COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: Coal assessment report for the Hudette Trend coal property, British Columbia

TOTAL COST: $84,037

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

SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):

YEAR OF WORK: **2011**

PROPERTY NAME**: Hudette Trend**

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE:
Coal Licence 392477

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN:

MINING DIVISION: **Liard**

NTS / BCGS**: NTS 93O/8E**

LATITUDE: **55° 25’ 01" North**; LONGITUDE: **122° 02’ 22" West** (at centre of work)

UTM Zone: 10N EASTING: **560800** NORTHING: **6141600**

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

MAILING ADDRESS: **800-668 West Hastings Street, Vancouver, BC, V6B 1P1**

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

MAILING ADDRESS: **800-668 West Hashing Street, Vancouver, BC, V6B 1P1**

REPORT KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralisation, size and attitude). **coal, Minnes Group, Bickford Formation, Bullhead Group, Cadomin Formation, Gething Formation, Gaylard Member, Bluesky Member, anticlines, synclines, thrust faults**

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS: **Coal Assessment Reports 490, 522, 524, 525, 584, 585, 587, 588, 667, 888, 936, and 937; Petroleum Report 863**

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK (in metric units)	ON WHICH TENURES
GEOLOGICAL (scale, area)			
	Ground, mapping	**nil**	
	Photo interpretation	**nil**	
GEOPHYSICAL (line-kilometres)			
	Ground (Specify types)	**nil**	
	Airborne	**nil**	
	(Specify types)		
	Borehole		
	Gamma, Resistivity **(in two boreholes)**	**336.77 metres**	**392477**
	Resistivity **(in two boreholes)**	**336.77 metres**	**392477**
	Caliper **(in two boreholes)**	**336.77 metres**	**392477**
	Deviation **(in two boreholes)**	**336.02 metres**	**392477**
	Dip	**nil**	
	Others **Gamma-Density through rods (in one borehole)**	**111.54 metres**	**392477**
	Core	**nil**	
	Non-core (rotary) **in 2 boreholes**	**347.46 metres**	**392477**
SAMPLING AND ANALYSES			
Total # of Samples **nil**			
	Proximate	**nil**	
	Ultimate	**nil**	
	Petrographic	**nil**	
	Vitrinite reflectance	**nil**	
	Coking	**nil**	
	Wash tests	**nil**	
PROSPECTING (scale/area)		**nil**	
PREPARATORY/PHYSICAL			
Line/grid (km)		**nil**	
Trench (number, metres)		**nil**	
Bulk sample(s)		**nil**	

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2 Introduction

The Hudette Trend coal property comprises 1,470 hectares of Crown coal licenses, situated within the Brazion coalfield of northeastern British Columbia. This report presents results of two year-2011 boreholes (designated as MCW 11-12 and MCW 11-14) drilled close to the property's eastern boundary, placed within the context of a geological compilation map and supporting discussion of structural and stratigraphic geology.

The boreholes were drilled by a rotary (non-coring) method. Accordingly, no samples of the intersected coals were available for analysis. Geophysical logs of MCW 11-12 and MCW 11-14 are presented in **Appendix A** of this report.

Near-surface sedimentary rocks within and adjacent to the Hudette Trend coal property are of Lower Cretaceous age, comprising (from youngest to oldest) the basal two members of the Gething Formation, and the underlying Cadomin and Bickford formations (**Figure 2-1**; **Map 2-3; Table 3-1**). Younger rocks, of the upper part of the Gething Formation and also of the yet-younger Fort St. John Group, were almost certainly originally-present at Hudette Trend, but these rocks have been stripped away by erosional processes.

The Gething Formation contains all of the presently-known potentially-mineable coal beds at Hudette Trend. Limited amounts of coal, of unknown mineability, may also occur within the Cadomin and Bickford formations, but exploration of these two older rock-units has been sparse at Hudette Trend, as has been the general case within the Brazion coalfield. Hudette Trend's coals have not been worked by any historic, nor current, coal-mining operations.

Associated sedimentary rocks comprise conglomerates, sandstones, siltstones, mudstones, carbonaceous mudstones, concretionary ironstone and tuff. Marine mudstones and siltstones are not known to be present within the near-surface strata, but the local occurrence of moderately- to intensely-bioturbated mudstones and siltstones within the basal half of the Gething Formation may point to the presence of marine-influenced sediments within this rock-unit. The facies of the majority of the Gething Formation, and also of the underlying Cadomin and Bickford formations, are otherwise fluvial.

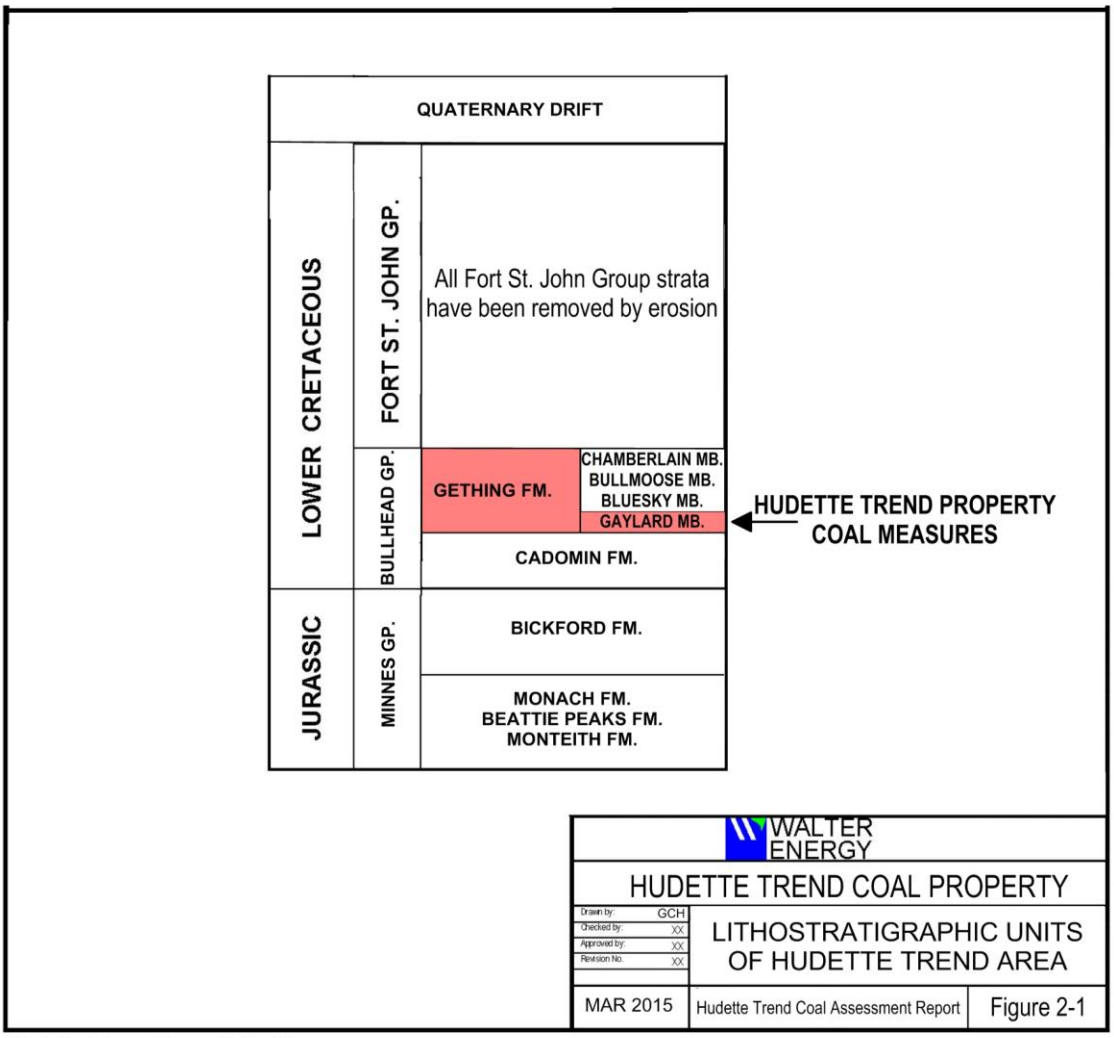
Bedrock within the Hudette Trend coal property is moderately-deformed, apparently less-so than is the case in the Mink Creek (Sultan and Cathyl-Huhn, 2014) and Mink North (Cathyl-Huhn, 2015) coal properties which adjoin Hudette Trend to the east and northeast respectively. Broad, northwest-striking, northeast-verging open folds predominate at Hudette Trend. These folds are most commonly associated with northeast-verging thrust-faults, which themselves are likely to be folded owing to passive deformation above subsequent underlying thrusts.

Within the Gaylard coal-measures, several coal zones have been found by historic and current drilling at Hudette Trend. Coal beds range in thickness from a few decimetres to several metres. Historic drilling has established that thicker, and possibly more laterally-extensive, coals occur in the upper hundred or so metres of the Gaylard Member.

Owing to the wide spacing between historic and current boreholes at Hudette Trend, no attempt is here made to definitively correlate the Gaylard Member coals, save that the coals intersected in current boreholes MCW 11-12 and MCW 11-14 may readily be correlated with those found in several boreholes nearby within the adjoining Mink Creek coal property (as reported by Sultan and Cathyl-Huhn, 2014). Furthermore, one thick coal zone at Hudette Trend (the Brenda Seam of Klatzel-Mudry et al, 1984) may be correlative with the F coal zone within

the Mink Creek property, and possibly also with Seam C60 being presently worked at Walter Energy's Brule Mine (Cathyl-Huhn and Avery, 2014), situated ten kilometres east-southeast of the Hudette Trend property.

Extensive drilling will be required in order to define any exploitable coal resources at Hudette Trend, in keeping with modern Canadian standards for coal-resource reporting (Hughes *et al*, 1989), which require certain spacings of valid and verifiable data-points.



Hudette_Trend-Figure-2-1.srf/jpg

2.1 Scope of report

This report has been compiled and submitted by Walter Canadian Coal Partnership (WCCP) in keeping with the provisions of the *Coal Act* and the *Coal Act Regulation*, with respect of exploratory activities on Crown coal tenures within British Columbia.

This report documents exploratory work completed on WCCP's Hudette Trend coal property, situated within the Brazion coalfield, in the northeastern part of British Columbia. WCCP acquired the Hudette Trend coal licenses directly from the provincial Crown in 2002 (as

tenures 391530, 391531, 391532, 392477, and 392478). Details of these tenures are presented as **Table 2-1**.

WCCP's current exploratory work was conducted in year-2011, with the drilling of the two boreholes at Hudette Trend. No subsequent physical work has been done at Hudette Trend, other than passing examination of coal exposures and associated rock outcrops within road-cuts along the Falling Creek Connector Road (**Map 2-3**). Estimated thicknesses of lithostratigraphic units at Hudette Trend are based upon results of current and historic drilling, and upon analysis of map patterns. Measured sections of the strata have not been obtained, owing to incomplete exposure and structural complexity.

Table 2-1: Tenures comprising the Hudette Trend coal property

Tenure Number	Map	Block	Units	Date Acquired	Area (hectares)	Former coal licence numbers
391530 (4 units)	93O/8E	I	3, 4, 13, and 14	January 8, 2002	294	2934 and 6398
391531 (4 units)	93O/8E	I	25, 26, 35, and 36	January 8, 2002	294	2036 and 6396
391532 (4 units)	93O/8E	H	81, 82, 91, and 92	January 8, 2002	294	2931 and 6419
392477 (4 units)	93O/8E	I	1, 2, 11, and 12	April 3, 2002	294	2933 and 6421
392478 (4 units)	93O/8E	H	61, 62, 71, and 72	April 3, 2002	294	6417
Totals:	**5 tenures**		**20 units**		**1,470 hectares**	

Note: Map sheets listed are within the National Topographic System; 'E' denotes the eastern half-sheet. Blocks and Units refer to the British Columbia Coal Tenures Grid System, whose unit cells are based upon original NAD 27 surveys, and translated into NAD 83 coordinates for purposes of mapping. Former coal licence numbers refer to historic tenures (during prior ownership by third parties).

