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EXPLORATION AND MINING IN BRITISH COLUMBIA 2013



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Regional Geologist Summaries
EXPLORATION AND MINING
in British Columbia 2013

EXPLORATION AND MINING IN THE NORTHEAST REGION, BRITISH COLUMBIA

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SUMMARY AND TRENDS

Metallurgical coal is British Columbia's biggest export commodity, representing a record 65% of BC mineral production in 2012. Metallurgical coke is a solid carbonaceous residue produced from low-ash, low-sulphur bituminous coal and is a key ingredient in steel production where it is used as fuel and a reducing agent in the smelting of iron in blast furnaces. It comprises about 20% of blast furnace production costs. As such, economic trends in metallurgical coal reflect the state of manufacturing and construction sectors on a global scale. Although BC metallurgical coal has buyers from Asia to South America to Europe, aggressive steel production in China had culminated in high inventories that put downward pressure on steel component pricing in 2013. The average selling price of premium metallurgical coal continued to decline from a peak range of US\$200 - \$283/tonne in 2011 (reflecting flooding in Australia and logistical bottlenecks) to \$145/tonne or lower in 2013. In the Peace River Coalfield, lower coking coal prices and sales volumes caused a year-on-year drop in revenues of 30% at Walter Energy Inc's Canadian operations for the first six months of 2013. In Q2, the company's average hard coking coal and low-volatile PCI coal net selling prices were down 31% and 14% year-on-year necessitating strict cost control measures and significant improvements in cash cost of production per tonne. This was a common trend across the industry. However, despite the slight market oversupply and difficult pricing environment, the medium-to-long-term outlook for metallurgical coal remained positive. A gradual rise in coal price is expected to reflect widening supply shortfalls over the next 10 - 15 years, with high-quality metallurgical coals becoming increasingly valuable.

Ridley Terminals, the main port servicing the Peace River Coalfield, is in the third year of an expansion project that will double the total annual terminal capacity to 24 Mt by the end of 2014. This will accommodate an expected rise in export coal volumes from existing and new mines in Northeast BC. Additionally, as part of a multi-year expansion, the Canadian National Railway in 2012 announced plans to build five long sidings in the Edmonton-Prince Rupert corridor to accommodate an expected doubling of carloads to about one million by 2015. Coal transport represents about 11% of railway traffic across Canada.

Following upon the 2012 record year for exploration activity and investment in the Northeast Region, 2013

was more subdued. Cost cutting measures and capital expenditure reductions in response to the challenging market conditions forced some companies to reduce the scope of exploration projects, slow the pace of projects, or delay projects until improvement in coal price. Canadian Dehua International Mines Co Ltd and HD Mining International Ltd, which had together represented about 24% and 52% of expenditure in the coalfield in 2011 and 2012, temporarily delayed exploration activity at the Bullmoose River, Wapiti River, and Murray River projects for much of 2013. On the upswing, Anglo American plc in August officially announced the first \$50 M phase at Roman Mountain of a multi-year \$200 M Trend Mine expansion project. The global diversified mining company sees an advantage in its Peace River Coalfield projects in that they are relatively small-scale and modest cost with the potential to increase production of high-quality coal in an area with good rail and port infrastructure. Total exploration expenditure for the region in 2013 was \$81.6 M with the main contribution coming from mine evaluation stage and advanced stage projects. This represented a 25% drop from the 2012 peak value. Drilling at 54 525 m dropped more significantly by 55% from the 2012 value. Grassroots and Early Stage projects combined increased by 3% from 2012 indicating a higher proportion of generative work in 2013. On-lease exploration increased 9% with the transitioning of two projects out of the Mine Evaluation stage. Exploration highlights included:

- Mines Act Permits issued for mines at **Quintette-Babcock** (Teck Coal Ltd) and **Roman Mountain** (Anglo American plc);
- Completion of Prefeasibility studies at **Sukunka** and **Suska** (Glencore);
- completion of a Preliminary Economic Assessment for **Huguenot** (Colonial Coal International Corp);
- Federal Court decision allowed HD Mining International Ltd to continue with employment of Temporary Foreign Workers and work resumed on Surface Facility development and bulk sample excavation at **Murray River**;
- permitting approval for Surface Facility development and bulk sample excavation at **Gething** (Canadian Kailuan Dehua Mines Co Ltd);

- on-lease drilling at **Brule**, **Perry Creek**, and **Willow Creek** mines (Walter Energy Inc), and clean coal pilot test sample taken at **Quintette-Babcock** (Teck Coal Ltd);
- drilling programs at **EB** (Walter Energy Inc); **Quintette-Babcock** (Teck Coal Ltd); **Roman Mountain** and **Roman Northwest** (Anglo American plc); **Sukunka** (Glencore); **Wapiti River** (Canadian Dehua International Mines Group Inc); **Waterfall** (Anglo American plc);
- and an experimental geophysics program at **Roman Mountain** and **Roman Northwest** (Anglo American plc).

PEACE RIVER COALFIELD

The Peace River Coalfield of northeastern BC extends nearly 400 km along the Northern Rocky Mountain inner foothills from the Alberta border, 180 km east of Prince George, to 130 km north of Hudson's Hope at Pink Mountain. Medium to low volatile bituminous coal seams of economic thickness and continuity are hosted by the Lower Cretaceous Gething (up to 1036 m thick) and Gates (up to 280 m thick) sedimentary formations of the Bullhead and Fort St. John Groups, respectively (Cunningham and Sprecher, 1992; Gibson, 1992). The Gething Formation represents the dominant coal-bearing strata north of the Sukunka-Bullmoose area west of Tumbler Ridge, whereas the Gates Formation is the dominant host in the southern part of the coalfield. These are mined to produce hard-coking coal (HCC) and ultra low-volatile pulverized coal injection (ULV-PCI) products. PCI coal is a high-rank thermal coal used to sustain blast furnace temperatures in steelmaking. The HCC is internationally sought for its coking strength under blast furnace conditions. Coals from both formations are relatively low in ash (6 - 15%) and sulfur (0.3 - 0.7%; Grieve, 1995). Some Gething Formation seams have such low ash contents that the run-of-mine (ROM) coal doesn't require further processing. Seams from both formations typically yield low-ash clean coal product. In 2012, the BC government estimated 4900 Mt of potentially mineable resources in the coalfield.

The coal-bearing rocks were deposited in an alternating succession of transgressive and regressive cycles along the western edge of the Western Canadian Sedimentary Basin, a foreland basin, formed during the Late Jurassic to Early Cretaceous Columbian Orogeny at a time of high eustatic sea level (Stott, 1984). Depositional environments varied from marine to pro-deltaic and near shore, to delta plain and alluvial. Sedimentary rocks include inter-layered mudstone, siltstone, coal, fine-to-coarse sandstone, and conglomerate depending on the paleo-setting at time of deposition. The economic coal-bearing Gething and Gates Formations are thought to have formed within deltaic and strand plain environments with buried organics derived from back barrier marshes and wet forest swamps (Grieve, 1995).

These rocks were later compressed during the Late Cretaceous to Tertiary Laramide Orogeny. Variably plunging symmetric to asymmetric folds, box-folds, and thrust faults generally trend NW-SE on a local to regional scale, often with tightly-folded and thrust faulted anticlines bordering more gently folded synclines.

A deal between the BC government, mining companies, and Japanese steel mills in the early 1980s brought the coalfield into production. This required infrastructure support (power, rail, and road) and the establishment of the town of Tumbler Ridge. Of note, in July 2013 the Tumbler Ridge Paleontological Museum announced the biggest dinosaur discovery in the province's history.

SUMMARY FIGURES AND TABLES

Figure 1 shows locations of mines and select exploration projects discussed in this report. Figure 2 shows the major coal-bearing sedimentary formations, mines and exploration projects in the Peace River Coalfield. Figure 3 provides an annual comparison of exploration expenditures over the last 10 years. Figure 4 sets out the approximate allocation of 2013 expenditures among Grassroots, Early stage, Advanced stage, Mine Evaluation, and Mine Lease exploration in the region. Figure 5 compares annual drilling statistics over the last 10 years. Table 1 provides summary statistics for the producers, with forecast 2013 production. Table 2 lists the details of select exploration programs in 2013.

MINES AND QUARRIES

COAL MINES

The year began with four open-pit coal mines operating in the Peace River Coalfield of the Northeast Region: the **Trend** mine of Peace River Coal Inc, wholly owned by Anglo American plc (Anglo-PRC); and the **Perry Creek (Wolverine)**, **Brule**, and **Willow Creek** mines of Western Coal Corp, wholly owned by Walter Energy Inc (WEWC). The latter two operations combined produce premium ULV-PCI thermal coal in addition to bituminous coal of metallurgical quality. In April, operations were curtailed at the Willow Creek Mine due to the combination of depressed coal prices, and a company-wide effort by Walter Energy to evaluate its operations with respect to cost reduction initiatives. In March, the company made an appeal to shareholders for continued support of their corporate strategy which outlined decisions to reduce production at Brule Mine and idle the underperforming Willow Creek Mine. It also highlighted recent improvements in production cost-per-tonne across the Western Coal Corp properties. Forecast total production in the coalfield for 2013 is about 5.5 Mt.

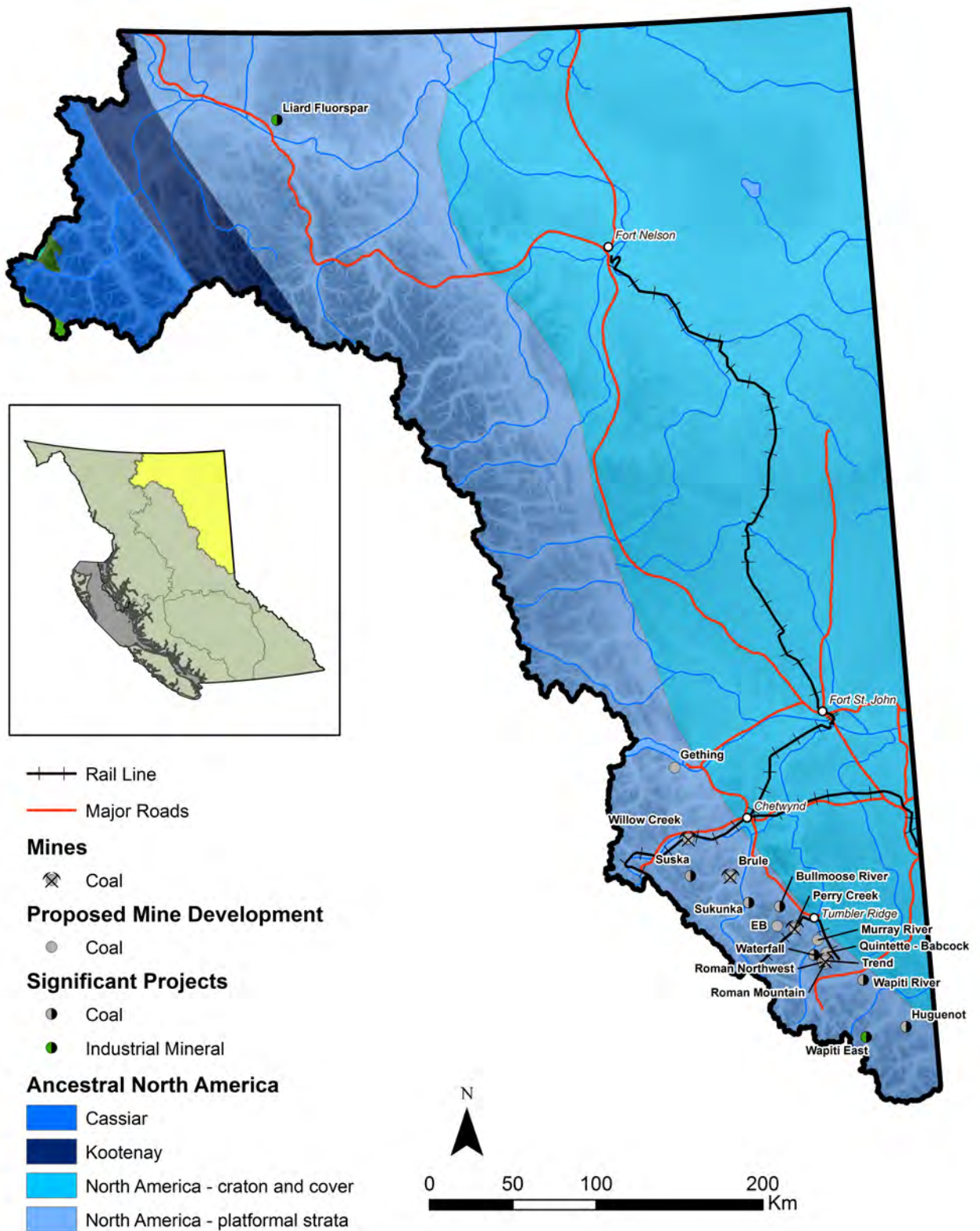


Figure 1. Mines and select exploration projects, Northeast Region, 2013.

