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Regional Geologist Summaries

EXPLORATION AND MINING IN BRITISH COLUMBIA 2013



6 Year
Index Included



Ministry of
Energy and Mines

Regional Geologist Summaries
EXPLORATION AND MINING
in British Columbia 2013

Ministry of Energy and Mines
Mines and Mineral Resources Division

Front Cover:

Teck Resources Ltd. project geologist overlooking North Cirque project area. Kwadacha limestone and Gunsteel Formation shale outcrops are in the background, view is to the northeast.

Back Cover:

View of the Window pit area at the Sukunka coal project in the Peace River coalfield showing the Chamberlain Seam.

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January 2014

FOREWORD

INTRODUCTION

Regional Geologist Summaries, Exploration and Mining in British Columbia 2013 represents the latest annual review of the activities of the province's exploration and mining industry. The record goes back to 1874 when the *Annual Report of the Minister of Mines* (Figure 1) first went to print and has evolved through various formats over the years. The volume provides a region-by-region perspective with an in-depth look at significant projects in British Columbia. An index of projects contained in the regional summary papers has been prepared. It looks back six years and it intended to add value to the documents by making property searches easier.

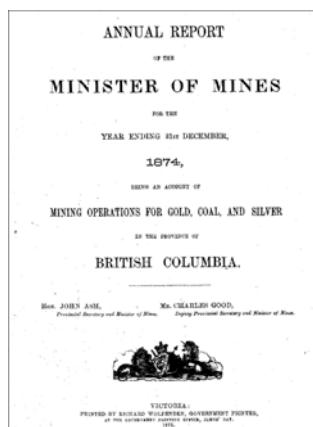


Figure 1. The duty of the collection of information on the province's mining industry goes back to 1874 when the *Annual Report of the Minister of Mines* first went to print.

Provincial Summary, *British Columbia Mines and Exploration Review 2013* is a companion volume to this publication and provides a more generalized overview of the province's mining and exploration industry (Figure 2). The province's exploration sector for coal, metals and industrial minerals is large and by necessity the reviews and summaries contained in this volume tend to be focused on the larger and/or more advanced projects.

Readers are also encouraged to use this publication in concert with the online geological databases accessible through the Ministry of Energy and Mines Internet site (<http://www.empr.gov.bc.ca/Mining/Pages/default.aspx>). The Ministry's well known MapPlace is a gateway to mineral and coal inventories (MINFILE; COALFILE); assessment reports; tenure; geology; geochemistry; and geophysics.

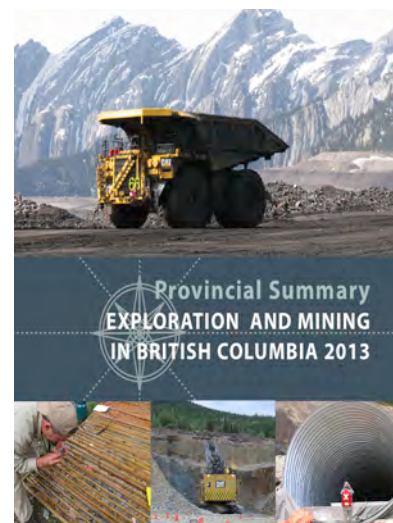


Figure 2. Provincial Summary, *British Columbia Mines & Mineral Exploration Review 2013* is a companion volume to this publication and provides a more generalized overview of the Province's Mining

BC's Regional Geologists and the Geological Survey

The Regional Geologists are located in Vancouver (Bruce Northcote), Smithers (Jeff Kyba), Kamloops (Jim Britton), Prince George (Paul Jago) and Cranbrook (Fiona Katay) (Figures 3, 4 and 5). We are very pleased to welcome Fiona Katay to our team this year. Among the experience she brings us is her knowledge of coal geology.

The Regional Geologists' role will continue to include providing geological and mineral industry expertise and promotion of mineral exploration and development in the province. As regional subject experts they also support various functions of the natural resource sector agencies in meeting the broader goals of government.

