COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT:
Coal Assessment Report for the EB Main coal property, Mt. Spieker area, British Columbia

TOTAL COST: $154,467

AUTHOR(S): **C.G. Cathyl-Huhn P.Geo.**
SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):**CX-9-7**

YEAR OF WORK: **2014-2015** REPORT DATE: **21 October, 2015**

PROPERTY NAME: **EB Main (Mt. Spieker)**

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE: **none during the 2014-2015 reporting period. Only analytical work was done in 2014-2015, on samples from previously-reported drilling.**

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: **93P 015**

MINING DIVISION: **Liard (Peace region)**
NTS / BCGS: **NTS 93P/3 BCGS 093P.003, 004, 013 and 014**
LATITUDE: **55° 06’ 00" N**
LONGITUDE: **121° 24’ 00" W** (at centre of work)
UTM Zone: **10N** EASTING: **602003** NORTHING: **6107078**

OWNER(S): **Walter Canadian Coal Partnership**

MAILING ADDRESS: **200-235 Front Street (P.O. Box 2140), Tumbler Ridge, B.C., V0C 2W0**

OPERATOR(S) [who paid for the work]: **Wolverine Coal Partnership**

MAILING ADDRESS: **200-235 Front Street (P.O. Box 2140), Tumbler Ridge, B.C., V0C 2W0**

REPORT KEYWORDS
Coal, Gates Formation, Falher Member
REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:
Coal Assessment Report 965 (primary reference); reports 552, 553, 555, 556, 558, 901;
Petroleum Assessment Report 863.

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK	ON WHICH TENURES
		(in metric units)	
GEOLOGICAL (scale, area)			
	Ground, mapping	**nil**	**n/a**
	Photo interpretation	**nil**	**n/a**
GEOPHYSICAL (line-kilometres)			
	Ground (Specify types)	**nil**	**n/a**
		nil	**n/a**
	Airborne	**nil**	**n/a**
	(Specify types)	**nil**	**n/a**
	Borehole –	**nil**	**n/a**
	Gamma, Resistivity	**nil**	**n/a**
	Resistivity	**nil**	**n/a**
	Caliper	**nil**	**n/a**
	Deviation	**nil**	**n/a**
	Dip	**nil**	**n/a**
	Others (specify)	**nil**	**n/a**
	Core	**nil**	**n/a**
	Non-core	**nil**	**n/a**
SAMPLING AND ANALYSES			
Total number of Samples		**144 samples**	**381714 and 381715**
	Proximate **(with sulphur and FSI)**	**343 samples**	**381714 and 381715**
	Ultimate	**nil**	**n/a**
	Petrographic **(on lab-scale clean coal products of washability tests)**	**32 samples**	**381714 and 381715**
	Vitrinite reflectance **(on lab-scale clean coal products of washability tests)**	**32 samples**	**381714 and 381715**
	Gieseler fluidity	**33 samples**	**381714 and 381715**
	Ash chemistry (as major oxides)	**306 samples**	**381714 and 381715**
	Light transmittance (for oxidation)	**46 samples**	**381714 and 381715**
	Coking	**none**	**n/a**
	Wash tests	**51samples**	**381714 and 381715**
PROSPECTING (scale/area)		**none**	**n/a**
PREPARATORY/PHYSICAL		**none**	**n/a**
Line/grid (km)		**none**	**n/a**
Trench (number, metres)		**none**	**n/a**
Bulk sample(s) -- **large-diameter cores**		**none**	**n/a**

Section 5 (Coal quality, coal resources, and coal reserves), a part of section 9, Appendix B and Appendix C 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

1 Table of contents

1.1 List of tables

1.2 List of maps

1.3 List of figures

2 Objectives, situation, and details of work

This report presents newly-available results of laboratory-scale coal-quality tests concerning Gates Formation (Falher Member) coals from the EB Main coal property (mineral tenures 381712 through 381717, inclusive), situated in the Peace River area of northeastern British Columbia, Canada.

No further physical work has been done within the property during the 2014-2015 work period, but considerable analytical work has been done on previously-collected coal samples. Results of analyses are here-presented, including copies of third-party analytical certificates. Total cost of work, including preparation of this report, is estimated to be $154,467 (Canadian funds), exclusive of taxes.

This report is intended to guide Walter Canadian Coal Partnership's ongoing coal-resource appraisal and mine-planning of the EB Main coal property. This report is an update and successor to the previously-submitted Coal Assessment Report No.965 (CAR-965).

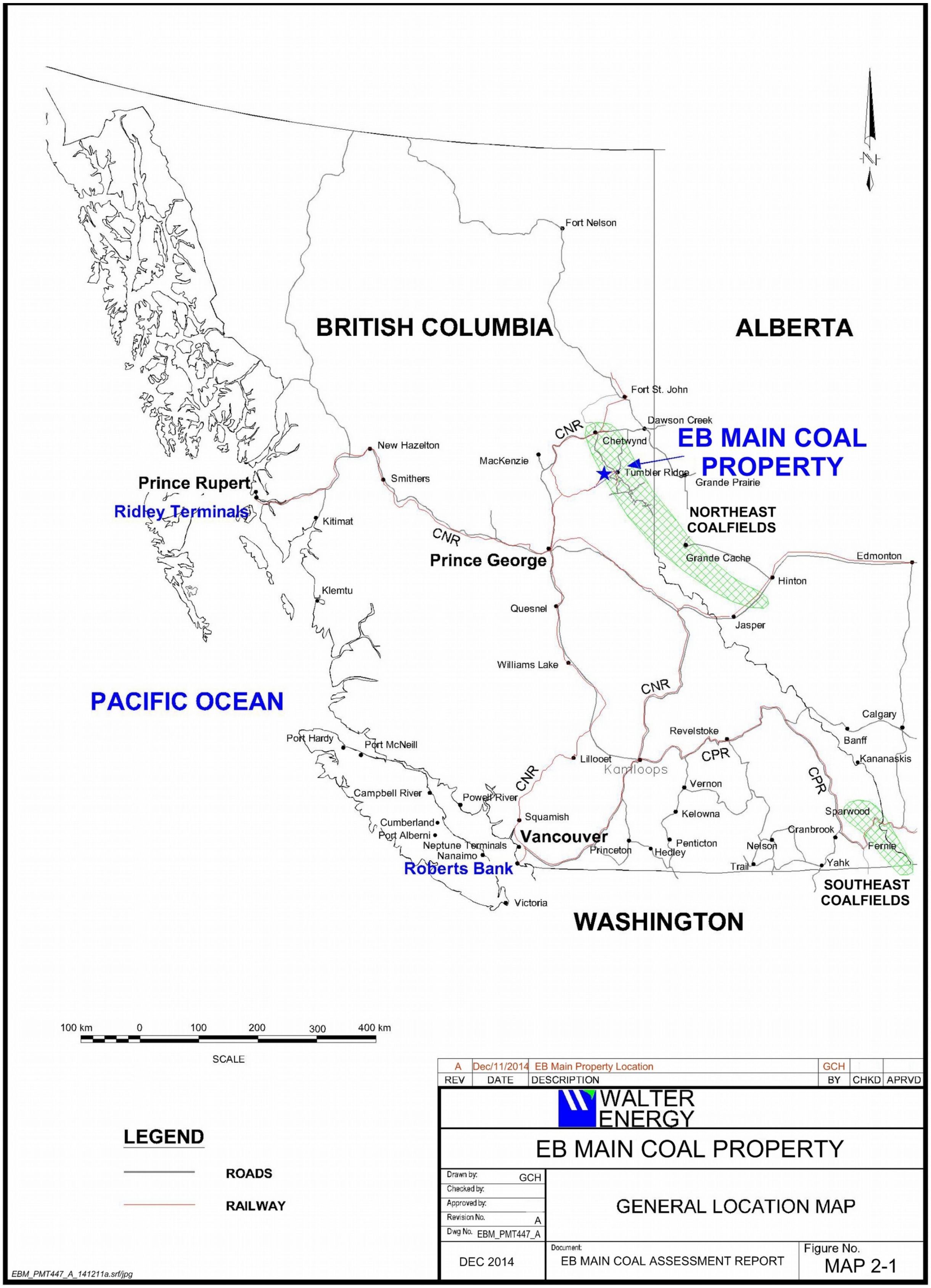
2.1 Location and access

General location of the property, within northeastern British Columbia, is depicted as **Map 2-1**, and coal land tenure (**Table 2-1**) is depicted in relation to the local topographic setting of the EB Main coal property as **Map 2-2**.

The EB Main coal property is located approximately 100 kilometres south of the town of Chetwynd, and 30 kilometres west of the town of Tumbler Ridge, within the western half of map-area 93 P/03 of Canada's National Topographic System. Road access to EB Main is via paved provincial highway BC-29, southeastward from Chetwynd or northwestward from Tumbler Ridge, and thence twelve kilometres southwestward along the gravelled Wolverine Forest Service Road, to its junction with the gravelled, non-status Perry Creek Road. EB Main is located a further eight to fifteen kilometres to the northwest along Perry Creek Road. Several former logging-roads and coal-exploration trails, some of them now repurposed as natural-gas wellsite service roads, branch from Perry Creek Road and thus provide vehicular access to the northwestern portion of the EB Main coal property.

The northeastern portion of the property is an elevated plateau, rimmed by steep cliffs. Access to this area was formerly available via drill trails, but these routes are now frequently blocked by talus, and access is therefore solely by walking, or by helicopters. Landing-sites for helicopters are available along exposed ridge-crests, but walking outward from these alpine areas is rendered more difficult by dense, scrubby forest cover near treeline.

Crushed sandstone and conglomerate from localised colluvial deposits are the only sources of good-quality rock for construction aggregate and road-building. Locally-quarried siltstone and mudstone (mostly from the Moosebar Formation) have been used for construction of natural-gas drilling-rig roads. These fine-grained materials pack down acceptably to make smooth roads, although roads thus constructed become muddy in wet weather and dusty in dry weather.


N
Fort Nelson
BRITISH COLUMBIA
ALBERTA
Fort St. John
Dawson Creek
CNR
Chetwynd
EB MAIN COAL
PROPERTY
Tumbler Ridge
Grande Prairie
New Hazelton
MacKenzie
Smithers
Prince Rupert
Ridley Terminals
Kitimat
NORTHEAST
COALFIELDS
CNR
Prince George
Grande Cache
Edmonton
Hinton
Klemtu
Quesnel
Jasper
Williams Lake
PACIFIC OCEAN
CNR
Calgary
Revelstoke
Banff
Port Hardy
Port McNeill
CPR
Kananaskis
Lillooet
Kamloops
CNR
CPR
Vernon
Campbell River
Powell River
Sparwood
Kelowna
Squamish
Cumberland
Port Alberni
Cranbrook
Neptune Terminals
Vancouver
Penticton
Nelson
Fernie
Nanaimo
Princeton
Hedley
Roberts Bank
Trail
Yahk
SOUTHEAST
COALFIELDS
Victoria
WASHINGTON
100 km
0
100
200
300
400 km
SCALE
LEGEND
ROADS
RAILWAY
A
Dec/11/2014
EB Main Property Location
GCH
REV
DATE
DESCRIPTION
BY
CHKD
APRVD
WALTER
ENERGY
EB MAIN COAL PROPERTY
Drawn by: GCH
Checked by:
Approved by:
Revision No. A
Dwg No. EBM_PMT447_A
GENERAL LOCATION MAP
DEC 2014
Document:
EB MAIN COAL ASSESSMENT REPORT
Figure No.
MAP 2-1
EBM_PMT447_A_141211a.srf/jpg

Surface access for drilling and other exploratory works is regulated by the provincial government, subject to the *Coal Act Regulations* and the *Mines Act*. The EB Main property is situated within the Wapiti PSYU (Public Sustained Yield Unit), with timber cutting subject to the terms of a *Free Use Permit* issued by the Ministry of Forests, with area-based stumpage fees.

2.2 Property description

The EB Main coal property consists of six coal licences (as depicted in **Map 2-2**), originally acquired late in October of 2000 by Western Canadian Coal Corporation (WCCC), subsequently passed onward to the reorganised Western Coal Corporation (WCC) and, following WCC's acquisition by Walter Energy, transferred onward to Walter Canadian Coal Partnership (WCCP). All of these coal tenures cover ground previously held by Brameda Resources Limited, and optioned by them to various companies (although these options subsequently lapsed).

Coal licences grant to their holder the exclusive right to explore for coal, subject to consultation with local First Nations, coordination of access with other tenure-holders (such as oil and gas firms, other mineral-tenure holders, and timber companies), and the successful submission of an exploratory work plan. Coal licences do not, in and of themselves, confer the ownership of coal upon their holder (as the coal remains the property of the Crown via the province of British Columbia), but they can under appropriate circumstances be converted into coal leases, upon which a scheme of mining may be established. Holders of coal licences are obliged to make annual reports to the Crown, as concerns exploratory work done on their respective tenures. Prior to 1986, the Crown required that a certain minimal amount of assessable exploratory work be done each year, in order to retain the tenure in good standing. Since 1986 there have been no such requirements for annual work commitments, although such requirements may be re-enacted at some future date.

The term of coal licences is one year, which may normally be extended upon the payment of an area-based annual rental fee as prescribed by the provincial *Coal Act Regulation*. EB Main is now approaching the end of its third five-year span of increased rental fees, at $15/hectare. In October of 2015, however, the fourth five-year span will commence, and rental fees will increase to $20/hectare). **Table 2-1** presents details of the coal tenures at EB Main, whose aggregate area is 1,780 hectares (approximately 4,398 acres) and whose annual rental cost is now $35,600.

Table 2-1: Coal tenures at EB Main (as of October, 2015)

Tenure Numbers		Land description		Area	Dates		Annual rental at $20/ha
Current	Historic	Blocks	Units		Issued on	Renew by	
381712	CL 3052	93P/03 Blk.F	1,2,11,12	297 ha	Oct. 30, 2000	Oct.30, 2015	$5940
381713	CL 3051	93P/03 Blk.F	3,4,13,14	297 ha	Oct. 30, 2000	Oct.30, 2015	$5940
381714	CL 3047	93P/03 Blk.F	21,22,31,32	297 ha	Oct. 30, 2000	Oct.30, 2015	$5940
381715	CL 3046	93P/03 Blk.F	23,24,33,34	297 ha	Oct. 30, 2000	Oct.30, 2016	$5940
381716	CL 3042	93P/03 Blk.F	41,42,51,52	296 ha	Oct. 30, 2000	Oct.30, 2015	$5920
381717	CL 3041	93P/03 Blk.F	43,44,53,54	296 ha	Oct. 30, 2000	Oct.30, 2015	$5920
Totals		6 coal licences / 24 units		1780 ha			$35,600

2.3 Infrastructure

Electrical power is potentially available from B.C. Hydro's Bullmoose Mine substation, served by 230-kilovolt transmission line 2L322, although six to eight kilometres of newly-built power line would be required to serve the EB Main property. Mine plans currently under consideration include the option of installing Diesel-powered generators at the proposed EB minesite. The final choice of power source will entail a balance of capital and operating costs, against environmental impacts.

Telecommunications are available via satellite telephone systems. Satellite access is excellent in upland areas, but unreliable in the heavily-wooded hillsides. Cellular telephone coverage is not reliably available at EB Main, owing to distance from transmitters, and issues of line-of-sight in mountainous country.

2.4 Base-maps, imagery, and surveys

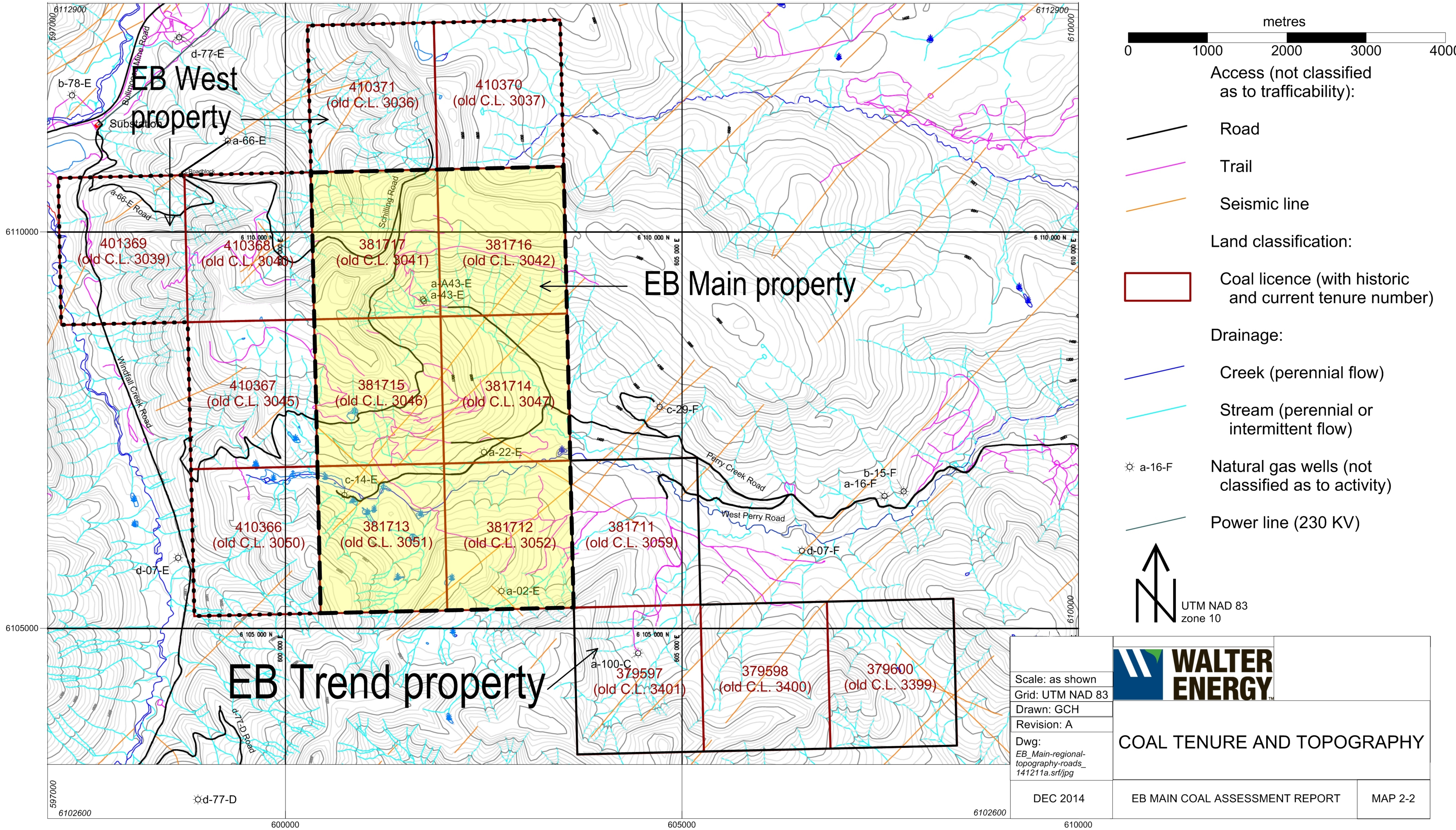
Base-mapping for EB Main is freely available from the provincial government's Base Map Online Store, which affords a facility for downloading shaded-relief topographic maps at 1:20,000 scale. Hardcopy British Columbia Geographic System (BCGS) and digital Terrain Resource Information Management (TRIM) maps 093P.003, .004, .013, and .014 cover the property. Canada's national Army Survey Establishment (ASE) has also for several decades maintained a series of topographic maps at 1:50,000 scale, as part of the National Topographic System (NTS). MTS map-sheet 92P/3 covers the EB Main property. Depending on their vintage, these maps are referred to the North American Datums of 1927 (NAD27) or that of 1983 (NAD83). UTM NAD83 grid references are used exclusively within the current report.