2.2 Situation and objectives

The Hudette Trend coal property is located in the Peace River region of northeastern British Columbia (**Map 2-1**), an area which has seen considerable coal-exploration activity since the late 1960s.Walter Energy Inc., and predecessor and associated firms, have for some years operated metallurgical-coal mines to the north (Willow Creek Mine) and to the southeast (Brule and Dillon mines) of the Hudette Trend property.

From the 1970s onward, the Hudette Trend area has been mapped and drilled for coal. This historic exploration has generally been conducted at reconnaissance scale, with helicopter-supported geological traversing followed by sparse programmes of exploratory drilling and mechanised trenching (**Maps 2-2** and **2-3; Table 2-2**). In addition to the coal-industry work, the oil and gas industry has been moderately active within the Hudette Trend area, mainly via the

acquisition of seismic-reflection survey data along widely-spaced cross-section lines. No oil and gas wells have yet been drilled within the Hudette Trend area.

The Hudette Trend coal property is still at a preliminary stage of exploration, with insufficient data to support the estimation of coal resources to current Canadian standards (*vide* Hughes *et al*, 1989).

2.3 Property description

The Hudette Trend coal licenses are located within the Liard Mining District of northeastern British Columbia, situated within the eastern half of map-area 93O/8 of Canada's National Topographic System. The aggregate area of the property is 1,470 hectares, covering 20 units within the provincial mineral-tenure grid system.. The property comprises five Coal Licences, granted by the provincial Crown in January and April of 2002 (as tenures 391530, 391531, 391532, 392477, and 392478). Details of these tenures are presented above as **Table 2-1**.

2.4 Location and access

Chetwynd town, located on Highway 97 and situated 54 kilometres northeast of the property, is the closest incorporated settlement to Hudette Trend (**Map 2-1**). Chetwynd's population was reported as 2,633 persons in the year-2006 census. In the context of more-distant communities within British Columbia, the Hudette Trend coal property is located 135 kilometres south of Fort St John, 100 kilometres west of Dawson Creek, and 310 kilometres east of Prince George. Vancouver is situated 725 kilometres to the south-southwest of the property. Commercially-scheduled aircraft flights connect Vancouver to Fort St. John.

Primary access to the property from Chetwynd is via paved provincial highway BC-97, which intersects the Hasler Creek Forest Service Road (FSR), 24 kilometres west of Chetwynd. Southward 28 kilometres along the Hasler Creek FSR is a junction with the Falling Creek Connector Road (the FCCR).

The FCCR generally follows the southwestern boundary of the Hudette Trend coal property, as shown in **Map 2-2**. Alternate access to the property is provided by Sukunka FSR, an all-weather gravel road, extending along the eastern bank of the Sukunka River. The Sukunka FSR is accessible from Chetwynd via highways BC-97 and BC-29. At 16.5 kilometres along the Sukunka FSR, the Blind Creek Road (a non-status industrial road) crosses Sukunka River on a high-capacity bridge, and extends generally westward along the southwestern bank of Blind Creek, meeting the FCCR from the southeast after 21.5 kilometres.

2.5 Climate

The nearest climate station to Hudette Trend is the town of Chetwynd, whose climate is 'cool continental', with frigid winters and warm summers. Average annual rainfall and snowfall at Chetwynd are 306 millimetres and 169 centimetres respectively. The average frost free period ranges between 84 to 91 days, and about 30 days with some fog are expected per year. The mean daily temperature at Chetwynd is 15.4 C in July and -10.7 C in January. Winter temperatures below -40C are not uncommon, with the coldest weather occurring in January and February of most years.

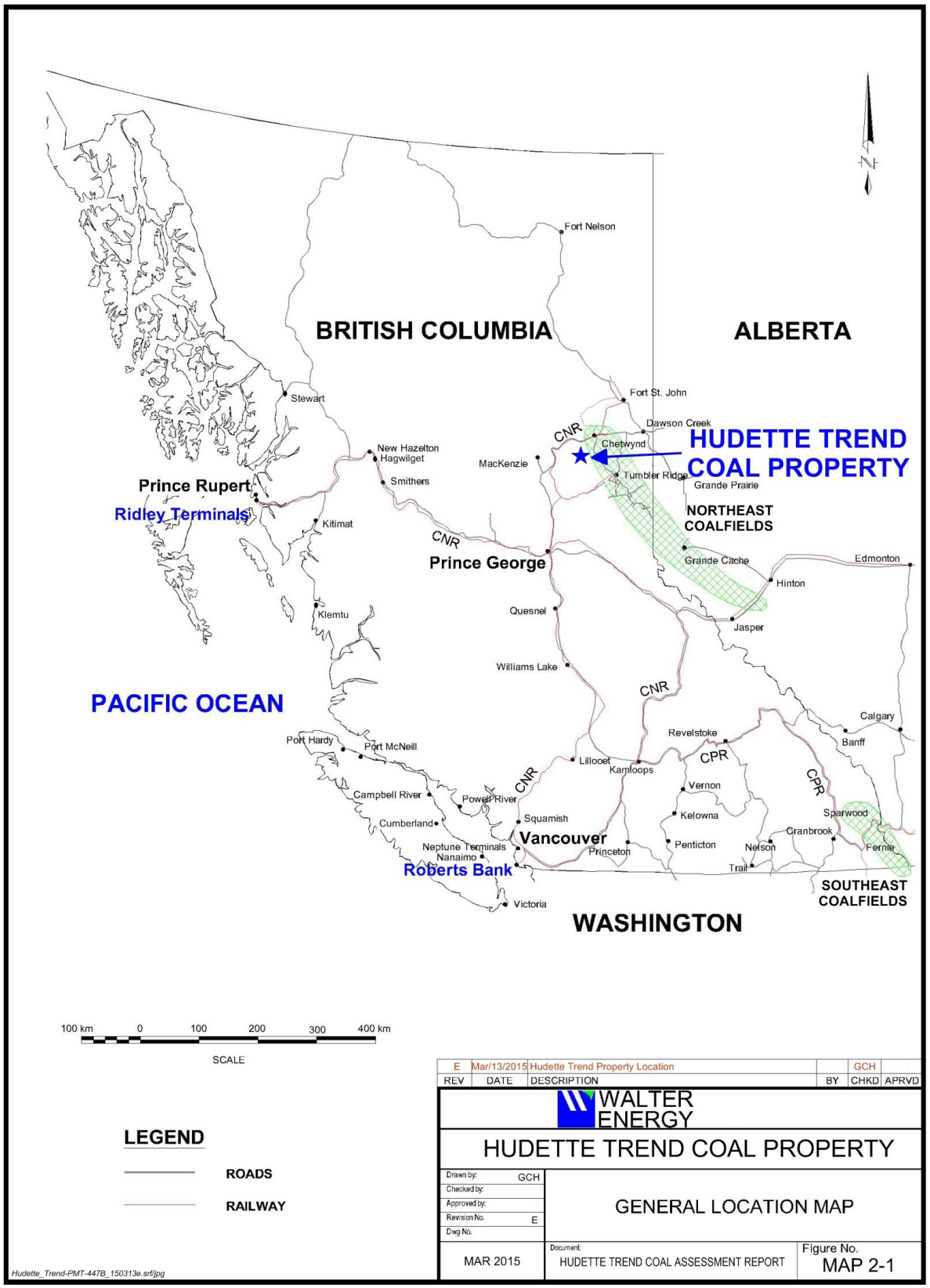

BRITISH COLUMBIA
ALBERTA
Fort Nelson
Fort St. John
Dawson Creek
Stewart
New Hazelton
Hagwilget
Chetwynd
CNR
HUDETTE TREND
COAL PROPERTY
MacKenzie
Tumbler Ridge
Grande Prairie
Prince Rupert
Ridley Terminals
Smithers
Kitimat
NORTHEAST
COALFIELDS
CNR
Prince George
Grande Cache
Edmonton
Hinton
Klemtu
Quesnel
Jasper
Williams Lake
CNR
PACIFIC OCEAN
Calgary
Revelstoke
Banff
Port Hardy
Port McNeill
Lillooet
Kamloops
CPR
CNR
Vernon
CPR
Campbell River
Powell River
Kelowna
Sparwood
Squamish
Cumberland
Vancouver
Cranbrook
Neptune Terminals
Nanaimo
Princeton
Penticton
Nelson
Fernie
Roberts Bank
Trail
SOUTHEAST
COALFIELDS
Victoria
WASHINGTON
100 km 0 100 200 300 400 km
SCALE
LEGEND
ROADS
RAILWAY
E Mar/13/2015 Hudette Trend Property Location GCH
REV DATE DESCRIPTION BY CHKD APRVD
WALTER ENERGY
HUDETTE TREND COAL PROPERTY
Drawn by: GCH
Checked by:
Approved by:
Revision No. E
Dwg No.
GENERAL LOCATION MAP
MAR 2015
Document: HUDETTE TREND COAL ASSESSMENT REPORT
Figure No. MAP 2-1
Hudette_Trend-PMT-447B_150313e.srf/jpg

Table 2-2: Historic (pre-2011) coal exploration boreholes

Borehole	Coal Assessment Report	Metres		UTM NAD 83 coordinates		Borehole orientation		Tenure / outside property
		Elevation	Total depth	Easting	Northing	Azimuth	Dip	
DH-7401	584	1127	227.08	560815	6142577	vertical		391530
DH-7505	584	1280	346.86	561304	6139595	225º	-65º	outside
PP 79-05	587	1220	259.15	563323	6145321	010º	-70º	outside
FC 80-1	522	1195	269.5	559542	6144476	vertical		391531
FC 81-1	523	1220	282.55	559312	6144216	vertical		391531
FC 81-2	523	1185	341.5	560508	6142328	vertical		391530
FC 81-3	523	1183	291.8	561948	6140719	vertical		391532
FC 82-1	524	1272	201	560312	6141856	vertical		391530
FC 82-2	524	1165	198	560878	6141941	vertical		391530
FC 82-3	524	1140	180	563043	6139986	vertical		391532
FC 82-4	524	1237	198	561768	6140336	vertical		391532
FC 82-5	524	1338	198	560142	6141296	vertical		outside
FC 82-6	524	1255	201	558965	6143468	vertical		391531
FC 82-7	524	1230	201	558339	6143686	vertical		391531
FC 82-8	524	1268	201	558497	6145106	vertical		391531
FC 82-9	524	1258	200	558777	6145311	vertical		outside
FC 82-11CH	524	1187	11	560598	6142356	vertical		391530
FC 82-11P1	524	1177	27	560638	6142311	vertical		391530
FC 82-11P2	524	1187	50	560563	6142351	vertical		391530
FC 82-13	524	1152	171	562373	6140926	vertical		391532
Total of historic drilling within property: 15 boreholes, overall 2850.43 metres								

Notes: Positions given are approximate, and should be confirmed by ground-based surveys as and when possible. Borehole DH-7505 is also discussed within a paper by Duff and Gilchrist (1981)

