, reverse flood (LDRF) holes were completed to obtain bulk samples of the 3, 8, 9 and 10 seam series.

2. Summary of Work Done

In 2013, a total of thirty three (33) reverse circulation holes (7,751m) and six (6) LDRF holes for a (391m) were drilled, for a total of 8,142m.

Rotary drilling was performed by Foraco Canada Ltd (Calgary, AB) using a GEFECO 30K-DH drill rig. All holes were geophysically logged through the drill pipe using the gamma-neutron method. Holes that remained open following the removal of the drill pipe were logged for down hole deviation, caliper and gamma-density. The geophysical logs were produced by DataLog Technology (Appendix B). Management of the exploration project was under the direction and supervision of Teck Coal Ltd., Sparwood Geology department.

Coal seams intersected by rotary drilling were sampled in 0.5m intervals. Representative composite samples for each coal seam intersected were prepared and analyzed by Elk Valley Environmental Services (EVES) laboratory in Sparwood, BC. Selected composites underwent single gravity washes and clean proximate analysis: Ash, VM, RM, Sulfur, FSI and P₂O₅. A split of each composite sample was sent to David E. Pearson and Associates (Victoria, BC) for petrographic analysis.

Large diameter, reverse flood holes were also drilled by Foraco Canada Ltd, using a Foremost DR-24 Rig to ODEX twenty (20) inch casing and sample with an eighteen (18) inch bit. Bulk samples were collected, shipped to GWIL Industries in Calgary, AB for preliminary crushing and washability work, then sent to Hazen Research in Golden, Colorado for pilot scale washing with magnetite and water rather than lab scale chemical washes. Clean coal samples were sent to ALS Lab in Vancouver, BC for detailed carbonization, and to Pearson for petrographic analysis.

Access roads and drill-site locations were laid out by Silenus Resource Management Inc., Cranbrook, BC. Road and drill-site construction was completed by the Fiorentino Bros Contracting, Cranbrook, BC. All timber harvesting services was provided by Trucut Logging Ltd. (Sparwood, BC). Align Surveys, Fernie, BC provided collar location surveys for all drill-holes.

All holes were drilled within District lot #4589. Drill-hole collar locations are given in Appendix B.

Reference:

- i. Illustration No. 1a. Index Map - Coal Properties
- ii. Illustration No. 2A: 2013 Completed Exploration – CMO2 Ortho-photo Map

3. Results

The primary program goal of the 2013 drilling program at CMO2 was to evaluate the 5 and 7 seam thrust overlap on Marten Ridge and refine the delineation of faulting in both Wheeler Creek drainage and the eastern flank of Wheeler Ridge. The program consisted of 33 holes at an average depth of 235 meters, and 6 LDRF holes with an average depth of 70m. The holes intersected much of the stratigraphic section, from the Elk through the Mist Mountain Formation. As a result of the RC drilling, better control of seam positions and thicknesses was achieved. Additional E-W trending, normal faulting with vertical displacements of up to 300m was identified on the northwest end of Marten Ridge; and a repeat block of 9 and 10 seams was better delineated in Wheeler Ridge. Results from LDRF drilling indicated that most of the major seams should be categorized as semi-soft and semi-hard coking coals, which may result in a price increase if coal is moved from the PCI classification.

The clean coal assay results, as well as washability data and coking analysis, from the LDRF composite samples were added to the seam's qualities in the geologic data base.

Seam qualities increase the knowledge of the coal's marketability and assist the long term mine plan for the region (available analysis is given in Appendix C).

IV. Conclusion

The 2013 exploration drilling program has successfully increased drill-hole density and increased confidence in faulting structures. The program has increased geological model confidence through confirmation of the existence and continuity of coal seams in the package. The LDRF results also confirmed higher grade coal than previously modeled. These results have allowed the update of the CMO2 resources model and completion of an economic assessment of the area. The update to the resources for Coal Mountain Phase 2 is shown below:

[Redacted]

[Redacted]					
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

The economic assessment of Coal Mountain Phase 2 is based on assumptions to project future mining costs over the period of 2018 through 2043.