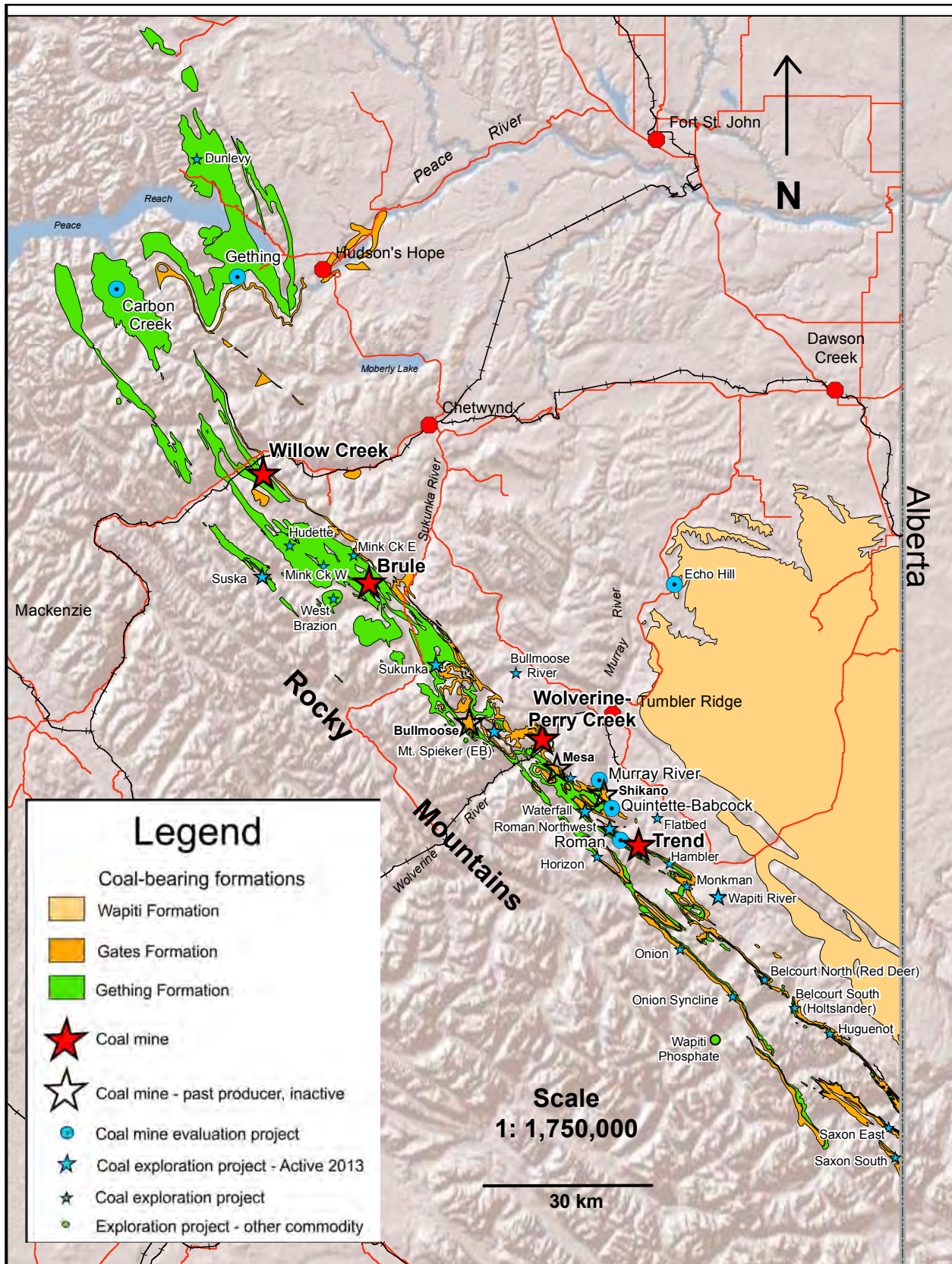


Figure 2. Map of Peace River Coalfield showing the distribution of economic coal-bearing geology, mines and exploration projects. Map by Janet Riddell, BC Senior Minerals Coal Geologist.

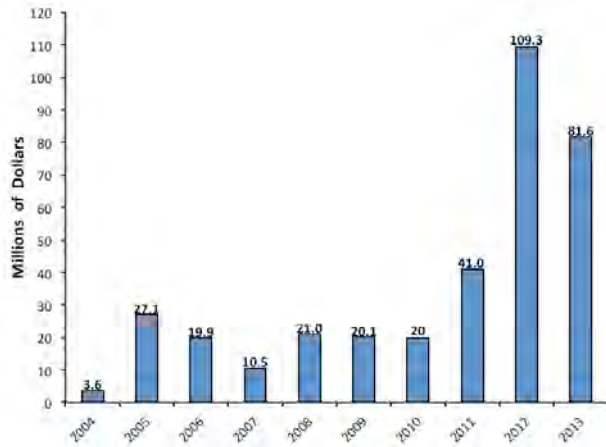


Figure 3. Annual exploration spending estimates in millions of dollars, Northeast Region (amount for 2010 is a rough estimate).

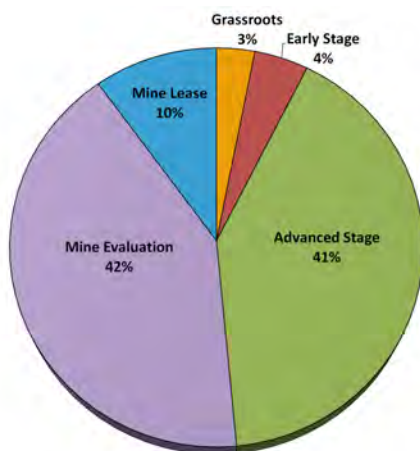


Figure 4. Exploration expenditures in 2013 by exploration stage (Grassroots: initial reconnaissance; Early stage: focused work on a target; Advanced stage: resource delineation, PEA and Prefeasibility; Mine Evaluation: focus on EA certificate, Feasibility studies, social license and government approval; Mine Lease: on-lease infill and mine development exploration). Year-on-year, the combined Grassroots/Early stage categories increased by 3%, the Advanced stage increased by 4%, the Mine Evaluation stage decreased by 16%, and Mine Lease increased by 9%.

The forecast production in 2012 (5.8 Mt) represented about 19% of the provincial total. Actual production in 2012 was 5.9 Mt.

South of Tumbler Ridge

Mining in 2013 at the **Trend** (MINFILE 0931 030) mine of Anglo-PRC, 25 km south of Tumbler Ridge, was focused on finishing Phase 3, continuing Phase 4, and a pushback in Phase 1. Continued mining of Phases 5 and 6 will be leveraged with the stripping ratio at the Roman Mountain expansion to maintain production. Export metallurgical coal production for the first half of the year was 912 000 tonnes, an increase of 55.2% year-on-year despite a company-wide decrease of 9% in Q2 due to

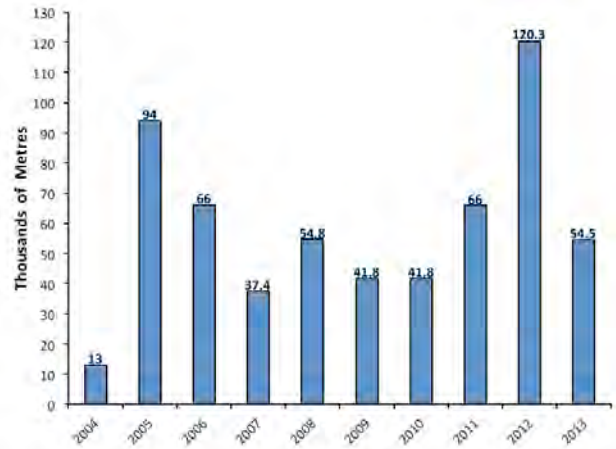


Figure 5. Annual exploration drilling estimates in thousands of metres, Northeast Region (amount for 2010 is a rough estimate).

strategic production cuts. The total product sales volume for 2012 was about 1.38 Mt. With the addition of the Roman Mountain expansion project in 2014, the combined Trend-Roman mine is expected to increase production to 2.5 Mt/y by 2016, and to 4 Mt in subsequent expansion phases. As of Dec 31 2012, reserves were estimated at 20.2 Mt ROM coal (Proven and Probable), with an additional in situ mineable resource of 21.2 Mt (Measured and Indicated) and 1.4 Mt (Inferred). South of Babcock Creek, Phases 1, 2 and 3, began in 2006, 2008, and late-2010 respectively. Farther southeast along strike of the Waterfall Anticline across Gordon Creek, Phases 4, 5 and 6 have been exhaustively explored and fully permitted. Three excavator fleets are used for operations. Since 2010, the company has reduced production costs by about 37% to \$120/tonne. Mine life is expected to continue another 10 years to about 2023.

Hard-coking coal of medium-volatile bituminous rank is being mined from the Lower Cretaceous Gates Formation (D, E, F, G, I, J, and K seams) along the steeply-dipping northeast limb of a tight upright fold, the Waterfall Anticline. Stratigraphy is continuous in the area with good correlation of coal seams. Cumulative coal thickness is about 16.5 m, excluding the K-seam.



Figure 6. Trend Mine – View northwest from Phase 4 at mining in Phase 3.

TABLE 1. FORECAST MINE PRODUCTION AND RESERVES, NORTHEAST REGION, 2013

Mine	Operator	Deposit Type/ Commodity	Actual Clean Coal Production in 2012 (Mtonnes)	Targeted Clean Coal Production in 2013 (Mtonnes)	Proven and Probable Reserves, Mtonnes ROM (Dec 31, 2012)	Measured and Indicated Resource, Mtonnes in situ mineable inclusive of Reserves (Dec 31, 2012)
Brule	Walter Energy Inc (Western Coal Corp)	Pulverized coal (PCI)	1.83	1.4	19.4 (proven)	31.9
Perry Creek (Wolverine Project)	Walter Energy Inc (Western Coal Corp)	Hard coking coal (HCC)	1.82	1.8	11.0 (proven)	26.1
Trend	Anglo American plc (Peace River Coal Inc)	HCC	1.38	1.8	20.2	41.4
Willow Creek	Walter Energy Inc (Western Coal Corp)	PCI, HCC	0.87	0.45	19.0	50.1

Structurally variable seams of the Lower Cretaceous Gething Formation (Bird and GT seams) are also present and can be blended with Gates Formation coals. ROM coal has a 20% ash content that washes to an 8.5% ash coal.

Wolverine Valley area

At the **Perry Creek** (MINFILE 093P 025) mine (Wolverine Project) of WEWC, 18 km west of Tumbler Ridge, mining was completed in Phases 3A and 3B in August and reclamation work followed. Phase 3 had been mined down the axial surface of the Perry Syncline open fold. Phase 3A developed at a faster rate than 3B to provide specific mill feed for processing and the two areas are offset in the pit. The Phase 3 open-cut area will be maintained as a potential subaqueous storage area. On the gently-dipping southwest limb of the syncline, mining continued in Phase 4A. Transitioning to Phase 4B is planned for early 2014. A 10-hole on-lease drilling program was carried out across both 4-phases to gather structural and coal quality data in advance of mining. Other work included construction of a new haul road to the South Dump, and reclamation work on the East Stockpile area. A 150 m pushback of the highwall is being investigated as Phase 5, tentatively scheduled for 2018 - 2019. Expected production in 2013 is about 1.8 Mt clean coal. The mine is permitted to produce up to 3 Mt/y and has a 3.5 Mt/y load-out facility. Actual production in 2012 was 1.82 Mt of clean coal tonnage equivalent. Cash cost of production and productivity were compromised in Q2 by property development costs and downtime from unanticipated

repairs. The company also expected overall production from the Western Coal Corp operations to be lower in Q3 due to the Perry Creek mine moving into a less favourable phase of its mining cycle. However in October mining of the highly productive J-seam began in Phase 4A. As of March 2013, recoverable coal reserves were stated at 11.0 Mt (proven), and the resource inclusive of reserves was 26.1 Mt in situ mineable coal (Measured and Indicated). Mine life is expected to continue another 6 years to about 2019.

The Perry Creek (Wolverine) mine lies within an asymmetrical open fold, the Perry Creek Syncline. HCC of medium-volatile bituminous rank is being mined from the Lower Cretaceous Gates Formation seams (E2, E3, F, G, J1, J2, J3 in descending order). The 3-ply basal J-seam comprises about 7 m coal thickness, while the remaining seams average 1 - 2.5 m. The J-seams are split by a transgressive lag conglomerate that thickens to the north and east. These seams are easier to mine and process but are softer coking coal, which requires blending with Perry Creek upper seams or Willow Creek coal for the final HCC product.