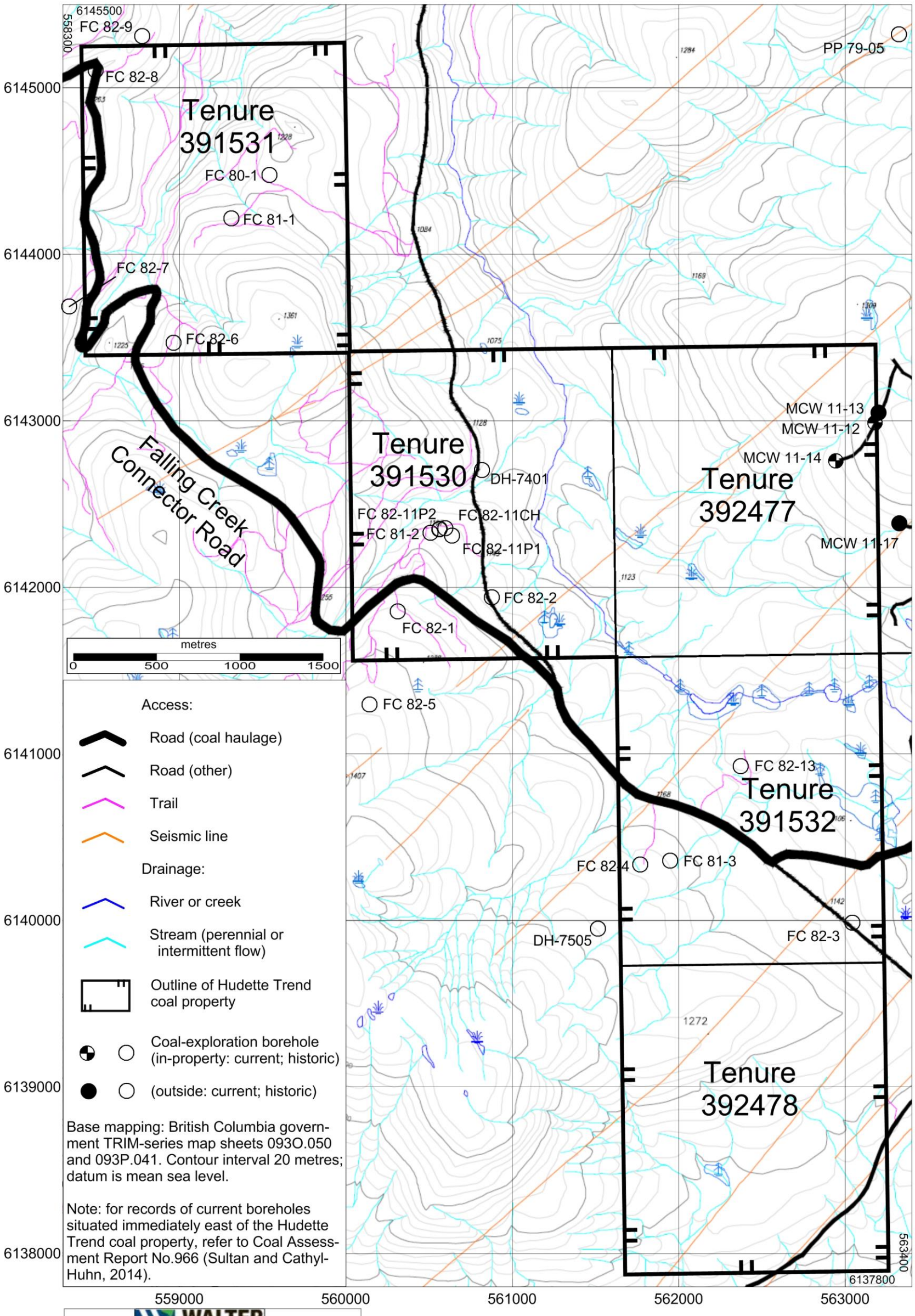
Table 2-3: Cross-reference to historic coal assessment reports

Company	Authority	Coal Assessment Report Number
Esso Resources Canada Ltd.	Waters, 1981	522
Esso Resources Canada Ltd.	Klatzel-Mudry *et al*, 1982	524
Esso Resources Canada Ltd.	Klatzel-Mudry *et al*, 1984	525
Kennecott Canada Exploration Inc.	Hovis *et al*, 2006	888
Norcen Energy Resources Ltd.	Newson, 1980	587
Pan Ocean Oil Ltd.	Dyson, 1975	584
Pan Ocean Oil Ltd.	Dyson, 1977	585

HUDETTE TREND

UTM NAD 83

CANADA
NTS 93 O/8 and 93 P/5



Access:

- Road (coal haulage)
- Road (other)
- Trail
- Seismic line

Drainage:

- River or creek
- Stream (perennial or intermittent flow)

- Outline of Hudette Trend coal property
- Coal-exploration borehole (in-property: current; historic)
- (outside: current; historic)

Base mapping: British Columbia government TRIM-series map sheets 093O.050 and 093P.041. Contour interval 20 metres; datum is mean sea level.

Note: for records of current boreholes situated immediately east of the Hudette Trend coal property, refer to Coal Assessment Report No.966 (Sultan and Cathyl-Huhn, 2014).

WALTER ENERGY

Scale: as shown	Coal Tenure and Topography	
UTM NAD 83		
Revision: B		
Drawn: GCH		
MAR 2015	HUDETTE TREND COAL ASSESSMENT REPORT	MAP 2-2

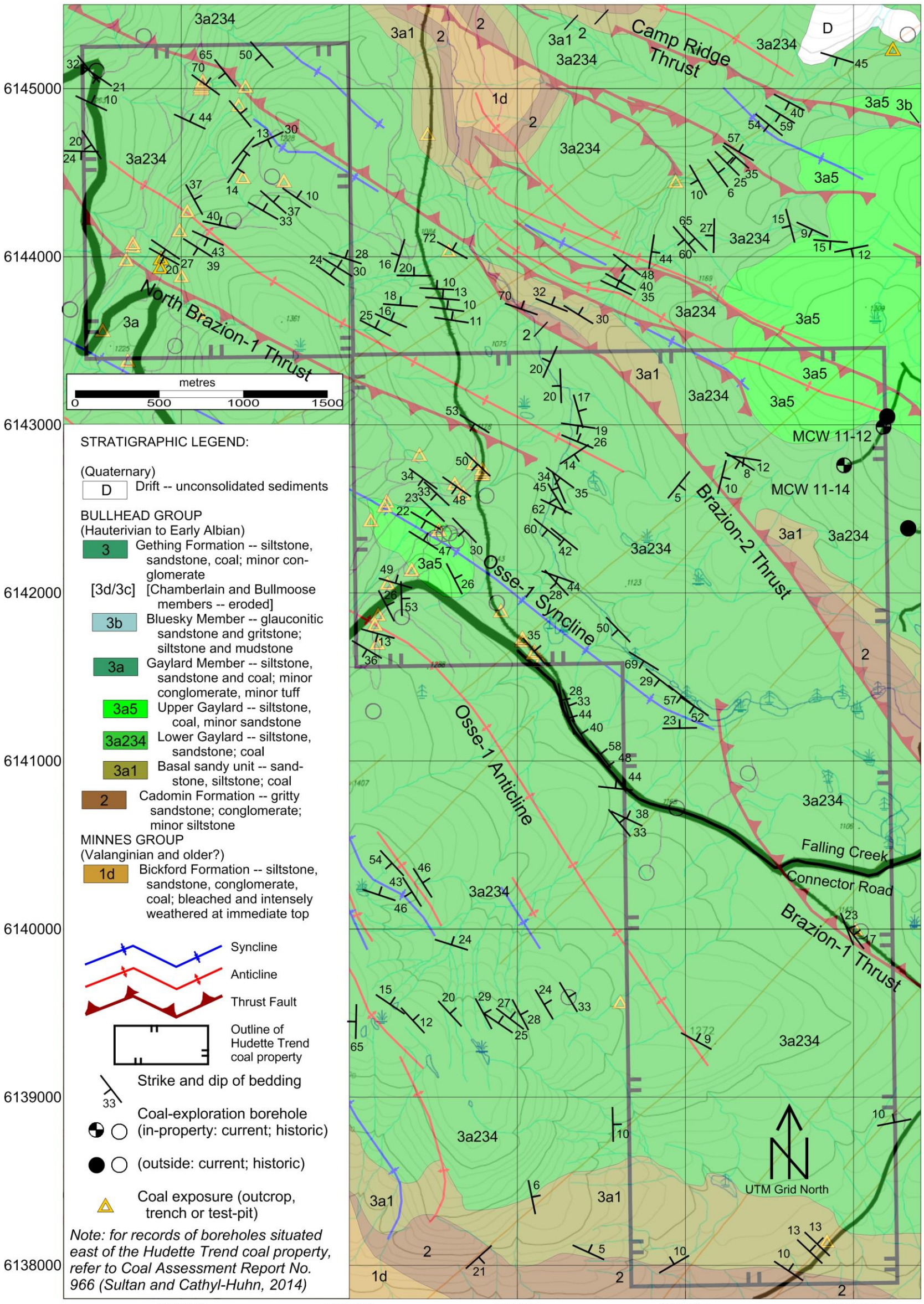
UTM Grid North

Drawing: Hudette_Trend-topography_150310b.srf/jpg
Drawn: C.G. Cathyl-Huhn, P.Geo.(BC) Lic.Geol (WA) RMSME
Date: 10.March, 2015 Scale: as shown by bar scale
Grid: UTM NAD83 Zone 10, in metres

HUDETTE TREND

UTM NAD 83

CANADA
NTS 93 O/8 and 93 P/5



STRATIGRAPHIC LEGEND:

(Quaternary)

D — Drift -- unconsolidated sediments

BULLHEAD GROUP
(Hauterivian to Early Albian)

3 — Gething Formation -- siltstone, sandstone, coal; minor conglomerate

[3d/3c] — [Chamberlain and Bullmoose members -- eroded]

3b — Bluesky Member -- glauconitic sandstone and gritstone; siltstone and mudstone

3a — Gaylard Member -- siltstone, sandstone and coal; minor conglomerate, minor tuff

3a5 — Upper Gaylard -- siltstone, coal, minor sandstone

3a234 — Lower Gaylard -- siltstone, sandstone; coal

3a1 — Basal sandy unit -- sandstone, siltstone; coal

2 — Cadomin Formation -- gritty sandstone; conglomerate; minor siltstone

MINNES GROUP
(Valanginian and older?)

1d — Bickford Formation -- siltstone, sandstone, conglomerate, coal; bleached and intensely weathered at immediate top

Syncline

Anticline

Thrust Fault

Outline of Hudette Trend coal property

Strike and dip of bedding

Coal-exploration borehole (in-property: current; historic)

(outside: current; historic)

Coal exposure (outcrop, trench or test-pit)

Note: for records of boreholes situated east of the Hudette Trend coal property, refer to Coal Assessment Report No. 966 (Sultan and Cathyl-Huhn, 2014)

WALTER ENERGY

Scale: as shown	Geology of Hudette Trend Coal Property
UTM NAD 83	
Revision: E	
Drawn: GCH	
MAR 2015	HUDETTE TREND COAL ASSESSMENT REPORT — MAP 2-3

Geological compilation by C.G. Cathyl-Huhn, 2015, incorporating data from Kennecott Exploration (Hovis et al, 2006), Esso Resources (Klatzel-Mudry et al, 1982; 1984), Legun (2003), and Walter Energy (Sultan and Cathyl-Huhn, 2014).

Base mapping: British Columbia government TRIM-series map sheets 093O.050 and 093P.041, originally compiled at 1:20,000 scale

Drawing: Hudette_Trend-geology_150315e.srf/jpg
Drawn: C.G. Cathyl-Huhn, P.Geo.(BC) Lic.Geol (WA) RMSME
Date: 15.March, 2015 Scale: as shown by bar scale
Grid: UTM NAD83 Zone 10, in metres

2.6 Landforms and forest cover

The Hudette Trend property lies within the Inner Foothills of the Rocky Mountains. Topography comprises deeply-dissected, steep-sided, rounded hills and mountains, with elevations ranging from 980 to 1361 metres above sea level. Topographic contours at 20-metre intervals, based upon provincial government mapping, are shown in **Map 2-2**. The property is heavily forested, chiefly with pine and spruce, and low-level scrub. Satellite imagery indicates that a considerable proportion of the valley-slope areas have been logged, with cutblocks at various stages of regrowth.