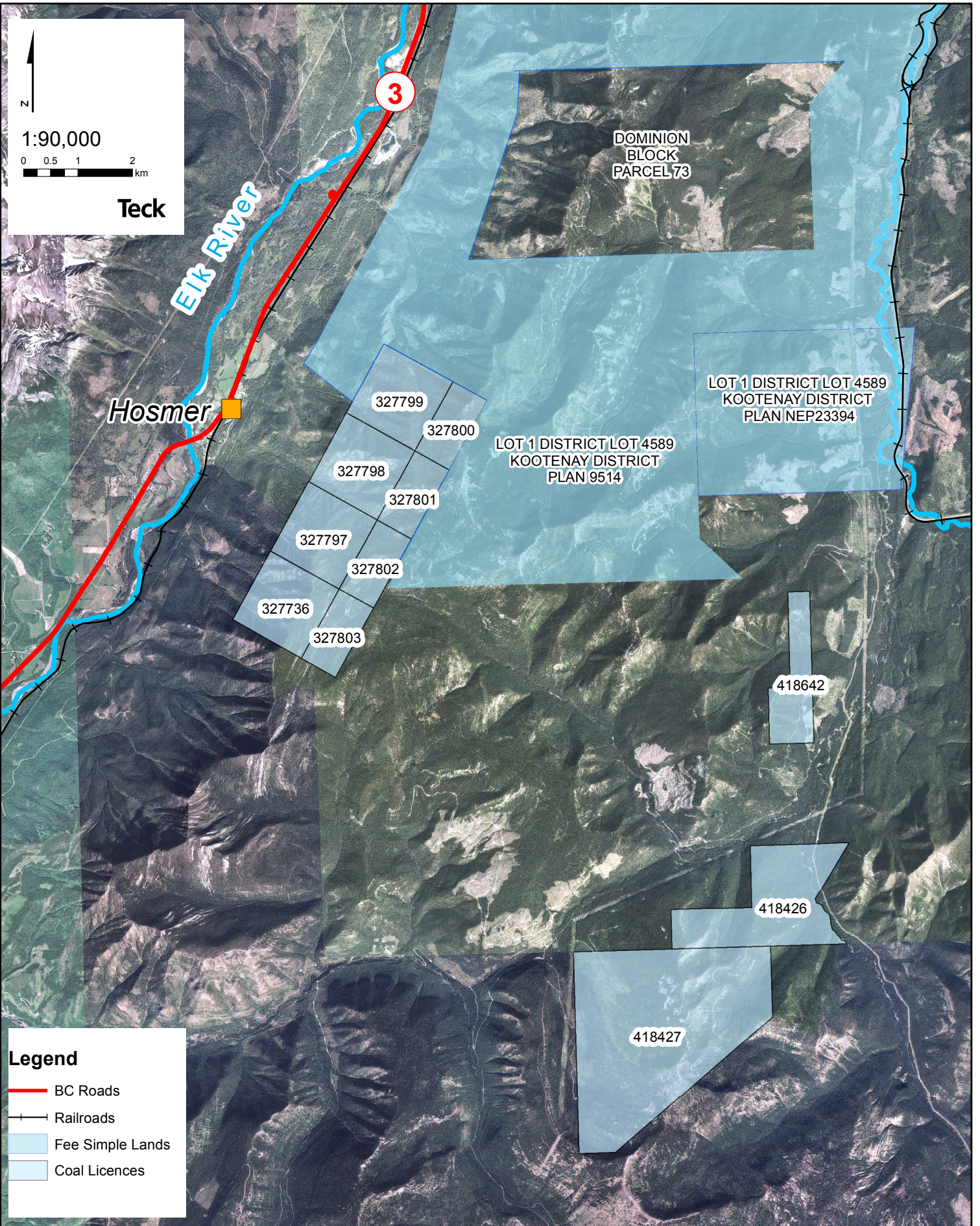
Table 4 - Commodity Prices and Cost Assumptions

<u>Commodity Prices</u>	
Semi Soft Coking coal (US\$/mtcc)	144
PCI Coal (US\$/mtcc)	132
Thermal Coal (US/mtcc)	99
<u>Other Assumptions</u>	
Oil Price (WTI - US\$/Bbl)	90
Natural Gas (US\$/Mbtu)	5.3
Discount Rate (%)	8
Exchange Rate (CAD/USD)	1.1

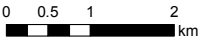
Annual total costs are currently set at \$110/t. Based on 2013 long-term price assumptions, the CMO2 coal resource is economic as an open-pit venture.

Further RC drilling is recommended at the CMO2 property to move more resources from both speculative and inferred categories into indicated and measured, as well as to increase the amount and density of coal quality data (ash, volatile matter, P₂O₅, S, FSI, and DDPM). Test pits and further bulk coal sampling are strongly advised before full scale production commences.

The goal of future CMO2 drilling will be to achieve greater than 200 x 200 meter drill density in the potential mineable areas identified by the economic assessment and continue wider spaced exploration drilling outside those areas.