Detailed base-maps of the original Mt. Spieker coal property were produced in the late 1970s: copies of these maps are included in various of the historic Coal Assessment Reports, although they are generally marked-up and their depicted coordinate systems are clearly not UTM NAD83 (and may, instead, be some form of local polyconic system used by Brameda Resources).

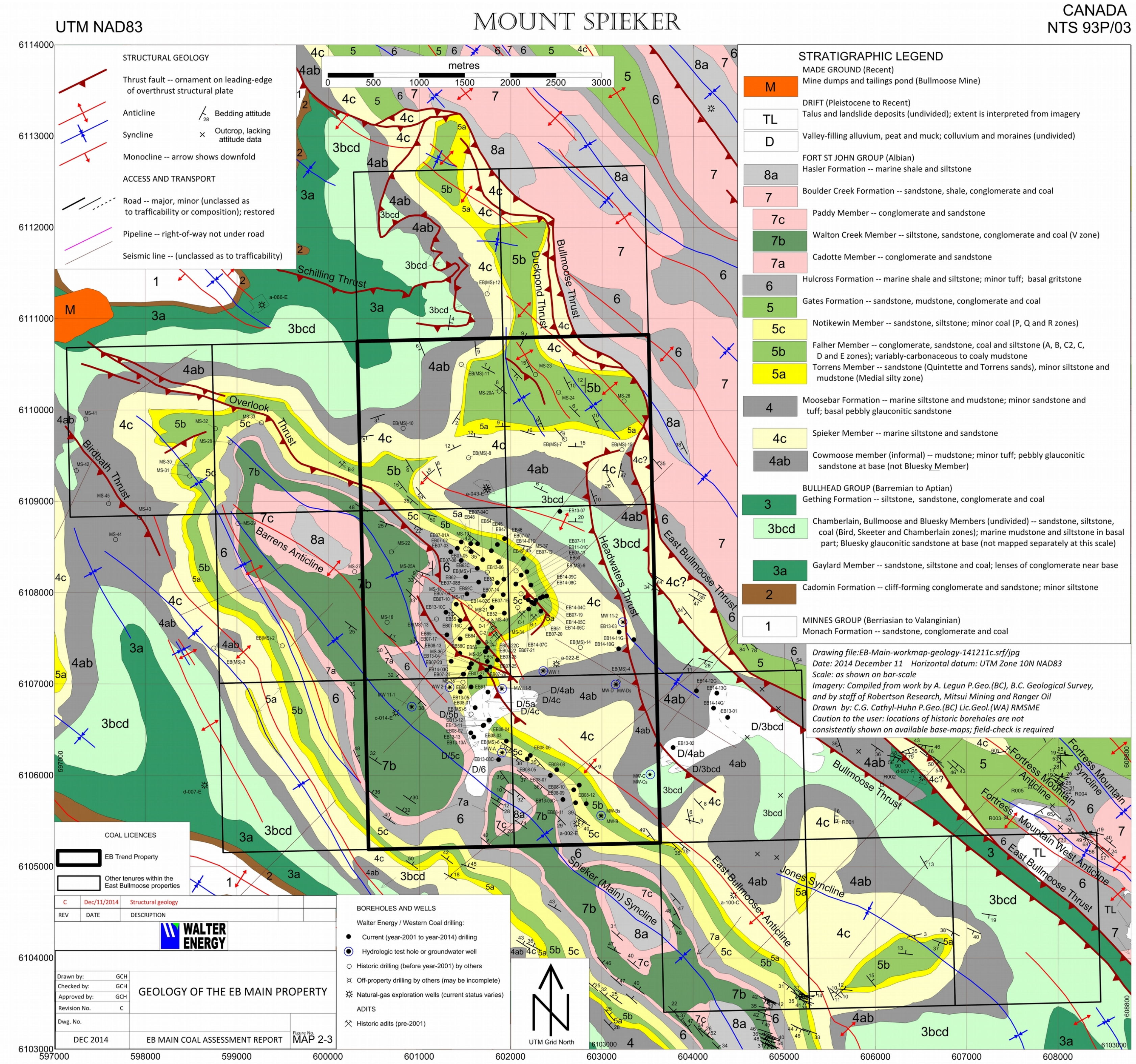
Georeferenced satellite photography is freely available via the *Google Earth* web-service, as discussed further below. In general, this imagery is sufficiently detailed for studies of gross geological and geomorphological structure, but mostly of year-2005 to year-2006 vintage (despite its copyright date of 2014), and therefore lacking in details of recent road-construction by the logging, mining and petroleum industries. Various archival aerial photographs are held in WCCP's Canadian technical files; the vintage of these photographs is clearly quite old, as few roads or forestry cutblocks are shown on them. Nevertheless, the aerial photographs are useful for stereo-viewing of landforms. Legal survey control points have been installed in conjunction with petroleum development, but their specific locations within the EB Main coal property are not known.

2.5 Physiography, landscapes, climate, and forest cover

Elevations range from 1395 metres above sea level, in the valley-bottom of Perry Creek (at the property's eastern edge) to 1971 metres above sea level, atop Mount Spieker, (in the northeastern corner of the property). Terrain is generally mountainous, with very steep hillslopes, capped by rolling sub-alpine plateaux which have been dissected by steep northeast-draining gullies, ravines, creeks and glacial cirques. Impassable cliff bands are present in some upland areas.


EB West property
EB Main property
EB Trend property
410371 (old C.L. 3036)
410370 (old C.L. 3037)
401369 (old C.L. 3039)
410368 (old C.L. 3040)
381717 (old C.L. 3041)
381716 (old C.L. 3042)
410367 (old C.L. 3045)
381715 (old C.L. 3046)
381714 (old C.L. 3047)
410366 (old C.L. 3050)
381713 (old C.L. 3051)
381712 (old C.L. 3052)
381711 (old C.L. 3059)
379597 (old C.L. 3401)
379598 (old C.L. 3400)
379600 (old C.L. 3399)
Schilling Road
Windfall Creek Road
Perry Creek Road
West Perry Road
a-66-E Road
Substation
d-77-E
b-78-E
a-66-E
a-A43-E
a-43-E
a-22-E
c-14-E
a-02-E
d-07-E
c-29-F
b-15-F
a-16-F
d-07-F
a-100-C
d-77-D
6112900
6110000
6105000
6102600
597000
600000
605000
610000
metres
0 1000 2000 3000 4000
Access (not classified as to trafficability):
Road
Trail
Seismic line
Land classification:
Coal licence (with historic and current tenure number)
Drainage:
Creek (perennial flow)
Stream (perennial or intermittent flow)
a-16-F
Natural gas wells (not classified as to activity)
Power line (230 KV)
N
UTM NAD 83 zone 10
Scale: as shown
Grid: UTM NAD 83
Drawn: GCH
Revision: A
Dwg: EB_Main-regional-topography-roads_141211a.srf/jpg
WALTER ENERGY
COAL TENURE AND TOPOGRAPHY
DEC 2014
EB MAIN COAL ASSESSMENT REPORT
MAP 2-2

8



MOUNT SPIEKER
UTM NAD83
CANADA
NTS 93P/03
STRUCTURAL GEOLOGY
Thrust fault -- ornament on leading-edge of overthrust structural plate
Anticline
Syncline
Monocline -- arrow shows downfold
Bedding attitude
Outcrop, lacking attitude data
ACCESS AND TRANSPORT
Road -- major, minor (unclassed as to trafficability or composition); restored
Pipeline -- right-of-way not under road
Seismic line -- (unclassed as to trafficability)
metres
0 500 1000 1500 2000 2500 3000
STRATIGRAPHIC LEGEND
MADE GROUND (Recent)
M Mine dumps and tailings pond (Bullmoose Mine)
DRIFT (Pleistocene to Recent)
TL Talus and landslide deposits (undivided); extent is interpreted from imagery
D Valley-filling alluvium, peat and muck; colluvium and moraines (undivided)
FORT ST JOHN GROUP (Albian)
8a Hasler Formation -- marine shale and siltstone
7 Boulder Creek Formation -- sandstone, shale, conglomerate and coal
7c Paddy Member -- conglomerate and sandstone
7b Walton Creek Member -- siltstone, sandstone, conglomerate and coal (V zone)
7a Cadotte Member -- conglomerate and sandstone
6 Hulcross Formation -- marine shale and siltstone; minor tuff; basal gritstone
5 Gates Formation -- sandstone, mudstone, conglomerate and coal
5c Notikewin Member -- sandstone, siltstone; minor coal (P, Q and R zones)
5b Falher Member -- conglomerate, sandstone, coal and siltstone (A, B, C2, C, D and E zones); variably-carbonaceous to coaly mudstone
5a Torrens Member -- sandstone (Quintette and Torrens sands), minor siltstone and mudstone (Medial silty zone)
4 Moosebar Formation -- marine siltstone and mudstone; minor sandstone and tuff; basal pebbly glauconitic sandstone
4c Spieker Member -- marine siltstone and sandstone
4ab Cowmoose member (informal) -- mudstone; minor tuff; pebbly glauconitic sandstone at base (not Bluesky Member)
BULLHEAD GROUP (Barremian to Aptian)
3 Gething Formation -- siltstone, sandstone, conglomerate and coal
3bcd Chamberlain, Bullmoose and Bluesky Members (undivided) -- sandstone, siltstone, coal (Bird, Skeeter and Chamberlain zones); marine mudstone and siltstone in basal part; Bluesky glauconitic sandstone at base (not mapped separately at this scale)
3a Gaylard Member -- sandstone, siltstone and coal; lenses of conglomerate near base
2 Cadomin Formation -- cliff-forming conglomerate and sandstone; minor siltstone
MINNES GROUP (Berriasian to Valanginian)
1 Monach Formation -- sandstone, conglomerate and coal
Drawing file:EB-Main-workmap-geology-141211c.srf/jpg
Date: 2014 December 11 Horizontal datum: UTM Zone 10N NAD83
Scale: as shown on bar-scale
Imagery: Compiled from work by A. Legun P.Geo.(BC), B.C. Geological Survey, and by staff of Robertson Research, Mitsui Mining and Ranger Oil
Drawn by: C.G. Cathyl-Cuhn P.Geo.(BC) Lic.Geol.(WA) RMSME
Caution to the user: locations of historic boreholes are not consistently shown on available base-maps; field-check is required
Schilling Thrust
Overlook Thrust
Birdbath Thrust
Barrens Anticline
Duckpond Thrust
Bullmoose Thrust
Headwaters Thrust
East Bullmoose Thrust
Spieker (Main) Syncline
East Bullmoose Anticline
Jones Syncline
Fortress Mountain Syncline
Fortress Mountain Anticline
Fortress Mountain West Anticline
COAL LICENCES
EB Trend Property
Other tenures within the East Bullmoose properties
C Dec/11/2014 Structural geology
REV DATE DESCRIPTION
WALTER ENERGY
Drawn by: GCH
Checked by: GCH
Approved by: GCH
Revision No. C
Dwg. No.
GEOLOGY OF THE EB MAIN PROPERTY
DEC 2014
EB MAIN COAL ASSESSMENT REPORT
MAP 2-3
BOREHOLES AND WELLS
Walter Energy / Western Coal drilling:
Current (year-2001 to year-2014) drilling
Hydrologic test hole or groundwater well
Historic drilling (before year-2001) by others
Off-property drilling by others (may be incomplete)
Natural-gas exploration wells (current status varies)
ADITS
Historic adits (pre-2001)
UTM Grid North
6114000
6113000
6112000
6111000
6110000
6109000
6108000
6107000
6106000
6105000
6104000
6103000
597000 598000 599000 600000 601000 602000 603000 604000 605000 606000 607000 608000

9

Soil cover is patchy, consisting mainly, till, alluvium and peat at lower elevations, and talus and colluvium at higher elevations. Much of the upland plateau surface is covered by frost-shattered bedrock with interspersed patches of organic muck in poorly-drained areas.

EB Main has a continental alpine climate, characterised by long, moderately cold, snowy winters and short, rainy summers. Snow and frost may occur in any month of the year. On east- and north-facing slopes, winter snow-cover lingers into late summer, and small patches of firn persist year-round in the headwalls of the cirques. Winds are generally gusty and ongoing, with rare calm periods. Convective thunderstorms frequently occur during summer months, bringing intense rain-showers and occasional hail.

Coniferous forest covers the lower slopes of the property, declining in size and vigour with increasing altitude and wind-exposure. Subalpine slopes are occupied by patchy, stunted, densely-tangled coniferous krummholz, and the upland areas are covered by grasses, mosses and lichens. The EB Main coal property is situated within two biogeoclimatic zones (Aldritt-McDowell, 1998; Macdonald and Hewitt, 2007).

- ESSF: the Engelmann Spruce-Subalpine Fir zone, above 1200 metres, and beneath 1700 to 1800 metres' elevation, depending upon topographic aspect; characterised by a moderately dense coniferous forest; and
- BAFA: the Boreal Altai Fescue Alpine zone, above 1700 to 1800 metres' elevation, characterised by alpine tundra with willows, grasses, sedges and lichens and patches of krummholz subalpine fir and lodgepole pine, often comprising excellent habitat for caribou.

2.6 Exploration history

Exploration at EB Main commenced with structural and stratigraphic geological mapping, conducted by Dr. Peter Jones (1960) on behalf of Triad Oil in 1959, and subsequent drilling (**Section 2.6.2**, **Table 2-2**) supported by further geological mapping, undertaken by Mitsui Mining (Shima and Nishio, 1975; Shima and Kinoshita, 1976; Yayoshi and Wada, 1977), and Robertson Research (Jordan and Dawson, 1978) during the 1970s, and by Peace River Coal Incorporated (Jefferys, 2007) in 2006.

In addition to the exploratory mapping by industrial workers, regional structural and stratigraphic mapping were undertaken by workers from the British Columbia Geological Survey Branch, published as open-file reports by Kilby and Wrightson (1987b) and Legun (2009b).

Widely-spaced drilling was also undertaken by oil and gas companies, seeking to explore and develop natural gas deeply-buried carbonate reservoirs within thrust-faulted and folded Triassic rocks. A moderately-dense grid of seismic-reflection survey lines was established in support of natural gas exploration. More densely-spaced drilling has been undertaken by various coal companies, including Walter Energy (as documented in the latter part of **Table 2-2**). Details of borehole positions, depths, and geophysical logs run in the various coal-exploration boreholes are presented in the previously-submitted CAR-965 (Cathyl-Huhn, Singh, and LeMay, 2014).

Table 2-2: Coal-exploration boreholes at EB Main

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
EB(MS)-1	601744.67	6108224.08	1767.7	508.41	Core	NQ	unknown	1975-09-10	CAR-552
EB(MS)-4	603177.97	6107025.58	1443.7	115.21	Core	NQ	unknown	1976-09-16	CAR-552
EB(MS)-5	601566.37	6106669.58	1534.5	142.06	Core	NQ	unknown	1976-09-09	CAR-552
EB(MS)-6	601913	6106312	1531	157.28	Core	NQ	unknown	1976-09-23	CAR-552
EB(MS)-7	602591.47	6109680.98	1807.1	276.15	Core	NQ	unknown	1977-09-12	CAR-555
EB(MS)-8	601538.27	6109477.98	1722.3	112.17	Core	NQ	1977	1977	CAR-555
EB(MS)-9	602113.17	6107988.38	1708.9	255.42	Core	NQ	unknown	1977-08-25	CAR-555
EB(MS)-10	600819.87	6109798.88	1675.6	77.42	Core	NQ	unknown	1977-07-26	CAR-555
EB(MS)-11	601456.87	6110500.48	1760.7	182.88	Core	NQ	1977	1977	CAR-555
EB(MS)-13	601186.17	6107711.08	1686.5	276.45	Core	NQ	unknown	1977-08-11	CAR-555
EB(MS)-14	602764.07	6107402.18	1462.1	151.49	Core	NQ	1977	1977	CAR-555
EB(MS)-15	603218.47	6109567.38	1821.9	101.15	Core	NQ	1977	1977	CAR-555
MS-16	600645.27	6107675.78	1689.9	328.25	Core	HQ	1978-06-17	1978-06-25	CAR-556
MS-17	601554.87	6107842.38	1747.1	160.63	Core	HQ	1978-06-21	1978-06-24	CAR-556
MS-18	601365.57	6108036.58	1827.4	245.97	Core	HQ	1978-06-26	1978-07-02	CAR-556
MS-19	601508.07	6108480.08	1751.9	160.63	Core	HQ	1978-06-27	1978-06-30	CAR-556
MS-20	not surveyed		unknown	285.6	Core	HQ	1978-07-01	1978-07-03	CAR-556
MS-20A	601873.37	6110208.18	1904.8	320.73	Core	HQ	1978-07-26	1978-08-13	CAR-556