Their roles and responsibilities include:

- fostering sustainable exploration, development and use of the province's mineral and coal resources;
- providing clients with up-to-date technical information and professional advice about known and potential mineral and coal deposits;
- acting as regional contacts for the Geological Survey and pursuing joint project work;

- providing geological and mineral resource information to project review or land-use decision-making processes;
- monitoring the status of the mining industry and the development of infrastructure required for mineral resource development;
- working on field projects and surveys, compilations, promotional brochures and deposit models; and
- contributing information to maintain and update geosciences databases (e.g. MINFILE).



Figure 3. The locations of the various regions referred to in this publication and the locations of many of the cities and towns in the province.



Figure 4. From left to right: Regional Geologists Bruce Northcote and Paul Jago, Co-op student Wes Harman, Regional Geologist Jeff Kyba, Director of the Mineral Development Office Bruce Madu, Regional Geologist Jim Britton.



Figure 5. Fiona Katay is the new Regional Geologist for the Kootenay/Boundary regions.

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Methodology

Compilation of both *Exploration and Mining in British Columbia* documents presents certain challenges. Deadlines demand manuscript submission before all information from programs carried out later in the year is available, and before some programs are even complete. It is also difficult to garner information on all programs that have occurred. In particular, critical grassroots exploration that leads to many new discoveries may be difficult to track because it typically occurs below *Mines Act* permit thresholds.

Regional geologists maintain contact with their industry peers throughout the year, and ideally are able to visit them at project sites to view outcrops and drill core and to discuss results and progress. A significant amount of information is gleaned from corporate press releases, websites and reports. Late in the year informal surveys are conducted to gather as much of the statistical information as possible, but in some instances the authors use their professional judgement to provide reasonable estimates.

Exploration expenditures are broken down by category: grassroots exploration, early-stage exploration, advanced exploration, mine evaluation, and mine lease exploration. Grassroots exploration commonly does not require permitting and the activities and expenditures assigned to this category are less likely to be reported. Early-stage exploration involves focused activities often based on a deposit model. It may include geophysics, geochemistry, trenching and drilling. Advanced-stage exploration is concerned with resource definition emphasizing drilling and bulk sampling, but may include baseline environmental studies, economic pre-feasibility work and exploration of secondary targets. Mine evaluation begins with the firm commitment to develop a resource, and usually coincides with a pending application to government to open a mine; it tends to concentrate on the environmental, social, engineering and financial assessments of a project. Mine lease exploration represents work on a mining property beyond known reserves; it may have characteristics of early-stage or advanced exploration.

Since the exploration expenditures include some estimates, final dollar figures for each region are rounded to the nearest whole million.

ACKNOWLEDGMENTS

The cooperation of the industry in providing information and access to project sites is always welcomed and sincerely appreciated. Gabriel Li and Anika Johal in Vancouver have provided valuable support in sections throughout the publication. The keen eyes of Lawrence Aspler have improved the document on many fronts. Compilation and layout of the volume was completed by George Owsicki and Garry Payie of Total Earth Science Services.

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INDEX (2007-2013 Exploration and Mining in British Columbia)

EXPLORATION AND MINING IN THE OMINECA REGION, BRITISH COLUMBIA

By C. Paul Jago, M.Sc., GIT
Regional Geologist, Prince George

SUMMARY AND TRENDS

With China's economic growth slowing below expectations in the first quarter, there was a broad sell-off of copper, gold and other commodities that lowered spot metal prices and negatively affected stock values. Investor sensitivity to US monetary policy and economic recovery also led to a punctuated outflow of gold-backed exchange traded funds (ETFs). Gold price declined as much as 28% year-on-year, and copper declined up to 13%. The commodities super-cycle that had resulted in a linear rise of about \$500 M annually in BC mineral production value since 2003 (\$2900 M to \$7400 M in 2012) appeared to be flattening and reversing. Bear market conditions forced larger companies to rein in expenditures and defer spending on grassroots exploration; and challenging equity financing forced some recently active junior companies to relinquish options, report impairment charges, and write off projects altogether. Many companies were actively seeking more innovative means of financing to avoid equity dilution. More private equity and sovereign wealth funds were entering the market. Despite this adverse economic climate, some intermediate and junior companies with attractive projects and access to funding or existing cash flow were able to support significant exploration programs. Some exploration programs started midway or later in the field season as funding requirements were met. A top highlight for the year was the completion of the Mt. Milligan Mine construction project as the mine went into commercial production in October making it the first new greenfields metal mine in BC since the Max Molybdenum mine in 2007, and the Huckleberry and Kemess South mines in 1997.