1:90,000



Teck

Hosmer

Elk River

3

DOMINION
BLOCK
PARCEL 73

LOT 1 DISTRICT LOT 4589
KOOTENAY DISTRICT
PLAN NEP23394

LOT 1 DISTRICT LOT 4589
KOOTENAY DISTRICT
PLAN 9514

327799

327800

327798

327801

327797

327802

327736





327803

418642

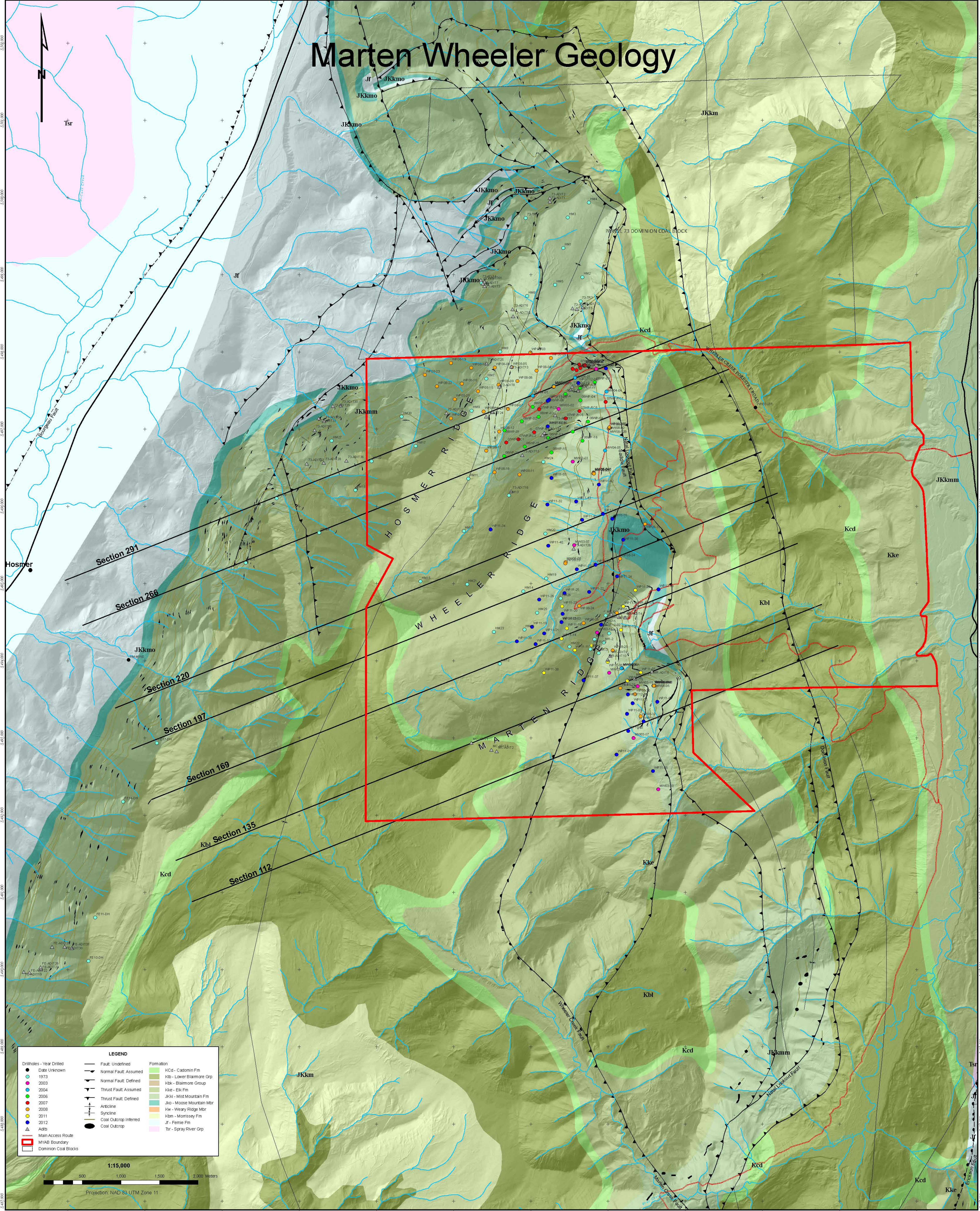
418426

418427

Legend

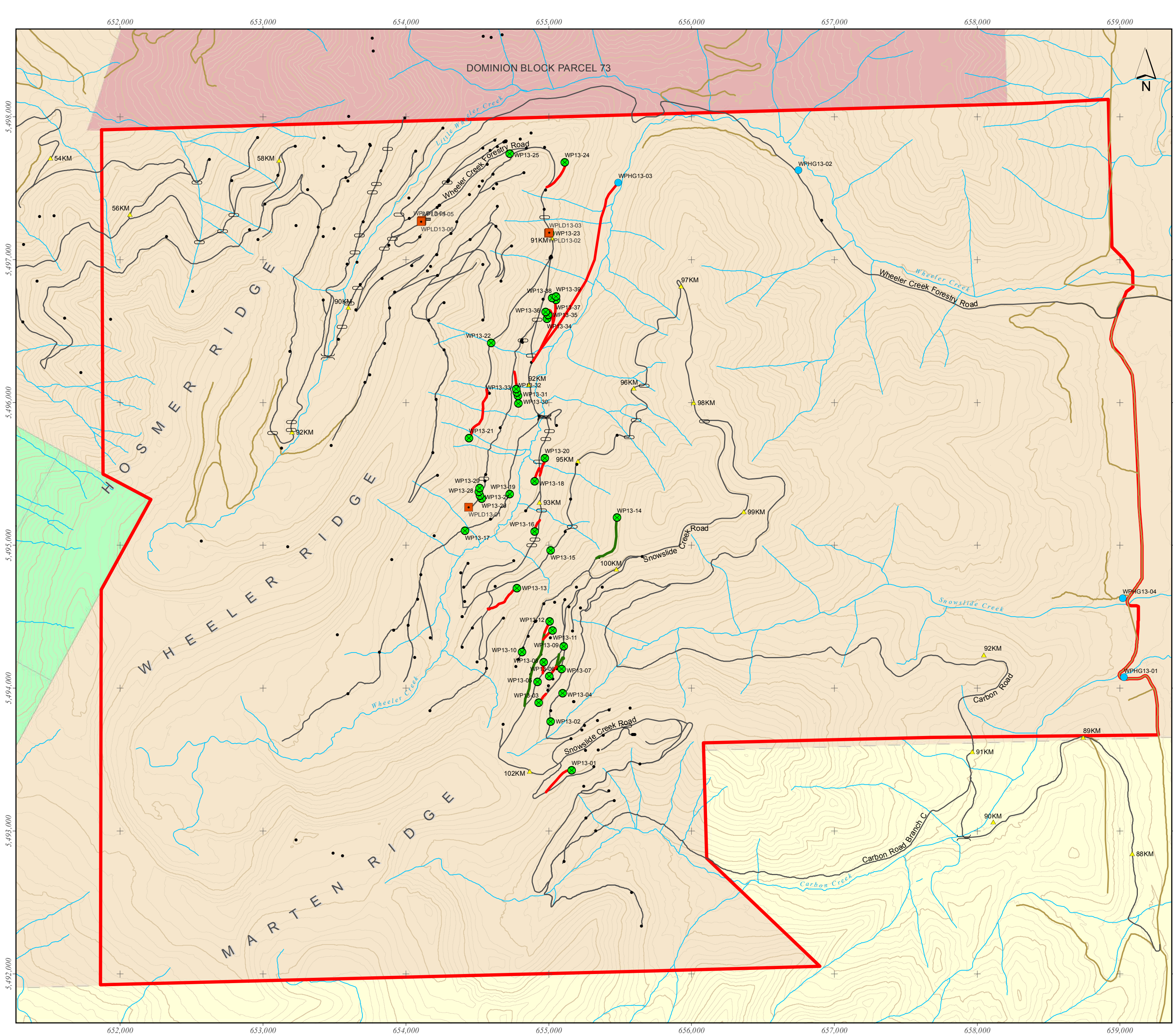
-  BC Roads
-  Railroads
-  Fee Simple Lands
-  Coal Licences

Marten Wheeler Geology



LEGEND			
●	Drill-holes - Year Drilled	—	Fault: Undefined
●	Date Unknown	—	Normal Fault: Assumed
●	1973	—	Normal Fault: Defined
●	2003	—	Thrust Fault: Assumed
●	2004	—	Thrust Fault: Defined
●	2006	—	Anticline
●	2007	—	Syncline
●	2009	—	Coal Outcrop Inferred
●	2011	—	Coal Outcrop
●	2012	—	
▲	Adits	—	
—	Main Access Route	—	
—	MYAB Boundary	—	
—	Dominion Coal Blocks	—	
■	Formation	■	KCD - Cadomin Fm
■	Kkb - Lower Blainmore Grp	■	Kkk - Blainmore Group
■	Kke - Elk Fm	■	JKkl - Mt St Mountain Fm
■	Jkmo - Moose Mountain Mbr	■	Jf - Femie Fm
■	Kkm - Morrisey Fm	■	Jr - Spray River Grp
■	Jf - Femie Fm		
■	Jr - Spray River Grp		