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
MS-21	601693.77	6107710.28	1702.3	106.71	Core	HQ	1978-07-03	1978-07-04	CAR-556
MS-22	600692.17	6108445.78	1875.8	430.38	Core	HQ	1978-07-05	1978-07-18	CAR-556
MS-23	602271.77	6110388.58	1941.7	70.1	Core	HQ	1978-07-15	1978-07-17	CAR-556
MS-24	602523.37	6110196.58	1944.9	56.69	Core	HQ	1978-07-19	1978-07-21	CAR-556
MS-25	not surveyed		unknown	46.33	Core	HQ	1978-07-20	1978-07-26	CAR-556
MS-25A	600992.37	6108181.48	1857.6	386.18	Core	HQ	1978-07-27	1978-08-07	CAR-556
MS-26	603241.27	6110099.98	1929.2	49.07	Core	HQ	1978-07-23	1978-07-25	CAR-556
MS-34	602077.47	6107838.78	1701.6	103.09	Core	HQ	1980	1980	CAR-558
MS-35	601639.97	6107257.98	1560.3	120.49	Core	HQ	1980	1980	CAR-558
MS-36	601565.87	6107222.18	1560.6	160.26	Core	HQ	1980	1980	CAR-558
MS-37	602059.07	6108239.68	1716.1	158.8	Core	HQ	1980	1980	CAR-558
MS-38	601476.07	6107019.18	1558.5	137.92	Core	HQ	1980	1980	CAR-558
MS-40	601803.87	6107652.48	1679.3	74.8	Core	HQ	1980	1980	CAR-558
EB-45	601787.007	6108460.814	1726.052	100.9	Rotary	13 cm	unknown	2001-08-27	CAR-965
EB-46	601931.801	6108593.003	1676.029	52.6	Rotary	13 cm	unknown	2001-08-27	CAR-965
EB-47	601853.644	6108528.661	1706.759	40.5	Rotary	13 cm	unknown	2001-08-28	CAR-965
EB-48	601560.779	6108536.528	1737.271	125.9	Rotary	12 cm	unknown	2001-09-16	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
EB-49	602140.634	6108373.315	1681.374	31.3	Rotary	13 cm	unknown	2001-08-30	CAR-965
EB-50	602222.031	6108084.169	1676.066	65.1	Rotary	12 cm	unknown	2001-09-16	CAR-965
EB-51	602330.59	6107798.788	1647.145	43.1	Rotary	13 cm	unknown	2001-08-31	CAR-965
EB-52	601930.149	6107776.365	1699.194	98.3	Rotary	12 cm	unknown	2001-09-04	CAR-965
EB-53	601854.765	6108109.092	1763.435	147.5	Rotary	12 cm	unknown	2001-09-08	CAR-965
EB-54	601693.489	6108361.811	1758.084	130.9	Rotary	12 cm	unknown	2001-09-18	CAR-965
EB-55	601446.405	6107697.268	1699.49	153.5	Rotary	12 cm	unknown	2001-09-23	CAR-965
EB-56	601744.115	6107398.986	1588.128	9	Rotary	unknown	unknown	unknown	CAR-965
EB-57	601743.507	6107247.502	1549.764	15	Rotary	unknown	unknown	unknown	CAR-965
EB-58C	601442.318	6107335.935	1581.596	132.9	Spot-core	HWG?	unknown	2001-10-27	CAR-965
EB-59C	601704.144	6107968.03	1770.849	176.3	Spot-core	HWG	unknown	2001-10-19	CAR-965
EB-60	601566.081	6106967.845	1550.877	153.75	Rotary	12 cm	unknown	2001-09-15	CAR-965
EB-61	601751.706	6106913.203	1530.69	99.2	Rotary	12 cm	unknown	2001-09-18	CAR-965
EB-62	601507.288	6108172.922	1811.454	227.1	Rotary	12 cm	unknown	2001-09-18	CAR-965
EB-63C	601633.636	6108266.779	1778.532	161.09	Spot-core	HWG	unknown	2001-10-25	CAR-965
EB-64	601646.377	6107457.819	1615.909	105.33	Rotary	12 cm	unknown	2001-09-19	CAR-965
EB-65	601300.785	6107538.869	1627.611	197.9	Rotary	12 cm	unknown	2001-09-20	CAR-965
EB 07-01A	601458.23	6108557.44	1731	132.3	Rotary	11.43 cm	2007-06-09	2007-06-16	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
EB 07-02	601415.56	6108487.85	1766.85	180.39	Rotary	11.43 cm	2007-06-22	2007-06-24	CAR-965
EB 07-03	601342.9	6108448.6	1800.35	209.21	Rotary	12.06 cm	2007-07-02	2007-07-05	CAR-965
EB 07-04C	601637.9	6108536.13	1728.16	108.28	Core	HQ	2007-07-07	2007-07-20	CAR-965
EB 07-05	601562.87	6108452.18	1748.17	151.79	Rotary	unknown	unknown	unknown	CAR-965
EB 07-06	601457.2	6108353.16	1783.92	191.74	Rotary	unknown	unknown	unknown	CAR-965
EB 07-07	601865.99	6108339.85	1735.88	135.06	Rotary	11.43 cm	2007-06-07	2007-06-09	CAR-965
EB 07-08	not surveyed		unknown	155.45	Rotary	unknown	unknown	unknown	CAR-965
EB 07-08A	not surveyed		unknown	175.26	Core	no	2007-06-13	2007-07-03	CAR-965
EB 07-08B	601649.85	6108116.09	1778.74	178.16	Spot-core	PWF	2007-07-03	2007-07-10	CAR-965
EB 07-09	601521.15	6107988.42	1798.33	212.39	Rotary	11.43 cm	2007-06-17	2007-06-19	CAR-965
EB 07-10	601403.9	6107874.82	1759.58	216.75	Rotary	11.43 cm	2007-06-12	2007-06-14	CAR-965
EB 07-11	602176.91	6108230.24	1679.56	62.9	Rotary	11.43 cm	unknown	2007-04-22	CAR-965
EB 07-11A	not surveyed		unknown	57.46	Core	6-inch	unknown	unknown	CAR-965
EB 07-11B	not surveyed		unknown	57.73	Core	6-inch	unknown	unknown	CAR-965
EB 07-11C	not surveyed		unknown	61.21	Core	6-inch	unknown	unknown	CAR-965
EB 07-11D	not surveyed		unknown	87.36	Core	PWF	unknown	2007-09-10	CAR-965
EB 07-12	602114.57	6108192.94	1702.64	131.8	Rotary	11.43 cm	unknown	2007-03-24	CAR-965
EB 07-12A	not surveyed		unknown	58.67	Core	6-inch	unknown	2007-03-29	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
EB 07-12B	not surveyed		unknown	59.42	Core	6-inch	unknown	2007-04-02	CAR-965
EB 07-12C	not surveyed		unknown	26.41	Core	6-inch	unknown	2007-04-11	CAR-965
EB 07-12D	not surveyed		unknown	58.8	Core	unknown	unknown	unknown	CAR-965
EB 07-13	602057.56	6108096.38	1721.24	143.06	Rotary	10.79 cm	2007-06-27	2007-06-28	CAR-965
EB 07-14	601917.77	6107978.98	1738.71	141.25	Rotary	10.79 cm	2007-06-25	2007-06-26	CAR-965
EB 07-15	601793	6107839.43	1713.01	119.82	Rotary	10.79 cm	2007-06-24	2007-06-25	CAR-965
EB 07-16C	601558.53	6107604.6	1660.55	143.28	Core	HQ	2007-07-22	2007-08-05	CAR-965
EB 07-17	601445.47	6107494.46	1626.59	171.56	Rotary	11.43 cm	2007-06-28	2007-06-29	CAR-965
EB 07-18	not drilled								
EB 07-19	602353.48	6107957.26	1640.97	61	Rotary	11.43 cm	2007-06-09	2007-06-10	CAR-965
EB 07-20	602258.07	6107878.69	1683.65	90.01	Rotary	11.43 cm	2007-06-11	2007-06-11	CAR-965
EB 07-21	602197.1	6107822.47	1682.14	79.76	Rotary	11.43 cm	2007-06-11	2007-06-12	CAR-965
EB 07-22	601727.54	6107355.9	1575.53	65.35	Rotary	11.43 cm	2007-07-14	2007-07-14	CAR-965
EB 07-22C	601720.24	6107356.13	1576.41	52.12	Core	HQ	2007-07-28	2007-08-04	CAR-965
EB 07-23	601547.3	6107178.35	1556.09	104.42	Rotary	11.43 cm	2007-07-10	2007-07-12	CAR-965
EB 07-24	601480.26	6107108	1557.67	126.92	Rotary	11.43 cm	2007-07-09	2007-07-10	CAR-965
EB 07-25	601777.01	6107186.62	1539.32	93.05	Rotary	10.79 cm	2007-06-29	2007-06-30	CAR-965
EB 07-26	601738.08	6107153.06	1539.29	92.89	Rotary	11.43 cm	2007-07-01	2007-07-02	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
EB 07-27	601667.18	6107075.09	1541.41	65.99	Rotary	11.43 cm	2007-07-22	2007-07-24	CAR-965
EB 07-28	601855.06	6107262.82	1541.71	59.74	Rotary	10.79 cm	2007-07-26	2007-07-28	CAR-965
EB 08-01	601610.85	6106741.71	1536.64	72.75	Rotary	12.06 cm	2008-09-04	2008-09-15	CAR-965
EB 08-02	601705.72	6106549.99	1510.61	45.72	Rotary	unknown	2008-09-07	2008-09-10	CAR-965
EB 08-03	601952.15	6106375.22	1521.36	111.64	Rotary	12.06 cm	2008-08-30	2008-08-31	CAR-965
EB 08-04	601766.04	6106604.88	1511.87	38.1	Rotary	unknown	2008-09-11	2008-09-14	CAR-965
EB 08-05	602182.09	6106178.89	1590.92	129.8	Rotary	10.16 cm	2008-08-31	2008-09-02	CAR-965
EB 08-06	602216.17	6106217.87	1579.41	77.65	Rotary	12.06 cm	2008-08-31	2008-08-31	CAR-965
EB 08-07	602436.04	6106000.33	1673.78	181.7	Rotary	10.16 cm	2008-08-26	2008-08-30	CAR-965
EB 08-08	602505.2	6106062.93	1634.65	87.2	Rotary	10.16 cm	2008-09-02	2008-09-03	CAR-965
EB 08-09	602691.99	6105842.73	1635.44	111.7	Rotary	10.16 cm	2008-08-27	2008-08-28	CAR-965
EB 08-10	602751.66	6105893.8	1626.5	77.93	Rotary	11.43 cm	2008-08-28	2008-08-29	CAR-965
EB 08-11	602712.23	6105701.04	1587.46	99.04	Rotary	11.43 cm	2008-09-04	2008-09-04	CAR-965
EB 08-12	602828.32	6105690.95	1570.6	64.9	Rotary	11.43 cm	2008-09-03	2008-09-04	CAR-965
EB 08-13	601569.31	6107222.77	1556.54	102.43	Rotary	12.7 cm	2008-09-15	2008-09-17	CAR-965
EB 11-01C	602055	6108094	1721	133.39	Core	HQ	2011-10-25	2011-11-10	CAR-965
MW 11-1	600916.3	6106749.49	1682.39	unknown	Rotary	unknown	unknown	unknown	CAR-965
MW 11-2	603230.16	6107679.12	1429.25	unknown	Rotary	unknown	unknown	unknown	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (continued)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
MW 11-5	601904.11	6106948.19	1517.78	unknown	Rotary	unknown	unknown	unknown	CAR-965
WW 1	602356.42	6107144.92	1477.99	unknown	Rotary	unknown	unknown	unknown	CAR-965
WW 2	601333.55	6106964.89	1561.62	unknown	Rotary	unknown	unknown	unknown	CAR-965
EB 13-03	603188	6107570	1429.6	151.52	Rotary	11.43 cm	2013-08-06	2013-08-09	CAR-965
EB 13-04	601348.8	6107249	1576.66	176.78	Rotary	11.43 cm	2013-08-13	2013-08-15	CAR-965
EB 13-05	601447.3	6106915	1557.66	139.34	Rotary	11.43 cm	2013-08-16	2013-08-18	CAR-965
EB 13-06	601924.8	6108148	1753.22	164.59	Rotary	11.43 cm	2013-08-19	2013-08-20	CAR-965
EB 13-07	602537.7	6108891	1544.88	176.78	Rotary	11.43 cm	2013-08-20	2013-08-23	CAR-965
EB 13-08C	601868.4	6106172	1548.23	280.37	Core	9.6 cm	2013-09-03	2013-09-10	CAR-965
EB 13-09C	602572.4	6105735	1655.17	262.76	Core	9.6 cm	2013-10-12	2013-10-16	CAR-965
EB 13-10C	601290.5	6107787	1716.61	223.95	Core	10.16 cm	2013-10-28	2013-10-30	CAR-965
EB 13-11	601698.6	6106544.6	1516.65	132.58	Rotary	11.43 cm	2013-09-23	2013-10-01	CAR-965
EB 13-12	601761	6106604	1517.47	111.25	Rotary	11.43 cm	2013-10-02	2103-10-07	CAR-965
EB 13-13	601563.7	6106465	1515.57	70.1	Rotary	11.43 cm	2013-10-08	2013-10-08	CAR-965
EB 13-13A	601595.55	6106420.2	1507.57	216.4	Rotary	11.43 cm	unknown	2013-10-30	CAR-965
MW-A	601907.28	6106248.09	1555.23	145.41	Rotary	9.5 cm	2013-07-28	2013-07-29	CAR-965
MW-B	602988.68	6105557.23	1525.2	93.67	Rotary	9.5 cm	2013-07-23	2013-07-24	CAR-965
MW-Bs	602991.57	6105557.71	1524.22	23	Rotary	unknown	unknown	unknown	CAR-965

Table 2-2: Coal-exploration boreholes at EB Main (concluded)

borehole	UTM (NAD 83)		metres		drilling details		date (year/month/day)		Coal Assessment Report reference
	easting	northing	elevation	depth	method	size	commenced	completed	
MW-C	603527.06	6106005.78	1444.03	68.87	Rotary	10.5 cm	2013-07-25	2013-07-26	CAR-965
MW-Cs	603529.69	6106006.65	1443.8	18	Rotary	unknown	unknown	unknown	CAR-965
MW-D	603154.33	6106997.62	1439.16	93.67	Rotary	9.5 cm	2013-07-27	2013-07-28	CAR-965
MW-Ds	603152.51	6106996.11	1439.3	12	Rotary	unknown	unknown	unknown	CAR-965
EB 14-01C	601870.346	6108340.45	1736.425	141.73	Core	22.86 cm	2014-07-21	2014-07-29	CAR-965
EB 14-02C	601793.311	6107838.808	1714.555	120.39	Core	24.13 cm	2014-07-30	2014-08-05	CAR-965
EB 14-03C	601485.958	6107109.14	1558.87	115.82	Core	24.13 cm	2014-08-06	2014-08-13	CAR-965
EB 14-04C	602393.578	6107964.485	1624.395	27.12	Core	9.6 cm	2014-08-14	2014-08-15	CAR-965
EB 14-05C	602323.135	6107942.369	1662.184	61.26	Core	9.525 cm	2014-08-15	2014-08-18	CAR-965
EB 14-06C	602275.948	6107917.019	1682.742	87.17	Core	9.525 cm	2014-08-18	2014-08-20	CAR-965
EB 14-07C	602230.308	6107894.957	1692.704	97.53	Core	9.525 cm	2014-08-20	2014-08-23	CAR-965
EB 14-08C	602192.546	6107922.759	1699.27	100	Core	11.43 cm	2014-08-23	2014-08-25	CAR-965
EB 14-09C	602159.683	6107947.219	1703.268	108.5	Core	11.43 cm	2014-08-25	2014-08-27	CAR-965
EB 14-10G	603184.427	6107387.914	1430.116	39.62	Rotary	unknown	2014-09-17	2014-09-20	CAR-965
EB 14-11G	603349.289	6107487.692	1413.554	48.76	Rotary	unknown	2014-09-15	2014-09-17	CAR-965

Notes: borehole MS-20 is presumed to be close to borehole MS-20A; similarly, borehole MS-25 is presumed to be close to borehole MS-25A. Positions of boreholes MS-35 and MS-36 are inferred to have been mistakenly swapped during the compilation of Little's report; their positions as given here are 'unswapped', based upon on a nearby current borehole (EB08-13), drilled as a check of this possibility. Borehole EB07-18 was apparently not drilled, as no record of its existence nor planned location has been found. Logs noted as 'thru rods' were run with steel drill rods or casing within the borehole, typically on account of caving conditions. Boreholes EB07-05 and EB07-06 collapsed prior to geophysical logging; only their total depth is known (from drillers' reports). No details have been found concerning boreholes MW11-1, MW11-2, MW 11-5, WW-1 and WW-2, other than tabulation of their locations. .

2.7 Current assessable work

Current assessable work at EB Main comprises analytical work performed on core samples retrieved from year-2014 boreholes, drilled within Coal Licences 381714 and 381715. Although the existence and principal details of these boreholes had previously been reported in CAR-965, analytical results were not yet available at the time of that report's submission.

Core descriptions for year-2014 boreholes have not yet been located within Walter Energy's technical files, despite a search for such records within plausible locations. Owing to the complete turnover or departure of technical staff who were formerly involved in the year-2014 drilling, it is now considered unlikely that the logs will be found.

2.8 Acknowledgements and professional responsibility

Walter Energy's former manager of coal quality, Christy Burres, provided analytical data for the year-2014 core samples, including a spreadsheet of sample information (including depth, thickness and core recovery figures compiled by staff of Walter Energy's exploration department) and copies of third-party analytical certificates. Furthermore, Ms. Burres compiled the analytical protocol and flowsheet presented within **Appendix A** of the present report.

Gwyneth Cathyl-Huhn P.Geo. accepts overall professional responsibility for the contents of this report, and to that effect has signed and sealed the original copy of the report.

3 Geology

Regional and local geology of EB Main (and the Sukunka-Quintette coalfield in general) is known mainly from the extensive work of D.F. Stott (1960; 1961; 1963; 1968; 1973; 1974; 1982; 1998), and D.W. Gibson (1992a, 1992b) on behalf of the Geological Survey of Canada (1968; 1973; 1982; 1998). As well, numerous coal-company reports are available as open file documents from the provincial Geological Survey Branch. The most useful of these reports (available as Coal Assessment Report No.556) was written by G.R. Jordan and F.M. Dawson (1978), working for Robertson Research (North American) Limited, on behalf of Ranger Oil (Canada) Limited.

3.1 Regional geology

The EB Main coal property lies within the Sukunka-Quintette coalfield of northeastern British Columbia, part of the Foothills structural province of the Canadian Cordillera. All rocks exposed at the ground surface are of Early Cretaceous age, belonging to the Bullhead (Barremian to Aptian stages) and Fort St. John (Albian stage) groups. Where the entire section has been preserved from erosion, total thickness of the Lower Cretaceous rocks is about 2.5 kilometres. Depth to Precambrian continental basement, including both Mesozoic and Palaeozoic rocks, is more substantial, in the range of 10 to 12 kilometres (McMechan, 1984), although some of this thickness is attributable to thrust-induced structural telescoping of the rock.