2.7 Acknowledgements and professional responsibility

Thanks are due to Dr. Muzaffer Sultan at Walter Energy, and to Dr. Peter Jones at International Tectonic Consultants, for thought-provoking discussions of stratigraphy and of structural geology respectively. Sara McPhail and David Richardson, at the B.C. Ministry of Natural Gas Development, assisted in locating details of natural-gas wells. Blake Snodsmith at Walter Energy provided a TRIM base-map, from which the topographic base of **Map 2-2** was derived. Thanks are also due to administrator Connie Wong in Walter Energy's Vancouver office, for her careful work in preparing the digital version of this report and many previous reports.

Gwyneth Cathyl-Huhn P.Geo. Lic.Geol. RMSME accepts professional responsibility for data and conclusions presented within this report.

3 Exploration

Both historic (pre-2011) and current (year-2011) coal exploration has been done by various parties at and near the Hudette Trend coal property. The vast majority of the work is historic in nature, having largely been sponsored by the coal departments of various oil companies during the period up to and immediately after the oil price escalation of the early 1980s. The author of the present report, whilst in the employ of one such coal-exploration group, visited the Hudette Trend property as part of a regional structural and coal-quality survey, in the summer of 1980.

3.1 History of exploration

The following discussion is adapted mainly from an unpublished report for Unicorn International Mines Group Inc. (Ryan, 2010).

Coal was first discovered in the Peace River District in 1793, by Alexander MacKenzie's exploring expedition (MacKenzie, 1801). Prior to 1980, less than 100,000 tonnes of coal were mined at all locations within northeastern British Columbia (Ryan, 2002).

At a location on Hasler Creek, situated 8 kilometres north-northeast of the Hudette Trend coal property, the Hasler Creek Coal Company commenced small-scale underground coal-mining in 1943, continuing through 1944 and 1945. The Northern Alberta Railways took 4,500 short tons of Hasler Creek coal for use in their locomotives serving their Dawson Creek railroad division (Spivak, 1944, Stott, 1973).

In the late 1950s, several oil companies undertook structural and stratigraphic mapping within and adjacent to the Hudette Trend coal property, and within the Brazion coalfield generally. A report done for Triad Oil, by Dr. Peter Jones (1960) is the most useful of those reports which are publicly-available. Cooper *et al* (2004) further discuss fold-fault geometry,

The expansion of steel production in mid-1960s stimulated exploration for metallurgical coking coal. By the mid-1970s within northeastern British Columbia, most of the land with coal potential had been acquired by mining companies, or by oil and gas companies seeking to enter the coal industry as a means of diversification. Initial development interest was along the existing railway (then known as the British Columbia Railway) which passed through Pine Pass and thus connected Chetwynd and Dawson Creek with then-existing ports along British Columbia's western coast.

Interest in coal development increased with rapid increase in crude oil prices, and concomitant increase in coal prices. These price increases were followed in short order by the signing of a joint government-industry agreement between Japan and Canada, to develop new coal mines, highways, railways, other infrastructure, and a workers' townsite at Tumbler Ridge. Shipments of northeastern British Columbia coal through a new port at Ridley Island (near Prince Rupert, British Columbia) commenced in 1984, and have continued to the present day, albeit at currently-reduced levels owing to the present depression in global coal prices.

Owing to its relative isolation at the time, the Hudette Trend coal property did not receive as much exploratory attention as other, more accessible, parts of the northeastern British Columbia coalfields. As the oil and gas industry and the forestry industry gradually extended their industrial road networks westward from Sukunka River and southward from Pine River, it became easier to bring drilling rigs into the Hudette Trend area. This increased access accounts

for the sparse extent of historic geological studies (**Table 2-4**) and historic coal-exploration drilling at and near Hudette Trend (**Table 2-2**).

In all, 15 historic boreholes (as reported in previous coal-assessment reports, cited in **Section 10** of this report), totalling 2850.43 metres' length, have been drilled within the Hudette Trend coal property. As well, 2 current (year-2011) boreholes, totalling 347.46 metres' length, are here-reported for the first time, with logs presented in **Appendix A** of this report.

3.1.1 Progress of regional and local exploration

The earliest coal exploration at or near Hudette Trend was conducted by Pan Ocean Oil Ltd. (Pan Ocean) in 1974 and 1975 (Dyson, 1975), with the drilling of two boreholes: DH-7401 (situated within Coal Licence 391530) and DH-7505 (off-property but within coal lands now held by Walter Energy, about 150 metres west of Coal Licence 391532). Both of these boreholes were valid tests of the Gaylard coal-measures, although neither hole intersected the Upper Division of the Gaylard, now known to contain thicker coals. DH-7505 reached the base of the Gething Formation (the only hole within the vicinity of Hudette Trend to have done so), passed through a complete section of the Cadomin Formation (including its medial coal bed), and ended within the uppermost part of the Bickford Formation.

After 1975, Pan Ocean concentrated their exploratory efforts in more northerly and easterly parts of their holdings, and the lands comprising the Hudette Trend property were subsequently restaked for coal licences in 1980 by Esso Resources Canada Ltd. (Esso), as part of their Falling Creek coal property (Waters, 1981; Klatzel-Mudry *et al*, 1982). Between 1980 and 1982, Esso drilled fourteen boreholes (in the FC-series) within the area now covered by the Hudette Trend tenures, and a further three boreholes (also in the FC-series) nearby to the northwest and southwest (as shown on **Map 2-2**).

Esso concentrated their efforts on what is now recognised as the Upper Division of the Gaylard Member coal-measures, finding thick coal (their Brenda coal zone, now correlated with the Mink Creek F coal zone) within land now covered by Coal Licence 391530). Esso halted work in 1984, on account of the worldwide decline in coking-coal markets.

3.1.2 Governmental and academic investigations

In the early and mid-1960s, post-graduate geological research and structural modelling was undertaken by J.E. Hughes (1963), under the sponsorship of the provincial Department of Mines and Petroleum Resources. Subsequent reports on reconnaissance-scale stratigraphic and structural analysis, and a regional geological synthesis, were published in the middle and late 1960s (Hughes, 1964; 1967).

The Geological Survey of Canada published a regional-scale structural synthesis (McMechan, 1984), consisting of a map and cross-section at a scale of 1:250,000, followed by a journal article concerning the geometry of thrust-faults (McMechan, 1985).

In 1990 and 1991, staff of the British Columbia Geological Survey Branch mapped the Hudette Trend property and surrounding area at a scale of 1:50,000 (Cunningham and Sprecher, 1992). Two stratigraphic studies of the relationship between the Gething, Bluesky and Moosebar formations were published by provincial government staff, incorporating results from numerous coal-exploration boreholes (Kilby, 1984a; Legun, 1990). A

compilation map of the geology of the Peace River coalfields on a scale of 1:200,000 was subsequently published by Legun (2003).

3.2 Current (year-2011) exploration

Western Coal (now Walter Energy) conducted a small exploration programme within the Hudette Trend coal property, during year-2011. Two rotary-drill boreholes (MCW 11-12 and MCW 11-14, as depicted upon **Map 2-2**) were drilled within the northeastern corner of Coal Licence 392477. Access to these sites was via a trail running southwesterly and downhill from the northwestern corner of Walter Energy's adjoining Mink Creek coal property (Sultan and Cathyl-Huhn, 2014). Drill pads for both boreholes were built on the trail.

The purpose of the drilling was to test the Gaylard Member coal-measures for potentially-mineable coal seams, and to assess the lateral continuity of the coal beds. To this end, both boreholes were valid exploratory tests of the Lower Division of the Gaylard, albeit with disappointing findings. The thickest coal found was the conjoint K1/K2 coal, at a drilled depth of 22 metres in borehole MCW 11-14, with true stratigraphic thickness of 0.82/1.00 (net/gross) metres, and most of the coals were less than 40 centimetres thick (as noted in **Table 5-1**).

Table 3-1: Current (year-2011) drilling at Hudette Trend

Borehole	Easting	Northing	Elev-ation	Total depth	Azimuth	Dip	Commenced (day/month/ year)	Completed (day/month/ year)	Geophysical logs run?
MCW11-12	563178.49	6142985.67	1338.1	117.34	035	-55	23.Aug, 2011	25.Aug, 2011	Yes
MCW11-14	562943.43	6142757.21	1277.8	230.12	vertical		26.Aug, 2011	29.Aug, 2011	Yes

Table 3-2: Geophysical logs run in current boreholes

Borehole	Easting	Northing	Elev-ation	Total depth	Gamma/ Caliper/ Resistivity/ Density	Gamma/ Neutron	Gamma/ Density	Deviation	Dipmeter
MCW11-12	563178.49	6142985.67	1338.1	117.34	107.74	107.22	111.54	107.02	not run
MCW11-14	562943.43	6142757.21	1277.8	230.12	229.03	229.19		229.00	not run

3.2.1 Borehole geophysics

Downhole geophysical logging was done by Century Wireline Services within the two year-2011 boreholes. A standard coal-industry suite of logs was run:

- Gamma/caliper/resistivity/density (9239C sonde);
- Gamma/density through drill rods (9068A sonde, uncalibrated);
- Gamma/neutron (9057A sonde); and
- Deviation (9057A sonde)

Copies of resultant downhole geophysical logs are presented in **Appendix A**, with an inventory of logs given above as **Table 3-3** (also repeated as **Table A-1** within **Appendix A)**.

3.2.2 Current coal-quality work

No coal samples were taken from the strata intersected by the two current boreholes, insofar as they were drilled by non-coring methods. Accordingly, no analytical work was done.

3.2.3 Cross-reference to historic coal-quality work

Numerous historic coal samples were taken from trenches and historic boreholes. Details of these samples, and their associated analytical results, are reported within the various coal assessment reports produced by previous operators of the Hudette Trend coal property.

4 Geological setting

The coalfields of northeastern British Columbia are hosted by marine and non-marine clastic sediments of Jurassic, Cretaceous and earliest Tertiary age. These rocks form a series of thick sequences of molasse and flysch, all of which was deposited into the Rocky Mountain Foreland Basin of Western Canada. The basin is bounded by the mobile crustal terranes of the Cordilleran Orogen to the west, and the cratonic rocks and Palaeozoic cover sequences of the Canadian Shield to the east.

4.1 Regional structural setting

Most of the Jura-Cretaceous sediments were derived from orogenically-uplifted landmasses lying to the southwest of the basin, although patterns of sedimentation were to some extent influenced by occasional vertical movements of underlying structures within the cratonic basement rocks, chief amongst which was the Peace River Arch (Stott, 1968).

During Late Mesozoic and Early Cenozoic time, the Cordilleran Orogen underwent two main phases of deformation: the Late Jurassic to earliest Late Cretaceous Columbian Orogeny, and the Late Cretaceous to Oligocene Laramide Orogeny (Douglas *et al*, 1970). Both of these orogenies were driven by transpressional crustal movements along the outboard (western) edge of the North American continent. In each case, orogenic activity was driven by the collision of northward-moving exotic crustal terranes, which in turn caused compressive strains within the previously-accreted western margin of the continent. Northeast-directed overthrusting of Palaeozoic rocks caused episodic uplift of the Cordilleran Orogen, in turn providing a ready source of sediment into the Foreland Basin.

The present-day Rocky Mountains are the most visible manifestation of Columbian and Laramide overthrusting, which gradually proceeded northeastward, with successively-younger thrusts tending to break through the Foreland rocks at successively-deeper stratigraphic levels. As successively-younger thrusts developed, they generated passive folding within overlying, previously-deformed rocks. Overlying, older thrusts were therefore passively folded along with their adjoining strata. Recognition of this folding is essential to understanding the structural geology of the Hudette Trend property and its surroundings.

From southwest to northeast, the Cordilleran fold-thrust belt gradually changes structural styles (Thompson, 1979) from a thrust-dominant regime (within the mostly-Palaeozoic carbonate-clastic rocks of the Rocky Mountain Main Ranges and Front Ranges) to a mixed fold-thrust regime (within the Inner Foothills, including the Hudette Trend property) to a gently-folded frontal regime (within the Outer Foothills, five or more kilometres to the northeast of Hudette Trend).