1:15,000
 0 500 1,000 1,500 2,000 Meters
 Projection: NAD 83 UTM Zone 11

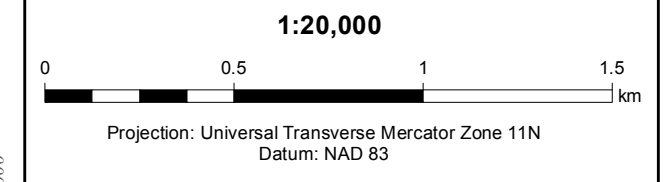


Summary of Work for 2013

- Legend**
- 2013 Drilled Holes
 - Reverse Circulation Hole
 - Hydro-geo Hole
 - Large Diameter Hole
 - Road Construction**
 - 2013 Constructed Roads
 - 2013 Upgraded Roads
 - Existing Holes
 - Existing Access
 - MoF Permitted Roads
 - MYAB Boundary
 - Dominion Block Parcel 73
 - Teck Freehold
 - Private Land
 - Crown Surveyed Land



PROJECT:
**Coal Mountain
Phase 2**



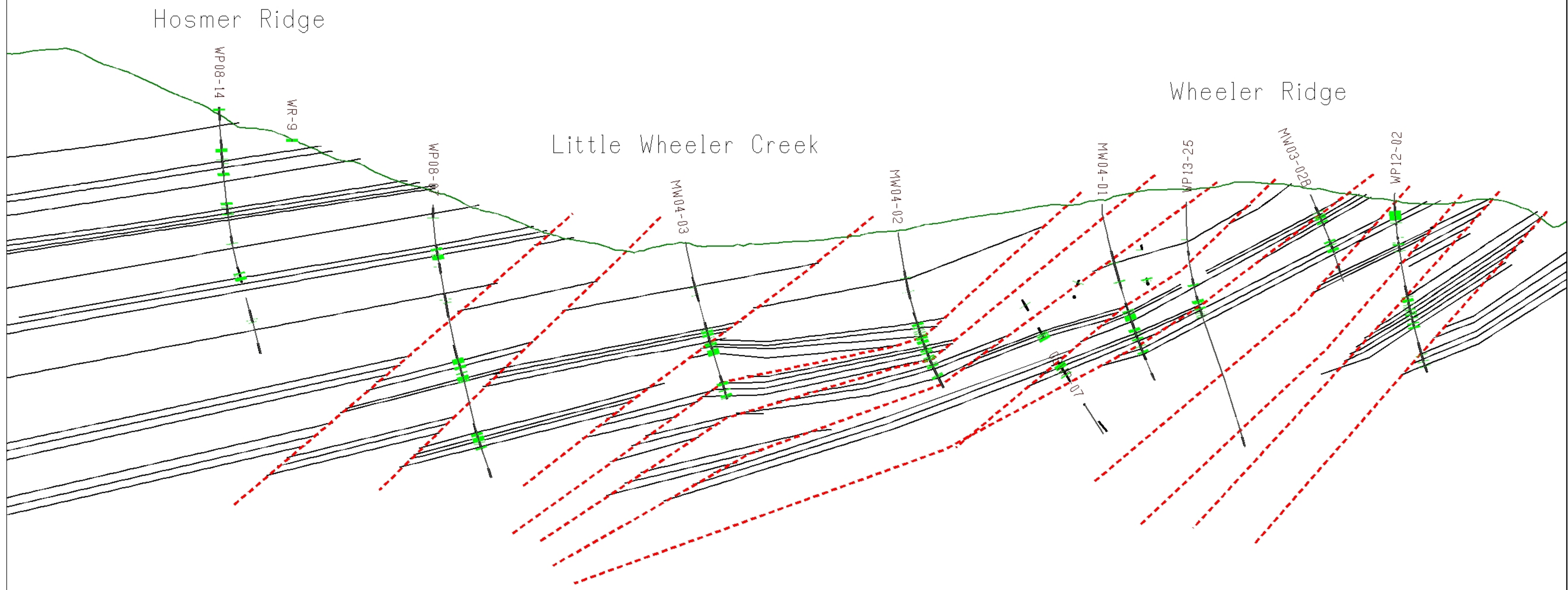
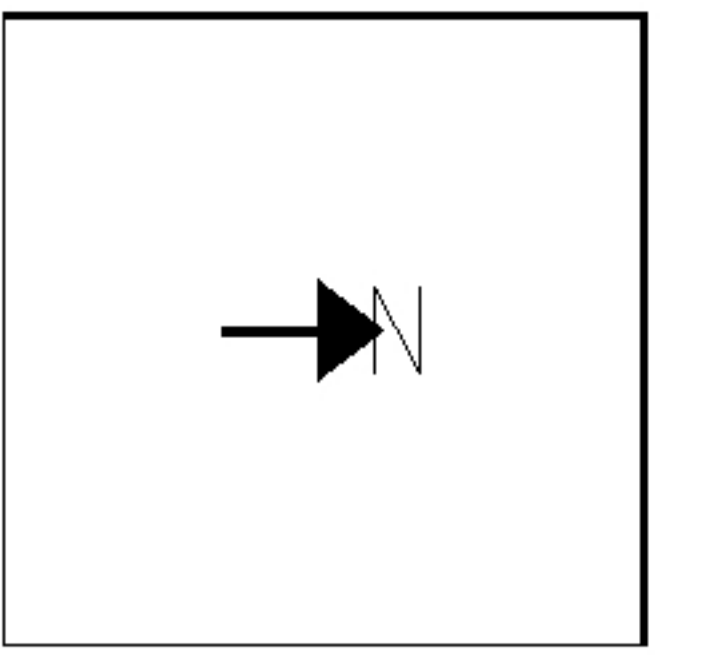
Location:
Sparwood, B.C.