Detailed structural mapping by Dr. Peter Jones (1960), on behalf of Triad Oil, covers the EB Main property and nearby areas, at a scale of 1:63,630 (one inch to one mile). More recent regional-scale geological mapping by M. McMechan (1994), also on behalf of the Geological Survey of Canada, covers the EB Main property and nearby portions of the Sukunka-Quintette coalfield, at a scale of 1:250,000.

The majority of sedimentary rocks within the Sukunka-Quintette coalfield are clastic in nature, ranging in grain-size from claystones and mudstones through pebble-conglomerates. Lesser amounts of biologically- and chemically-derived sedimentary rocks are present, comprising coals, banded and nodular ironstones, glauconite-rich sandstones and gritstones, and impure dolomites.

Volcanic rocks constitute a very small component of the Jurassic and Early Cretaceous strata, comprising very fine- to fine-grained tuffs (discussed in greater detail in **Section 4.2.3.1** of this report), interpreted to be wind-borne distal ash-fall deposits from contemporaneous volcanoes within the Coast Plutonic Complex, far to the southwest of the property. No intrusive rocks are known to occur at EB Main, nor within the Sukunka-Quintette coalfield in general.

3.1.1 Regional stratigraphy and exploratory concept

During much of the Early Cretaceous, the Western Interior of North America was occupied by a shallow seaway, variably-designated by different authors as the Western Interior Sea, the Boreal Sea, or by various analogues of formation names, such as the Clearwater Sea, Hulcross Sea or Moosebar Sea. Into this seaway, various paleodeltas were built.

Coal deposits formed atop the paleodeltas, as a result of plant growth, peat accumulation, and burial of that peat beneath sufficient sediment to protect the peat from subsequent erosion. Peat-forming and peat-burial processes were repeated several times, in concert with autogenic fluvial/deltaic processes such as meandering, avulsion and deltaic lobe-switching, and also in concert with wider-ranging allogenic processes such as eustatic sea-level change. The outcome of these processes was the development of several vertically-stacked coal zones, each comprised of one or more coal beds.

Regionally, coal is known to be present within five paleodelta systems, within the Boulder Creek (Walton paleodelta), Gates (Notikewin and Falher paleodeltas), and Gething (Chamberlain and Gaylard paleodeltas) formations. Of these three formations, only the Gates and Gething formations have attracted any significant exploratory interest within the Sukunka-Quintette coalfield, including at EB Main, and of those latter two formations, the vast majority of drilling at EB Main has been within the Falher paleodelta of the Gates Formation, with a lesser amount of drilling within the Chamberlain paleodelta of the Gething Formation.

Coal-measures of the Walton paleodelta, but this coal system has not typically been regarded as an exploratory target in its own right (owing to an apparent scarcity of thick coal beds with coking potential), although it has attracted some attention within the Highhat Mountain area, several tens of kilometres to the northeast of EB Main.

3.1.2 Regional tectonic setting

The EB Main coal property, and its regional surroundings, is characterised by a thin-skinned deformational style comprising folded, laterally-arcuate thrust faults and associated fault-bend folds (Barss and Montandon, 1981).

Age relationships amongst the thrusts are as generally observed within the Cordilleran fold-thrust belts of the Laramide Orogen within North America, with the oldest thrusts occupying stratigraphically-higher positions, generally to the tectonic inboard side (hence, to the southwest) of the stratigraphically-lower and younger thrusts. As a general observation, the thrusts dip to the southwest and strike to the northwest, with vergence (sense of tectonic transport) to the northeast. Thrusts range in scale from mesoscopic features with stratigraphic displacements of a few decimetres to a few metres, to regionally-throughgoing faults and fault zones (such as the Bullmoose Fault and associated splays) with stratigraphic displacements of several hundred metres to more than a thousand metres. Thrusts characteristically overlap in *en echelon* manner, with displacement gradually transferring from one fault to another via trains of folds (Dahlstrom, 1970).

Bedding dips within the Sukunka-Quintette coalfield (including the EB Main property) are generally less than 20 degrees within the broad synclinoria which characterise the coalfield. Steep dips (rarely near-vertical to overturned) are occasionally observed within tightly-folded displacement-transfer zones near the ends of *en echelon* thrusts.

Regionally, the Hasler and Moosebar formations are often zones of *décollement* (tectonic detachment), characterised by near-bedding-parallel thrust faults (Cooper and others, 2004). Near-bedding detachments are occasionally seen within soft muddy siltstones and mudstones of the basal Falher Member of the Gates Formation, as well as within the Cowmoose mudstone within the Moosebar Formation. Gates Formation coals may also host bedding-parallel detachment zones, as expressed by the concentration of shearing within internal partings of impure coal or coaly rock.

Table 3-1: Table of lithostratigraphic units and significant coal beds

Geological Age		Lithostratigraphic Units: Group	Formation	Member	Division	Thickness	Map-Units		Coal Beds/Coal Zones: Bed	Zone
Early Cretaceous	Late Albian	Fort St. John	Hasler			>20 m	8a			
			----- *uppermost extent of drilled rocks at EB Main* -----							
			Boulder Creek	Paddy		9 to 30 m	7	7c		
				Walton Creek		95 to 115 m		7b	V coal bed	
	Late Middle Albian			Cadotte		20 to 40 m		7a		
	Middle Albian		Hulcross			105 to 125m	6			
	Late Early Albian		Gates	Notikewin		63 to 105 m	5	5c	P, Q and R coal beds (underlain by 'Blue Marker' bioherm)	
				Falher		75 to 85 m		5b	A, BL, BU, CL, CU, C2L, C2U, DL and DU coal beds; E coaly rock (horizon only)	
				Torrens	Quintette sandstone	25 m		5a		
					Medial siltstone	13 m				
					Torrens sandstone	12 m				
			Moosebar	Spieker		150 to 170 m	4	4c		
				Cowmoose mudstone		75 to 110 m		4b		
				basal 'Green Marker'		nil to 2.4 m		4a		
		Bull-head	Gething	Chamber-lain	(unnamed coal measures)	34 m	3	3d	Upper Bird	Bird zone
									Lower Bird	
									Skeeter coal bed	
									Chamberlain coal bed	
					Chamber-lain sandstone	11 to 17 m				
				Bullmoose	Upper	16 to 21 m		3c		
					Middle	1.5 to 3 m				
					Lower	15 to 17 m				
				Bluesky		0.3 to 3 m		3b		
	Hauterivian to Late Early Albian			Gaylard		145 to 150 m		3a	'Middle and Lower Coals' (Gething A through Gething E)	
	Hauterivian to Barremian		----- *lowermost extent of drilled rocks at EB Main* -----							
			Cadomin			50 m	2			
	Berriasian to Val-anginian	Minnes	Monach			>300 m	1		not yet explored	

Note: this chart revised December 12, 2014. Marker beds and 'Divisions' are local lithologic units without formal stratigraphic rank, although in most cases they extend across property boundaries.

3.2 Local geology

Approximately 1400 metres of Mesozoic (mostly Early Cretaceous) strata are present at EB Main, locally thickened to 1800 to 1900 metres by structural telescoping along thrust-faults. The Mesozoic section is incomplete, owing to deep erosion of its uppermost beds, accomplished during the Late Tertiary and Quaternary.

With the exception of thin bands of tuffaceous volcanic ash, all of the Lower Cretaceous strata within the EB Main area are sedimentary rocks. Intrusive igneous rocks, volcanic flows, and evaporites are unknown within the EB Main area.

3.2.1 Local stratigraphy

Within the EB Main property, rocks belonging to the Bullhead and Fort St. John groups are exposed at the ground surface, with the older rocks of the Minnes Group inferred to be present within the deeper subsurface.

Formations mapped (see **Map 2-3** and **Table 3-1**) as being present at outcrop range downwards from the Hasler Formation (map-unit 8a, the youngest mapped formation) to the Gething Formation (map-unit 3, the oldest mapped formation). Older formations are inferred to be present in the deeper subsurface, on the basis of their outcrop pattern (outside the bounds of the EB Main coal property) and their interpreted presence in natural-gas exploration wells.

In addition to formations, formal and informal lithostratigraphic units with ranks ranging from member to division to (marker-) bed may be recognised within the closely-drilled southern four coal licences at EB Main. These subordinate units are discussed in greater detail within **Section 4** of this report.

3.2.2 Local structural geology

The EB Main coal property consists of a gently-deformed 'layer-cake' of sedimentary rocks, predominantly in normal (‘tops-up’) stratigraphic positions, therefore with upward-younging age relationships.

Exceptions to this situation are presented by at least four laterally-throughgoing, northeast-verging, northwest-striking thrust faults, defining a series of narrow to broad structural ‘plates’ (thrust sheets) separated by complexly-crumpled smash zones adjacent to the thrusts. Each of the structural plates is thus telescoped upon the underlying plate, acting to structurally shorten (in a southwest-northeast direction) and thicken (in a vertical direction) the overall section of sedimentary rocks. Thrust faults are inferred to have developed in the typical downward-younging sequence of successive faulting, with one exception as noted below in **Section 3.2.3**. Overall intensity of deformation (and hence structural shortening, as signified by increased inclination of bedding, and by shortened wavelength of folds), appears to increase from the southwestern corner of the EB Main property to its northeastern corner.

3.2.3 Discussion of faults

As noted above, at least four throughgoing northeast-verging thrust faults have been mapped at EB Main, with several more low-displacement ‘minor’ thrust faults found within boreholes drilled thus far (**Table 3-2**), and also locally-mappable at ground surface. **Map 2-3** depicts the structures under discussion.

From southwest to northeast, the major thrust faults are:

Overlook Thrust, interpreted to have partially-shortened the Notikewin Member and Hulcross Formation within the west-central upland part of the EB Main property, and to possibly have splayed southward into several anastomosing imbricate 'slices' within the closely-drilled central part of the property. The southeastward continuity of the Overlook Thrust has not yet been satisfactorily established, although structural studies now underway may lead to its recognition as far along strike as the southeastern corner of Coal Licence 381712.

Headwaters Thrust, interpreted to have brought the uppermost coal-measures of the Gething Formation to the bedrock surface within the east-trending uppermost valley of Perry Creek. The southeastward continuation of the Headwaters Thrust has not yet been established, and it may ‘tip out’ laterally in an anticline-syncline couple formed by the East Bullmoose Anticline and the Jones Syncline, within the adjoining EB Trend coal property (Cathyl-Huhn and Singh, 2014).

Bullmoose Thrust, interpreted to have brought the uppermost Gething coal-measures over the Moosebar Formation for much of its length. Displacement of the Bullmoose Thrust appears to increase northwestward along its trace, throwing the Spieker Member of the Moosebar Formation over the Hasler Formation, within the northeastern corner of the EB Main property.

East Bullmoose Thrust, interpreted to telescope the Moosebar Formation over Boulder Creek Formation, within the northeastern corner of the EB Main property. The East Bullmoose Thrust appears to be an out-of-sequence thrust, being truncated (to the north along strike) by the overlying Bullmoose Thrust.

Of the faults enumerated above, the Bullmoose and East Bullmoose thrusts are the major through-going structural features at regional scale, with the Overlook and Headwaters thrusts having a lesser degree of lateral continuity. Stratigraphic displacement across the Headwaters-Bullmoose-East Bullmoose thrust complex is estimated to be at least 630 metres down to the northeast. Stratigraphic displacement across the Headwaters Thrust by itself is estimated to be 30 to 100 metres. The poorly-constrained stratigraphic displacement across the Overlook Thrust is estimated to be only 20 to 50 metres. It should be noted these estimates of displacement are at best approximate, owing to paucity of deep drilling through fault zones.

Fault-to-bedding cutoff angles (alpha-angles) of 30 degrees are considered to be plausible for competent strata (in keeping with widely-applied 'rule of thumb' amongst Canadian structural geologists). However, alpha-angles considerably less than 30 degrees (down to zero degrees in particularly weak strata such as the basal Cowmoose tuff-bearing shales of the Moosebar Formation, and within the sheared black shales overlying the Gates B coal zone) are considered to be locally possible. Detection of low-alpha thrust faults in non-cored boreholes is a challenging problem, as minimal structural repetition may thus be engendered.

Table 3-2: Drilled intersections of faults at EB Main

Borehole	metres			Asssurance of existence	Borehole	metres			Asssurance of existence
	From	To	Shear zone thickness			From	To	Shear zone thickness	
EB(MS)-1	189.57	189.59	0.02	Probable	EB07-04C	26.3	26.4	0.1	*unranked*
EB(MS)-1	244.73	244.75	0.02	Probable	EB07-10	109.5	109.52	0.02	*unranked*
EB(MS)-1	424.26	424.28	0.02	Probable	EB07-16C	90	90.02	0.02	*unranked*
EB(MS)-4	80	80.1	0.1	Established	EB07-20	72.01	72.5	0.49	*unranked*
EB(MS)-9	121.53	121.55	0.02	Established	EB07-25	58	59	1	*unranked*
EB(MS)-13	129.2	129.4	0.02	Possible	EB07-28	27	27.02	0.02	Probable
MS-17	38.2	38.73	0.53	Probable	EB08-07	55.55	56.1	0.55	Possible
MS-20A	169.61	171.63	2.02	Probable	EB08-07	150.85	150.88	0.03	Established
MS-22	262.8	263	0.02	Probable	EB08-07	153.05	153.1	0.05	Established
MS-22	289.18	289.2	0.02	Probable	EB08-11	86.5	87.1	0.6	*unranked*
MS-25A	47.98	48	0.02	Possible	EB13-03	139.08	139.1	0.02	Probable
MS-35	78.01	78.03	0.02	Probable	EB13-04	27.85	27.95	0.1	Established
EB54	114.8	114.9	0.1	*unranked*	EB13-06	66.5	66.52	0.02	*unranked*
EB55	118.38	118.4	0.02	Established	EB13-08C	207.13	207.57	0.44	Probable
EB60	120.9	120.92	0.02	Probable	EB13-09C	224.07	224.28	0.21	Established
EB61	46.8	46.82	0.02	Probable	EB13-09C	230.32	233.93	3.61	Probable
EB62	11	11.02	0.02	Possible	EB13-10C	15.2	15.22	0.02	Probable
EB63C	17.7	17.72	0.02	Possible	EB13-10C	162.26	162.69	0.43	Established
EB64	57.4	57.6	0.02	Established	EB13-11	127.9	128	0.1	Probable
EB65	79.1	79.12	0.02	Probable	MW-A	28.15	28.32	0.17	Established
EB65	97.25	97.27	0.02	Probable	MW-D	57.3	57.4	0.1	Probable

Note: a shear-zone thickness of 0.02 metres is assigned as default, in those cases in which actual measurement is unavailable.

4 Stratigraphic synopsis

The following discussion (repeated with only minor amendments, from the corresponding chapter of CAR-965) sets forth details of the lithology, inferred origin, typical thickness and contact relationships of the various lithostratigraphic units present at EB Main, keyed to the map-unit numbers used in **Map 2-3** and **Table 3-1**. **Map 2-3** presents bedrock geology, upon which is overlaid the inferred extent of significantly-thick (ca. 20 metres or greater) unconsolidated sediments within the map-area.

Lithostratigraphic units are discussed in stratigraphic order from uppermost (youngest) to lowermost (oldest) within the exposed sequence of strata.

4.1 Unconsolidated deposits (map-units M, TL and D)

Within the area of **Map 2-3**, unconsolidated naturally-present and human-emplaced deposits, of Quaternary to Recent age, are shown as map-units M (made ground), TL (talus and landslide deposits) and D (alluvial, colluvial and glacial deposits, collectively mapped as 'Drift').

Map-units M and TL are not present <u>within</u> the boundaries of the EB Main property, as map-unit M is associated with the old workings of Bullmoose Mine (outside the EB Main property. Map-unit TL is associated with the glacially-undercut dip-slopes of Fortress Mountain (also outside the EB Main property). Map-unit D is, however, present within the property.

4.1.1 Made ground (map-unit M)

Within the mapped area, but situated three kilometres to the west of the EB Main coal property's northwestern corner (and therefore outside the bounds of the property), 'made ground' comprises mine waste material and coal-washery tailings associated with the historic operations of Teck Corporation's now-closed Bullmoose Mine. The extent of these deposits was mapped from satellite imagery (Cathyl-Huhn and Singh, 2014).

4.1.2 Talus and landslide deposits (map-unit TL)

Blocky, grey-weathering, bouldery deposits of sparsely-vegetated to unvegetated material are prominently visible on the glacially-undercut, steep-sloping north- and southwest-facing flanks of Fortress Mountain, four kilometres east of the southwestern corner of the EB Main property. Satellite imagery clearly shows the lobate shape of these deposits, which are interpreted to be talus and/or landslide deposits of Late Pleistocene to Recent age. Morphology of the deposits suggests that they post-date the most recent deglaciation; however, their age is not directly known.

4.1.3 Drift (map-unit D)

'Drift' is a collective term of convenience for undivided deposits of valley-filling alluvium, peat and muck, together with colluvial deposits and glacial till. Thickness and extent of Drift within and adjacent to the EB Main property has been mapped mainly by interpretation of landforms on satellite imagery and aerial photographs, supported by borehole information (as previously presented within CAR-965), and constrained by bedrock exposures. Closely-spaced drilling within the upper valley of Perry Creek has intersected a steep-walled, deeply-infilled bedrock channel. Maximum Drift thickness here is at least 94 metres, as indicated by borehole EB 13-12.

4.2 Fort St. John Group (map-units 8a through 4ab)

An incomplete section of the Fort St. John Group is present at EB Main, owing to the group's uppermost rocks (of the Dunvegan, Cruiser and Goodrich formations) having been stripped off by erosion. The youngest remaining rocks belong to the basal part of the Hasler Formation.

4.2.1 Hasler Formation (map-unit 8a)

Only the basal 20 metres' thickness of the Hasler Formation, comprising dark grey, rusty-weathering, rubbly- to platy-weathering, locally-concretionary shale, siltstone and sandstone, of shallow-marine origin, is present within the EB Main property. These rocks are poorly-exposed as colluvial rubble and felsenmeer, within the southernmost upland areas of Coal Licences 381712 and 381713, and immediately east of the Bullmoose Thrust, within the northeastern corner of Coal Licence 381716. The Hasler Formation has not been intersected by any of the historic nor current boreholes at EB Main, owing in large measure to the formation's limited preservation from erosion.

The Hasler formation is of Late Albian age (Koke and Stelck, 1985). The Hasler's presumed upper contact with the overlying Goodrich Formation has been removed by erosion throughout the EB Main property, whilst its disconformable contact with the underlying Paddy Member of the Boulder Creek Formation is placed at the base of a few decimetres of erosive-based pebbly mudstone to silty gritstone.