4.2 Regional stratigraphic setting

Regional stratigraphic nomenclature within the coalfields of northeastern British Columbia has undergone considerable revision during the past fifty years. Principal workers, whose reports were used as primary references for the present report, are J.E. Hughes (1964, 1967), D. Stott (1968, 1973, 1981, 1998), P.McL.D. Duff and R.D. Gilchrist (1981), and D.W. Gibson (1992).

The stratigraphic sequence within the northwestern part of the Brazion coalfield (including Hudette Trend) comprises Lower Cretaceous rocks of the Fort St. John and Bullhead

groups, and older Jurassic to Lower Cretaceous rocks of the Minnes Group (**Figure 2-1**; **Table 4-1**). Fort St. John Group rocks are completely absent at Hudette Trend, owing to substantial erosion. Minnes Group rocks are present only in the subsurface at Hudette Trend, inasmuch as the entirety of the property is covered with Bullhead Group rocks (**Map 2-3**). Almost all of the property is covered with coal-measures of the Gething Formation, which forms the upper part of the Bullhead Group.

Considerable stratigraphic controversy (as expressed in works of Hughes and Stott) has revolved around the identity and stratigraphic topology of rocks underlying and overlying the coal-measures of the Gething Formation. In this report, the Gething Formation, as well as immediate sub-Gething rocks, is assigned to the Bullhead Group, following Stott's extensive regional work.

In more detailed stratigraphic studies within the Brazion and Sukunka-Quintette coalfields, Gibson (1992) divided the Gething Formation into four members. From top down, these are the Chamberlain, Bullmoose, Bluesky, and Gaylard Members. At the latitude of the Hudette Trend coal property, only the Gaylard Member contains coal of potentially-mineable thickness, although within the nearby Burnt River property (McClymont, 1981; Cathyl-Huhn and Avery, 2014b), the Chamberlain Member also appears to be coal-bearing.

Supra-Gething rocks are assigned to the Fort St. John Group, following Stott's work as subsequently modified by Gibson (1992b).

4.3 Local structural geology

Structural geology of the Hudette Trend area would be difficult to decipher on the sole basis of bedding attitudes within exposed bedrock, owing to the isolated nature of the outcrops. Much of our understanding of local structural geology comes from borehole intersections of coal-measures, supplemented by exposures of bedrock along the banks of major streams and in road-cuts.

An additional source of structural information, albeit indirect, is from the interpretation of landforms as visible in aerial photographs and on detailed topographic maps, although this indirect observation is locally hampered by Drift cover.

Map 2-3 depicts the current understanding of bedrock structure. The Hudette Trend property is broadly folded throughout its extent, and locally-disrupted by thrust faults, indicative of a compressional tectonic regime consistent with its setting within the Inner Foothills structural zone.

- North Brazion-1 Thrust: this northeast-verging fault transects the northwestern portion of the property, and may die out along strike to the southwest, within the property's central area.

- Brazion-1 Thrust: this northeast-dipping fault transects the southern end of the property. Historic borehole FC 82-3 intersected a broad zone of sheared and slickensided rocks within the Gaylard Member of the Gething Formation, thus proving the presence of a fault. Kinematics of the fault have not been established.

- Brazion-2 Thrust: this northeast-dipping fault transects the northeastern side of the property. Although this fault is mapped as a southwest-verging thrust, its vergence has not yet been

confirmed by direct observation of kinematic indicators within its bounding rocks. The Brazion-2 Thrust may represent the upper ('leading-edge') detachment of a local triangle zone, or alternatively it may represent the trailing edge of a klippe which in turn would underlie the western part of the nearby Mink Creek coal property.

Despite the local intensity of deformation, normal stratigraphic sequences are generally preserved at Hudette Trend. Thrust-induced tectonic shortening, leading to structural thickening of the Gaylard coal-measures, is locally proven by drilling.

4.4 Local stratigraphy

Based largely upon geophysical log interpretation, the following stratigraphic sequence (as shown in **Table 4-1**) has been identified within and adjacent to the Hudette Trend coal property.

Table 4-1: Table of formations and subdivisions

Group/Formation/ Member			Map-unit	Lithology and thickness		
Quaternary Drift			D	alluvium; lodgement till; moraines; generally less than 5 m thick		
Fort St. John Group				*completely removed by erosion within the mapped area*		
Bullhead Group	Gething Fm.	Chamberlain Mb.	3d	marine sandstone and siltstone		*completely removed by erosion within the mapped area*
		Bullmoose Mb.	3c	marine siltstone and mudstone		
		Bluesky Mb.	3b	glauconitic pebbly sandstone, turb-iditic siltstone and mudstone; pebbly mudstone and conglomerate; 7 to 30 m thick		*completely removed by erosion within the property; present only at eastern margin of mapped area*
		Gaylard Mb.	3a	fining-upward cycles of sandstone, siltstone , mudstone and coal; minor tuff; local concentration of sandstone beds towards base of this unit; 450 to 500 metres thick.	*3a5*	*<u>Upper Gaylard</u>: siltstone, mudstone and coal (coal zones A through F/Brenda); minor sandstone and tuff; 55 to ?130 m thick*
					3a234	*<u>Lower Gaylard</u>: siltstone, sandstone and mudstone; minor coal (coal zones G through S); 275 to 325 m thick.*
					3a1	*<u>Basal sandy unit</u>: sandstone and siltstone; minor coal (Contact coal bed) near base; 75 to 100 m thick.*
	Cadomin Fm.		2	gritty to pebbly, siliceous sandstone and sandy conglomerate with distinctive 'blocky' gamma-log response; minor siltstone and coal; 25 to 35 m thick; erosional base		
Minnes Gp.	Bickford Fm.		1d	siltstone, sandstone, conglomerate, and mudstone; minor coal; 285 to 300 m thick		*present only at depth beneath the property; only the uppermost Bickford coal-measures have been tested by drilling*
	Monach Fm.		1c	sandstone and conglomerate; siltstone; 210 to 260 m thick		
	Beattie Peaks Fm.		1b	siltstone, sandstone and mudstone; minor coal; 285 to 350 m thick		
	Monteith Fm.		1a	quartzite and sandstone; minor siltstone; 340 to 425 m thick		

Relationships between the various rock-units that occur within and adjacent to the Hudette Trend coal property are shown on the geological map (**Map 2-3**) accompanying this report. **Map 2-3** incorporates results of current drilling, together with historic drilling and geological mapping done by others, as cross-referenced in **Section 10** of this report. Geological contacts shown on the map are approximate to inferred, owing to the locally-thick Drift cover and the generally-discontinuous nature of bedrock exposures. Most of the outcrop data were recorded from isolated exposures, generally along creeks or in road-cuttings, as the rocks were exposed during construction.

Rock-units are discussed in detail below, in order from youngest (generally nearest the ground surface) to oldest. Localised inversions of stratigraphic position have been induced by thrust-faulting, but the overall stratigraphic relations remain readily-recognisable, owing to distinctive geophysical and lithological characteristics of the various rock-units.

4.5 Drift (map-unit D)

Unconsolidated sediments, of Quaternary age, form a patchy blanket at the ground surface throughout the Hudette Trend coal property.

The most pervasive Drift cover consists of glacial till, usually less than 5 metres thick. Patches of sandy, gravelly and bouldery alluvium are present within stream channels.

4.6 Fort St. John Group (not mapped, owing to absence)

In contrast to the situation within properties lying to the north and east, the younger Cretaceous rocks of the Fort St. John Group have been completely removed by erosion at Hudette Trend. Most active erosion is likely to have occurred during a prolonged episode of regional uplift during the Tertiary era, followed by further glacial scouring during the Quaternary era, and continuing through fluvial down-cutting to the present time.

4.7 Bullhead Group (map-units 3 and 2)

An incomplete section of the Bullhead Group is present within the entirety of the Hudette Trend coal property, where the Bullhead rocks have been completely stripped-away by erosion. Both formations of the Bullhead -- the younger Gething and the older Cadomin -- are present at Hudette Trend, with the Gething containing all of the property's known potentially-mineable coal beds.

4.7.1 Gething Formation (map-unit 3)

The Gething Formation, of Hauterivian to late Early Albian age (Gibson, 1992), 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 and an intervening marine-influenced bay, of which the basal delta (the coal-bearing Gaylard paleodelta) extended throughout the Brazion coalfield, and the Falling Creek area in general, including the Hudette Trend coal property. At the latitude of Hudette Trend, the overlying delta (the younger Chamberlain paleodelta) is presumed to have been only represented by a thin, non-coal-bearing, fringe of sandy/silty

delta-front to prodeltaic deposits (Gibson, 1992), although now completely stripped-away by erosion.

The Gething Formation forms the top of the Bullhead Group (Stott, 1968, as used in the present report), and of the Crassier Group (*sensu* Hughes, 1964, as observed in the adjoining Mink Creek coal property by Sultan and Cathyl-Huhn, 2014). At Hudette Trend, the Gething Formation's original thickness was likely to have been well over 500 metres. In contrast, within the nearby Highhat Mountain area (ten kilometres to the east of Hudette Trend), complete sections of the Gething Formation are 475 to 720 metres thick, although some of that thickness is made up by marginal-marine deposits between deltaic lobes.

During historic (pre-2011) as well as current (year-2011 and more recently) drilling of the Hudette Trend coal licenses, every coal-exploration borehole has intersected some section of the Gething Formation, but the thickness of the formation can only be indirectly estimated from this work, since none of the boreholes started at or above the top of the complete Gething section, and only one of the boreholes reached the underlying Cadomin Formation.

The basal contact of the Gething Formation with the underlying Cadomin Formation is inferred to be abrupt to possibly erosional at the local scale (Cant, 1996) and interfingering at the regional scale (Stott, 1968; Gibson, 1992), 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 or multi-storey sandstone characteristic of the underlying sub-Gething beds.

4.7.1.1 Stratigraphic subdivisions of the Gething Formation

The presence of a thick, fine-grained, marine sub-unit within the Gething Formation was first recognised in the early 1970s by coal-exploration geologists working within the Sukunka area, on the eastern bank of Sukunka River, about 20 kilometres southeast of the Hudette Trend property (Wallis and Jordan, 1974). The mid-Gething marine band was subsequently found by boreholes drilled in the Rocky Creek area, about 15 kilometres south of the Hudette Trend property (Chowdry, 1980). In 1992, the Geological Survey of Canada published a review of the Gething Formation (Gibson, *op.cit.*), drawing upon coal-exploration results to define a fourfold subdivision of the Gething. From top downward, Gibson recognised four members:

- Chamberlain Member: marine and non-marine sandstone and siltstone, locally containing coal of mineable thickness;
- Bullmoose Member: marine siltstone, mudstone and sandstone, lacking coal;
- Bluesky Member: marine sandstone, conglomerate, siltstone and mudstone, lacking coal, but characteristically containing glauconite at its top; and
- Gaylard Member: non-marine siltstone, sandstone and mudstone, with numerous coal beds, some of which are of mineable thickness.

4.7.1.2 Chamberlain Member (map-unit 3d)

At Hudette Trend, the Chamberlain Member of the Gething Formation is inferred to have been completely removed by erosion, and thus it is not mapped within the area covered by **Map 2-3**.

The Chamberlain Member −where present, elsewhere within the Mink-Hudette sector of the Brazion coalfield −comprises a few (3 to perhaps 20) metres of very thinly- to thinly-interbedded, sparsely to moderately bioturbated very fine-grained sandstone and siltstone, with occasional bands of silty mudstone. Further details of the Chamberlain Member, and its position within the broader Gething Delta deposystem, are presented in the year-2015 coal assessment report for the Mink North coal property (Cathyl-Huhn, 2015), and in Gibson's year-1992 regional synthesis.

4.7.1.3 Bullmoose Member (map-unit 3c)

At Hudette Trend, the Bullmoose Member of the Gething Formation is inferred to have been completely removed by erosion, and thus it is not mapped within the area covered by **Map 2-3**.