Chetwynd-Pine River Area

The **Brule** (MINFILE 093P 007) mine of WEWC is 37 km south of Chetwynd in the Brazion Group of properties that includes the Willow Creek mine. Mining of Seam 60 continued at the north end of the Camp (South) Pit and mining of the Lower and Upper Seams continued at the south end of the pit. Mining will advance to the north in separate phases and be closely

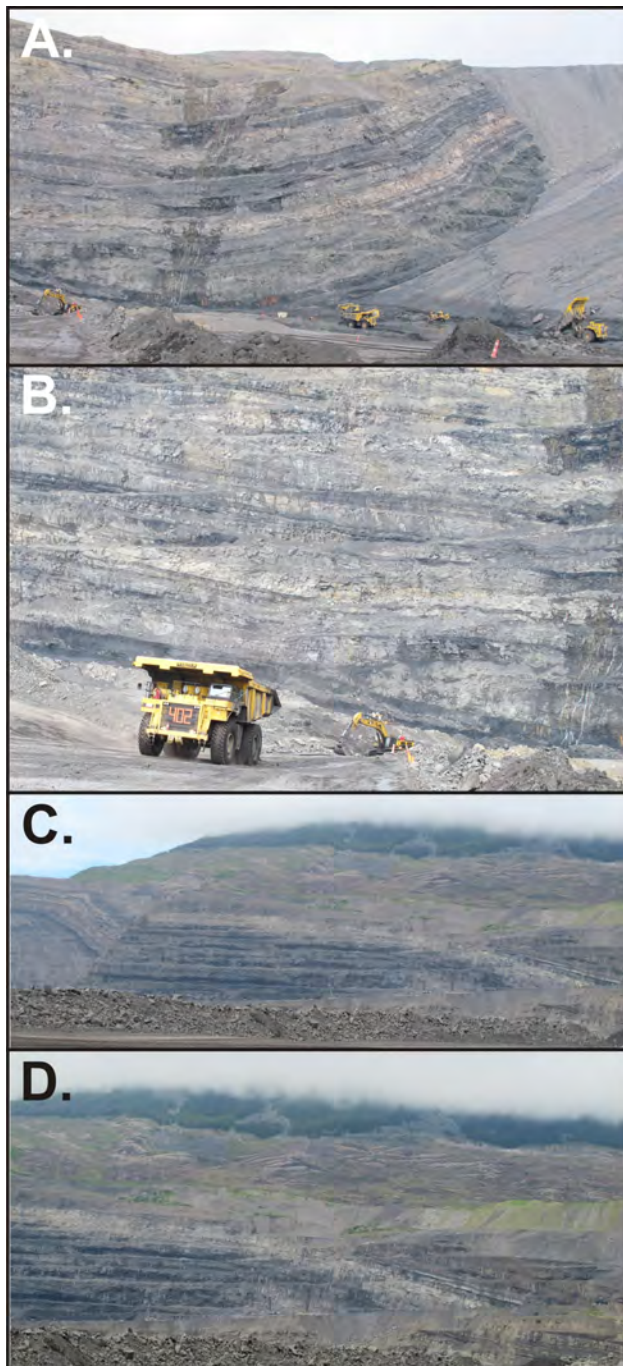


Figure 7. Perry Creek Mine – **A, B.** Mining full Middle Gates sequence A-J seams in Phase 3A. The rusty coals at bottom are the J2 seam, the J3 parting pinches out to the west; **C, D.** View southwest at Phase 4A drilling. Phase 4B is in the green area above the Armand sandstone unit (Upper Gates). Phase 3B is lower right.

followed with backfilling for improved water management. The Brule (North) Pit will be incorporated into the north expansion area. In winter 2013, two geotechnical holes were drilled in the Brule Pit north wall through the full coal sequence and 17 groundwater monitoring holes were drilled around the margins of the Brule Pit. The deepest hole was drilled to 182 m. Mining north of the Brule pit is anticipated in 3 - 4 years. An

exploration mapping program carried out in the summer focused on identifying Moosebar Formation shales above the coal-bearing Gething sequence and marker units within the sequence. The mapping updated and reinterpreted some geology and structure from historic mapping on the property by Teck Corp. On-lease exploration is continuing northwest of the mine where tectonic thickening of coal seams is anticipated. At the end of Q2 the company reported increasing productivity and improved performance from Q1 had resulted in the cash cost of production dropping 21.5% to \$79.82/tonne. Mine infrastructure can support a production rate of 2 Mt/y. Actual production in 2012 was 1.83 Mt of clean coal tonnage equivalent. Production for 2013 is estimated at 1.4 Mt clean coal. As of March 2013, recoverable coal reserves were stated at 19.4 Mt (proven), and the resource inclusive of reserves was 31.9 Mt in situ mineable coal (Measured and Indicated). Mine life is expected to continue another 10 years to about 2023. The Brule and Willow Creek operations employ 400 workers including contractors, with 180 full-time Walter employees at Brule.

The mine produces ULV-PCI coal from three Gething Formation seams within the northwest-trending Owl Creek syncline. The cumulative coal average thickness is 12.2 m. The Upper 60 seam goes to the wash plant, whereas the Upper and Lower seams need no processing and go directly to load-out. ROM coal is trucked 60 km on the Falling Creek Connector Road to the processing plant and rail load-out facility at the Willow Creek mine.

In April, WEWC curtailed production at the **Willow Creek** (MINFILE 0930 008) mine, 38 km west of Chetwynd in the Pine Valley area. The cash cost of sales target for the Willow Creek Mine in 2012 was \$150/tonne, making it the most expensive of the three Western Coal Corp mines to operate by \$20-30/tonne. The company is confident that Willow Creek will be able to make a swift return to production with recovery of the pricing market. Operations for the remainder of 2013, with a 70% reduced workforce, were limited to the processing plant in support of the Brule Mine, and minor in-pit work. Internationally, the company had closed five coal operations as part of a more aggressive operational management approach to address underperforming assets. The company recorded a one-time charge of \$7.5 M in severance costs to idle the mine. On-lease drilling for coal quality data was completed early in the year, in advance of continued mining planned for Phase 4N.

Actual production at Willow Creek in 2012 was 0.87 Mt of clean coal tonnage equivalent with one-third HCC and two-thirds ULV-PCI coal. An increase in production to 1.2 Mt was planned, but due to the suspension of mining the actual tonnage for 2013 was about 0.45 Mt clean coal. The mine is permitted to produce up to 1.7 Mt/y. As of March 2013, recoverable coal reserves were stated at 19.0 Mt (17.7 Mt proven, 1.3 Mt probable) and the resource inclusive of reserves was 50.1 Mt in situ

mineable coal (Measured and Indicated). Once operations resume, mine life is expected to continue another 16 - 20 years. Willow Creek coal has a higher CSR (Coke Strength after Reaction) and is marketed at a premium separately from Wolverine project coal. Both Willow Creek and Brule (Upper 60 seam) ROM coal products are processed at the Willow Creek site.

Nine economic coal seams (youngest to oldest numbered: 1 - 4, A, 5 - 9) of the Gething Formation occur within the northeast limb of the 4 km long Willow Creek Anticlinorium, with thrust faulted subsidiary synclinal folds and northeast dipping monoclines. Thrust faulting (Willow Thrust) is steeply northeast dipping. The coal seams are commonly split, with individual coal units averaging 1.2 m thickness, and a cumulative thickness of about 29 m. Three seams (5, 7, and 8) are ULV-PCI coal. Folding and faulting are more complex in the Willow South area.

QUARRIES

Sand and Gravel (Aggregate)

Sand and gravel (aggregate) are construction materials used extensively in commercial, industrial and public works, and are a main component of concrete. These deposits are typically found in river valleys; a limited number of locations contain materials that meet specifics of quantity and quality. Over thirty NOW applications came through the Prince George MEM office in 2013 from private individuals and companies, construction companies and contractors, holding and trucking companies, and energy and oil service companies for sand and gravel operations. From south to north, these were located along the:

- Sukunka River (0.5 km, Strachan pits);
- Pine River (Half Moon, Johnston Sand, West Can #1 pits);
- Kiskatinaw River (5 Mile, Bedell, and Swamp Donkey Shale pits);
- Pouce Coupé River (Moore 2 pit);
- Peace River and Taylor (W6 Aggregates and Glenn Fox pits);
- Graham River (Holler Pit);
- Halfway River (Crystal Springs Ranch, Lot 2765, DL 1948, Pink Mtn Road Quarry pits);
- Beatton River (Tote Road Quarry);
- Sikanni Chief River (South Sikanni Quarry, Jedney Pit);
- Minaker River (Buckinghorse Quarry);
- Prophet River and Fort Nelson (Wide Sky Disposal, Golo Tenneh Shale pits);
- Dunedin River (Tsimeh Dunedin Pit);

- Fort Nelson River (MacKiwi gravel Quarry, Patry Quarry and Aggregate Pit);
- Komie Creek (Dilly Pit)
- Liard River (La Biche River, Tsoo Creek Rock pits); and
- Petitot River (Petitot Pit).

The Ministry of Transportation and the Oil and Gas Commission also permit aggregate operations, so the list above is only a partial representation of permit applications in the Northeast. It was a particularly busy year for aggregate from the Taylor - Fort St. John area north to Fort Nelson. Production was primarily for use in the energy sector as roadwork and well site construction material.

MINE DEVELOPMENT AND EVALUATION

COAL PROJECTS

South of Tumbler Ridge

In August, a Mines Act Permit was signed by the Minister of Energy and Mines and Anglo-PRC announced the start of construction at the **Roman Expansion Trend** (Roman Mountain) project, 2 km south of the Trend Mine on Roman Mountain. The \$50 M first phase of the \$200 M multi-year expansion project includes the construction of a water management system (ditching and catchment structures and a sedimentation pond) and a selenium treatment plant. Once in operation, the expansion will comprise 5 km of linear open-cuts in several phases to capture the Middle Gates coal seams on Roman Mountain, and satellite pits for the Upper Gething coal seams. Mining will start lower in the Middle Gates sequence (G - J seams), where the stripping ratio is less, as an open-cut on the southwest limb of the syncline. This will later be infilled with waste rock from push backs and/or open-cuts moving higher in Gates Formation toward the D-conglomerate at the centre of Roman Mountain. Access and open-cuts will then be established on the northeast limb of the syncline, and the ultimate pit will encompass both fold limbs. By 2029, open-cut Phases 1 to 3 at Trend are to be filled with waste rock from the Roman operation. Production is expected to be 1 Mt/y for Roman, bringing the combined Trend-Roman production to 2.5 Mt. The Roman and Trend operations will be integrated to make the best use of existing mine infrastructure, although additional plant capacity and mining equipment will be required to increase and sustain production. The company foresees the Roman expansion coming into production by 2015, coinciding with the coal market's recovery from oversupply. The mine plan includes financial and habitat offsetting in accordance with the BC Government's Peace Northern Caribou Plan (PNCP) of \$2.6 M and 1852 ha of tenure. The PNCP

TABLE 2. SELECTED EXPLORATION PROJECTS, NORTHEAST REGION, 2013

Property	Operator	Minfile (BCGS ref)	Commodity	Deposit Type	Work Program
Bullmoose River	Canadian Dehua International Mines Group Inc / Canadian Bullmoose Mines Co Ltd	(093P 003,004,006, 013, 014, 023)	Metallurgical coal	Sedimentary	EN, R
EB (Mt. Spieker)	Walter Energy Inc (Western Coal Corp)	093P 015	Metallurgical coal	Sedimentary	A, DD (768 m), GD (459 m), RC (1645 m)
Gething	Canadian Kailuan Dehua Mines Co Ltd	093O 025, 029	Metallurgical coal	Sedimentary	EN, R
Huguenot	Colonial Coal International Corp	093I 014 (93I 049,059)	Metallurgical coal	Sedimentary	CQ, PEA
Liard Fluorspar	Prima Fluorspar Corp	094M 005, 006, 007,009, 010	Fluorspar	Carbonate-hosted	GC (rock, soil)
Murray River	HD Mining International Ltd	(093P 005, 093I 095)	Metallurgical coal	Sedimentary	BU (100 000 tonnes), GD (1019 m), EN
Quintette - Babcock	Teck Coal Ltd	093I 011	Metallurgical coal	Sedimentary	BU (50 000 tonnes), CQ, DD (1000 m), GD (1000 m), RC (11 325 m), EN
Roman Mountain	Anglo American plc (Peace River Coal Inc)	093I 030	Metallurgical coal	Sedimentary	A, DD (8500), GP (305.7 line-km), EN
Roman Northwest	Anglo American plc (Peace River Coal Inc)	(093I 014, 015)	Metallurgical coal	Sedimentary	A, DD (880 m), RC (2240 m), GP (27.5 line-km)
Sukunka	Glencore	093P 014	Metallurgical coal	Sedimentary	A, DD (1700 m), GD (300 m), PF, EN
Suska	Glencore	093O 050	Metallurgical coal	Sedimentary	DD (1500 m), EN, PF
Wapiti East	Fertoz International Inc	093I 008, 022 (093I.047)	Upwelling-type phosphate	Sedimentary	A, DD (2000 m), G, GC (rock), P
Wapiti River	Canadian Dehua International Mines Group Inc	093I 013	Metallurgical coal	Sedimentary	DD (14 347), EN
Waterfall	Anglo American plc (Peace River Coal Inc)	(093I 095)	Metallurgical coal	Sedimentary	A, DD (2000 m)