4.2.2 Boulder Creek Formation (map-unit 7)

The Boulder Creek Formation comprises 145 to 160 metres of interbedded conglomerate, sandstone, siltstone, mudstone and coal. Boulder Creek rocks are present within the core of the Spieker Syncline, along the crest of Mount Reesor Ridge, thus occupying the southwestern portions of Coal Licences 381712, 381713, and 381715. Within the EB Main property, the Boulder Creek is divisible into three members: the upper coarse-grained Paddy Member (map-unit 7c), the medial, dominantly fine-grained coal-measures of the Walton Creek Member (map-unit 7b), and the lower coarse-grained Cadotte Member (map-unit 7a). The Paddy and Cadotte members correspond to similarly-named strata within the subsurface Deep Basin of northwestern Alberta, whereas the Walton Creek appears to be confined to the Foothills, including the EB Main area (Gibson, 1992b; Krawetz, 2008; Roca and others, 2008; Henderson and others, 2014).

The Boulder Creek's three members are expressed in outcrop as two cliff-forming bands separated by a medial recessive band. The three members can also be readily traced in aerial photographs and satellite imagery. Only the Walton Creek and Cadotte members have been drilled at EB Main, in historic boreholes MS-16, MS-22, and MS-25A.

The basal contact of the Boulder Creek Formation with the underlying Hulcross Formation is generally abrupt and therefore considered to be conformable at local scale (Gibson, 1992b), although it may intertongue at regional scale.

4.2.2.1 Paddy Member (map-unit 7c)

The Paddy Member of the Boulder Creek Formation comprises 9 to 30 metres of thick-bedded to massive, cliff-forming pebble-conglomerate, gritstone, sandstone and minor siltstone, within the central portion of the Spieker Syncline. No coal, other than isolated discontinuous lenses of coalified plant trash, is known from the well-exposed Paddy Member at EB West (Cathyl-Huhn and Avery, 2014b), and similarly the Paddy is expected to contain no significant amount of coal at EB Main.

The Paddy Member's age at EB Main is not directly known (owing to lack of diagnostic fossils) but its age is constrained to Late Albian by the ages of underlying and overlying rocks (Gibson, 1992b). The basal contact of the Paddy Member with the underlying Walton Creek Member is inferred to be intertonguing at property-wide scale, and abrupt to erosional at local scale.

4.2.2.2 Walton Creek Member (map-unit 7b)

The Walton Creek Member of the Boulder Creek Formation comprises 95 to 115 metres of generally-recessive siltstone, variably-carbonaceous, locally root-penetrated mudstone and thin coal beds, of which only one (the 'V' coal bed) appears to be laterally-continuous within the vicinity of EB Main (although none of the historic nor current boreholes have passed through its stratigraphic level). Swale-forming fine-grained rocks are punctuated by cliff-forming lenses of sandstone, gritstone and pebble-conglomerate, inferred to be channel-fills.

Gibson (1992b) considered the Walton Creek Member to be of probable Late Albian Age, based upon its angiosperm flora. The basal contact of the Walton Creek Member with the underlying Cadotte Member is generally abrupt, and regarded by Gibson (*op. cit.*) as being conformable, although Krawetz (2008) noted that the top of the Cadotte is usually distinctively 'lumpy'.

4.2.2.3 Cadotte Member (map-unit 7a)

The Cadotte Member of the Boulder Creek Formation comprises 20 to 40 metres of cliff-forming sandstone and pebble-conglomerate with rare thin interbeds of siltstone. The Cadotte generally coarsens upward, with its sandstones being at its base and its conglomerates being in its middle and at its top. Other than isolated coalified logs, the Cadotte Member is devoid of coal. The basal contact of the Cadotte Member with the underlying Hulcross Formation is generally abrupt and therefore considered to be conformable at local scale (Gibson, 1992b), although it may intertongue at regional scale.

4.2.3 Hulcross Formation (map-unit 6)

The Hulcross Formation comprises 105 to 125 metres of thinly-interbedded, locally-concretionary medium grey siltstone, fine-grained sandstone and dark grey mudstone with occasional very thin but extremely-persistent interbeds of soft, light grey to white, tuffaceous volcanic ash. Mesoscale (a few decimetres to a few metres thick) fining-upward sequences reminiscent of proximate turbidites or tempestites are common within the Hulcross Formation near EB Main, as are trace-fossils and poorly-preserved shell fossils. Sideritic concretions are commonly found in isolated, laterally-persistent bands.

Fine-grained pyrite is locally-abundant within the Hulcross rocks, which are inferred to have been deposited beneath a stratified water column within a restricted-circulation seaway

(Stelck and Leckie, 1988).

Coal is rarely present within the Hulcross Formation, comprising isolated bands of interbedded bright coal and rock, a few centimetres to a few decimetres thick. These coals lack a rooty underbed, and they are therefore inferred to have originated as driftwood within the formation's shallow-marine setting. The thickest Hulcross coal is 45 centimetres thick, found in borehole EB07-03.

The Hulcross Formation is of Middle Albian age (Stelck and Leckie, 1988; Gibson, 1992b). Its immediate base is marked by a thin (generally a few centimetres to decimetres, rarely up to 1.4 metres thick) erosive-based bed of cherty pebbly sandstone or gritstone, locally informally termed the 'Basal Grit marker'.

4.2.3.1 Hulcross 'ash bands' as structural and stratigraphic markers

Tuffaceous volcanic ash bands (colloquially termed as 'ash bands' or as 'bentonites' although their mineralogy may vary from that of typical bentonites) form laterally-extensive, readily-correlatable, distinctively light-weathering, locally popcorn-weathering, lithological and geophysical (high natural-gamma count rate) markers a few centimetres to a few decimetres thick (Kilby, 1985; Gibson, 1992b).

Ash bands are of practical value in property-scale structural studies, as they aid the tracing of faults and folds through the Hulcross Formation. At least twenty ash-bands can be traced locally and regionally, of which six bands (from top down, designated as 20-ash, 16-ash, 12-ash, 8-ash, 5-ash, and 4-ash) are consistently-recognisable at EB Main (Cathyl-Huhn, 2014).

4.2.4 Gates Formation (map-unit 5)

The Gates Formation comprises 220 to 230 metres of interbedded sandstone, siltstone, conglomerate, shale and coal. The Gates Formation, as were the Boulder Creek and Hulcross formations, was formerly considered a member of the Commotion Formation (Stott, 1968), and that obsolete usage is evident in old coal assessment reports (*e.g.* Jordan and Dawson, 1978).

At EB Main, and within the Sukunka-Quintette coalfield generally, the Gates Formation may be usefully subdivided into three members, in order from top down:

Notikewin Member, comprising 63 to 105 metres of interbedded, locally-glauconitic sandstone and siltstone, with minor conglomerate, carbonaceous mudstone and generally-thin coal;

Falher Member, comprising 75 to 85 metres of conglomerate, sandstone and generally-thick coal, with muddy siltstone, carbonaceous mudstone and silty mudstone; and

Torrens Member, comprising 45 to 55 metres of sandstone, with minor siltstone, and lacking coal.

Each of these members may further be subdivided into informal or formal lithostratigraphic divisions (Leckie and Walker; 1982; Leckie, 1983; 1985; Caddel, 1999; Wadsworth and others, 2003; Caddel and Moslow, 2004), largely corresponding to changes in the shoreline position of the Western Interior Seaway (Legun, 2006; 2007; 2008; 2009a). These finer subdivisions of the Gates Formation aid in the determination of the stratigraphic displacements of thrust-faults, and in the correct correlation of the formation's coal beds. A detailed discussion of the formation's subdivisions is presented in Coal Assessment Report 938 (Cathyl-Huhn and Avery, 2014b).

The Gates Formation is of late Early Albian age (Stott, 1982; Wan, 1996). The basal contact of the Gates Formation with the underlying Moosebar Formation is gradational by interbedding at both regional and local scale. Details of the three members of the Gates are presented below.

4.2.4.1 Notikewin Member (map-unit 5c)

The Notikewin Member of the Gates Formation comprises 63 to 105 metres of siltstone and sandstone with minor conglomerate, variably-carbonaceous, locally root-bearing mudstone, and thin coal beds. Overall, the Notikewin is finer-grained than the underlying Falher Member of the Gates Formation (Leckie and Walker, 1982), and it tends to be more recessive-weathering than the Falher, although the Notikewin's basal sandstone/ conglomerate division locally forms a cliff band in hillside exposures.

Leckie (1985; 1989) has recognised four lithostratigraphic divisions within the Notikewin Member, of the which the uppermost division (Leckie's Facies D of the Notikewin) is most significant in that it locally contains coal of potentially-mineable thickness (within the Q coal zone, comprising the closely-adjacent Q and overlying QR coal beds).

The Notikewin Member within the Mt. Spieker area (including the EB Main property) also contains a lithologically- and geophysically-distinctive mollusc-shell reef deposit (here designated as the 'Blue Marker'), comprising a mud-matrix bioherm formed by closely-packed shells of *Ostrea* and other molluscs. The Blue Marker is readily recognised in core by the presence of shell-fossils, and in geophysical logs by its anomalously-high gamma-ray log response. The Blue Marker is readily-distinguishable and stratigraphically-unique, rendering possible the recognition of thrust-faults within the Notikewin by means of the marker's structural repetition.

The basal contact of the Notikewin Member atop the underlying Falher Member is abrupt to erosional, almost always marked by a few centimetres to decimetres of pebbly gritstone to pebble-conglomerate.

4.2.4.2 Falher Member (map-unit 5b)

The Falher Member of the Gates Formation comprises 75 to 85 m of conglomerate, sandstone and coal, accompanied by lesser proportions of muddy siltstone, carbonaceous mudstone and silty mudstone. On a regional basis, Falher coals are well-known to be generally thicker than are the coals of the Notikewin Member (Cathyl-Huhn and Avery, 2014b), and this is certainly also the case within the EB Main coal property, where only the Falher coals reliably attain mineable thicknesses.

The Falher Member is of Late Early Albian age (Wan, 1996). The basal contact of the Falher Member atop the Torrens Member is universally abrupt, and locally-undulating in detail.

4.2.4.3 Torrens Member (map-unit 5a)

Within the Sukunka-Quintette coalfield, the term 'Torrens Member' is often applied as a local name for the thick sandstone underlying the lowest of the mineable Gates coal beds. Within the Mt. Spieker area (including the EB Main, EB Trend and EB West coal properties), however, there are two of these sandstone units, the Quintette and Torrens sandstones, separated by a thick medial fine-grained 'silty zone' of interbedded siltstone, sandstone and shale. The medial silty zone of the Torrens Member lacks mineable coal at Mt. Spieker, despite its being the host of the K coal zone in the Quintette mines, further to the south within the coalfield (Cathyl-Huhn and Avery, 2014c).

The top of the Quintette Sandstone is almost always root-penetrated, at times distinctly softer, darker and carbonaceous to coaly (likely a paleosol), readily distinguishable from the harder, lighter-coloured and cleaner main body of the sandstone. The Quintette Sandstone is characteristically immediately overlain by the A coal bed (the basal coal of the Falher Member).

At EB Main, the Torrens Member is often 'tagged' by boreholes testing the Falher coals, as the Quintette Sandstone affords a ready indication that the basal section of Falher coal-measures has been completely drilled. The entire thickness of the Torrens Member is seldom drilled, as it is well-understood to lack significant coal, but some holes have gone through both sandstones and the intervening medial silty zone. The Torrens Member is now established to be 45 to 55 metres thick, of which the upper 25 metres comprises the Quintette Sandstone (Jordan and Dawson, 1978), whereas the medial silty zone is about 13 metres thick, and the basal Torrens Sandstone is about 12 metres thick.

The age of the Torrens Member is not directly known, as no diagnostic fossils have been found, but it is presumed to be Late Early Albian. The basal contact of the Torrens Member with the underlying Spieker Member of the Moosebar Formation is gradational by interbedding.

4.2.4.4 Notes concerning Gates Formation coals

Coals of the Gates Formation, and their enclosing sedimentary rocks, were deposited on the shoreline of the Western Interior Seaway between 108.7 and 111.0 million years ago, as part of an extensive complex of coastal plains, deltas and estuaries. Throughout the period of Gates Formation sedimentation, the shallow waters of the Western Interior Seaway generally lay a few kilometres to a few tens of kilometres northeast of EB Main, with the exception of a few isolated 'marine bands' associated with more substantial transgressions of the sea into and atop coal-forming coastal plain sediments. Such transgressions occasionally induced splitting within the Gates Formation coals (Wadsworth and others, 2003); splits were also occasionally induced by crevasse-splays from river channels, and perhaps also by drowning of coal-forming wetlands beneath lakes and ponds.

Within the EB Main coal property (Cathyl-Huhn, Singh, and LeMay, 2014; Minnes, 2007; Lortie and Burton, 2012), numerous coal zones, each comprising one or more individually-recognisable coal beds, are present within the Gates Formation. Coal zones and coal beds are designated by an upward-progressing system of lettering, from the A zone near the base of the formation, to the P, Q and R zones near the top of the formation. This scheme of designation resembles the upward-progressing lettering used at Teck Corporation's nearby Bullmoose Mine (with the exception that coal zones P, Q and R are not recognised at Bullmoose), and is thus the ontological inverse of the downward-progressing lettering used at Walter Energy's Perry Creek Mine.

Coal zones A through E occur within the Falher Member of the Gates Formation, whereas coal zones P through R occur within the Notikewin Member of the Gates Formation. In some cases, laterally-persistent bed-scale subdivisions of the coal zones have been recognised. For example, the C and D coal zones of the Falher Member each contain a lithologically- and geophysically-distinctive medial rock parting, such that the CU and CL coal beds may be recognised within the C zone, and the DU and DL coal beds may be recognised within the D zone. The B coal zone may be similarly subdivided into the BU and BL coal beds, although in this case, the subdivision is based upon the presence of a persistent 'dirty'zone at the top of the BL coal bed, and less-persistent but still generally-noteworthy zone of elevated gamma-log response at the base of the overlying BU coal bed.

The presence and geometry of the Gates Formation coals at EB Main has been established mainly by historic and current drilling, supported by historic test-pitting (mostly in the late 1970s) and the driveage of six adits, as documented within historic coal-assessment reports.

4.2.5 Moosebar Formation (map-unit 4)

The Moosebar Formation comprises 225 to 380 metres of dark grey, locally-concretionary mudstone and siltstone, with minor thin interbeds of sandstone and tuff, and a thin basal conglomerate. The wide variation of the Moosebar's thickness is likely due to overthrusting and concomitant tectonic thickening of its incompetent shales.

The Moosebar Formation is of Early Albian age (Stott, 1968). Its basal contact with the underlying Gething Formation is abrupt, and generally erosional, characteristically marked by a very thin band of variably-glauconitic gritty sandstone or pebbly gritstone.

At EB Main, and within the Sukunka-Quintette coalfield generally, the Moosebar Formation may be divided into three units. In order from top down, these are:

- Spieker Member (map-unit 4c): thinly-interbedded siltstone and sandstone, 150 to 170 metres thick;
- Cowmoose member (map-unit 4b): massive-appearing dark grey to black mudstone, with occasional thin bands of tuff, generally 75 to 110 metres thick, but possibly tectonically-thickened to 230 metres thick (Cathyl-Huhn and Avery, 2014b);
- 'Green marker' (map-unit 4a): variably-glauconitic gritty sandstone or pebbly gritstone, nil to 3 metres thick.

In the geological map (**Map 2-3**) presented with this report, map-units 4a and 4b are mapped together as 'map-unit 4ab', insofar as the Green marker (map-unit 4a) is so thin that it cannot be mapped separately at any property-wide scale.

4.2.5.1 <u>Spieker Member</u> (map-unit 4c)

The Spieker Member comprises 150 to 170 metres of thinly-interbedded, overall coarsening-upward sandy siltstone and sandstone, pervasively-bioturbated and possibly originating as proximal shallow-marine turbidites (Leckie, 1983) in front of the advancing Falher paleodelta.

Sandstone beds become thicker, coarser, and more abundant towards the top of the Spieker, and on the whole the Spieker Member is a transitional unit (Duff and Gilchrist, 1981) between the lower Moosebar mudstone and the overlying Torrens sandstones. In some earlier reports, the Spieker Member was termed the 'Sukunka Member' of the now-deprecated Commotion Formation (*vide* Wallis and Jordan, 1975).

The age of the Spieker Member is not directly known, but presumed to be Early Albian to possibly late Early Albian. Lithologically, the basal contact of the Spieker Member with the underlying Cowmoose Member is drawn at the base of the lowest band of sandy siltstone overlying the mudstones of the Cowmoose. In geophysical logs (see borehole EB13-02 at 141.9 metres' depth), the Spieker/Cowmoose contact is marked by an abrupt upward decrease in natural gamma-ray count-rate and a slightly less-abrupt upward increase in density-log response.

4.2.5.2 <u>Cowmoose Member</u> (map-unit 4b)

The Cowmoose Member of the Moosebar Formation comprises 75 to 90 metres of rubbly-weathering, massive-appearing black mudstone, punctuated by laterally-persistent bands crowded with ironstone concretions, and several thin (a few millimetres to a few decimetres) but laterally-persistent bands of light olive drab to white tuff. The tuff bands are useful as local structural markers (Duff and Gilchrist, 1981; Kilby, 1984a; Jordan and Dawson, 1988). The name 'Cowmoose' was introduced (Cathyl-Huhn and Singh, 2014) as an informal but practically-useful stratigraphic name, for the purposes of Walter Energy's geological studies; these rocks were previously referred to as the 'basal mudstone member' of the Moosebar Formation (Cathyl-Huhn and Avery, 2014b) or simply as the 'mudstone member' (Duff and Gilchrist, 1981).

The recommended type-section of the Cowmoose Member is on the northeastern face of Cowmoose Mountain, ten kilometres northwest of the EB Main property. The recommended alternative reference-section of the Cowmoose Member is on the western face of Mount Spieker, within the EB West coal property, immediately north of the EB Main property.

Within the EB Main property, the Cowmoose Member is locally well-exposed in shale-pits with the lowland portion of Coal Licence 381716. The Cowmoose mudstones are sparsely-bioturbated, and locally contain sparse to abundant burrow-fillings, irregular blebs and euhedral crystals of pyrite, indicative of overall anoxic depositional conditions. Pyrite is particularly abundant near the base of the Cowmoose Member.