The geology of the Omineca Region of BC lends itself to prospecting for a wide range of metals including magnesium, niobium, rare-earth elements (REE), molybdenum, nickel, copper, zinc, lead, silver and gold. However, the main focus of exploration in 2013 was copper, gold, silver and zinc. Deposit-types explored for included epithermal gold-silver in the Nechako Plateau and Toodoggone district; copper-gold porphyry in the Quesnel terrane and Toodoggone; and stratiform zinc-lead-silver within the Ancestral North American margin north of Williston Lake.

Total exploration expenditure for the region in 2013 was \$102.5 M with the main contribution coming from mine evaluation stage and advanced stage projects. This represented a 37% drop from the 2012 peak value.

Drilling at 80 332 m, roughly the same as in 2010, significantly dropped by 73% from the 2012 value. Grassroots and early stage projects combined increased by 8% from 2012 indicating a higher proportion of generative work in 2013. Mine evaluation increased by 56% as the Blackwater project proceeded to Final Feasibility. Exploration highlights included:

- Feasibility Studies commenced and completed for **Blackwater** (New Gold Inc), and completed for **Kemess Underground** (AuRico Gold Inc);
- commencement of Prefeasibility Studies at **Aley** (Taseko Mines Ltd);
- positive Preliminary Economic Assessments completed for **Decar** (Cliffs Natural Resources Exploration Canada Inc and First Point Minerals Corp), and for **Kwanika** (Serengeti Resources Inc);
- updated resource estimates for **Blackwater** (New Gold Inc) and **Decar** (Cliffs Natural Resources Exploration Canada Inc and First Point Minerals Corp);
- and drilling programs, here listed by targeted deposit-type:

Porphyry (copper-gold): **Brenda** (Canasil Resources Inc), **Captain** (Orestone Mining Corp), **Kemess East** (AuRico Gold Inc), **Takla-Rainbow** (Manado Gold Corp)

Low-sulfidation epithermal or vein (gold-silver): **3Ts** (Independence Gold Corp), **Aspen East** (Redhill Resources Corp), **Capoose** (New Gold Inc), **Fawnie Regional Program** (New Gold Inc), **JD** (Tower Resources Ltd)

SEDEX (zinc-lead-silver): **Akie** (Canada Zinc Metals Corp), **Cirque** (Teck Resources Ltd).

SUMMARY FIGURES AND TABLES

Figure 1 shows locations of mines and select exploration projects discussed in this report. Figure 2 provides an annual comparison of exploration expenditure over the last four years. Figure 3 sets out the approximate allocation of 2013 expenditures among Grassroots, Early stage, Advanced stage, and Mine Evaluation exploration in the region. Figure 4 compares annual drilling statistics over the last four years. Table 1 gives 2012 mine production tonnage, expected 2013 production, and