Date:
3/25/2014

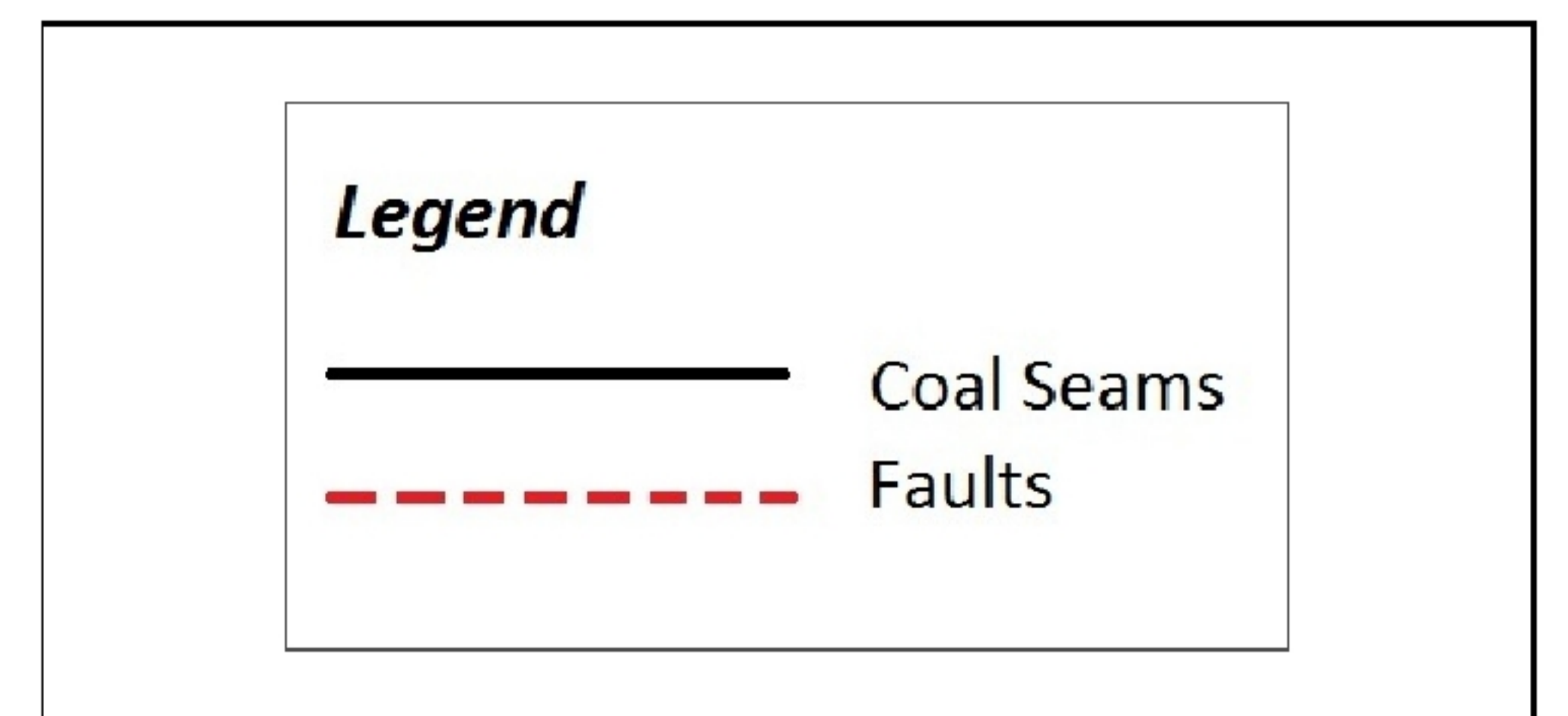
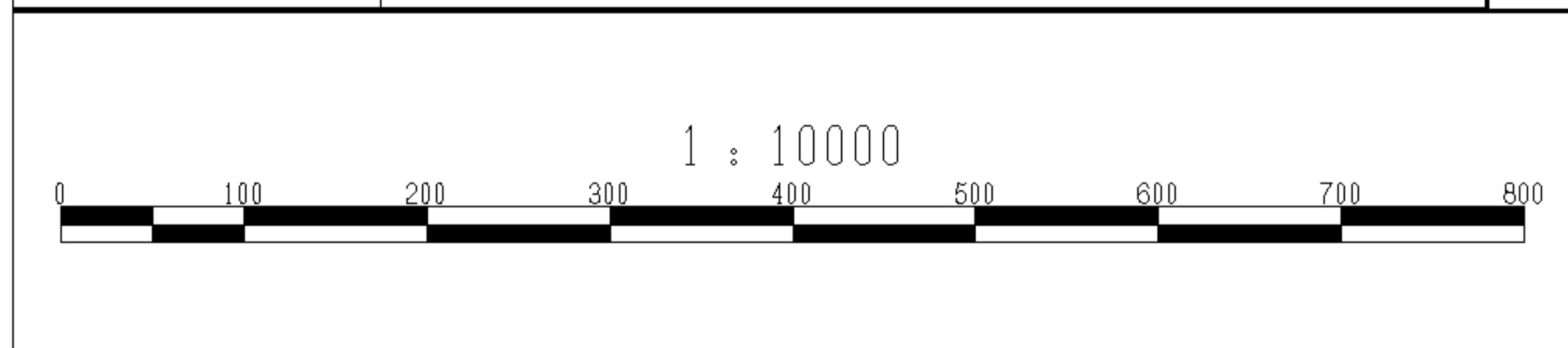
Drawn By:
DJG