The age of the Cowmoose Member is Early Albian (as noted for the mudstones of the Moosebar Formation by Stott, 1968). The basal contact of the Cowmoose mudstones over the underlying basal glauconitic zone (the Green marker) is gradational to abrupt, and generally easily-recognised on geophysical logs.

4.2.5.3 Green Marker (map-unit 4a)

The Green Marker, comprising the distinctive basal glauconitic zone of the Moosebar Formation comprises 0.2 to perhaps 3 metres of variably-glauconitic, chert-rich lithic arenite, locally containing stringers or lenses of gritstone or pebble-conglomerate. This zone is locally altogether absent (Cathyl-Huhn and Avery, 2014b), whereas it also occasionally scours deeply down into the underlying Chamberlain coal-measures.

Glauconite development within this unit is patchy, in contrast with its more obvious presence in other parts of the Sukunka-Quintette coalfield. Earlier reports (Wallis and Jordan, 1975; Jordan and Dawson, 1978) denoted this zone as the Bluesky Formation, on the grounds of its lithologic similarity to the typical Bluesky rocks of the Alberta Syncline and Deep Basin, but that correlation is now understood to be incorrect (Kilby, 1984b; Legun, 1990; Gibson, 1992a). The Bluesky Member *sensu stricto* is currently understood to form a sub-unit within the Gething Formation, underlying the Gething's Bullmoose Member, and overlying the Gaylard Member. The age of the Green Marker is not directly known, but presumed to be Early Albian. Its basal contact with the underlying Chamberlain Member of the Gething Formation is abrupt, and locally erosional, with several metres of relief at local scale.

4.3 Bullhead Group (map-units 3 and 2)

The Bullhead Group consists of two formations, the Gething Formation which comprises the majority of the group's thickness, and the underlying and consistently thinner Cadomin Formation (Stott, 1963; 1968; 1973; McLean, 1977). The Gething Formation is inferred to form bedrock within the northern tributary valley of Perry Creek, whereas the Cadomin Formation is known (from natural-gas exploration wells) to occur at greater depths within the subsurface.

The uppermost coal-measures of the Gething Formation's Chamberlain Member have been tested by coal-exploration drilling at several locations within the EB Main property, whereas the lowermost coal-measures of the Gething's Gaylard Member have thus far been only once been effectively tested by a coal-exploration borehole (EB13-07, within Coal Licence 381716). This borehole is interpreted to have reached the uppermost part of the Cadomin Formation (at a depth of 169.4 metres, thus encountering a drilled thickness of 146.9 metres of Gaylard coal-measures).

4.3.1 Gething Formation (map-unit 3)

The Gething Formation, of Hauterivian to Early Albian age within the Early Cretaceous (Gibson, 1992a), comprises thin to thick interbeds of siltstone, sandstone, mudstone and coal, with lesser amounts of gritstone, pebble-conglomerate, ironstone and tuff.

The Gething Formation originated as a complex of non-marine to shallow-marine sedimentary deposits, laid down by meandering and braided streams and rivers within a widely-extensive belt of coastal deltas, of which two (the younger Chamberlain and older

Gaylard paleodeltas) extended into the Mt. Spieker area, including the EB Main coal property.

Coals of the Gething Formation at EB Main, and their enclosing sedimentary rocks, were deposited between 111 and 123 million years ago (Gibson, *ibid.*), on the basis of regional plant-fossil and foraminiferal zonations.

Following upon suggestions made by coal-company geologists (Wallis and Jordan, 1975) and subsequent correlation by the British Columbia Geological Survey (Duff and Gilchrist, 1981; Legun, 1990), Gibson formally divided the Gething Formation into three members: the upper, non-marine to transitional Chamberlain Member, the middle marine Bullmoose Member, and the basal, non-marine to transitional Gaylard Member. A fourth member of the Gething Formation, the Bluesky Member, is on the basis of more recent work (Cathyl-Huhn and Avery, 2014b) also inferred to be present between the base of the Bullmoose Member and the top of the Gaylard Member.

Complete (albeit often broken by thrust-faults) sections of the Chamberlain and Bullmoose members have been drilled at EB Main, and apparently-unfaulted sections of the Bluesky and Gaylard members have been drilled as well.

In the geological map accompanying this report (**Map 2-3**), the Gething Formation is mapped as two rather than four divisions: the conjoint Chamberlain, Bullmoose and Bluesky members (map-unit 3bcd) and the underlying Gaylard Member (map-unit 3a).

4.3.1.1 Chamberlain Member (map-unit 3d)

At EB Main, the Chamberlain Member comprises 45 to 55 metres of thickly-interbedded, brown-weathering sandstone and siltstone, containing three regionally-significant coal zones (as first described by Wallis and Jordan, 1975): the Bird coal zone (containing the Upper Bird and Lower Bird coal beds) near the member's top, and the Skeeter and Chamberlain coal zones (containing the Skeeter and Chamberlain coal beds respectively) within the member's middle.

The Chamberlain Member may be readily divided into two divisions on the basis of lithology: an upper coal-measures unit comprising interbedded siltstone, sandstone and coal, and a lower dominantly-sandy unit (informally denoted as the 'Chamberlain sandstone'). The Chamberlain sandstone forms a consistent marker bed in the northern half of the Sukunka-Quintette coalfield, including the EB Main area.

The age of the Chamberlain Member is late Early Albian (Gibson, 1992a). The basal contact of the Chamberlain Member with the underlying Bullmoose Member is drawn at the base of the lowest of the (usually two) thick sandstones beneath the Chamberlain coal bed. This contact is generally abrupt at local scale, but probably gradational by interfingering at the regional scale.

The Bird, Skeeter and Chamberlain coal zones are well-known from the Sukunka and Bullmoose coal properties, further to the northwest of EB Main, and as well, these zones have been drilled to a limited extent at Walter Energy's Perry Creek property, to the southeast of EB Main.

Bird coal zone

At EB Main, only the Upper Bird and Lower Bird coal beds consistently attain mineable thicknesses of potential interest for underground mining (for purposes of this discussion, considered to be a minimum of 1.5 metres). Thin (a few decimetres thick) beds of coal or dirty coal occasionally occur within the rock parting between the Upper Bird and Lower Bird coals; these thin bands are considered likely to represent isolated lenses of coalified logs, caught up within the body of sediment.

Both the Upper Bird and Lower Bird coals themselves are characteristically bounded by one to two decimetres of coaly rock or dirty coal. Existence of these inferior selvages is inferred from the characteristic 'shoulder' responses seen on geophysical density logs.

Skeeter coal zone

The Skeeter coal zone does not generally attain workable thickness at EB Main, although a 2.5-metre intersection is reported from historic borehole EB(MS)-7. A more typical thickness of the Skeeter is 1.2 to 1.3 metres.

Chamberlain coal zone

The impoverished marginal facies of the Chamberlain coal zone is almost always represented at EB Main by a few decimetres of carbonaceous mudstone or coaly rock, and thus it is sparsely-represented in Table 4-6. Thin coals are, however, locally present at the Chamberlain horizon: 0.7 metres of dirty coal in groundwater well MW-C, and 0.31 metres of coal in EB(MS)-1

Although the Upper Bird and Skeeter coal beds at least locally attain plausible thickness for underground mining at EB Main (given good structural conditions, as yet unproven) they are generally thinner than the Bird coal seen at EB West (locally over 4 metres, as reported by Cathyl-Huhn and Avery, 2014b).

4.3.1.2 Bullmoose Member (map-unit 3c)

The Bullmoose Member comprises 35 to 40 metres of thinly-interbedded, recessive-weathering mudstone, siltstone and minor sandstone of turbiditic aspect, forming several fining-upward sequences within an overall coarsening-upward sequence.

At EB Main, and possibly elsewhere within the Mt. Spieker area, three lithologic divisions may be recognised within the Bullmoose Member: an uppermost siltstone/sandstone unit (16 to 21 metres thick), a medial sandstone/siltstone unit (1.5 to 3 metres thick), and a basal mudstone/siltstone unit (15 to 17 metres thick). The Bullmoose Member possibly forms bedrock within parts of the lowland portion of Coal Licence 381714, but insufficient outcrop mapping has been done to establish its contacts and extent. The Bullmoose has been drilled in three year-2013 boreholes at EB Main -- its basal portion only within EB13-07, and most of its thickness within EB13-03 and groundwater-monitoring borehole MW-C.

Where seen in outcrop within the nearby EB West coal property (Cathyl-Huhn and Avery, 2014b), the Bullmoose Member does not contain any coal, other than isolated coalified logs and coarse, poorly-preserved 'plant trash', likely of drifted origin.

The general lack of coal is also observed in the three year-2013 boreholes which intersected the Bullmoose Member at EB Main. The Bullmoose Member does, however, contain abundant molluscan fossils, including *Pecten (Entolium)* cf. *irenense* McLearn (Gibson, 1992a) and *Yoldia kissoumi* (Duff and Gilchrist, 1981), which, although not age-diagnostic are, by dint of their abundance locally-characteristic of the unit.

The Bullmoose Member is of late Early Albian age (Gibson, 1992a); its basal contact with the Bluesky Member is generally gradational, but locally abrupt.

4.3.1.3 Bluesky Member (map-unit 3b)

Within the Mt. Spieker area (including EB Main and the adjoining EB West and EB Trend properties) the Bluesky Member comprises 0.3 to 3 metres of distinctively-heterolithic, characteristically-intensively bioturbated and locally-shellbearing pebbly mudstone to gritty sandstone, at times slightly to moderately glauconitic, with occasional pyrite flecks. The basal contact of the Bluesky with the underlying Gaylard Member has not been observed at outcrop at EB Main (although it was intersected by borehole EB13-07 at a depth of 22.5 metres, beneath a drilled Bluesky Member thickness of 1.8 metres); however, elsewhere within the Sukunka-Quintette coalfield, the Bluesky-Gaylard contact is generally abrupt to erosional.

The age of the Bluesky Member is not directly known, owing to lack of determinable fossils, but it is likely to be late Early Albian. The Bluesky Member of the Gething Formation, as its name implies, is likely to be correlative – and probably homotaxial if not strictly coeval – with the Bluesky Formation of the Dawson Creek area.

4.3.1.4 Gaylard Member (map-unit 3a)

The Gaylard Member comprises 145 to 150 metres of thickly-interbedded siltstone, mudstone and brown-weathering channel-filling sandstone, accompanied by minor ironstone, tuff, gritstone and conglomerate. Numerous poorly-exposed coal beds are known to be present within the Gaylard Member at the nearby EB West coal property (Shima and Nishio, 1975; Cathyl-Huhn and Avery, 2014b), but no Gaylard coals have thus far been seen at outcrop at EB Main.

One year-2013 borehole at EB Main (EB13-07) drilled a complete section of the Gaylard Member at EB Main, where four coal zones (informally designated from top down as the Gething A through Gething D zones (as tabulated in CAR-965) were intersected within an overall Gaylard thickness of 147 metres. No assurance of correlation is implied with the similarly-named 'Lower Gething' coals within the Sukunka coal property. In addition to the tabulated coals, several thinner (decimetres to a metre thick) zones of coaly rock and associated dirty coal were encountered within borehole EB13-07.

The age of the Gaylard Member is Hauterivian to late Early Albian (Gibson, 1992a). Its basal contact with the underlying Cadomin Formation is abrupt to possibly erosional at the local scale (Cant, 1996) and interfingering at the regional scale (Stott, 1968; Gibson, 1992a), drawn at the top of a bed of coarse-grained, often gritty and occasionally pebbly sandstone which may laterally grade into more typical pebble-conglomerate characteristic of the Cadomin.

4.3.2 Cadomin Formation (map-unit 2)

Regionally within the Sukunka-Quintette coalfield, the Cadomin Formation immediately underlies the Gething Formation, forming the basal part of the Bullhead Group (Stott, 1968). The Cadomin is resistant to erosion, and typically forms ledges to cliffs beneath the more-subdued slopes of the Gaylard Member.

The Cadomin comprises one or more thick beds of coarse-grained, gritty to pebbly sandstone and pebble-to cobble-conglomerate (McLean, 1977; Jordan and Dawson, 1978) with occasional lenses of siltstone and pebbly gritstone, and rare thin lenses of dirty coal. Sandy phases of the Cadomin Formation thus strongly resemble the basal pebbly sandstones of the Gaylard Member, and the Cadomin's distinction from the Gaylard locally rests mainly upon the Cadomin Formation's greater lateral continuity.

The top of Cadomin Formation has reached by only one borehole at EB Main (EB13-07, at a depth of 169.4 metres), a unique circumstance amongst all of Walter Energy's coal properties in the Mt. Spieker-Wolverine River area. The Cadomin has also been intersected by several natural-gas exploration wells within and near to the EB Main property. The Cadomin Formation is not, however, interpreted to outcrop at any point within the EB Main property, as suggested by its mapped outcrop trace (as shown on **Map 2-3**) lying completely outside the property's boundaries.

At EB Main and within the Mt. Spieker area in general, the Cadomin Formation is estimated to be 50 metres thick (Jordan and Dawson, 1978). Its basal contact with the underlying Monach Formation is likely to be erosional, with considerable local scour into the older sediments. Regionally, the base of the Cadomin marks a northeastward-deepening angular contact, cutting down into successively-older rocks of the Minnes Group (Stott, 1973).

4.4 Minnes Group (map-unit 1)

The Minnes Group is virtually unexplored (other than by natural-gas wells) in the vicinity of the EB Main property, owing to its outcropping position in valley-bottoms, where thick Drift cover generally obscures bedrock. The total thickness of the Minnes Group is at least 2000 metres (Stott, 1998). The Minnes Group within the Sukunka-Quintette coalfield comprises three formations: from top down, the Monach, Beattie Peaks and Monteith formations. Of these three, only the sandstone-rich, potentially coal-bearing Monach Formation is expected to outcrop near EB Main, within the valley of South Bullmoose Creek, one kilometre southwest of the southwestern corner of the property.

6 Reclamation

Disturbance associated with year-2014 drilling at EB Main comprised the reactivation of a pre-existing network of drilling roads and trails dating back to the period of historic work, and the construction of additional trails to serve new drilling sites which were not otherwise-accessible via pre-existing roads and trails. Drill pads were built as needed, with efforts made to limit the size and depth of disturbance, in keeping with a general policy of avoidance.

Drill sites were cleared of equipment, supplies and trash concomitant with demobilisation of drilling rigs and support vehicles. Casings remain in place and open at those drill sites which have been field-checked. Some of the drill pads have been covered with scattered woody debris, as a reclamation treatment, although their access trails remain open.

A large number of drill rods, pieces of steel casing, wooden dunnage, and white plastic piezometer casing, along with sacks of lost-circulation material, remain on-site at a laydown area situated at kilometre 13.5 of the Perry Creek Road.

Some higher-grade access roads have remained open, either to support other land uses such as the oil and gas industry, or in the reasonable expectation that these roads will be needed to support future coal exploration, or the anticipated development of the EB mine.

7 Statement of estimated costs

No detailed records have been located, as concerns the costing of the 2014-2015 analytical work performed on year-2014 core samples from the EB Main coal property, insofar as the majority of the work was done in-house at minesite laboratories, and the third-party laboratory (ALS) have wound-down their Canadian coal-analysis business.

Equivalent commercial costs can, however, be estimated from price-lists of other suppliers, and a general knowledge of the analytical service market in western Canada. Unit costs presented in **Table 7-1**, below, are derived from discussions with Heather Dexter at Birtley Coal & Minerals Testing, previous experience dealing with Pearson and Associates (a petrographic service firm), and Walter Energy's Canadian manager of coal quality, Christy Burres.

No allowances have been made for sample preparation, taxes and freight (on the cost side) or possible negotiated volume discount (on the beneficial side) of this estimate. Errors and omissions in estimation remain the responsibility of the author.

Table 7-1: Estimation of analytical costs for the 2014-2015 work programme

Work item	Assumed unit cost	Pricing from	Actual provider	Quantity	Estimated cost
Proximate analysis, with LECO sulphur and FSI	$110.55 each	Birtley	in-house laboratories	343	$37,919
Light transmittance test (LT) for coal oxidation	$85.00 each	Birtley	in-house laboratories	46	$3,910
Float-sink tests, set of five separations (at s.g. of 1.30, 1.40, 1.50. 1,60 and 1.70)	$260.00 per set	Birtley	in-house laboratories	51	$13,260
Gieseler fluidity test (incl. max. ddpm)	$240.00 each	Birtley	in-house laboratories	33	$7,920
Ash chemistry (set of thirteen oxides)	$243.00 per set	Birtley	ALS	306	$74,358
Petrography and reflectance	$300.00 per set	Pearson	CoalTech	32	$9,600
				Total	**$146,967**

To the analytical costs estimated above, an allowance for report preparation (comprising data assembly and the writing of the present report) by its author may be added. Fifteen days at $500/day (unloaded day-rate) would amount to $7,500 for this item, thus giving overall project costs of **$154,467**. To reiterate, this cost figure is an estimate, in light of lack of detailed cost allocation records.

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9 Conclusions

The present report is part of a broader examination of coal properties within the Brazion and Sukunka-Quintette coalfields of northeastern British Columbia, Canada.

The EB Main coal property contains coal-measures of Early Cretaceous age, within the Bullhead and Fort St. John groups of sedimentary rocks. These rocks are deformed by thrust faults and associated folds, consistent with the overall thin-skinned structural style of the Rocky Mountain Foothills of northeastern British Columbia. Coal of potentially-mineable thickness is known to occur within the Gething and Gates formations, with the bulk of work to date having been devoted to the Gates Formation coals.

Current work at EB Main (during the 2014-2015 work term) here-reported, is wholly non-disturbant, comprising coal-quality analyses on selected coals from amongst a suite of 144 core samples recovered from year-2014 boreholes. Although three of the boreholes were drilled at large diameter (for purposes of obtaining bulk samples for coking tests). such tests were not run. Total estimated cost of this work, including allowance for preparation of the present report, is $154,467 (Canadian funds), exclusive of taxes.

[redacted]

The present report documents the coal quality of these samples, as tested in Walter Energy's minesite laboratories and at third-party laboratories. Extensive washability testing was done, leading to the assembly of 46 clean-coal composite samples of float-1.50 s.g. material. Mean maximum vitrinite reflectance ($R_o max$) and petrographic constitution was measured in pellets made from these samples. Results of these studies are reported in confidential appendices to this report, in keeping with the provisions of the *Coal Act Regulation* of the Province of British Columbia.

The EB Main property merits further work, as a developed prospect.