The Bullmoose Member − where present, elsewhere within the Mink-Hudette sector of the Brazion coalfield − comprises about 110 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. Further details of the Bullmoose Member are presented in the year-2015 coal assessment report for the adjacent Mink North coal property (Cathyl-Huhn, 2015).

4.7.1.4 Bluesky Member (map-unit 3b)

At Hudette Trend, the Bullmoose Member of the Gething Formation is inferred to have been completely removed by erosion,; however, a small area of Bluesky rocks are shown, off-property, along the eastern edge of the area depicted within **Map 2-3**.

The Bluesky Member is a transitional unit between marine and non-marine facies. Accordingly, there has been considerable debate within the geological literature (as cogently summarised by Stott, 1968, and further discussed by Kilby (1984b) and Legun (1990), as to whether it properly belongs with the Gething Formation or the Moosebar Formation.

In areas lying fifteen or more kilometres to the north and east of the Hudette Trend property, where the Bullmoose and Chamberlain members of the Gething Formation can no longer be recognised, the Bluesky is customarily mapped as a formation in its own right, bounded above by the Moosebar Formation, and beneath by the Gething Formation (Legun, 1990).

The Bluesky Member generally consists of coarsening-upward cycles of interbedded mudstone, siltstone, and sandstone. Thin to medium interbeds of sandstone and mudstone give parts of the Bluesky a banded appearance. The top of the Bluesky is characteristically marked by a glauconitic horizon (Sultan and Cathyl-Huhn, 2014), containing contains abundant fine-grained, green glauconite within sandy mudstone and argillaceous, locally-pebbly, sandstone.

Regionally, the basal contact of the Bluesky Member with the underlying Gaylard Member is characterised by erosive-based chert- and quartz-pebble conglomerate up to a metre thick, grading to argillaceous sandstone with few randomly-distributed chert and quartz pebbles. The erosive-based Bluesky sediments likely represent the initial transgressive deposits of an early tongue of the Clearwater Sea, which shortly after

deposition of the Bluesky had transgressed to a southerly limit several hundred kilometres southeast of Hudette Trend (Gibson, 1992).

The Bluesky, as-drilled adjacent to the Hudette Trend property, is 8 to 30 metres thick. The age of the Bluesky Member is not directly known, but inferred to be late Early Albian on the basis of the ages of its bounding strata.

4.7.1.5 Gaylard Member (map-unit 3a)

The Gaylard Member is the basal unit of the Gething Formation, comprised dominantly of non-marine sedimentary rocks within the Hudette Trend coal property. Marine bands have been reported (Broatch, 1987) within the section now mapped as Gaylard Member, in areas to the southwest of Hudette Trend, and marine bands may well be present within the Hudette Trend's Gaylard as well.

The Gaylard Member at Hudette Trend consists principally of many vertically-stacked, locally erosive-based, fining-upward bedsets, such as are typical of fluvial and deltaic depositional settings. A typical cyclic succession of Gething sediments commences with basal sandstone (rarely basal gritstone or pebble-conglomerate), passing upward through coarse- to fine-grained sandstone, siltstone, variably-carbonaceous mudstone, rooty seatearth mudstone and coal. Most, but not all, Gething cyclothems are capped by coal beds, although many of these coals are too thin, or too dirty, to be considered mineable. Coals frequently contain partings of siltstone or variably-carbonaceous mudstone, tuff (the 'tonstein' bands of Kilby, 1984a and 1985) and rarely of ironstone.

Gamma-log response of the Gaylard sandstones are 'ragged' in detail, occasionally capped by an upward-increasing 'bell-shaped' log response. In contrast, the siliceous sandstones and conglomerates within the underlying Cadomin Formation display distinctly 'blockier' responses than those of the Gaylard sandstones.

All of the known coal occurrences within the Hudette Trend property are hosted by the Gaylard Member of the Gething Formation.

The thickness of the Gaylard Member is not directly known at Hudette Trend, owing to the lack of completely-drilled sections. However, by including the known-complete drilled thickness of the Upper Division at Mink Creek, and the drilled thicknesses of the Lower Division and the basal sandy unit at Hudette Trend, the overall thickness of the Gaylard Member may be reasonably estimated to range from 450 to 500 metres, which compares well with the thickness of 460 to 485 metres calculated for the Highhat River area (Cathyl-Huhn, 2015).

Correlation of Gaylard coal zones: At the adjoining Mink Creek coal property (Sultan and Cathyl-Huhn, 2014), the Gaylard Member contains at least nineteen readily-correlatable coal zones, and along the eastern edge of the Hudette Trend property, nine coal zones were intersected by year-2011 drilling, whereas within the more closely-drilled northwestern part of the Hudette Trend property, only seven named coal zones were recognised by Klatzel-Mudry *et al* (1984; their Figure 8).

At Hudette Trend, the thick Brenda Seam of Klatzel-Mudry *et al* is probably correlative with the F coal zone at Mink Creek (Sultan and Cathyl-Huhn, 2014), and possibly also with Seam C60 at Brule Mine (Cathyl-Huhn and Avery, 2014). However,

insufficient review of Hudette Trend's historic lithostratigraphic and chemostratigraphic data has yet been done to firmly assess whether such a correlation is valid across the entirety of these properties.

Age of the coals: Coals of the Gaylard Member at Hudette Trend, and their enclosing sedimentary rocks, were deposited during Hauterivian to late Early Albian time, between 112 and 133 million years ago, on the basis of regional plant-fossil and foraminiferal zonations, as presented by Gibson (1992).

4.7.1.6 Internal subdivisions of the Gaylard Member

The Gaylard Member may be readily subdivided into five informal divisions at Brule Mine (Cathyl-Huhn and Avery, 2014a), and into two or three informal divisions within the Mink Creek coal property (Sultan and Cathyl-Huhn, 2014). At Hudette Trend, three divisions of the Gaylard may be readily traced in the subsurface, via characteristic geophysical-log responses and lithologies, although with somewhat more difficulty at the surface, owing to poor exposure of the strata.

Table 4-1 presents this tripartite scheme of subdivisions, and **Table 4-2** sets forth their observed occurrence in boreholes at and near Hudette Trend.

Table 4-2: Drilled thickness of Bullhead and Minnes strata at and near Hudette Trend

borehole	Drift	Gaylard Member						Cadomin Formation		Bickford Formation		total depth
		Upper Division		Lower Division		Basal sandy zone						
	thick-ness	top	thick-ness	top	thick-ness	top	thick-ness	top	thick-ness	top	thick-ness	
DH-7401	0			starts	>165.96	165.96	>61.12	DNR	DNR	DNR	DNR	227.08
DH-7505	4.88			starts	>172.06	176.94	95.55	272.49	52.27	324.76	>22.10	346.86
PP 79-05	35.0			starts	>138.6	173.6	>85.55	DNR	DNR	DNR	DNR	259.15
FC 80-1	1.0			starts	>177.0	178.0	77.2	255.2	>14.3	DNR	DNR	269.5
FC 81-1	1.9			starts	>183.5	185.4	>97.15	DNR?	DNR?	DNR	DNR	282.55
FC 81-2	5.8	starts	>4.5?	10.30?	324.8?	335.1	>6.4	DNR	DNR	DNR	DNR	341.5
FC 81-3	15.1			starts	>276.7	DNR	DNR	DNR	DNR	DNR	DNR	291.8
FC 82-1	0.6			starts	>192.2	192.8	DNR	DNR	DNR	DNR	DNR	201
FC 82-2	17.6	starts	>19.54	37.14	>160.86	DNR	DNR	DNR	DNR	DNR	DNR	198
FC 82-3	1.6			starts	>52.4	-----	-----	-----	-----	-----	-----	-----
FC 82-3	thrust fault at 54.0 m (backthrust?)				-----	-----	-----	-----	-----	-----	-----	-----
FC 82-3	lower plate starts in Lower Division				>126.0	DNR	DNR	DNR	DNR	DNR	DNR	180
FC 82-4	2.8	starts	>31.6	34.4	>163.6	DNR	DNR	DNR	DNR	DNR	DNR	198
FC 82-5	2.8			starts	>173.4	176.2	>21.8	DNR	DNR	DNR	DNR	198
FC 82-6	2.6			starts	>198.4	DNR	DNR	DNR	DNR	DNR	DNR	201
FC 82-7	5.5			starts	>139.2	144.7	>56.3	DNR	DNR	DNR	DNR	201
FC 82-8	5.2			starts	>162.8	168	>33.0	DNR	DNR	DNR	DNR	201
FC 82-9	2.7			starts	>195.1?	197.8?	>2.2?	DNR	DNR	DNR	DNR	200
FC 82-11CH	2.55	starts	>8.45	DNR	DNR	DNR	DNR	DNR	DNR	DNR	DNR	11
FC 82-11P1	0	starts	>7.6	7.6	>19.4	DNR	DNR	DNR	DNR	DNR	DNR	27
FC 82-11P2	4.5	starts	>7.15	11.65	>38.35	DNR	DNR	DNR	DNR	DNR	DNR	50
FC 82-13	0			starts	>171.0	DNR	DNR	DNR	DNR	DNR	DNR	171
MCW 11-12	3.35			starts	>111.74	DNR	DNR	DNR	DNR	DNR	DNR	117.34
MCW 11-13	2.5	starts	>38.2	40.7	>143.7	DNR	DNR	DNR	DNR	DNR	DNR	184.4
MCW 11-14	6.1			starts	>211.0	217.1	>13.02	DNR	DNR	DNR	DNR	230.12
MCW 11-17	5.8			starts	>206.5	212.3	>33.06	DNR	DNR	DNR	DNR	245.36

Note: Figures shewn >thus are thicknesses of incomplete intersections, owing to the top and/or base of the unit having not been encountered by drilling. All depths and thicknesses are given in metres.

The Upper Gaylard of Hudette Trend is confidently correlated with the Upper Gaylard of the Mink Creek property, and less-confidently correlated with Division 5 of the Gaylard Member at Brule Mine. Similarly, although less-confidently, the Lower Gaylard may be

correlated across to Divisions 2, 3, and 4 at Brule Mine. Finally, the basal sandy unit of the Gaylard at Hudette Trend may be correlated with the upper portion of the Dresser Formation at Mink Creek, and Division 1 of the Gaylard at Brule Mine.

4.7.2 Cadomin Formation (map-unit 2)

The Cadomin Formation immediately underlies the Gething Formation, forming the basal part of the Bullhead Group (Stott, 1968). As such, the Cadomin Formation includes strata which may alternatively be assigned to the now-deprecated Dresser Formation of the Crassier Group *sensu* Hughes (1964).

The Cadomin Formation comprises one or more thick beds of coarse-grained, gritty to pebbly sandstone and pebble-conglomerate (McLean, 1977) with occasional lenses of siltstone and pebbly gritstone, and rare thin lenses of coal. The Cadomin Formation may be distinguished from the sandier parts of the Gaylard Member, upon the bases of the Cadomin Formation's greater lateral continuity, the Cadomin's distinctly-'blocky' gamma-log response, and the consistent presence of an intervening zone of fine-grained coal-measures strata.

At Hudette Trend, the Cadomin Formation is estimated to be 25 to 55 metres thick, represented by one of more beds of clean, coarse, siliceous sandstone. Historic borehole DH-7505 intersected two sandstone beds between drilled depths of 894 feet and 1065.5 feet (as shown on a correlation chart by Duff and Gilchrist, 1981); between the two sandstones is approximately 3 metres of fine-grained rocks, including a 90-centimetre coal bed.

By comparison with nearby properties, the Cadomin's basal contact with the underlying Bickford Formation of the Minnes Group is presumed to be erosional, with considerable local scour into the older sediments. Regionally, the base of the Cadomin marks a northeastward-deepening angular unconformity, cutting down into successively-older rocks of the Minnes Group (Stott, 1973).