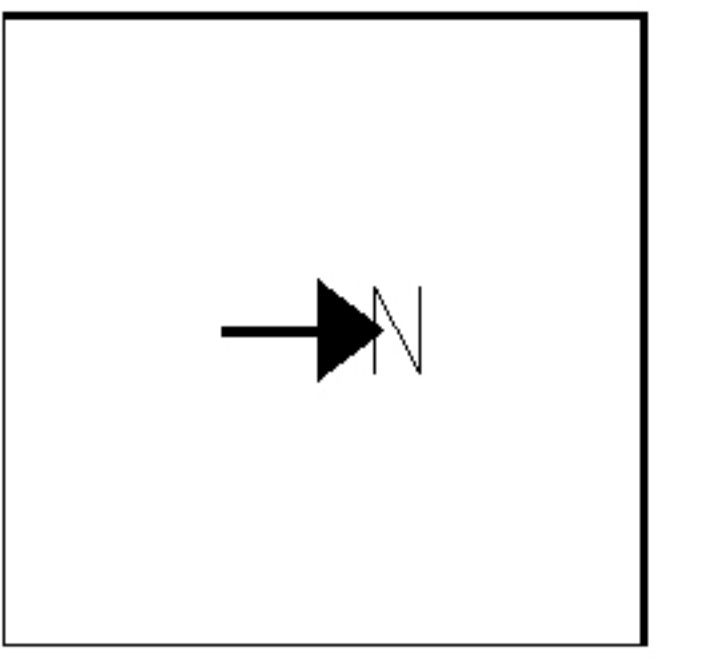
Contour Interval:
20 meters

File:
2013 Summary of Work.pdf



PROJECT:	Coal Mountain Phase 2 Cross Section
SECTION	291 - 4869721
DATE:	December 2013