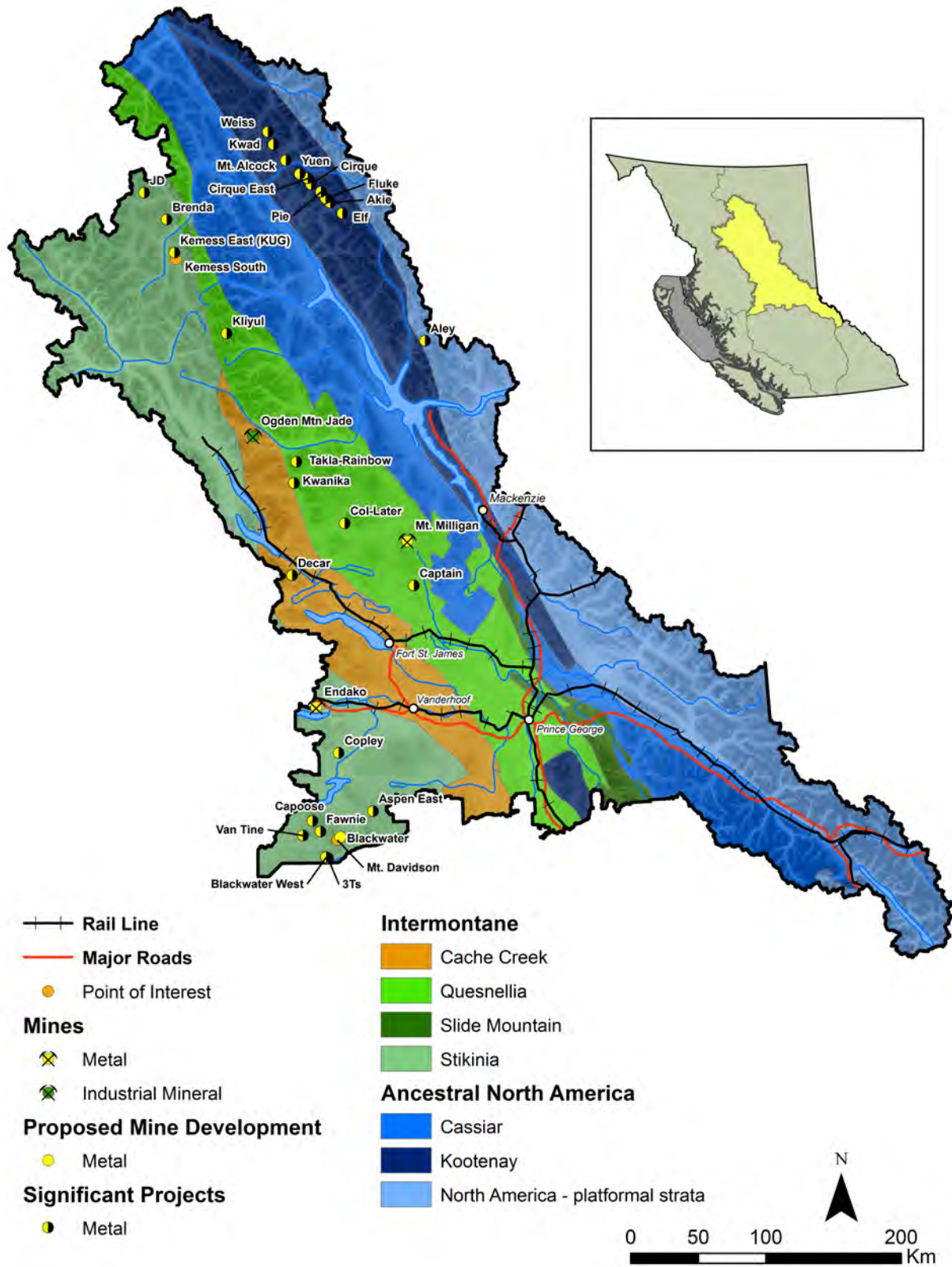


Figure 1. Mines and select exploration projects, Omineca Region, 2013.

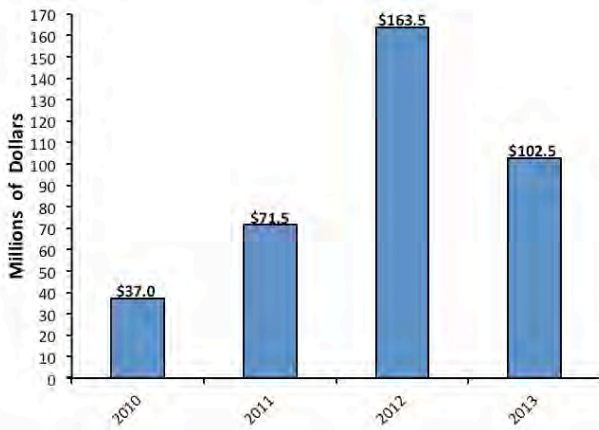


Figure 2. Annual exploration spending estimates in millions of dollars, Omineca Region (including four years data since the redefining of the boundary in 2010).