4.8 Minnes Group (map-unit 1)

The Minnes Group comprises clastic sedimentary rocks of latest Jurassic and earliest Cretaceous age, forming a poorly-exposed deltaic/shelfal/basinal complex which is overlain by, and therefore largely concealed by, the Bullhead Group.

Four formations are locally recognised within the Minnes Group. From top down, they are the Bickford Formation (equivalent to most of the now-deprecated Brenot Formation of Hughes, 1964), the Monach Formation, the Beattie Peaks Formation, and the Monteith Formation (Stott, 1981; 1998). Coal is known to at least locally occur in all four of the Minnes Group's formations (Chowdry, 1980), but only the Bickford Formation is inferred to occur at reasonable depths within the Hudette Trend coal property, and therefore to be a credible target for coal exploration.

4.8.1 Bickford Formation (map-unit 1d)

The Bickford Formation (named for Mount Bickford, near Pine Pass) consists of non-marine sandstone, siltstone, mudstone and coal, with a total thickness of 285 to 300 metres (Chowdry, 1980). Channel-filling conglomerates, up to 11 metres thick, locally

occur near the top of the formation (Stott, 1998). The uppermost few metres of the formation, immediately beneath the base of the Cadomin Formation, is typically bleached and altered to a distinctively-soft, very light grey to white layer of clay-rich sediment.

Coals of potentially-mineable thickness were reported (Chowdry, 1980; Kalkreuth, 1982) from the Bickford Formation within the Rocky Creek coal property (south of Hudette Trend), on the basis of extensive drilling during the early 1980s, but only the extreme uppermost part of the Bickford has been drilled at Hudette Trend, and its local coal potential is therefore yet largely-unknown.

The Bickford Formation, being composed of relatively weak fine-grained rocks as compared with the strong coarse-grained strata above (in the Cadomin Formation) and below (in the Monach Formation), is suspected to be a zone of regional-scale *décollement*, from thrust-faults rise upward across the Cadomin Formation (Lingrey, 1996).

5 Coal

The Gething Formation contains several coal seams, at least some of which are sufficiently thick to constitute reasonable exploratory targets, within the Hudette Trend coal property. Past workers (vide Klatzel-Mudry *et al*, 1984) have made reasonable progress towards the delineation and correlation of the Gething coals, all of which occur within that formation's Gaylard Member.

5.1 Coals within the current boreholes at Hudette Trend

Table 5-1 presents a listing of Gaylard Member coals encountered in the two current boreholes (MCW 11-12 and MCW 11-14, both of them having been drilled in year-2011) at Hudette Trend. These coals are correlated, at a fair level of confidence, with like-named coals encountered by closely-spaced boreholes drilled within the adjoining Mink Creek coal property (*vide* Sultan and Cathyl-Huhn, 2014).

Table 5-1: Coal intersections in current boreholes

Borehole	Drilled depths		Thicknesses		Lith-ology	Coal bed name	Remarks
	From	To	Drilled	Stratigraphic			
MCW11-12	0	3.35	3.35	3.35	Drift		revised depth
MCW11-12	3.35	>103.92	>100.57		Lower Division of Gaylard		
MCW11-12	4.49	4.66	0.17	0.12	Coal		unidentified
MCW11-12	18.38	18.60	0.22	0.16	Coal	K1	
MCW11-12	19.90	20.20	0.30	0.21	Coal	K2	
MCW11-12	21.53	21.80	0.27	0.19	Coal	K3	
MCW11-12	23.61	23.78	0.17	0.12	Coal	L1	
MCW11-12	24.22	24.48	0.26	0.18	Coal	L2	
MCW11-12	25.60	26.00	0.40	0.28	Coal	L3	
MCW11-12	34.40	34.55	0.15	0.11	Coal		unidentified
MCW11-12	54.00	54.29	0.29	0.21	Coal	M	
MCW11-12	103.35	103.92	0.57	0.40	Coal	M	
	Total depth 117.34 m				Basal sandy unit not reached		
MCW11-14	0	6.10	6.10	6.10	Drift		revised depth
MCW11-14	6.10	217.10	>211.00		Lower Division of Gaylard		
MCW11-14	22.00	22.60	0.60	0.58	Coal	K1	
MCW11-14	22.75	23.00	0.25	0.24	Coal	K2	
MCW11-14	24.39	25.05	0.66	0.64	Coal	K3	
MCW11-14	25.20	25.35	0.15	0.15	Coal	K4	
MCW11-14	27.73	28.12	0.39	0.38	Coal	L1	
MCW11-14	29.23	29.82	0.59	0.57	Coal	L2	
MCW11-14	47.36	47.62	0.26	0.25	Coal	M	

Table 5-1: Coal intersections in current boreholes (continued)

Borehole	Drilled depths		Thicknesses		Lith-ology	Coal bed name	Remarks
	From	To	Drilled	Stratigraphic			
MCW11-14	90.00	90.25	0.25	0.24	Coal		unidentified
MCW11-14	99.80	100.25	0.45	0.44	Coal	N1	
MCW11-14	100.63	100.80	0.17	0.16	Coal		unidentified
MCW11-14	102.85	103.26	0.41	0.40	Coal	O1	
MCW11-14	110.36	110.50	0.14	0.14	Coal	O2	
MCW11-14	115.18	115.52	0.34	0.33	Coal		unidentified
MCW11-14	126.11	126.28	0.17	0.16	Coal		unidentified
MCW11-14	135.48	136.01	0.53	0.51	Coal	P1	
MCW11-14	159.06	159.55	0.49	0.48	Coal	Q	
MCW11-14	173.90	174.75	0.85	0.82	Coal	R	
MCW11-14	195.70	196.63	0.93	0.90	Coal	S	
MCW11-14	217.10	230.12	>13.12		Basal sandy unit of Gaylard		
	Total depth 230.12m				Cadomin Formation not reached		

Note: coal bed intersections interpreted by M. Sultan, as presented in Mink Creek coal assessment report (Sultan and Cathyl-Huhn, 2014). Depths and thicknesses are given in metres. Unidentified coals have not been correlated.

6 Coal quality

No coal-quality data were obtained during the year-2012 drilling at Hudette Trend, owing to the single borehole having not been cored.

6.1 Note concerning historic coal-quality data

A considerable volume of coal-quality data, including some petrographic data, were obtained in the course of historic exploration at Hudette Trend. These historic data have not yet been subjected to a meta-analysis of their trends, although such a study would clearly be useful to any future evaluation of the Hudette Trend coal property.

Kalkreuth and McMechan (1991) report mean maximum vitrinite reflectance values (mean $R_o$max) ranging from 1.17% to 1.51%, for Gaylard and Cadomin coals cored by borehole DH-7505; all save one of these samples were within the inferred reflectance band for medium-volatile bituminous coals, with the sole exception being the 1.51% reflectance observed within a coal bed situated just above the base of the Gaylard Member. The latter coal is inferred to be of low-volatile bituminous rank.

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7 Coal-resource estimation

At its present density of drilling, Hudette Trend has not yet been sufficiently-explored to support coal-resource estimation. Further exploration would be needed before any consideration could be given to the recognition of measured or indicated coal resources.

8 Reclamation

Drilling at Hudette Trend during year-2011 was confined to two sites, situated along an exploration trail extending southwestward from the adjoining Mink Creek coal property. As per usual practice, the drill sites were cleared of equipment, supplies and trash prior to removal of the drilling rig, and appropriate revegetation seed mix was applied to the sites.

9 Statement of costs

'Current work' within the Hudette Trend coal property, for purposes of the present report, comprises exploratory work done in year-2011. Work done was minimal, comprising the drilling of two boreholes, using rotary (non-coring) methods. The borehole was geophysically logged, but no samples were taken for analysis.

For the year-2011 work, broken-out exploratory costs are not readily available from exploration department files. Year-2011 costs for Hudette Trend are therefore estimated, based on provincial average unit costs, following the methodology used in Coal Assessment Report No.936 for the nearby Brule property (Cathyl-Huhn and Avery, 2014a).

Table 9-1 presents the resultant estimated cost breakdown for work at Hudette Trend.

Table 9-1: Estimated exploratory cost breakdown by activity

Item/year	Year-2011			Total costs
	Quantities	Average unit costs	Estimated costs	
Rotary-drilling	347.46 metres	$201.34/metre	$69,958	$69,958
Core-drilling	nil	$210.34/ metre	nil	nil
Geophysic-al logging	340.73 metres	$17.56/ metre	$5,983	$5,983
Roadwork	347.46 metres	$23.30/ metre	$8,096	$8,096
Analytical work	nil	$79.63/ metre	nil	nil
		Totals	$84,037	$84,037

Notes: unit costs are on per-metre drilled length basis, derived from provincial average unit-costs, vide Bouchard (2011) report on behalf of Natural Resources Canada. Geophysical log metreage is slightly lower than drilled metreage, as the boreholes could not be logged to their total depths. Roadwork cost is derived from overall length of drilling, not scaled length of access trails.

10 References

The following reference materials were used in the compilation of this report, with citations given at relevant points within the report's text. All coal-assessment reports here cited are available in digital versions via the British Columbia Geological Survey Branch's webspace, with the exception that year-2014 and year-2015 reports are still confidential at the time of this writing, with expected public release in 2017 and 2018.

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11 Conclusions

Coal occurrences, of potentially-workable thickness, occur within the Hudette Trend coal property. Most of these coals are contained within the upper portion of the Gaylard Member of the Lower Cretaceous (Hauterivian to Early Albian) Gething Formation.

Exploration to date has been sparse, on account of difficult access and structural complexity. Rocks at Hudette Trend have been broadly folded, and broken by thrust faults. which themselves are likely to have been folded. Given the structural complexity of the area, insufficient work has yet been done to allow the assessment of coal resources within the property.

In all, 15 historic boreholes (as reported in previous coal-assessment reports), totalling 2850.43 metres' length, have been drilled within the Hudette Trend coal property. Two 'current' borehole (here-reported for the first time), with overall length of 347.46 metres, were drilled on the property in year-2011.

Owing to the wide spacing between historic and current boreholes at Hudette Trend, no attempt is here made to definitively correlate the Gaylard Member coals, save that the coals intersected in current boreholes MCW 11-12 and MCW 11-14 may readily be correlated with those found in several boreholes nearby within the adjoining Mink Creek coal property (as reported by Sultan and Cathyl-Huhn, 2014). Furthermore, one thick coal zone at Hudette Trend (the Brenda Seam of Klatzel-Mudry et al, 1984) may be correlative with the F coal zone within the Mink Creek property, and possibly also with Seam C60 being presently worked at Walter Energy's Brule Mine (Cathyl-Huhn and Avery, 2014), situated ten kilometres east-southeast of the Hudette Trend property.

Extensive drilling will be required in order to define any exploitable coal resources at Hudette Trend, in keeping with modern Canadian standards for coal-resource reporting (Hughes *et al*, 1989), which require certain spacings of valid and verifiable data-points.

Estimated current exploratory costs to date, covering year-2011 activities, are $84,037. The Hudette Trend coal property is regarded as being a property of merit, warranting further study of coal-quality trends.

12 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, in their Northeast British Columbia office in Tumbler Ridge, British Columbia.

b) This certificate applies to the current report, titled *Coal Assessment Report for the Hudette Trend coal property, British Columbia*, dated March 18, 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, 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 several countries for over 36 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) My most recent visit to the Hudette Trend coal property was in the summer of 1980.

f) I am the author of this report, titled *Coal Assessment Report for the Hudette Trend coal property, British Columbia*, dated March 18, 2015, concerning the Hudette Trend coal property.

g) As of the date of the writing 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*.

“original signed and sealed by”
Dated this 18th day of March, 2015. C.G. Cathyl-Huhn P.Geo. Lic.Geol. RMSME

Appendix A: Geophysical logs

Geophysical logging and the pertinent statistics of the two current boreholes are summarised in **Table A-1**. Copies of their geophysical logs are submitted as digital files accompanying this report, in both LAS and TIF format.