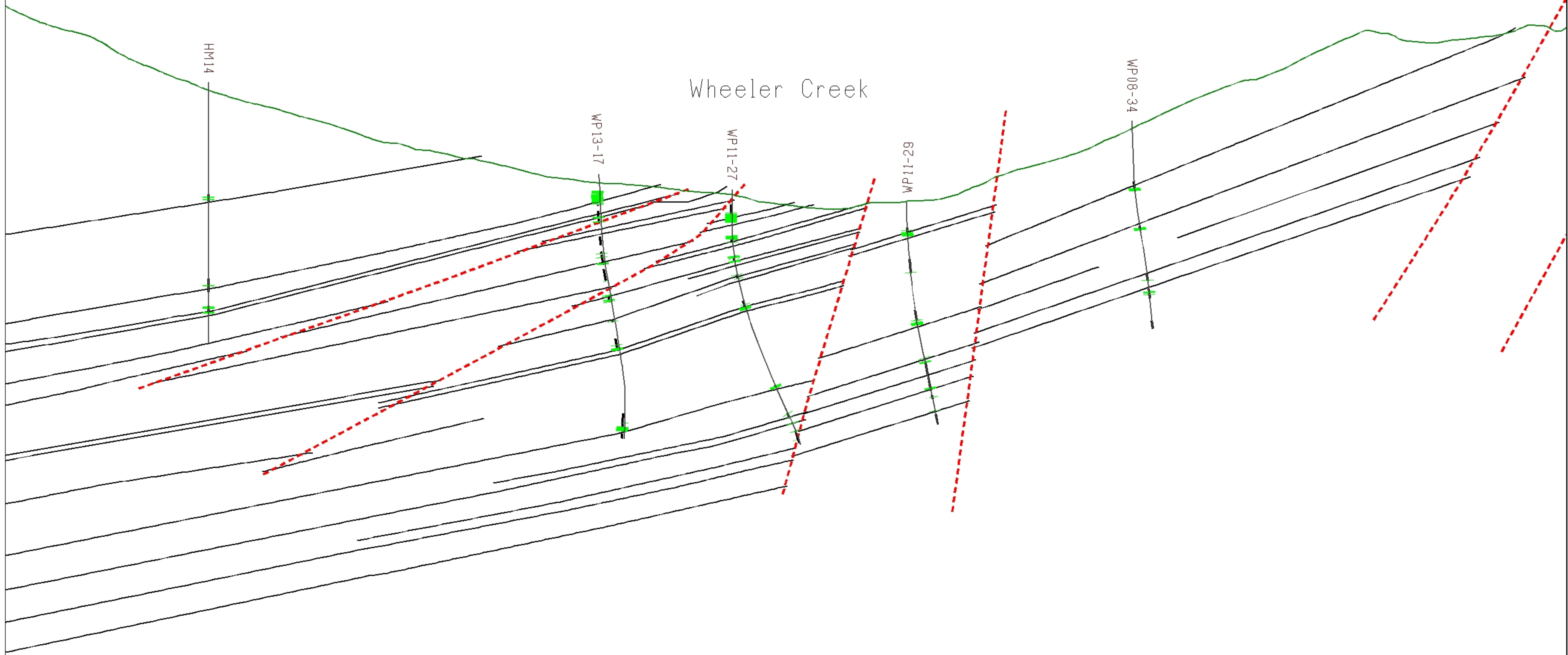




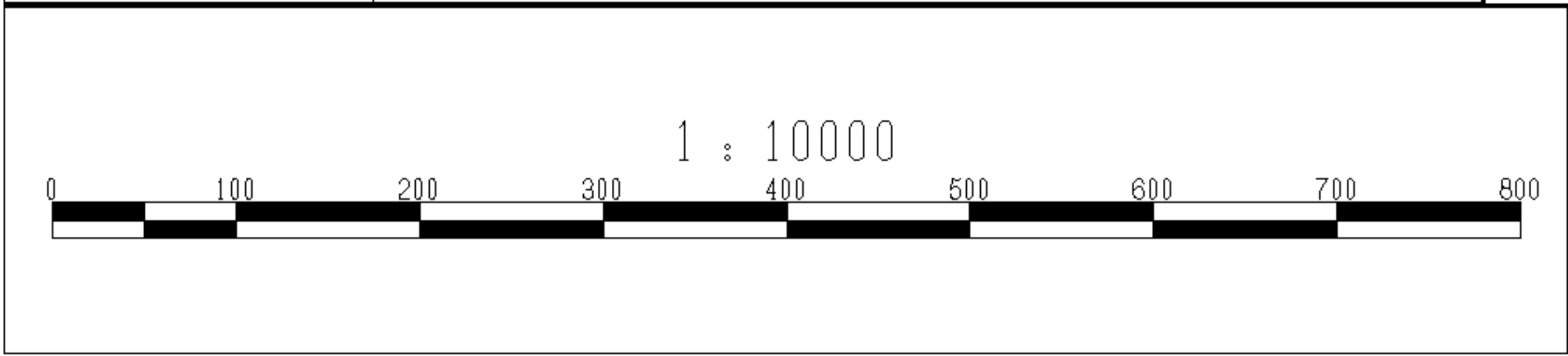
Wheeler Ridge

Marten Ridge

Wheeler Creek



PROJECT:	Coal Mountain Phase 2 Cross Section
SECTION	197 - 4867371
DATE:	December 2013



Legend

- Coal Seams
- - - Faults