10 Statement of qualifications

I, C.G. Cathyl-Huhn P.Geo.(BC) Lic.Geol.(WA) RMSME, do hereby certify that:

a) I am currently employed on a full-time basis by Walter Canadian Coal Partnership, a subsidiary of Walter Energy Inc., in their Canadian head office in Tumbler Ridge, British Columbia.

b) This certificate applies to the current report, titled *Coal Assessment Report for the EB Main coal property, Mt. Spieker area, British Columbia*, dated October 21, 2015.

c) I am a member (Professional Geoscientist, Licence No.20550) of the Association of Professional Engineers and Geoscientists of British Columbia, licensed as a geologist (Licence No.2089) in Washington State, a member (No.152081) of the Association for Iron & Steel Technology, and a founding Registered Member of the Society for Mining, Metallurgy and Exploration (SME, Member No.518350). I have worked as a colliery geologist in four countries for over 37 years since my graduation from university.

d) I certify that by reason of my education, affiliation with professional associations, and past relevant work experience, having written numerous published and private geological reports and technical papers concerning coalfield geology, coal-mining geology and coal-resource estimation, that I am qualified as a Qualified Person as defined by Canadian *National Instrument 43-101* and a Competent Person as defined by the Australian *JORC Code*.

e) I have worked as senior colliery geologist for Walter Canadian Coal Partnership's Canadian operations since November of 2011.

f) My most recent visit to the EB Main coal property was in October of 2015.

g) I am the author of this report, titled *Coal Assessment Report for the EB Main coal property, Mt. Spieker area, British Columbia*, dated October 21, 2015, concerning the EB Main coal property.

h) I accept professional responsibility for this report.

i) As of the date of this report, I am not independent of Walter Canadian Coal Partnership and Walter Energy, pursuant to the tests in Section 1.4 of *National Instrument 43-101*, for the reason that I am a full-time employee of Walter Canadian Coal Partnership.

j) The effective date of this report is October 21, 2015.

“original signed and sealed by”

Dated this 21st day of October, 2015. C.G. Cathyl-Huhn P.Geo. Lic.Geol. RMSME

Appendix A: Sample inventory and analytical procedures

This appendix presents details of core samples of coal and associated rock, as retrieved from year-2014 cored boreholes previously-reported in Coal Assessment Report No.965 (CAR-965). Only geophysical logs are available for the year-2014 boreholes, as their core descriptions (if extant) were not circulated by now-departed exploration group staff.

As noted in the 'sample number' column, certain of the individual samples were combined to form composites. In some cases, composites are comprised of all individual samples within their overall depth range, but in other cases, rock partings were excluded for composites (as clearly noted in **Table A-1**). Samples identified as 'roof', 'floor' or 'parting' were not analysed, but are here-reported for completeness.

Analytical results are presented in **Appendix B** (washability test results) and **Appendix C** (petrographic and reflectometric results**)**, on a confidential basis in keeping with provisions of the *Coal Act Regulation*, as these analyses were performed on clean coal derived from laboratory-scale washability tests.

Table A-1: Sample inventory

Borehole	Sample number	Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
		From	To	Drilled	Recov-ered			
EB14-01C	3854	44.80	45.25	0.45	0.45	100	Mudstone	Roof
	composite 3855/3856/3857	45.25	46.76	1.51	1.51	100	Coal	DU
	3855	45.25	45.33	0.08	0.08	100	Coal	DU
	3856	45.33	46.49	1.16	1.16	100	Coal	DU
	3857	46.49	46.76	0.27	0.27	100	Coal	DU
	3858	46.76	47.15	0.39	0.39	100	Mudstone	Parting
	composite 3859/3860/3861	47.15	48.80	1.65	1.65	100	Coal	DL
	3859	47.15	47.38	0.23	0.23	100	Coal	DL
	3860	47.38	48.23	0.85	0.85	100	Coal	DL
	3861	48.23	48.80	0.57	0.57	100	Coal	DL
	3862	48.80	49.11	0.31	0.31	100	Mudstone	Floor
	3863	67.20	67.60	0.40	0.4	100	Mudstone	Roof
	3864	67.60	69.50	1.90	1.9	100	Coal	CU
	3865	69.50	69.96	0.46	0.31	67	Mudstone	Parting
	composite 3866/3868	69.96	71.86	1.78	1.78	100	Coal	CL
	3866	69.96	71.62	1.66	1.66	100	Coal	CL
	(not in composite) 3867	71.62	71.74	0.12	0.12	100	Mudstone	Parting
	3868	71.74	71.86	0.12	0.12	100	Coal	CL

Table A-1: Sample inventory (continued)

Borehole	Sample number		Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
			From	To	Drilled	Recov-ered			
EB14-01C	3869		71.86	72.24	0.38	0.38	100	Mudstone	Floor
EB14-01C	3870		98.00	98.30	0.30	0.3	100	Mudstone	Roof
EB14-01C	3871		98.30	98.83	0.53	0.53	100	Coal	C2
EB14-01C	3872		98.83	99.00	0.17	0.17	100	Mudstone	Floor
EB14-01C	1859		119.04	119.34	0.30	0.3	100	Mudstone	Roof
EB14-01C	composite 1860/1861/1862		119.34	124.23	4.89	4.89	98	Coal	B
EB14-01C		1860	119.34	121.27	1.93	1.93	100	Coal	B
EB14-01C		1861	121.27	122.75	1.48	1.48	100	Coal	B
EB14-01C		1862	122.75	124.23	1.48	1.48	95	Coal	B
EB14-01C	1863		124.23	124.96	0.73	0.73	100	Mudstone	Floor
EB14-01C	1864		139.29	140.43	1.14	0.99	83	Coal	A
EB14-02C	1865		140.20	142.33	2.13	2.13	100	Sandstone	Floor
EB14-02C	1894		31.69	32.55	0.86	0.86	100	Mudstone	Roof
EB14-02C	1895		32.55	33.40	0.85	0.85	100	Coal	DU
EB14-02C	1896		33.40	33.80	0.40	0.4	100	Mudstone	Parting
EB14-02C	1897		33.80	35.50	1.70	1.53	90	Coal	DL
EB14-02C	1898		35.50	35.96	0.46	0.46	100	Mudstone	Floor
EB14-02C	1887		51.35	51.82	0.47	0.47	100	Mudstone	Roof
EB14-02C	composite 1888/1890		51.82	53.55	1.27	1.27	100	Coal	C
EB14-02C		1888	51.82	52.17	0.35	0.35	100	Coal	CR
EB14-02C	(not in composite)	1889	52.17	52.63	0.46	0.46	100	Mudstone	Parting
EB14-02C		1890	52.63	53.55	0.92	0.92	100	Coal	CU
EB14-02C	1891		53.55	54.00	0.45	0.45	100	Mudstone	Parting
EB14-02C	1892		54.00	55.50	1.50	1.5	100	Coal	CL
EB14-02C	1893		55.50	56.00	0.50	0.5	100	Mudstone	Floor
EB14-02C	1882		71.73	72.80	1.07	1.07	100	Mudstone	Roof
EB14-02C	1881		72.80	73.30	0.50	0.5	100	Coal	C2
EB14-02C	1883		73.30	74.30	1.00	1	100	Mudstone	Floor
EB14-02C	1879		91.08	91.52	0.44	0.37	84	Mudstone	Roof

Table A-1: Sample inventory (continued)

Borehole	Sample number		Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
			From	To	Drilled	Recov-ered			
EB14-02C	composite 1876/1877/1878		91.52	97.33	5.81	5.76	99	Coal	B
		1876	91.52	92.25	0.73	0.73	100	Coal	B
		1877	92.25	94.67	2.42	2.37	98	Coal	B
		1878	94.67	97.33	2.66	2.66	100	Coal	B
	1880		97.33	97.69	0.36	0.36	100	Mudstone	Floor
	1885		109.73	111.60	1.87	1.87	100	Mudstone	Roof
	1884		111.60	112.67	1.07	0.84	78	Coal	A
	1886		112.67	115.82	3.15	3.15	100	Sandstone	Floor
EB14-03C	1926		35.76	36.02	0.25	0.25	100	Mudstone	Roof
	1927		35.80	37.20	1.40	1.4	100	Coal	DU
	1928		37.20	37.70	0.50	0.5	100	Mudstone	Parting
	1929		37.70	39.45	1.75	1.75	100	Coal	DL
	1930		39.45	39.90	0.45	0.45	100	Mudstone	Floor
	1931		55.98	56.59	0.61	0.61	100	Mudstone	Roof
	composite 1932/1934		56.60	58.20	1.28	1.28	100	Coal	CU
		1932	56.60	56.78	0.18	0.18	100	Coal	CU
	(not in composite)	1933	56.78	57.10	0.32	0.32	100	Mudstone	Parting
		1934	57.10	58.20	1.10	1.1	100	Coal	CU
	1935		58.20	58.62	0.42	0.42	100	Mudstone	Parting
	1936		58.62	60.00	1.38	1.38	100	Coal	CL
	1937		60.00	60.81	0.81	0.81	100	Mudstone	Floor
	1938		73.19	73.70	0.51	0.51	100	Mudstone	Roof
	1939		73.70	74.05	0.35	0.35	100	Coal	C2
	1941		74.05	75.12	1.07	1.07	100	Mudstone	Floor
	1942		95.70	96.39	0.69	0.69	100	Mudstone	Roof
	1943		96.60	101.95	5.35	5.35	100	Coal	B
	1944		101.95	102.10	0.15	0.15	100	Mudstone	Floor
	1945		114.00	115.80	1.80	1.8	100	Mudstone	Roof
	1946		115.80	117.12	1.32	1.09	83	Coal	A
	1947		112.67	115.82	3.15	3.15	100	Mudstone	Floor

Table A-1: Sample inventory (continued)

Borehole	Sample number	Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
		From	To	Drilled	Recov-ered			
EB14-04C	1901	19.05	21.50	2.45	2.15	88	Mudstone	Roof
	1902	21.50	22.77	1.27	0.74	58	Coal	A
	1903	22.77	26.36	3.59	3.59	100	Sandstone	Floor
	1904	38.90	39.30	0.40	0.4	100	Coal	BU
	1905	39.30	40.45	1.15	0.48	42	Mudstone	Roof
EB14-05C	1906	40.45	43.00	2.55	1.96	77	Coal	B
	1907	43.00	43.48	0.48	0.48	100	Mudstone	Floor
	1908	55.93	56.65	0.72	0.57	79	Mudstone	Roof
	1909	56.65	57.91	1.26	1.26	100	Coal	A
	1910	57.91	58.55	0.64	0.64	100	Sandstone	Floor
EB14-06C	1911	15.80	16.50	0.70	0.7	100	Mudstone	Roof
	1912	16.50	18.55	2.05	0.45	22	Coal	CU
	1913	18.55	18.92	0.37	0.37	100	Mudstone	Parting
	1914	18.92	20.50	1.58	1.39	88	Coal	CL
	1915	22.62	23.17	0.55	0.55	89	Sandstone/ Siltstone	Floor
	1916	59.70	60.30	0.60	0.6	100	Mudstone	Roof
	1917	60.30	64.80	4.50	1.75	39	Coal	B
	1918	64.80	65.18	0.38	0.38	100	Mudstone	Floor
	1919	77.41	77.86	0.45	0.45	26	Mudstone	Floor
	1920	78.45	79.71	1.26	1.26	100	Coal	A
	1921	79.71	80.10	0.39	0.39	100	Sandstone	Roof
EB14-07C	1922	6.09	7.00	0.91	0.76	84	Mudstone	Roof
	1923	7.00	8.20	1.20	1	83	Coal	DU
	1924	8.20	8.50	0.30	0.3	100	Carb shale	Parting
	1925	8.50	10.20	1.70	1.57	92	Coal	DL
	1951	10.20	10.76	0.56	0.56	100	Mudstone	Floor
	1952	26.32	26.92	0.60	0.53	88	Mudstone	Roof
	1953	26.92	28.03	1.11	0.76	68	Coal	CU
	1954	28.03	28.72	0.69	0.35	50	Mudstone	Parting
	1955	28.72	30.30	1.58	0.66	41	Coal	CL

Table A-1: Sample inventory (continued)

Borehole	Sample number	Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
		From	To	Drilled	Recov-ered			
EB14-07C	1956	30.30	30.80	0.50	0.5	100	Mudstone	Floor
	1957	45.00	45.32	0.32	0.2	63	Coal	C2
	1958	67.62	68.45	0.83	0.83	100	Mudstone	Roof
	1959	68.45	72.60	4.15	3.81	92	Coal	B
	1960	72.60	73.00	0.40	0.4	100	Mudstone	Floor
	1961	87.40	89.05	1.65	1.24	75	Coal	A
	1962	86.74	87.40	0.66	0.66	100	Mudstone	Roof
	1963	91.80	92.97	1.17	0.75	64	Coal	A repeat
	1964	92.97	93.37	0.40	0.4	100	Sandstone	Floor
EB14-08C	1965	13.71	14.55	0.84	0.84	100	Mudstone	Roof
	1966	14.55	15.87	1.32	0.66	50	Coal	DU
	1967	15.87	16.42	0.55	0.25	45	Mudstone / Carb Shale	Parting
	1968	16.42	18.00	1.58	1.58	100	Coal	DL
	1969	18.00	18.38	0.38	0.38	100	Mudstone	Floor
	1970	32.61	33.72	1.11	1.11	100	Mudstone	Roof
	1971	33.72	35.39	1.67	1.6	96	Coal	CU
	1972	35.39	36.20	0.81	0.59	73	Mudstone	Parting
	1973	36.20	37.47	1.27	1.16	91	Coal	CL
	1974	37.47	38.40	0.93	0.6	65	Mudstone/Sandstone	Floor
	1975	52.00	52.35	0.35	0.35	100	Coal	C2
	3476	73.76	74.36	0.60	0.6	100	Mudstone	Roof
	3477	75.40	79.42	4.02	3.75	93	Coal	B
	3478	79.42	80.00	0.58	0.58	100	Mudstone	Floor
	3479	92.04	93.27	1.23	0.56	46	Mudstone	Roof
	3480	93.27	94.22	0.95	0.78	82	Coal	A
	3481	94.22	94.82	0.60	0.6	100	Mudstone	Floor
EB14-09C	3482	18.48	19.40	0.92	0.92	100	Mudstone	Roof
	3483	19.40	20.57	1.17	0.3	26	Coal	DU
	3484	20.57	21.20	0.63	0.23	52	Coaly shale	Parting

Table A-1: Sample inventory (concluded)

Borehole	Sample number	Depth (metres)		Thickness (metres)		Core recov-ery %	Sample type	Sample of
		From	To	Drilled	Recov-ered			
EB14-09C	3485	21.20	22.80	1.60	0.99	62	Coal	DL
	3486	22.80	23.20	0.40	0.4	100	Mudstone	Floor
	3487	37.79	38.25	0.46	0.3	65	Mudstone	Roof
	3488	38.25	38.47	0.22	0.22	100	Coal	CU
	3489	38.47	38.82	0.35	0.17	49	Mudstone	Parting
	3490	39.97	40.60	0.63	0.51	81	Mudstone	Parting
	3491	40.60	41.95	1.35	0.99	73	Coal	CL
	3492	41.95	43.58	1.63	1.44	88	Siltstone	Floor
	3493	56.79	57.09	0.30	0.3	100	Coal	C2
	3494	77.72	79.58	1.86	1.6	86	Mudstone	Roof
	3495	79.58	79.85	0.27	0.21	78	Coal	BU
	3496	81.10	84.40	3.30	2.33	71	Coal	B
	3497	84.40	85.34	0.94	0.63	67	Sandstone	Floor
	3498	97.84	98.65	0.81	0.75	93	Mudstone	Roof
	3499	98.65	99.75	1.10	0.56	51	Coal	A

Note: drilled and recovered thicknesses, percentage core recovery, and coal bed identifications are as given in sample inventory prepared by former exploration staffers (Muzaffer Sultan P.Geo. and Garry Holmlund) of Walter Energy.

During the 2014-2015 programme of analytical work upon core samples taken in year-2014 boreholes, washability tests were done in-house at Walter Energy's minesite analytical laboratory, under the supervision of Walter Energy's manager of coal quality, Christy Burres. Following is Ms. Burres' description and flowsheet (**Figure A-1**) of work on the year-2014 samples.

Processing and analysis of year-2014 NEBC exploration core samples

The following steps were undertaken:

1. Core samples were delivered to the Wolverine minesite laboratory by Walter Energy's exploration geologists, Dr. Muzaffer Sultan and Garry Holmlund.
2. Sample identification numbers were recorded in database when received.
3. All initial processing of the core samples was performed at the Wolverine laboratory.
4. Samples were dried at 95°F/35°C.
5. Manual specific gravity test was performed on three larger chunks of core (from 6-inch cores only).
6. Samples were then manually broken down to pass through a screen with 2-inch square openings.

7. Float/Sink tests were performed on samples at cutpoints of 1.30, 1.40, 1.50, 1.60, 1.70 (using perchloroethylene, dibromomethane, and mineral spirits).
8. Float/Sink fractions were dried and weights of each fraction recorded.
9. Each float/sink fraction was split down. Reserve uncrushed portions of 6-inch cores were retained for potential future testing.
10. Splits of each float/sink fraction were crushed.
11. Crushed portions of 1.30, 1.40, 1.50 float fractions were split down further in order to retain crushed splits to create 1.30/1.40/1.50 composite samples for petrographic and Gieseler fluidity analysis.
12. Portions of 1.30, 1.40, 1.50, and all of 1.60, 1.70 and sinks were then pulverised for analysis and the creation of pulverised 1.30/1.40/1.50 composite samples.
13. Proximate analysis, total sulphur and free swelling index (FSI) were performed on each float fraction, and on sinks, at the Willow Creek minesite laboratory.
14. All on-site Walter Energy (northeastern British Columbia labs) analysis was performed in duplicate or triplicate and the average result reported.
15. A subsample of each float and sink fraction was sent to ALS Coal Lab in Richmond, British Columbia, for ash chemistry analysis.
16. Proximate analysis, total sulphur, FSI, Gieseler fluidity and light transmittance (LT) testing were performed on a weighted 1.30/1.40/1.50 composite sample at the Willow Creek laboratory.
17. A subsample of each weighted 1.30/1.40/1.50 composite was sent to ALS Coal Lab in Richmond for ash chemistry analysis.
18. A subsample of each weighted 1.30/1.40/1.50 composite was sent to CoalTech Petrographic Associates, Inc., in Murrysville, Pennsylvanian, for petrographic analysis including determination of mean maximum reflectance of vitrinite.