Work Program Abbreviations:

A = access (trail, road construction on claims); BU (X tonnes) = bulk sample (weight in tonnes if known); CD = condemnation drilling; CQ = coal quality testing; CT = carbonization test (coal); DD (Xm) = diamond drilling (totalling X metres); EN = environmental baseline studies/monitoring, remediation work; FS = Feasibility studies; G = geology, mapping, etc.; GC = geochemical sampling (rock, silt, soil, etc.); GD = geotechnical drilling; GP = geophysics (general); P = prospecting; PEA = Preliminary Economic Assessment, scoping study; PF = Prefeasibility studies; R = reclamation; RC = reverse circulation drilling; TR = trenching

developed financial and habitat offsetting requirements in 2012-13 to support the recovery of at-risk South Peace Northern Caribou herds through pilot application projects at Roman Mountain and Babcock Mountain. The company is also finalizing economic benefit agreements with the neighbouring First Nations. Mine construction will create 100 jobs and the operating mine would secure the jobs of up to 450 employees in the Tumbler Ridge area. As of end 2012, in situ mineable resource was stated at 37.0 Mt (Measured and Indicated), an increase of 38.6% from 2012. Average strip ratio is estimated at 6.4 : 1. Mine life is estimated at 16 years to about 2031.

The Roman Mountain (MINFILE 093I 030) project sits in a close-folded syncline (Murray Syncline) of 4 km strike length. Looking down strike, the mountain has a prominent core of Gates Formation D-conglomerate sloping outward across the Gates coal sequence to recessive gullies of Moosebar Formation marine shale and then outward across the Gething Formation to shoulders of resistant Cadomin conglomerate at the base of the Gething. The Cadomin Formation then forms the core of the Waterfall Anticline on the northeast which hosts the Trend Mine. The coal sequence is similar to that at Trend with Gates (D, E, F, G, J seams) and Gething (Bird and GT seams) of 18.3 m and 7.5 m cumulate thickness, respectively. Complexities including thrust-faults and drag folding have been identified on the southwest limb of the syncline. Coal seams have been identified over a 3 km strike length.

Exploration on Roman Mountain in 2013 comprised a winter and summer program totalling 95 holes of rotary, PQ core, and geotechnical drilling. Drilling down-slope to the northwest near Babcock Creek obtained geotechnical, structural and coal quality data on Gething Formation seams. For the Gates seams, free-swelling index (FSI) measurements were taken to determine the limit of oxidation in cuttings from shallow holes drilled in 3-hole fan arrangements per seam. In August, an experimental

geophysical program began testing subsurface mapping capabilities of three geophysical techniques using seismic waves, ground penetrating radar (GPR) and resistivity.

Three NE-SW oriented lines were planned across Roman Mountain and three similar lines on Roman Northwest plus one ENE-WSW oblique line. The objective was to obtain high resolution data to resolve structures and define coal seams to 500 m depth, and to develop a geophysical signature for buried coal seams that could be used regionally. The low impact program was conducted on existing seismic lines in the area and outside caribou core winter habitat. With the ongoing development of a geophysical signature for buried coals, the company views the Trend-Roman operation as central to more regional growth opportunities.

Due to adverse market conditions, Anglo-PRC deferred exploration and development work at the **Horizon Ridge** (MINFILE 093I 032) project (formerly the Five Cabin Coal Project), 8 km west of the Trend Mine. The project is currently in the Pre-Application stage of the EA process. Several open-cuts are proposed with an estimated production of 1.6 Mt/y and a life expectancy of 20 years. The project sits in an asymmetric gentle-to-open syncline containing both Gates and Gething coal seams.

In late April, Teck Resources Ltd reported a drop in coal prices of 28% year-on-year to \$162/tonne, and announced a program to contain production costs at existing operations. The **Quintette-Babcock** (MINFILE 093I 011) mine re-start project, 20 km south of Tumbler Ridge, continued to progress through the Mines Act Permit Amendment (MAPA) application process. The Quintette mine operated from 1982 - 2000 with development in 1998 of open-cuts on Mt. Babcock (Big and Little Windy) producing about 2 Mt/y washed coal. In anticipation of permitting approval in Q2 and the start of coal production in 2014, engineering work was underway and long-lead equipment was being procured. Of the



Figure 8. Roman Mountain – View northwest from Trend Mine Phase 4 at Roman Mountain (Murray Syncline) on left, and Trend Mine Phase 3 (Waterfall Anticline) on right.

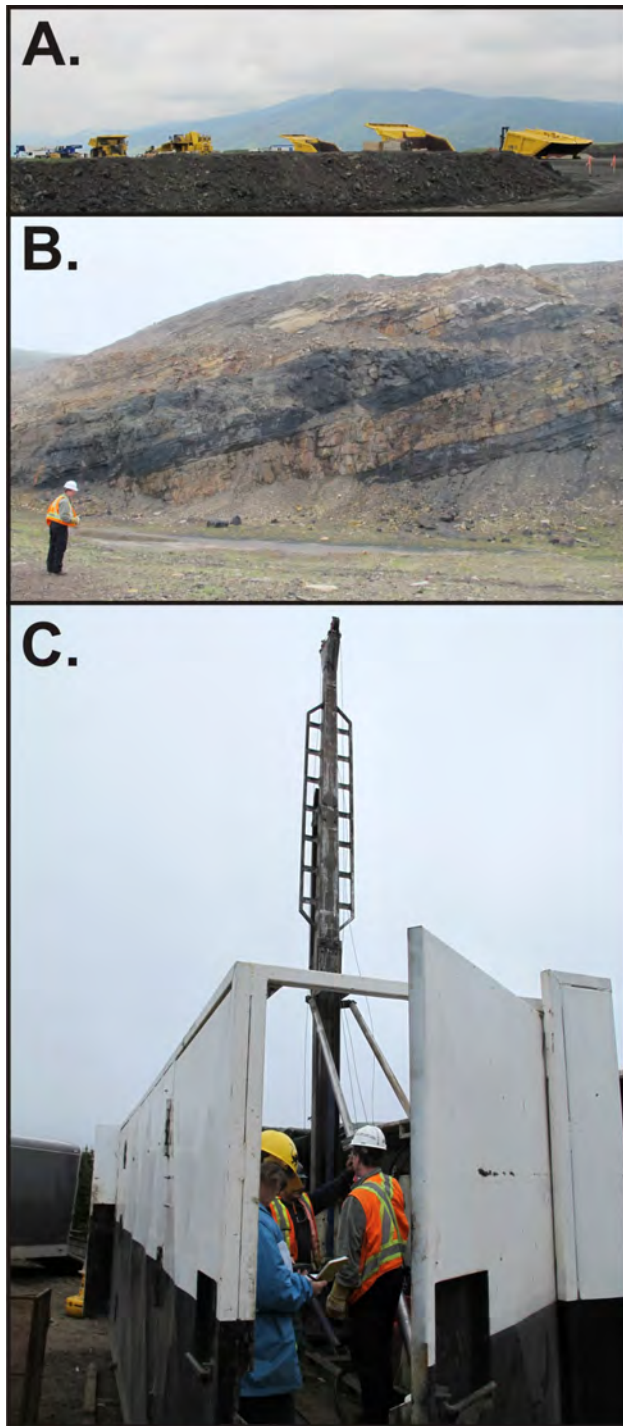


Figure 9. Quintette-Babcock – **A.** Laydown yard with new mining equipment; **B.** View SSE at gently-dipping D, E, and F seams in the Little Windy Pit area; **C.** Core drilling in the Northeast fault zone, Window Pit area.

\$858 M capital cost estimated in the 2012 Feasibility Study, another approximately \$670 M remained to be spent.

In June, the MAPA was approved for the open-cut mine operation focused on reopening the Windy (Big and Little) and Window pits on the NNW-to-north and northeast faces of Mt. Babcock. The mining plan calls for production from the Window Pit for the first two years,

then to the top of the Big Windy highwall for two years with a thin strip through the 80 m thick Hulcross Formation shale above the Gates sequence, followed by 3 - 8 years of mining of the Windy Pits, and then 4 more years at the Window Pit. The estimated resource is 180.5 Mt (Measured and Indicated), and 136.5 Mt (Inferred) of raw coal. By maximizing the use of existing infrastructure and processing plant, the mine is expected to produce an average 3.0 - 3.5 Mt/y washed coal over a 12 year mine life. Three of four separate streams would be used in the Quintette wash plant at full production. Siliclastic partings are to be separated from coal in the wash plant reducing to 8 - 8.5% clean ash. The company is planning to replace thermal dewatering with a more efficient and productive mechanical dewatering process using cyclones and air pressure for coarse and fine coal. The historic Shikano Pit, 6 km northwest Mt. Babcock would be used for a settling pond for wash plant fines. New mining equipment, breaker station, service truck shop, facility refurbishment, and accommodations are required for the restart. The mine would provide more than 500 full-time jobs in the Tumbler Ridge area.

In late July, Teck reported a 23% drop in coal price to \$159/tonne and 50.5% drop in Q2 earnings year-on-year. The company responded by intensifying capital conservation and cost reduction initiatives, including a slowing of the Quintette restart. A final production decision was delayed in order to defer \$300 M of capital expenditures in 2013 and \$350 M in early 2014. Detailed engineering work will continue so that an early 2014 positive decision would enable commercial production by mid 2015 in an improved market. The revised capital expenditure forecast for the project in 2013 was \$130 M. In October, a reduced production rate was being considered for the mine restart as a means of lowering start-up costs.

Late permitting approval in 2012, related to the establishment of a mitigation plan for core caribou habitat developed through the PNCP pilot application, caused a 61-hole RC drilling program to be deferred to 2013. The objectives of the program were to upgrade the reserve classification of the Window Pit through infill drilling, and continue drilling in the Windy Pit area. Only 20% of the reserve was classified as Proven. A 4-hole core drilling program continued exploring the northeast fault area to better define fault location (four known splays and disturbance zones); to gather coal quality and ARD data, and rock strength data for pit design. Rock mechanics around low angle bentonite layers were a particular focus. Other aspects of the 2013 program included a 30-hole shallow (<50 m) geotechnical drilling program for sedimentation pond foundations, groundwater monitoring wells, and borrow area determination; and 70 small test pits. Four drill rigs were on site in August (one core rig, two RC drill rigs, and one geotechnical drill rig). Engineering work included widening the haul road, surveying a cutline for the proposed conveyor from the Window Pit, and designing collection ditches to divert

contact water from the Babcock Creek watershed on the east side of Mt. Babcock (downstream from the Trend-Roman operation) to the less affected Murray River watershed on the west. Specific Gravity circuit tests and pilot scale wash plant tests were conducted on a 16-tonne bulk sample collected in 2012 by a Large Diameter Reverse Flood (LDRF) drilling technique. The delayed start-up provided an opportunity to mine a 50 Kt clean coal pilot test sample in October that was partitioned and sent to potential customers globally for blending tests.

Mt. Babcock is located 4 km northeast of the Trend Mine and Waterfall Anticline. It is a box fold anticline structure with a coal sequence similar to that of the Trend mine (D, E, F, G, J, and K seams) and an average cumulative coal thickness of 16.2 m. The Babcock Member (Upper Gates) and Hulcross Formation shales form the cap rock of the box fold above the Middle Gates coal sequence. The Windy pit area becomes more of a gently-folded asymmetric anticline from west to east. The Window pit area is a gentle asymmetric box-fold with thrust faults along the northeast fold hinge.