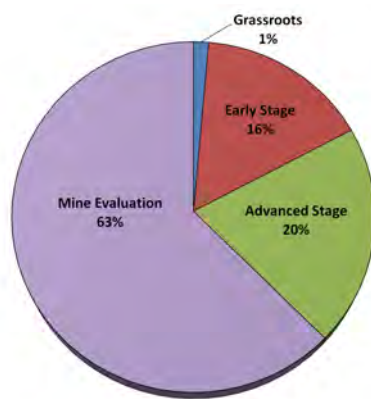


Figure 3. Exploration expenditures in 2012 by exploration stage (Grassroots: initial reconnaissance; Early stage: focused work on a target; Advanced stage: resource delineation, PEA and Prefeasibility; Mine Evaluation: focus on EA certificate, Feasibility studies, social license and government approval). Year-on-year, the Mine Evaluation stage proportionally increased by 56%. Grassroots and Early Stage combined increased by 8%.

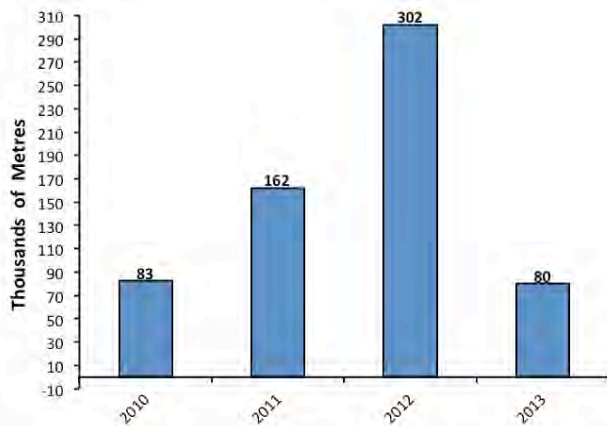


Figure 4. Annual exploration drilling estimates in thousands of metres, Omineca Region (including three years data since the redefining of the boundary in 2010).

reserves. Table 2 lists details of select exploration programs in 2013.

MINES AND QUARRIES

METAL MINES

Endako Mine

The challenging year of declining molybdenum prices and operational setbacks in 2012 for the **Endako Mine** (MINFILE 093K 006) of Thompson Creek Metals Co Inc (TCMC; operator and 75% owner) and Sojitz Corp (25% owner), 17 km west of Fraser Lake, continued to year-end with net losses reported for the quarter and year. TCMC took a \$530.5 M non-cash pre-tax write-down of its share of the Endako property, plant, equipment and development assets. In 2012, actual molybdenum production was 6.19 Mlbs at a cash cost per pound of \$15.42/lb. A total of \$78.4 M was spent on the Endako mill expansion in 2012. Work continued throughout Q4 and into 2013 to optimize plant operations, improve worker training programs, and implement a more aggressive maintenance program. Additionally, as a cash saving measure of \$2 M per month, mining focused on low grade stockpiles and six historic dumps, some of which were ore grade not included in reserves. An initial 2013 production guidance of 9.0 - 10.5 Mlbs at \$9.25 - \$10.75/lb reflected these improvements.

In addition to grade recovery challenges in processing oxidized stockpile material, in early 2013 tailings management issues were encountered where frozen water in the impoundment was preventing consistent return of water from Tailings Pond 1 (TP1) to the mill. This temporarily slowed production with only one ball mill running. Modifications were made to the piping of the tailings pond and other tailings management procedures were instituted to ensure sufficient water supply for future winter milling operation. A causeway was constructed to hold back slimes from TP3 and provide a deeper reclaim area for the barge in TP1. This slowed Q1 production and resulted in a lowering of the 2013 guidance to 7.5 - 8.5 Mlbs at a cash cost of \$10.75 - \$12.25/lb.