Table A-1: Geophysical logs run in current boreholes

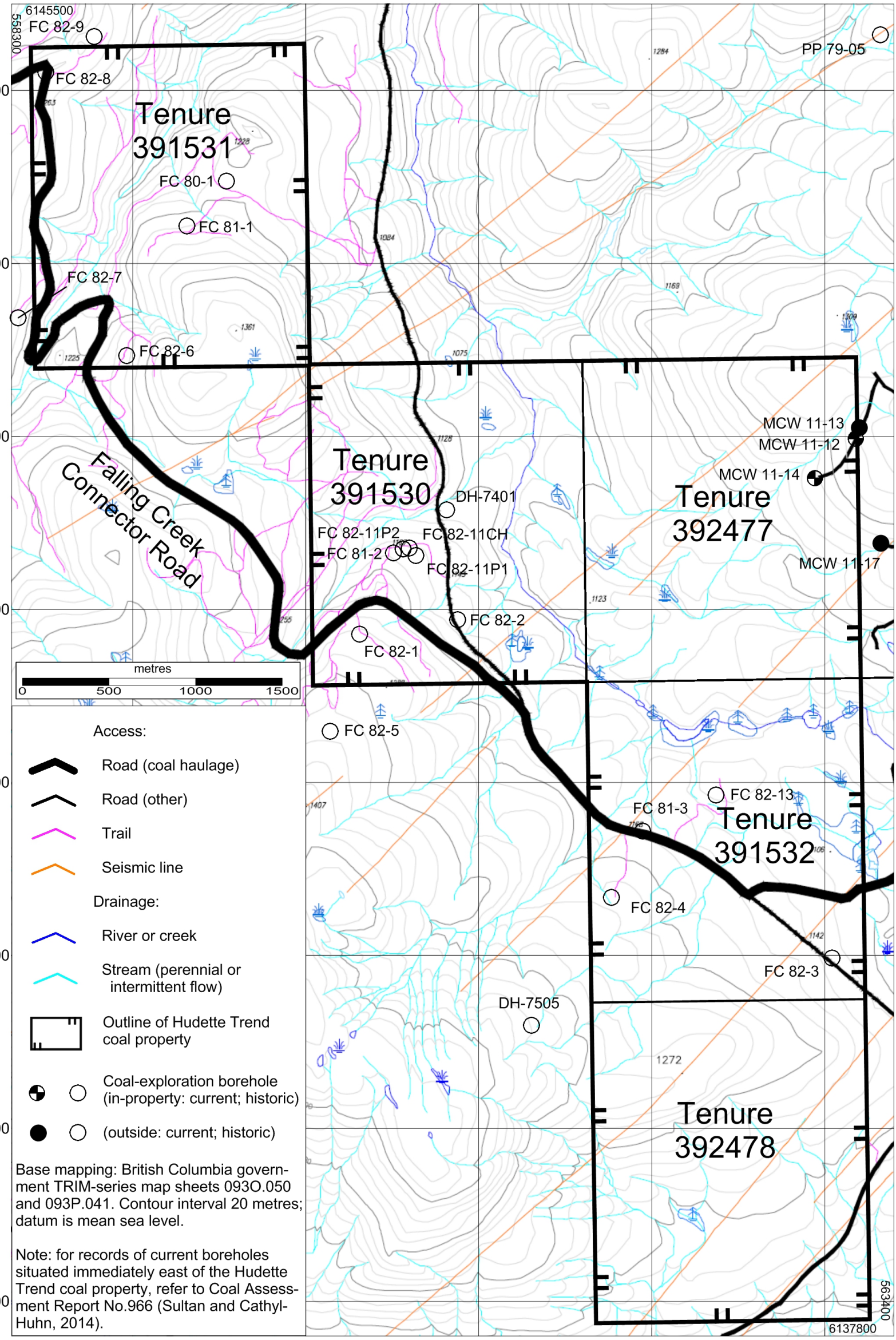
Borehole	Easting	Northing	Elev-ation	Total depth	Gamma/ Caliper/ Resistivity/ Density	Gamma/ Neutron	Gamma/ Density	Deviation	Dipmeter
MCW11-12	563178.49	6142985.67	1338.1	117.34	107.74	107.22	111.54	107.02	not run
MCW11-14	562943.43	6142757.21	1277.8	230.12	229.03	229.19		229.00	not run

Note: depths to which each log was run vary, according to borehole conditions and source-detector geometry of each sonde. Depths and elevations are given in metres. Positional references are to the UTM grid (Zone 10, NAD 83).

HUDETTE TREND

UTM NAD 83

CANADA
NTS 93 O/8 and 93 P/5



Access:

- Road (coal haulage)
- Road (other)
- Trail
- Seismic line

Drainage:

- River or creek
- Stream (perennial or intermittent flow)

- Outline of Hudette Trend coal property
- Coal-exploration borehole (in-property: current; historic)
- (outside: current; historic)

Base mapping: British Columbia government TRIM-series map sheets 093O.050 and 093P.041. Contour interval 20 metres; datum is mean sea level.

Note: for records of current boreholes situated immediately east of the Hudette Trend coal property, refer to Coal Assessment Report No.966 (Sultan and Cathyl-Huhn, 2014).

WALTER ENERGY

Scale: as shown	Coal Tenure and Topography	
UTM NAD 83		
Revision: C		
Drawn: GCH		
MAR 2015	HUDETTE TREND COAL ASSESSMENT REPORT	MAP 2-2

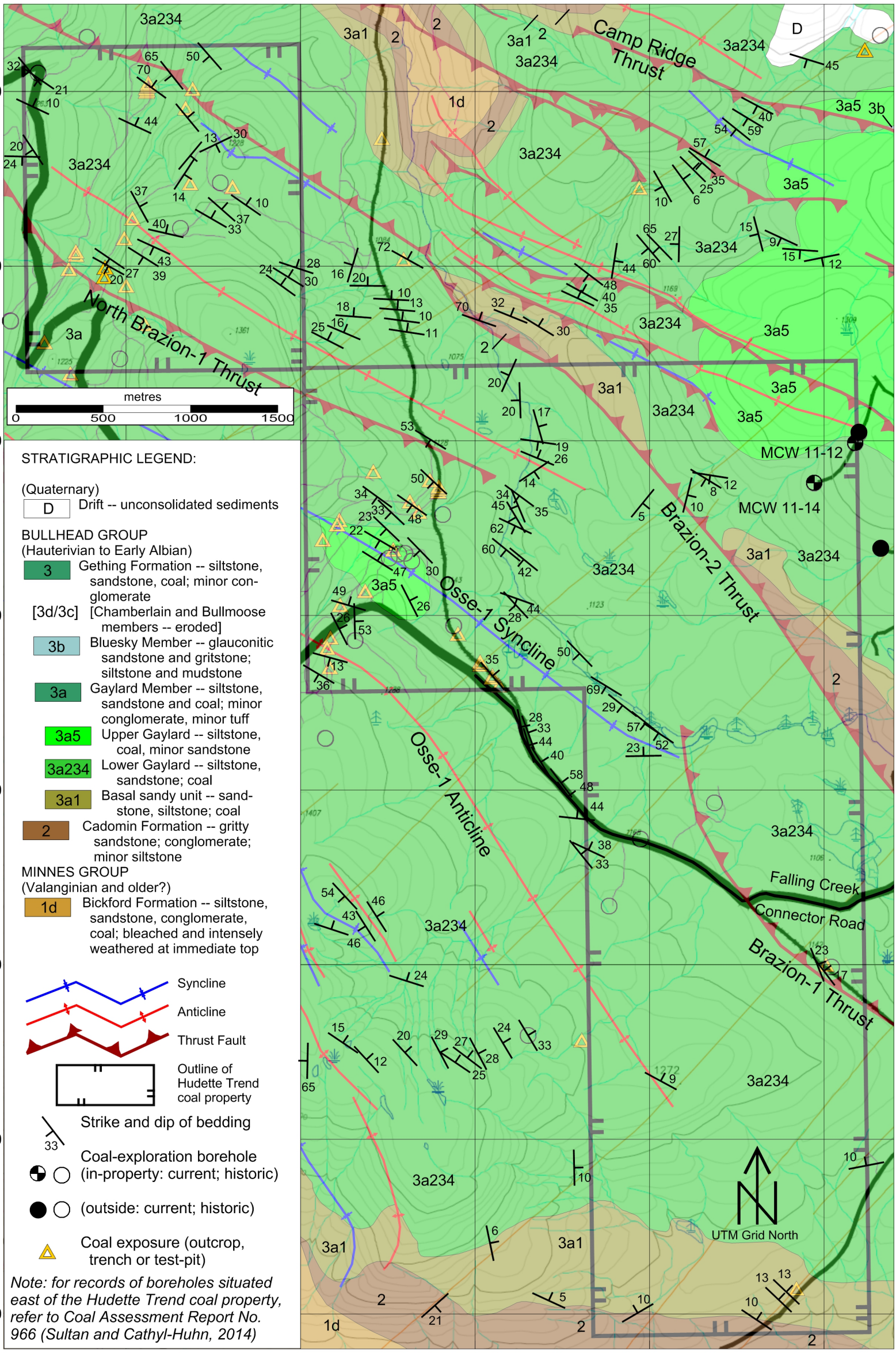
UTM Grid North

Drawing: Hudette_Trend-topography_150315c.srf/jpg
Drawn: C.G. Cathyl-Huhn, P.Geo.(BC) Lic.Geol (WA) RMSME
Date: 15.March, 2015 Scale: as shown by bar scale
Grid: UTM NAD83 Zone 10, in metres

HUDETTE TREND

UTM NAD 83

CANADA
NTS 93 O/8 and 93 P/5



STRATIGRAPHIC LEGEND:

(Quaternary)

D — Drift -- unconsolidated sediments

BULLHEAD GROUP
(Hauterivian to Early Albian)

3 — Gething Formation -- siltstone, sandstone, coal; minor conglomerate

[3d/3c] — [Chamberlain and Bullmoose members -- eroded]

3b — Bluesky Member -- glauconitic sandstone and gritstone; siltstone and mudstone

3a — Gaylard Member -- siltstone, sandstone and coal; minor conglomerate, minor tuff

3a5 — Upper Gaylard -- siltstone, coal, minor sandstone

3a234 — Lower Gaylard -- siltstone, sandstone; coal

3a1 — Basal sandy unit -- sandstone, siltstone; coal

2 — Cadomin Formation -- gritty sandstone; conglomerate; minor siltstone

MINNES GROUP
(Valanginian and older?)

1d — Bickford Formation -- siltstone, sandstone, conglomerate, coal; bleached and intensely weathered at immediate top

Syncline

Anticline

Thrust Fault

Outline of Hudette Trend coal property

Strike and dip of bedding

Coal-exploration borehole (in-property: current; historic)

(outside: current; historic)

Coal exposure (outcrop, trench or test-pit)

Note: for records of boreholes situated east of the Hudette Trend coal property, refer to Coal Assessment Report No. 966 (Sultan and Cathyl-Huhn, 2014)

WALTER ENERGY

Scale: as shown	Geology of Hudette Trend Coal Property	
UTM NAD 83		
Revision: E		
Drawn: GCH		
MAR 2015	HUDETTE TREND COAL ASSESSMENT REPORT	MAP 2-3

Geological compilation by C.G. Cathyl-Huhn, 2015, incorporating data from Kennecott Exploration (Hovis et al, 2006), Esso Resources (Klatzel-Mudry et al, 1982; 1984), Legun (2003), and Walter Energy (Sultan and Cathyl-Huhn, 2014).

Base mapping: British Columbia government TRIM-series map sheets 093O.050 and 093P.041, originally compiled at 1:20,000 scale

Drawing: Hudette_Trend-geology_150315e.srf/jpg
Drawn: C.G. Cathyl-Huhn, P.Geo.(BC) Lic.Geol (WA) RMSME
Date: 15.March, 2015 Scale: as shown by bar scale
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