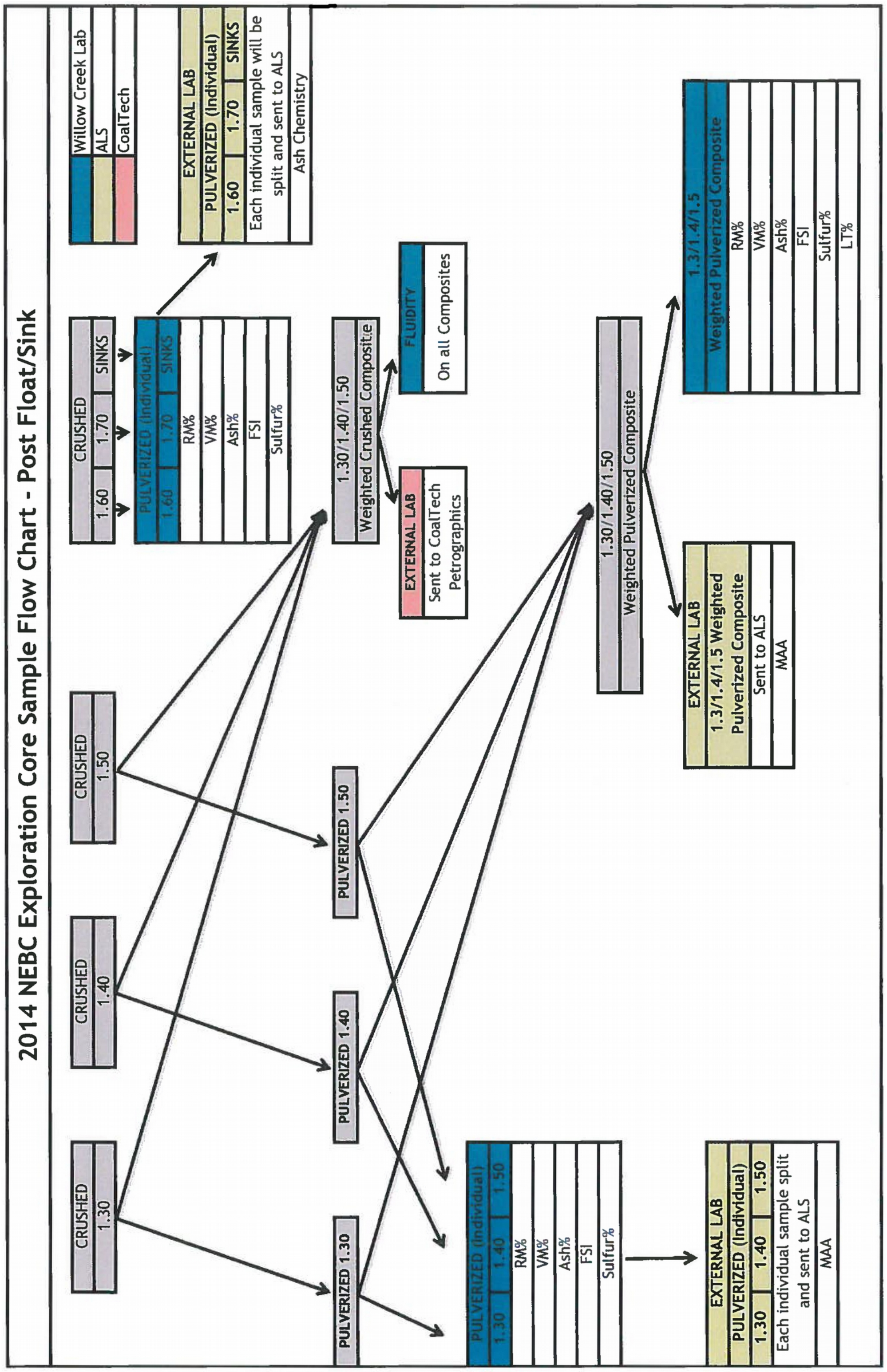
Notes:

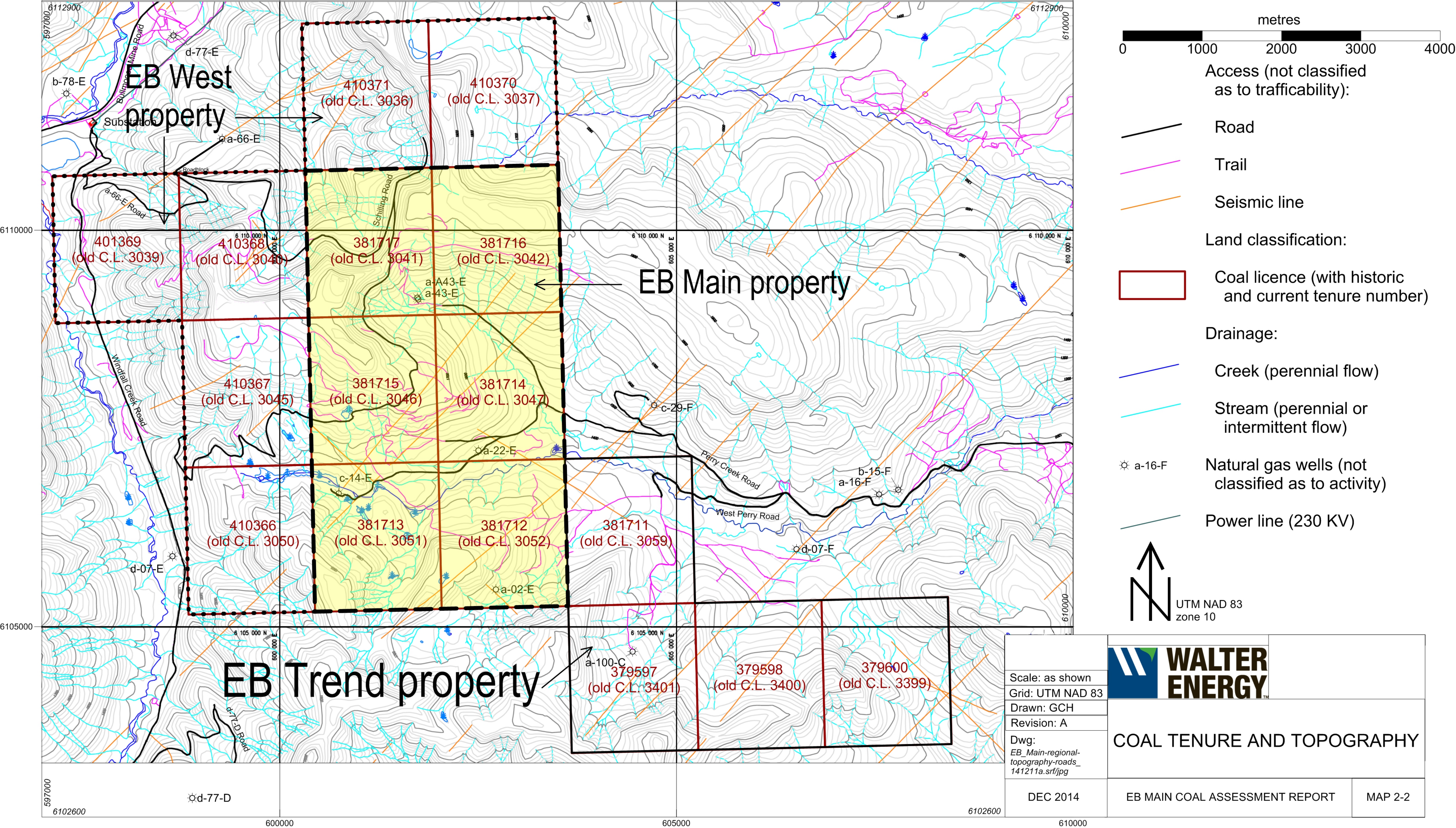
- Walter Energy's northeastern British Columbia round robin testing programme reference material was analysed and verified for accuracy with each sample batch during analysis of ash volatile matter, residual moisture, FSI and LT at the Willow Creek laboratory.
- The SC144-DR sulphur analyser was calibrated daily using LQCRM027, LQCRM066 and LQCRM094 certified reference material. A quality assurance (QA) check sample was analysed thereafter for every batch of ten core samples tested, to verify accuracy.
- Where applicable, all other equipment was calibrated on a daily basis prior to analysis

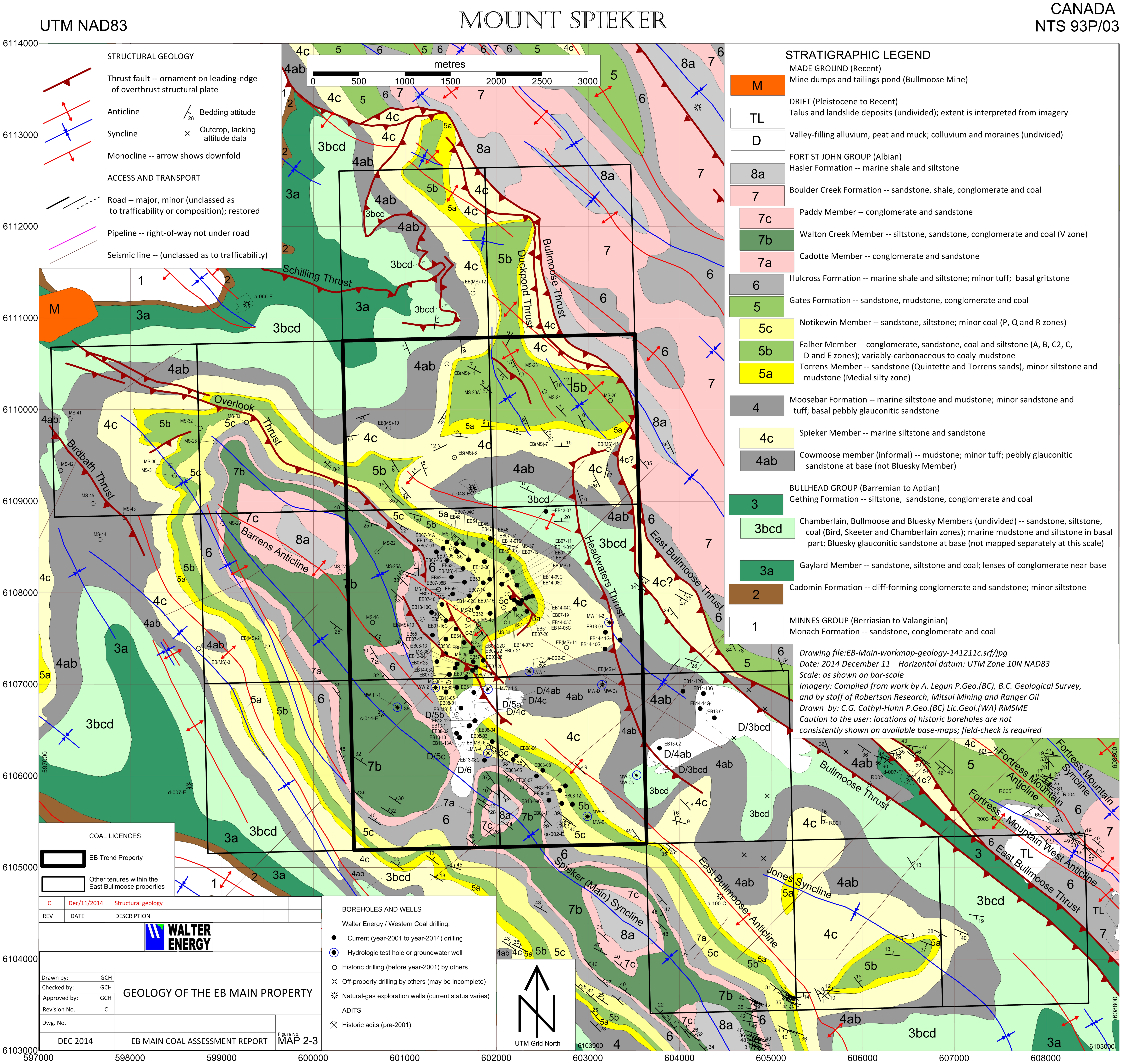
Testing Equipment used:

A&D HR 120 balance
Thermo Scientific Model 6958 oven
Vulcan 3-550 ashing furnace
FRICO free swelling index furnace
Thermo Scientific Lindberg Blue M volatile furnace
Leco SC-144 DR sulphur analyser
Preiser Model 4000 plastometer
Thermo Electron Corp Spectronic 20D+ spectrometer

Analytical flowsheet: **Figure A-1**




EB West property
EB Main property
EB Trend property
410371 (old C.L. 3036)
410370 (old C.L. 3037)
401369 (old C.L. 3039)
410368 (old C.L. 3040)
381717 (old C.L. 3041)
381716 (old C.L. 3042)
410367 (old C.L. 3045)
381715 (old C.L. 3046)
381714 (old C.L. 3047)
410366 (old C.L. 3050)
381713 (old C.L. 3051)
381712 (old C.L. 3052)
381711 (old C.L. 3059)
379597 (old C.L. 3401)
379598 (old C.L. 3400)
379600 (old C.L. 3399)
Bullmoose Mine Road
Substation
Roadblock
a-66-E Road
Schilling Road
Windfall Creek Road
Perry Creek Road
West Perry Road
d-77-D Road
d-77-E
b-78-E
a-66-E
a-A43-E
a-43-E
c-29-F
a-22-E
c-14-E
b-15-F
a-16-F
d-07-F
d-07-E
a-02-E
a-100-C
d-77-D
6112900
6110000
6105000
6102600
597000
600000
605000
610000
metres
0 1000 2000 3000 4000
Access (not classified as to trafficability):
Road
Trail
Seismic line
Land classification:
Coal licence (with historic and current tenure number)
Drainage:
Creek (perennial flow)
Stream (perennial or intermittent flow)
a-16-F
Natural gas wells (not classified as to activity)
Power line (230 KV)
N
UTM NAD 83 zone 10
Scale: as shown
Grid: UTM NAD 83
Drawn: GCH
Revision: A
Dwg:
EB_Main-regional-topography-roads_141211a.srf/jpg
WALTER ENERGY
COAL TENURE AND TOPOGRAPHY
DEC 2014
EB MAIN COAL ASSESSMENT REPORT
MAP 2-2


MOUNT SPIEKER
UTM NAD83
CANADA
NTS 93P/03
metres
0 500 1000 1500 2000 2500 3000
STRUCTURAL GEOLOGY
Thrust fault -- ornament on leading-edge of overthrust structural plate
Anticline
Bedding attitude
Syncline
Outcrop, lacking attitude data
Monocline -- arrow shows downfold
ACCESS AND TRANSPORT
Road -- major, minor (unclassed as to trafficability or composition); restored
Pipeline -- right-of-way not under road
Seismic line -- (unclassed as to trafficability)
STRATIGRAPHIC LEGEND
MADE GROUND (Recent)
M Mine dumps and tailings pond (Bullmoose Mine)
DRIFT (Pleistocene to Recent)
TL Talus and landslide deposits (undivided); extent is interpreted from imagery
D Valley-filling alluvium, peat and muck; colluvium and moraines (undivided)
FORT ST JOHN GROUP (Albian)
8a Hasler Formation -- marine shale and siltstone
7 Boulder Creek Formation -- sandstone, shale, conglomerate and coal
7c Paddy Member -- conglomerate and sandstone
7b Walton Creek Member -- siltstone, sandstone, conglomerate and coal (V zone)
7a Cadotte Member -- conglomerate and sandstone
6 Hulcross Formation -- marine shale and siltstone; minor tuff; basal gritstone
5 Gates Formation -- sandstone, mudstone, conglomerate and coal
5c Notikewin Member -- sandstone, siltstone; minor coal (P, Q and R zones)
5b Falher Member -- conglomerate, sandstone, coal and siltstone (A, B, C2, C, D and E zones); variably-carbonaceous to coaly mudstone
5a Torrens Member -- sandstone (Quintette and Torrens sands), minor siltstone and mudstone (Medial silty zone)
4 Moosebar Formation -- marine siltstone and mudstone; minor sandstone and tuff; basal pebbly glauconitic sandstone
4c Spieker Member -- marine siltstone and sandstone
4ab Cowmoose member (informal) -- mudstone; minor tuff; pebbly glauconitic sandstone at base (not Bluesky Member)
BULLHEAD GROUP (Barremian to Aptian)
3 Gething Formation -- siltstone, sandstone, conglomerate and coal
3bcd Chamberlain, Bullmoose and Bluesky Members (undivided) -- sandstone, siltstone, coal (Bird, Skeeter and Chamberlain zones); marine mudstone and siltstone in basal part; Bluesky glauconitic sandstone at base (not mapped separately at this scale)
3a Gaylard Member -- sandstone, siltstone and coal; lenses of conglomerate near base
2 Cadomin Formation -- cliff-forming conglomerate and sandstone; minor siltstone
MINNES GROUP (Berriasian to Valanginian)
1 Monach Formation -- sandstone, conglomerate and coal
Drawing file:EB-Main-workmap-geology-141211c.srf/jpg
Date: 2014 December 11 Horizontal datum: UTM Zone 10N NAD83
Scale: as shown on bar-scale
Imagery: Compiled from work by A. Legun P.Geo.(BC), B.C. Geological Survey, and by staff of Robertson Research, Mitsui Mining and Ranger Oil
Drawn by: C.G. Cathyl-Huhn P.Geo.(BC) Lic.Geol.(WA) RMSME
Caution to the user: locations of historic boreholes are not consistently shown on available base-maps; field-check is required
Schilling Thrust
Overlook Thrust
Birdbath Thrust
Barrens Anticline
Duckpond Thrust
Bullmoose Thrust
Headwaters Thrust
East Bullmoose Thrust
Bullmoose Thrust
Fortress Mountain Syncline
Fortress Mountain Anticline
Fortress Mountain West Anticline
East Bullmoose Thrust
Spieker (Main) Syncline
East Bullmoose Anticline
Jones Syncline
COAL LICENCES
EB Trend Property
Other tenures within the East Bullmoose properties
C Dec/11/2014 Structural geology
REV DATE DESCRIPTION
WALTER ENERGY
Drawn by: GCH
Checked by: GCH
Approved by: GCH
Revision No. C
Dwg. No.
GEOLOGY OF THE EB MAIN PROPERTY
DEC 2014
EB MAIN COAL ASSESSMENT REPORT
Figure No. MAP 2-3
BOREHOLES AND WELLS
Walter Energy / Western Coal drilling:
Current (year-2001 to year-2014) drilling
Hydrologic test hole or groundwater well
Historic drilling (before year-2001) by others
Off-property drilling by others (may be incomplete)
Natural-gas exploration wells (current status varies)
ADITS
Historic adits (pre-2001)
UTM Grid North
6114000
6113000
6112000
6111000
6110000
6109000
6108000
6107000
6106000
6105000
6104000
6103000
597000
598000
599000
600000
601000
602000
603000
604000
605000
606000
607000
608000