At the **Murray River** project, 13 km south of Tumbler Ridge, HD Mining International Ltd (co-owned by Huiyong Holdings BC and Canadian Dehua Lyliang Ltd) temporarily delayed their preliminary Surface Facility and 100 Kt bulk sample Plot-1 program. The Surface Facility area includes a North Shaft Site and a South Decline Site, separated by 1.7 km along the Murray River FSR. The decline portal, temporary coal preparation facilities, waste rock storage, and water management system were in development in advance of more permanent structures. Development to support full operational capacity, including a 5.8 km rail load-out, could be completed in 3.5 years. Three accesses are planned from surface to underground. A large-diameter (9.4 m wide) vertical shaft at the North Site would intersect a smaller-diameter decline shaft (5 m wide) grading at 16° to a depth of 500 m coming from the South Site. The vertical shaft would provide air-intake and access for workers and equipment. Another shaft at the north site would be for air-return only. The decline shaft will house a 1600 m conveyor. The targeted coal seams are at depths between 400 - 1000 m. Production control would be centralized underground with a conveyor belt running through the entire underground system and roadways in the coal seams. Long-wall working faces would be prepared for the J- and D-seams. In long-wall mining, a shearer with rotating cutting drums mines a panel of coal about one metre thick along a coal seam face beneath powered roof supports. The coal is then removed from the face and transported to surface along a system of conveyors. Powered roof support moves forward as mining progresses through the seam and the overhanging strata collapses into the void left behind. Production is estimated at 6 Mt/y over a 31 year mine life. Reserves are reported at 688 Mt of proven deposit at Plot-1, and the resource at 3180 Mt (Inferred). Coal production is proposed to start as early as mid 2015. The estimated

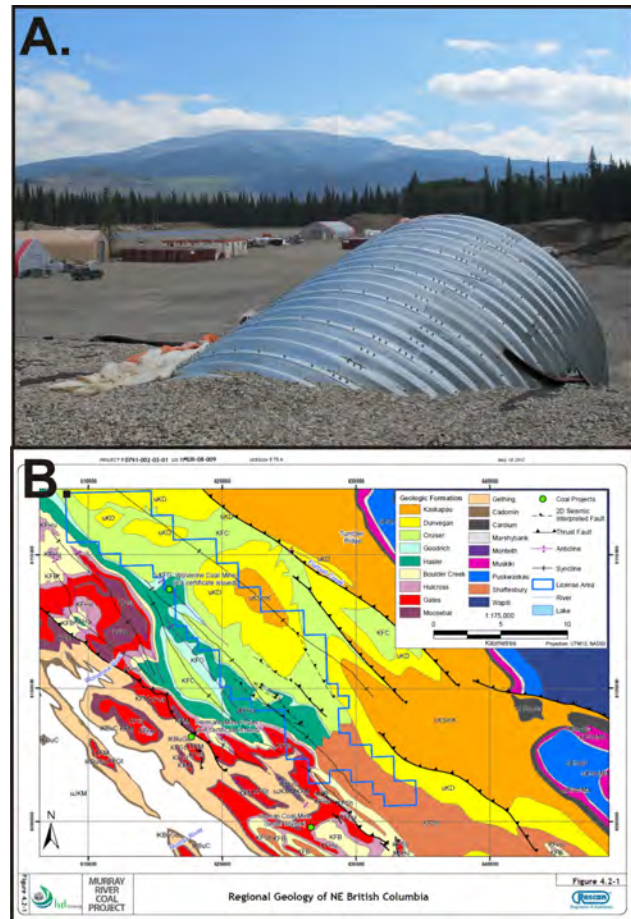


Figure 10. Murray River – **A.** View SSW across Murray River South Decline site with decline portal in foreground. The Quintette Shikano Pit and Mt Babcock (Windy and Window Pits) seen in background; **B.** Geology of the Murray River project area showing northwest trending 34 km long licensed area east of the surface expression of Gething and Gates Formation. Image is from 2012 Project Description, HD Mining International Ltd.

capital cost for the Phase-1 technical assessment and bulk sample is \$300 M. In April the project was being considered for a Substitution review by the Provincial EA under the *Canadian Environmental Assessment Act, 2012*, but a federal assessment by the Canadian Environmental Assessment Agency (CEAA) was continuing in November. The project is currently in the Pre-Application stage of EA, and baseline studies are continuing. The company is investigating using natural gas as a power source for the operation.

In April 2012, an initial workforce of 201 Huiyong Holdings miners was approved by Human Resources and Skills Development Canada (HRSDC) under the Temporary Foreign Worker (TFW) Program. The company plans to use the skilled temporary workforce for two years to complete the underground bulk sample collection. If the bulk sample proves the technical and economic viability of the project, and all requisite permits are in place, then the mine as initially planned would begin operation with TFWs and fully transition to a

Canadian workforce by year 14 at an annual 10% replacement rate. In late November, 17 workers had arrived and 60 more were scheduled to arrive in December. At this time two labour unions (the International Union of Operating Engineers - Local 115; and the Construction and Specialized Workers Union - Local 1611) brought a Federal Court challenge to the positive labour market opinions (LMO) that had enabled the TFW approval. In May 2013, the case was dismissed; however the project had been put on hold from late November 2012 and workers had returned to China. The court case allegedly raised concern from Dehua's international investors and caused some reluctance to proceed with additional funding of the Canadian projects. By September 2013, 30 Chinese workers had returned to the Tumbler Ridge area. In October, the area in front of the decline portal on the South site was being prepared for a conveyor to handle waste rock from the decline excavation and eventual bulk sampling. Mining equipment arrived on site from China including a continuous mining machine and belt conveyor. Seven groundwater monitoring holes were drilled and a shaft pilot hole was drilled on the North site. The company has invested \$50 M to date on local contractors, goods and services related to the project, including a \$15 M 92-unit townhouse development for workers in Tumbler Ridge. The proposed Murray River mine is estimated to generate \$90 M in revenue annually to the province and \$2.7 B over the life-of-mine. About 600 direct jobs and 700 indirect jobs would be required for construction and operation phases. The company has signed an MOU with Northern Lights College to develop a curriculum for training Canadian workers in the area in long-wall mining technique. The training program could start by late 2014. Huiyong Holdings BC's parent company Huiyong Holdings China operates nine mines in China.

A 1985 Quintette Coal Ltd assessment report on the area (COALFILE 619) describes a northwest-trending asymmetrical open syncline-anticline pair called the Shikano structure and a secondary fold pair called M-9, 600 m to the southwest. Geologic structure is reported as continuous except near primary fold axes and along the common limb where strata is disrupted by folds and thrust faults. The Murray River Project Description identifies 5 - 6 workable Gates Formation seams (top to bottom D, E, F, G/I, and J seam) of which the F and J seams are moderately thick (4.08 m and 4.79 m average thickness) and seams D and E2 are thin-to-moderately thick (2.77 m and 2.14 m). Seams G and I are considered thin and are not targeted. The average cumulative coal thickness is about 17 m. Seams F and J are identified as the main mining seams, and D and E as auxiliary. However, seams J and D would be the initial main mining seams to achieve production capacity. The J-seam would be mined at a rate of 3.8 Mt/y and the D-seam at 2.2 Mt/y totalling the 6 Mt/y. A minimum coal height of 1.4 m and up to 1000 m depth defines the preliminary economic limits. Distance between coal seams ranges from 80 - 120 m. The northwest-trending 34 x 2 - 8 km licensed area is

underlain by Lower to Upper Cretaceous sedimentary formations that overly the Gates Formation, and runs parallel to the trend of Gates Formation at surface about 4 km to the southwest.

No work was done by WEWC in 2013 on the **Hermann** (MINFILE 093I 031) project, 18 km southwest of Tumbler Ridge near Mast Creek. The project is designated as Prefeasibility and has an approved EA Certificate. Open-pit production of 1 Mt/y over 5 - 10 years is planned to follow after **EB** and carry mining in the Wolverine Group beyond 2030. As of March 2013, recoverable coal reserves were 9.1 Mt (Proven and Probable) for Hermann.

Wolverine Valley area

At Walter's **EB (Mt. Spieker)** property (MINFILE 093P 015), 24 km ENE of Tumbler Ridge, WEWC carried out a 14-hole drilling program for structural and coal quality information, and hydrological assessment. Cone penetrometer drilling was completed to test for substrate stability in potential waste rock storage areas. Geotechnical investigation focused on sites adjacent to the Perry Creek Road to Mt. Spieker from the Wolverine Road. The Perry Creek Road will link mining operations at the EB expansion project with the Perry Creek Mine wash plant. The EB project lies 11 km northwest of the Perry Creek mine within a 3.5 x 1.0 km north-south trending area that captures the Gates formation coal sequence. Four gently-to-moderately dipping coal seams (A, B, C, D) of medium volatile bituminous rank are targeted within subsidiary syncline-anticline and syncline-monocline pairs within the broader northeast limb of the Main (Spieker) Syncline. The average cumulative seam thickness is 13 m. A single pit is planned with north and south components. Start-up is anticipated for 2017 or later. Production of 1 Mt/y is expected over a mine life of 10 years. As of March 2013, recoverable coal reserves were 9.9 Mt (Proven). The project has an EA Certificate issued at end-2001 as part of the Wolverine Project.

In May, the **Echo Hill** (MINFILE 093P 021) thermal



Figure 11. EB (Mt. Spieker) – Moderately southwest dipping coal beds of Notikewin Member, Upper Gates Formation.

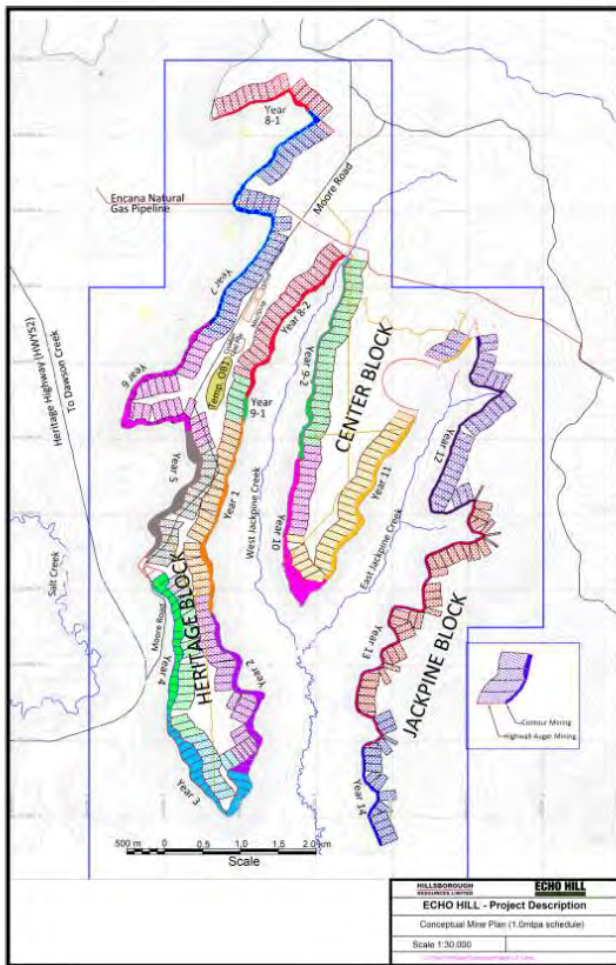


Figure 12. Echo Hill – Proposed Echo Hill Mine layout showing separate mining blocks. Image is from 2013 Project Description, Hillsborough Resources Ltd.

coal project, 40 km north of Tumbler Ridge, of Hillsborough Resources Ltd (a wholly-owned subsidiary of Vitol Ankor International B.V.) was federally approved for a single environmental review to be conducted by the Provincial EA office under a streamlined process in the *Canadian Environmental Assessment Act 2012* called Substitution that obviates the need for parallel Provincial and Federal assessments. Separate decisions are to be based on the single assessment. This followed the November 2012 submission of a revised Project Description to the EA office. A 2006 proposal for a combined 0.7 Mt/y mine and 184-MW electric power plant operation in response to BC Hydro’s Open Call for Power was withdrawn after the 2007 Provincial Energy Plan required new electricity sources to have net-zero greenhouse gas emissions. The updated proposal is for a combined contour highwall and auger mining operation with 2700 - 4000 t/d (1 - 1.5 Mt/y) raw thermal coal production for the Asian market over a mine life of 10 - 14 years. The coal reserve is 6.4 Mt for the contour mining portion, and 6.6 Mt for the highwall-auger portion of the plan. A 10 - 15 m highwall would be sequentially exposed along 42 km of coal subcrop with only 1.5 km exposed at any single time, preceding reclamation. The

subcrop coincides with plateau hillsides forming a rough M-shape divided into three mining blocks (Heritage, Center, and Jackpine). Highwall-augering would extract reserves up to 220 m into the coal face. The proposed mine does not require permanent waste rock storage or tailings management. Crushed and screened raw coal would be hauled off-site. Depending on permitting approval, construction is proposed to begin as early as Q2 2015 with operation and production following immediately in Q3. The project area-of-interest has a resource of 47.9 Mt (Measured and Indicated) and 1.0 Mt (Inferred). The entire property holds 80.1 Mt (Measured and Indicated) and 35.2 Mt (Inferred). The initial capital cost is estimated at \$35 M. The project is expected to create about 120 local jobs. A long-term service agreement is in place with Ridley Terminals to the end of 2021. The project is currently in the Pre-Application stage of the EA process.

North-south trending ridge-edged low plateaus in the area are composed of Upper Cretaceous sedimentary rocks of the Puskwaskau and Wapiti formations, in a series of northwest-trending gentle folds and no apparent major faulting. The upper part of the Puskwaskau Formation hosts the Wapiti coal seam. The seam ranges in thickness from about 1.4 – 2.2 m and is ranked as sub-bituminous A to high-volatile C bituminous coal with low sulfur and difficult washability characteristics.

Hudson’s Hope area

Cardero Resource Corp and subsidiary Cardero Coal Ltd started 2013 with work on financial arrangements for their **Carbon Creek** (MINFILE 093O 028) project, 48 km west of Hudson’s Hope. This included acquisition of adjacent coal licenses and raising capital. Cardero obtained 100% working interest in the project with Luxor Capital Group LP as a major shareholder at 12.3%.

In March, Cardero signed a letter of intent (LOI) with Canadian Forest Products Ltd (Canfor) outlining the terms for charter of the MV Williston Transporter for transporting construction materials and barging clean coal to the railhead at Mackenzie, BC. The arrangement would terminate in 2015 when Cardero expects to commission a purpose-built tug and barge system constructed on site in Mackenzie. The MV Williston Transporter, built by Findlay Navigation in 1994 to service the mining and forestry industries, is a self-propelled ice-breaking barge (360’, 7400 hp) with a deadweight capacity of 4000 tonnes. Cardero plans to use it during construction, initial production and ramp-up of the mine. The vessel can be loaded directly from shore, which would also allow for shipping of first product prior to construction of coal handling systems at the mine. Also in March, the company signed an LOI with Conifex Timber Inc and transportation subsidiary Navcor Inc concerning an initial 20 year term lease (renewable to 40 years) of lands held by Conifex at the Mackenzie Industrial Zone, where Cardero plans to develop a Transload Facility. The facility would include a barge docking system and a

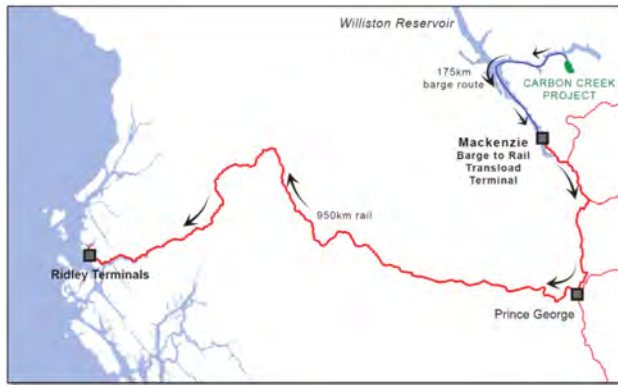


Figure 13. Carbon Creek – Proposed Carbon Creek Mine export route, Cardero Resource Corp.

railcar loading system, and is expected to handle 5 Mt/y at full production. The Transload Operating Agreement would provide Navcor with a role in both the operation of the facility and management of the CN Rail shipments to Ridley Terminals from Mackenzie. Detailed rail track designs and transload layout were to be expedited for the Feasibility Study, with geotechnical testing for the rail track and civil work planned for completion in 2013. Permit approval for rail service, water lease, and other necessary authorizations in the construction and operation of the Transload Facility remained to be confirmed by Cardero.

In April, a geotechnical drilling and trenching program was planned near Carbon Inlet for site suitability assessments of proposed mine facilities (coal processing plant, covered stockpiles, conveyors, and ancillary buildings); and several groundwater monitoring wells were to be added. At this time, the project was approved for a Substitution review by the Provincial EA under the *Canadian Environmental Assessment Act, 2012*. In May the company reported staff reductions and work suspension at Carbon Creek in order to preserve cash; and that it was seeking to option out or joint venture its non-core assets and monetize its iron assets. Work on the Feasibility Study was halted while the company worked to resolve financing issues. In November, the company received a delisting notification from the NYSE. The company's common shares remain listed on the TSX.

The 2012 Carbon Creek Prefeasibility study describes a combined surface and underground (room-and-pillar) operation with average production of 4.1 Mt/y clean coal over an initial 20 years. Reserves and resource are estimated at 121 Mt (Proven and Probable) and 468 Mt (Measured and Indicated). Products would be 60% HCC, 34% PCI and semi-soft coking coal (SSCC), and 6% oxidized thermal coal. The operation would be divided into a Central Surface Mine and North Mine areas. Coal product would be barged 175 km over Williston Lake from a processing plant near Carbon Inlet to Mackenzie for rail load-out. The project is expected to support 150 - 200 jobs in the construction phase, and up to 876 at full production. Waste rock would be sufficiently soft to compress and add to coarse coal

rejects, averting the need for a tailings impoundment. Drilling to end-2012 brought the total since 2011 to 42 000 m in 146 drill holes averaging 300 m depth. Compilation and analysis of the coal quality database has been completed. A coal product study by consultant Wood Mackenzie found both the HCC and SSCC are close to benchmark specification in the existing global coal market, and that the HCC would be marketed as medium volatile bituminous rank coal with low ash content (4 - 6%). A 15 year shipping agreement with Ridley Terminals starts in 2014. The project is in the Pre-Application phase of the EA process.

The property consists of a gentle doubly-plunging syncline between two anticlinal belts. Minor folds are associated with steep thrust faults. Over 30 Gething Formation coal seams have historically been identified on the property, with 12 main economic seams averaging between 1.14 - 2.17 m thickness. The deposit shows good continuity and simpler geometry than some deposits in the coalfield. The coal seams on the property have been divided into an upper seam package hosting SSCC/PCI and oxidized thermal coal, and a lower seam package hosting HCC.

In July, Canadian Kailuan Dehua Mines Co Ltd (CKDMC) received permitting approval for a 100 Kt bulk sample and surface facility preparation at the **Gething Bri-Dowling** (Gething) project (MINFILE 093O 029), 25 km west of Hudson's Hope, just southwest of the W.A.C. Bennett Dam on Peace Reach. A 15 Kt sample of metallurgical coal is planned. The 1325 x 250 m bulk sample surface facility area would include: two southwest-plunging decline portals (personnel/material and conveyor), waste rock/rejects disposal pile, coal transfer and stacker conveyors, screened coal stockpile, truck loading facility, large diameter ventilation fan,



Figure 14. Gething (Bri-Dowling) – Canadian Kailuan Mines Co Ltd engineer and Senior Minerals Coal Geologist Janet Riddell discussing regional geology.

water control system (ditches and settling ponds), and soil storage area. All surface equipment will be portable and temporary. The bulk sample will be mined by room-and-pillar method in a NNW trending F-shaped series of 6 m wide drifts separated by 20 m columns over a 460 x 400 m underground area. A scalping screen plant on surface will produce a sized product from ROM coal before haulage off site. At the sampling site, the Superior seam averages 1.2 m thickness and 30 m depth from surface, and the Trojan seam about 1.5 m thickness and 50 m depth. Similar coal depths from surface are reported in historic drill hole BC-80-13 of Utah Mines Ltd located 1.1 km to the southwest (COALFILE 469). Capital expenditure for the bulk sample is estimated at \$300 M and would provide about 190 full-time jobs (130 underground). On site work in 2013 included reclamation on previous geotechnical drilling programs and helicopter-assisted water sampling for baseline studies.

The property has a coal resource of 254.9 Mt (Measured and Indicated) and 530.8 Mt (Inferred) and is expected to produce 2 Mt of metallurgical coal annually for 20 - 30 years from the Trojan and Superior seams. An underground long-wall operation is planned. The company drilled the property to 900 m depth for a 2011 Feasibility Study. Historically, the coal has been ranked as medium (Superior) to high (Trojan) volatile bituminous. If permitting approval and social licence are secured, full mine development would have an estimated \$860 M capital expenditure and provide 800 full-time jobs. CKDMC is considering conveyor and barge coal transport to rail load-out in Mackenzie. The company has committed to working with the West Moberly First Nations to address the unique challenge of avoiding impacts to a cultural camp that lies within a few kilometres of the proposed mine. The company has a preference for hiring qualified Canadians and using local service providers, and has signed an MOU with Northern Lights College to help train local workers in the long-wall mining method. The project is in the Pre-Application stage of the EA process. The CKD joint venture includes the Kailuan Group, a major coal mining company in China; and the Shougang Group, China's largest steel producer.

The area is underlain by the gently dipping west limb of a NNW trending broad syncline. Four coal seams of the Lower Cretaceous Gething Formation are known, from top to bottom: the Superior, Trojan, Titan, and Falls. The syncline is historically reported as essentially unfaulted in the north part of the property but thrust faults increase to the south and west. The Superior and Trojan seams are continuous; the Superior is reported as thickest in the southern part and the Trojan in the southwest and northeast.

EXPLORATION HIGHLIGHTS

COAL PROJECTS

South of Tumbler Ridge

In May, Colonial Coal International Corp commissioned a study on their **Huguenot** project, 82 km SSE of Tumbler Ridge. The study reviewed coal quality data from past drilling programs (2008 - 2010), including wash test results, and coke tests, and characterizes a potential coal product. The results indicate that a Huguenot product would meet globally accepted HCC standards with favourable ash, sulfur and strength characteristics, and would be similar in quality to HCC being exported from other operations in the coalfield. In late September, the company announced the results of a positive PEA study for a combined surface and underground mining operation that would produce between 1.4 Mt - 5.9 Mt/y, averaging 3.0 Mt/y of clean coal over 31 years. In the first 12 years, the production rate from open-pit mining would be 3.2 Mt/y. Surface mining would continue to year 14, and from years 5 - 31 the production rate from underground mining would be 1.8 Mt/y, with underground mining starting in year three. Total clean coal production over the life of mine would be 89 Mt. Surface mining, at a stripping ratio of 8.6 : 1, would target steeply dipping sections of the North, Middle, and South resource blocks to produce 39 Mt clean coal from 56 Mt ROM coal. The underground component would target shallower dipping seams greater than 1.5 m thick in the North Block from below the economic limits of the open pit. Long-wall mining would produce 50 Mt clean coal product from 66 Mt ROM coal. The updated Measured and Indicated in situ coal resource for the North, Middle, and South Blocks increased 46.6% from the September 2012 estimate and includes:

- 132.0 Mt (Measured and Indicated) and 530 000 t (Inferred) at surface, and
- 145.7 Mt (Measured and Indicated) and 118.7 Mt (Inferred) underground.

The estimated pre-production capital cost for the proposed mine is US\$387 M. Environmental baseline studies are ongoing.

The Huguenot project is located on the northeast limb of the broad Belcourt Anticlinorium. Ten Gates Formation coal seams (numbered 1 - 10 from oldest to youngest) lie within a northwest-trending band of tight-to-open folds associated with a moderately northeast-dipping thrust fault sequence. The thrust faults (Holtslander North and Holtslander South) separate three structural blocks, the North, Middle, and South Blocks. The North Block sits above the Holtslander North Fault, and structurally above the Middle and South Blocks. Of the ten coal seams within the moderately northeast-dipping western limb of the Holtslander Synclinorium structure, four main seams (1, 5, 6B, 8) have a cumulative average thickness of 14.6 m. Strike of bedding rotates westward towards the



Figure 15. Huguenot – Coal bloom on Huguenot property, photo courtesy of Colonial Coal International Corp.

south. The Middle Block is located between the Holtslander North and South thrust faults. Of the ten coal seams in the moderate-to-steeply dipping western limb of the synclinorium structure, four main seams (1, 5, 6L, 8) have a cumulative average thickness of 19.4 m. The central portion of the block is cut by the steeply eastward dipping Pika thrust fault. The South Block lies structurally below the Holtslander South thrust. Of the 10 coal seams within the subvertical eastern limb of an asymmetrical anticline, five main seams (1, 2z, 4u, 5, 6L) have an average cumulative thickness of 15.9 m. The project lies within the historic Holtslander South area of the Belcourt Coal Joint Venture of Denison Mines Ltd and Gulf Canada Resources Inc. Regionally the Gates Formation coal seams correlate with those at the Belcourt property (to the NNW) and the Omega property (SSE).

Less than 5 km north of the Huguenot, and also on northeast limb of the Belcourt Anticlinorium, the **Belcourt-Saxon** (MINFILE 093I 014, 016) joint venture project of the Belcourt Saxon Coal Ltd Partnership, Anglo-PRC (50%) and WEWC (50%), saw some grassroots prospecting work in 2013, conducted by Anglo American Exploration Canada Ltd. The work focused on the Onion property, 20 km SSE of the Trend Mine. At year-end 2012, Anglo-PRC reported the Belcourt North/South resource at 171 Mt (Measured and Indicated), and a 2009 technical report gives 86.4 Mt in situ reserves (Proven and Probable). WEWC reported 28.5 Mt recoverable reserves (Proven and Probable) for the **Saxon** properties, classified as Prefeasibility, and a 2005 report estimated a resource of 53.1 Mt (Indicated - Saxon East) and 167.3 Mt (Inferred – Saxon East, South, and Omega). Phase 1 of the Bel-Sax project, with an expected start date close to 2020 at Belcourt, could have a production rate of 4 Mt/y and be viable for 40 years. Six economic Gates Formation coal seams at Belcourt North average 19.0 m total thickness, and seven seams at Belcourt South average 13.5 m thickness. Structurally, the

deposit sits in a northwest trending band of thrust-faulted, tight-to-open subsidiary folds along the northeast limb of the Belcourt Anticlinorium (Belcourt North) and in the Holtslander Synclinorium (Belcourt South). The combined Bel-Sax project extends northwest from the Alberta border for about 70 km.

Canadian Dehua International Mines Group Inc (Dehua) drilled for coal quality and subsurface assessment at the **Wapiti River** underground prospect in early spring of the year. The project is located 45 km south of Tumbler Ridge. The 2012-13 program consisted of 55 holes ranging from 500 - 1300 m depth and was designed to support Feasibility level studies. Dehua has estimated an HCC resource of 7000 Mt in the area and envisions an underground long-wall and room-and-pillar operation producing up to 6 Mt of clean coal annually. The property lies 13 km south of Anglo-PRC's Hambler project along trend of the Waterfall Anticline, and within the Boomerang and Duchess areas in the historic Duke Mountain Block of the Monkman developed prospect (MINFILE 093I 013). The Boomerang area comprises a syncline-anticline pair and the Duchess area comprises a roughly 3.5 km wide anticlinorium bound by steeply west and east dipping thrust faults. Twelve Gates Formation coal seams have historically been reported (B1 to B12 from older to younger), with the upper 3 seams generally less than 1 m thick, and the lower 9 seams ranging from 1.6 - 5.2 m in the Duchess Mountain area.

Anglo-PRC through Anglo American Exploration Canada Ltd conducted a grassroots mapping and prospecting program at their **Hambler** property, 10 km southeast of the Trend Mine along the Waterfall anticline.

Anglo-PRC completed an 8-hole large diameter core (LDC) drilling program on their **Roman Northwest** property, 2 km WSW of the Trend Mine on the east side of Mt. Kostuik. The 6" LDC was drilled as a bulk sample for coal quality data and drop shatter tests. In addition, an



Figure 16. Roman Northwest – View north at LDC drilling.

18-hole exploration drilling program was conducted on the southwest limb of the syncline for structural data. The northeast limb was explored in 2008. The Trend Mine expansion property lies 3 km northwest of Roman Mountain and is a continuation of the close-folded Murray syncline. The syncline has a subsidiary chevron fold and plunges to the northwest through Mt. Kostuik. Hulcross Formation marine shales (Fort St. John Group) form a weakly recessive core of the syncline at the top of the Gates coal sequence. As at Roman Mountain, the sequence moves outward from the syncline core through resistant D-conglomerate cliffs to Moosebar shale gullies and then Cadomin Formation ridges. A thrust fault and drag fold add complexity to the lower seams on the northeast limb of the syncline. Drilling for structure and coal quality data began in late 2013 at the contiguous **Waterfall** property on the northwest side of Mt. Kostuik, east of Barbour Creek.

At the end of January, Colonial Coal International Corp announced that review of data from the **Flatbed** project, 29 km SSE of Tumbler Ridge, identified three target areas for initial exploration. The review included historic records of coal exploration and oil/gas well drilling in the area, and the company's own reconnaissance work. The targets will be drill tested upon receipt of coal licenses and work permits that are under review. A potential underground operation would mine flat-lying coal seams of the Gates formation between 200 - 600 m depth, increasing to an estimated 1200 m at the southern end of the property. The property is located about 7 km northeast of the Waterfall Anticline structure

which hosts the Trend Mine. The resource is estimated at 100 Mt.

Wolverine Valley area

After drilling programs for coal quality and subsurface assessment in 2011 and 2012, Dehua ceased exploration at the **Bullmoose River** project to focus on drill road reclamation and continued environmental baseline studies. The project is located 26 km west of Tumbler Ridge, and about 11 km northeast of the past-producing Bullmoose Mine. An underground longwall and room-and-pillar mine is proposed, with annual production of 2 - 3 Mt clean coal and a mine life of 30 - 40 years. The northwest-trending regional Bullmoose thrust fault and the Mt. Spieker and Sukunka (Bullmoose) corridor lie 6 - 7 km west of the project. A broad syncline is cut by southwest dipping thrust faults at Sukunka (Bullmoose). Coal seams are historically reported in both the Gates (5 seams ranging from 0.5 - 4.0 m thick) and Upper Gething formations (3 seams ranging from 0.5 - 8.3 m thick). The Chamberlain seam is the most continuous Gething seam and allegedly thickens eastward towards Bullmoose Creek. Surface geology in the project area includes the Hulcross, Boulder Creek, and Hasler Formation rocks which sit stratigraphically above buried Gates and Gething Formations.

Anglo American Exploration Canada Ltd conducted a grassroots mapping and prospecting program at their **Wolverine North/South** properties, 31 and 38 km southwest of Tumbler Ridge, within a few kilometres on both sides of the Wolverine River. Gething Formation rocks have been mapped in the area.

Chetwynd-Pine River Area

Phase 1 drilling at Glencore's **Suska** (MINFILE 093O 050) project, 49 km WSW of Chetwynd was completed in January. In total, the 2012-13 program comprised 21 drill holes (rotary, core, and hydrogeological) totalling 25 500 m. The company's exploration focus then switched to the **Sukunka** (MINFILE 093P 014) project, 55 km south of Chetwynd. The Phase 1 program continued to April and sought to confirm historic drilling, fill gaps in historic geological and coal quality data, and upgrade the resource. Drilling included 17 core holes, two large diameter boreholes, and several hydrogeological holes. The company also excavated to the original floor of the historic BP Canada No. 1 and BP Canada Window underground portals in the Nose and Window pit areas, respectively, in order to better define the portals and clean up 40 years of weathering on the Skeeter and Chamberlain coal seams. The project is now moving through Glencore's internal project approval process from Prefeasibility to the Feasibility stage.

The 2013 Sukunka Project Description describes a combined surface and underground long-wall operation that would initially produce 1.5 - 2.5 Mt/y of HCC from

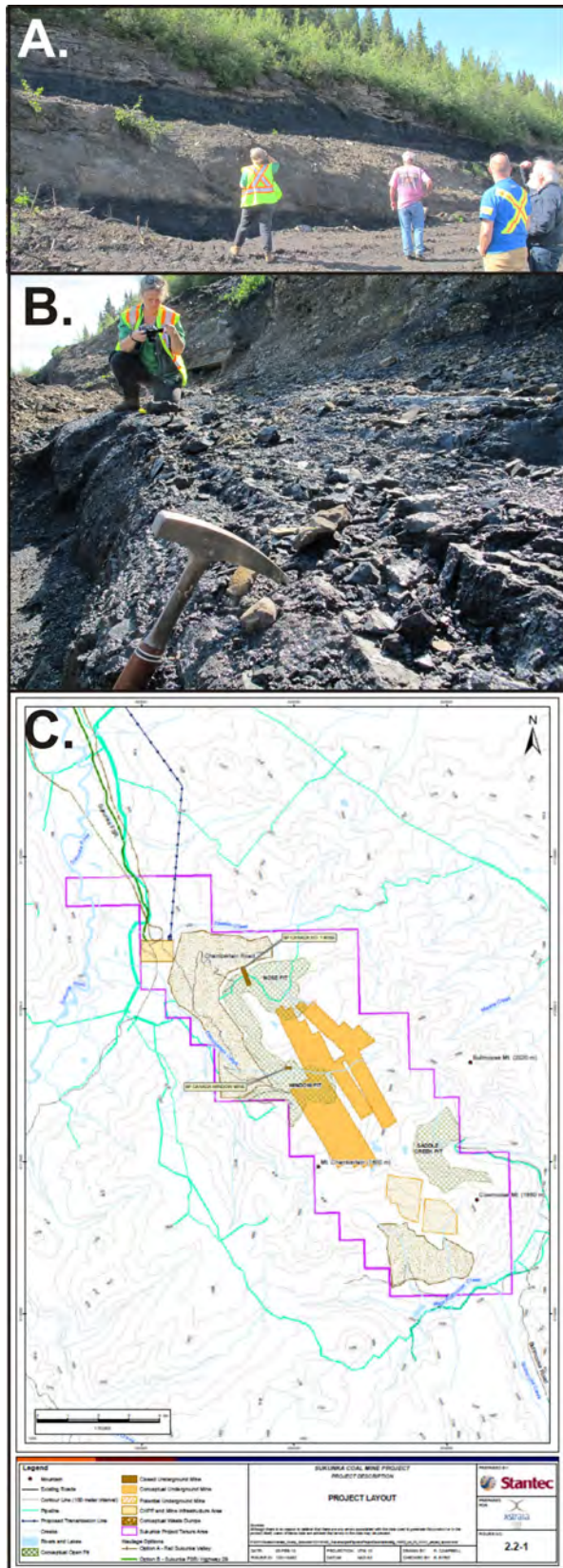


Figure 17. Sukunka – **A.** Examining flat-lying Chamberlain and Skeeter seams in Nose Pit area; **B.** Janet Riddell getting a closer look at the Chamberlain seam, Nose Pit area. The adit for the historic BP #1 Mine is seen in the background; **C.** Project layout from the 2013 Project Description, Xstrata Coal Canada (now Glencore).

surface mining. As the underground component increases to 2.7 Mt/y, total production would reach 6 Mt/y. Some PCI/thermal coal may also be produced. The plan for surface mining includes three open pit areas - Nose, Window, and Saddle Creek pits - within a 10 km NW-SE trending area west of Bullmoose Mountain. Mining would commence at the north end of the property in the Nose pit. The expected ROM stripping ratio for surface mining is 12.4 : 1. The underground component would be accessed from the open-cut highwall in the Window Pit (Chamberlain Creek) area, and a series of longwall panels in fault-bound blocks would extend northwest towards the Nose pit area and southeast towards the Saddle Creek pit area. Mine life is an estimated at 20 years minimum. Three Gething Formation coal seams are present, from top to bottom: Bird, Skeeter, and Chamberlain. Mining will target the Skeeter and Chamberlain seams with typical thicknesses of 1.5 - 2.5 m and 1.5 - 4.5 m, respectively (COALFILE 669). Skeeter thins to the south and is split into Main and Bottom seams in the northern part of the property. The Chamberlain is a single seam with an apparent split (Upper and Lower seams) towards the south. A blended product will be prepared for market with an expected 6% ash content after beneficiation. The construction phase is projected to begin as early as Q3 2015, with operations beginning Q4 2016. Construction would require 250 full-time jobs, and operations would require 700 full-time employees. Capital cost of the project is estimated at \$1800 M. In April, the project was approved for a Substitution review by the Provincial EA under the *Canadian Environmental Assessment Act, 2012*. A WMA for goat population prohibits motorized access above 1500 m on the property.

Structurally the property lies within a gently-folded broad asymmetrical syncline. Minor southwest-dipping thrust faults increase in intensity towards the north part of the property. The syncline has a vertical-to-overtaken western limb in the Bullmoose area about 10 km to the southeast.

Hudson's Hope area

NWP Coal Canada Ltd, a subsidiary of Jameson Resources Ltd, continued to work towards exploration and development of the Peace River coal projects **Dunlevy, Graham River, Peace Reach and Carbon East**. These are located 44 km northwest, 62 km northwest, 44 km west, and 50 km west of Hudson's Hope respectively. During 2013 NWP focused efforts mainly on **Dunlevy** (MINFILE 094B 023, 025) by refining tenure boundaries and advancing geologic models for an initial exploration drilling program. In December 2012, the BC government established a number of Coal Land Reserves (CLR) as part of an effort to protect high elevation Northern Caribou habitat in the South Peace region. The CLR impacted portions of the Dunlevy and Graham River properties, but about 80% of the targeted Gething Formation coals were preserved maintaining the project's high prospectivity. A recent

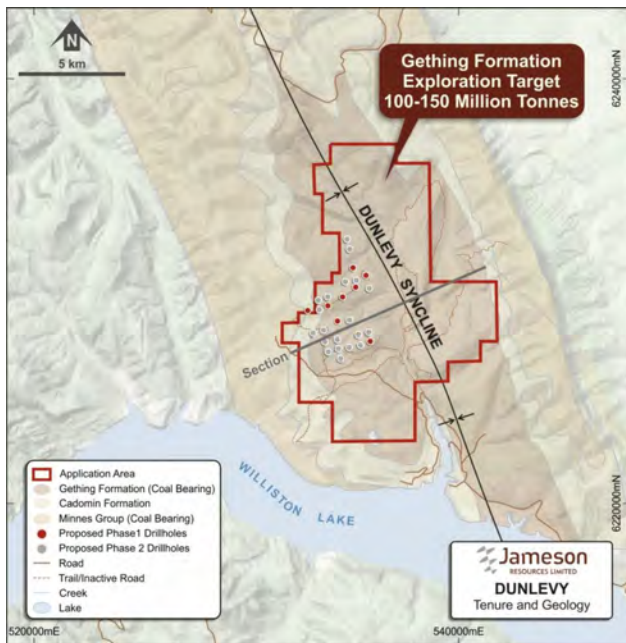


Figure 18. Dunlevy – Summary drilling plan for west limb of Dunlevy Syncline north of the Williston Lake Peace Reach, Jameson Resources Ltd.

independent geological evaluation estimates at least 100 - 150 Mt of potential metallurgical coal outside the CLR that could be mined at 2 Mt/y rate over a span of 50 - 75 years. On receipt of the coal licenses, the company plans a two-stage drilling program on the western limb of the Dunlevy syncline to determine the coal characteristics (number, thickness, and quality of seams). Geological mapping and hand trenching over the past 5 years has identified several coal seams ranging from 1.45 - 3.56 m thickness. The company is targeting a single seam of 1.5 - 2.5 m thickness. Preliminary analysis of coal samples has indicated metallurgical coal properties.

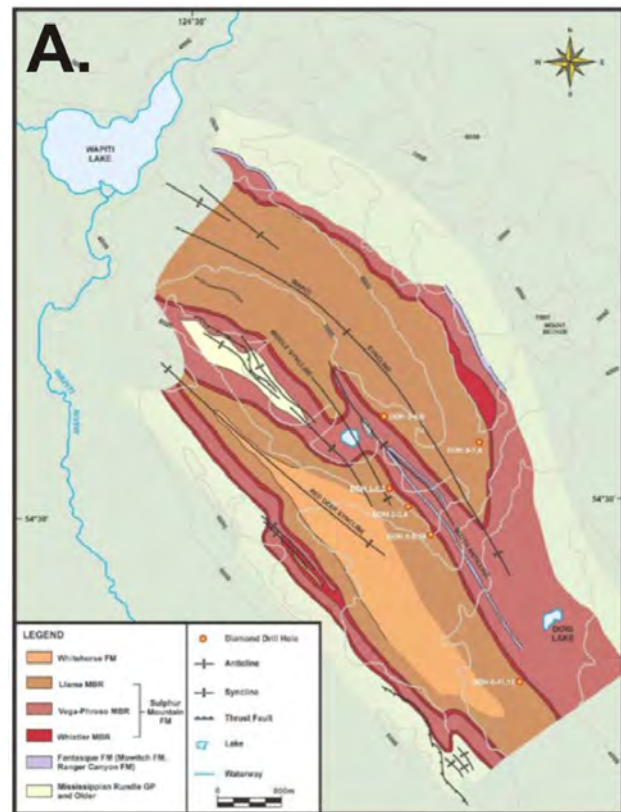
North of the Dunlevy Inlet of Peace Reach, the Dunlevy project extends NNW along the axial trace of the gently folded Dunlevy syncline for about 25 km between two marginal thrust-faulted anticlines. The western limb of the syncline hosts most of the Gething Formation coal exposures.

Anglo-PRC through Anglo American Exploration Canada Ltd conducted a grassroots mapping and prospecting program at their **Willow South** property, 47 km WNW of Chetwynd, south of Peach Reach on both sides of Carbon Inlet and 25 km north of the Willow Creek Mine. Six to eight traverses were completed. Gething Formation and Minnes Group rocks were previously mapped in the area.

INDUSTRIAL MINERAL PROJECTS

South of Tumbler Ridge

Fertoz International Inc continued exploring the **Wapiti East** (MINFILE 0931 008, 022) phosphate project, 76 km south of Tumbler Ridge. Fertoz optioned the project from Homegold Resources Ltd in 2012 and



Source: Modified after Heffernan (1980) and Legun and Elkins (1986)



Figure 19. Wapiti East (phosphate) – A. Geology of the Wapiti Lake area. Major fold structures from southwest to northeast include: Red Deer Syncline, Middle Syncline, South Anticline, Wapiti Syncline. Image is from the June 2013 Fertoz Ltd Prospectus; B. Drill core with basal phosphatic conglomerate, upper phosphorite, and fossil zone in the Whistler Member of the Sulphur Mountain Formation.

acquired 100% ownership in 2013. The program consisted of mapping, geochemical sampling (rock chip, channel, and soil) along known phosphorite horizons, and hand-portable drilling on the access road and sub-alpine areas. The objective was to validate thickness and continuity data of historical drilling and trenching. Similar work in 2012 identified a number of phosphorite beds along ridge-lines, mainly on the east limb of the Red Deer Syncline. Highlights included 32.6% and 35.5% P_2O_5 grab samples along the Road Showing, and a near-surface 20.0% P_2O_5 drill intercept over 1.45 m. Geological mapping has subdivided the Whistler Member phosphorite target into

seven segments totalling at least 27 km strike length along both limbs of the Red Deer Syncline, the South Anticline, and both limbs of the Wapiti Syncline. Phosphorite is a sedimentary rock with high concentration of phosphates. It has been measured in the area as 0.8 - 3.2 m thick beds with assays varying from 11.9 - 23.7% P_2O_5 (Butrenchuk, 1996) occurring mainly as fine pelletal and nodular phosphate in a carbonate-quartz matrix. Basal phosphatic conglomerates also occur in the Whistler Member. Yttrium and light rare-earths (La, Ce) have been identified in anomalous concentrations. The company seeks to identify a Direct Shipping Ore (DSO) product of 24 - 28% P_2O_5 phosphate rock that can be developed into an open-cut mine at a relatively low capital cost, for Canadian and US fertilizer markets. A 2013 assessment report estimated a potential resource of 4 Mt at 22% P_2O_5 on the property. This ore occurs at depths less than 20 m depth, and would be accessed with a single trench-like open-cut and progressively reclaimed. A second project, **Wapiti West**, 48 km WSW of Tumbler Ridge near the Sukunka River, has a 41 km strike length along the western Hart Ranges. Sizeable prospective areas within the Triassic belt remain largely untested.

Stratiform pelletal phosphate and phosphatic sediments of the Whistler Member are hosted in grey siltstone of the Middle Triassic Sulphur Mountain Formation (Spray River Group). Two other phosphate-bearing members (Vega-Phroso and Llama) are less strongly developed. Dolomite, limestone and shale also comprise the Sulphur Mountain Formation. Structurally the area is similar to the coalfield with northwest-trending tight anticlines, and broad asymmetrical synclines with gently dipping northeast limbs. Thrust faults include the Becker and North Thrusts, and additional minor faults. The main ore mineral in upwelling-type phosphate deposits is microcrystalline francolite, a carbonate-rich variety of fluorapatite. Deposition occurs in stable shelf and platform environments, commonly in partially restricted embayments, where cold upwelling currents mix with phytoplankton-rich warmer surface water. Phosphorus has agricultural (fertilizer) and industrial chemical applications.

Liard Plateau

At the south end of the Liard Plateau, Prima Fluorspar Corp continued grassroots exploration at their **Liard Fluorspar** property, 212 km WNW of Fort Nelson. Work since 2012 has focused on verifying historic exploration results through channel sampling of surface exposures at the Tam and Corel showings (MINFILE 094M 005, 007), and soil sampling at Tam. Semi-continuous channel samples returned 23.76% CaF_2 over 19.6 m at Corel and 23.49% CaF_2 over 74.6 m at Tam. The property encompasses 60 of 79 historic drill holes that supported a 1975 resource estimate (non NI-43-101 compliant) of 3.2 Mt averaging 32% CaF_2 . Historic metallurgical testing suggests acid-grade fluorspar (>97% CaF_2) valued as high as \$500 - 600/tonne in 2012, could

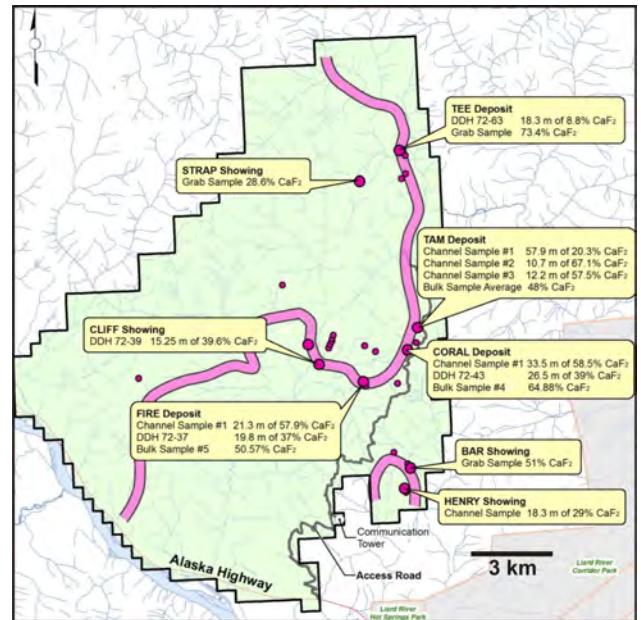


Figure 20. Liard Fluorspar – Map of Liard Fluorspar property showing distribution of prospects and showings with historic assay results. Image from Prima Fluorspar Corp Investor Presentation, March 2013. Scale added.

be produced using conventional flotation methods. Fluorspar is used in the production of hydrofluoric acid, fluorocarbons (aerosols, refrigerant), fluoropolymers (Teflon, Gor-Tex), refined petroleum, aluminum, steel, enriched uranium, glass, concrete, and medicine.

The property lies within continental shelf rocks of the Macdonald Platform at the western margin of the Liard basin, a sub-basin of the Western Canada Sedimentary Basin. A series of historic fluorspar prospects and showings occur in a 17 km long belt trending northward from Liard Hot Springs Provincial Park to the Tee prospect (MINFILE 094M 010). The belt is concentrated in a 2 - 4 km wide zone in the core of a gently south-plunging open anticline. The deposits occur as lenticular replacement bodies or cemented angular-clast breccias along the irregular unconformable contact between Middle Devonian Dunedin Formation limestone and fine clastics of the Upper Devonian to Lower Mississippian Besa River Formation. Karstification may have occurred during surface exposure of the limestone and later faulting may have been localized along the unconformity. Mineralization occurs predominantly in the limestone and generally consists of dark purple to black fluorite, calcite and witherite ($BaCO_3$) with lesser barytocalcite [$BaCa(CO_3)_2$], barite, calcite and quartz in variable amounts. An end-2012 technical report on the property explores possible genetic models for fluorite deposition in the belt. Although the deposits have characteristics of low temperature carbonate replacement or Mississippi-Valley type deposits, the report speculates an alkaline intrusive component as a potential fluid driver and source of fluorine. An historic 332 ± 56 Ma fission-track age of fluorite from the Gem showing (MINFILE 094M 002) indicates the fluorite deposition overlaps with Devonian-Mississippian carbonatite-syenite systems in the western

Rockies and also with baritic SEDEX deposits in the Kechika Trough. Deposition may be related to rifting or back-arc extensional tectonics effecting at the continental margin at that time (Nelson et al., 2007).

OUTLOOK FOR 2014

Walter Energy Inc will begin mining Phase 4B at the **Perry Creek** Mine, and continue with plans to develop the **EB (Mt. Spieker)** expansion project. Mining will commence in the north expansion area at the **Brule** Mine from the Camp (South) Pit. Anglo American plc expects to complete Phase 1 construction of the **Roman Mountain** expansion project and commence Phase 2, working toward a combined Trend-Roman operation in 2015. Exploration drilling will continue at **Waterfall**. Teck Coal Ltd will continue with engineering work at **Quintette-Babcock** and come to a production decision. HD Mining International Ltd will continue with Surface Facility development and collect a bulk sample during excavation of the mine decline at **Murray River**. Canadian Kailuan Dehua Mines Co Ltd plans Surface Facility development in support of a bulk sample excavation at **Gething (Bri-Dowling)**. Substitution EA reviews for several projects will continue including: Cardero Resources Corp's **Carbon Creek**, Glencore Xstrata's **Sukunka**, and Hillsborough Resources Ltd's **Echo Hill**. Anglo American Exploration Canada Ltd will continue their regionally focused experimental geophysics and prospecting programs.

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