Other mine infrastructure issues in Q1 included a 2713 m tear in one of the primary conveyor belts possibly caused by waste steel in stockpiled material. The setback did not significantly impact production but resulted in some temporary layoffs during belt repair. In addition, a decision was made to shut down the roaster for an estimated 18 months for retrofitting due to lower than expected recoveries. In an effort to defer the maintenance expense, concentrate was being transported offsite to TCMC's Langeloth Metallurgical Facility near Pittsburgh PA to be roasted.

TABLE 1. MINE PRODUCTION AND RESERVES, OMINECA REGION, 2013

Mine	Operator	MINFILE	Commodity	Deposit Type	Tonnes Mined (2012)	Tonnes Milled (2012)	Production (2012)	Production (2013)	Proven and Probable Reserves (Dec 31, 2012)	Measured and Indicated additional Resource (Dec 31, 2012)
Endako (75% share)	Thompson Creek Metals Co Inc	093K 006	Mo	porphyry	7 569 549 tonnes	12 357 163 tonnes	2 808 000 kg (6 191 000 lbs)	4 114 000 kg Mo (9 072 000 lbs)	305.4 Mt at 0.046% Mo	54.0 Mt at 0.038% Mo
Mt Milligan (commissioned in Q3)	Thompson Creek Metals Co Inc	093N 191, 194	Cu, Au, Ag	porphyry	N/A	N/A	N/A	4.9 Mkg Cu, 656.3 kg Au, 1300 kg Ag (10.9 Mlbs Cu, 21.1 Koz Au, 41.8 K oz Ag)	482.4 Mt at 0.39 g/t Au, 0.20% Cu	224.3 Mt at 0.21 g/t Au, 0.15% Cu
Shasta	Sable Resources Ltd	094E 050	Au, Ag	Low-sulfidation epithermal	10 000 - 20 000 tonnes	10 000 - 20 000 tonnes	N/A	N/A	5000 tonnes (estimate)	20 000 tonnes (estimate)

By June, mining had resumed in the southwest corner of the Denak West pit and northeast corner of the Endako pit, and both mined and stockpiled material was processed throughout the remainder of the year. Three benches mined in the Denak West pit hosted strong molybdenite veining and shear-hosted mineralization. Benches were also mined from the saddle zone between the Denak East and Endako pits to establish a more direct route to the in-pit crusher in preparation for return to mining along the Endako pit south wall. Mined stockpile areas included a dump southeast of the Endako pit, the Denak East in-pit low grade stockpile, and the higher grade (0.08% MoS₂) dump south of the Denak East Pit. An in-pit low grade stockpile was established near the in-pit crusher for readily accessible ore inventory. By end-June, an average 45 000 t/d was being milled with peak days of about 60 000 tonnes. For the first half of 2013 cash cost per pound produced was \$11.85 compared to \$18.51 in 2012, and by Q3 it was \$9.23/lb. Improvements to recovery continued, increasing from 55.4% to 68.2% year-on-year for the first half of 2013, with a target concentrate grade of 79% MoS₂. An average head grade of 0.07% MoS₂ was maintained throughout 2012 - 2013. Cut-off grade for resource and reserve is 0.042% MoS₂.

Mining plans include the development of a Super Pit by mining the saddle areas between the Endako, Denak East and Denak West pits; a step-back of the Endako pit; and the Northwest Extension zone pit. Reserves and additional resource are:

- 305.4 Mt at 0.046% Mo - containing 141.7 Mkg (312.4 Mlbs) Mo (Proven and Probable)
- 54.0 Mt at 0.038% Mo - containing 20.5 Mkg (45.2 Mlbs) Mo (Measured and Indicated).

Mine life is about 15 years. The \$650 M new mill, commissioned and ramped-up to commercial production in 2012, is designed to increase throughput levels by 77% from the previous 45 year-old mill to 52 000 t/d, increase yearly input levels up to 6.8 - 7.3 Mkg (15 - 16 Mlbs), and reduce operating costs. Expected recovery from the mill is 80%, with a final powder product of 91.5% MoO₃ (67% Mo) after roasting of concentrate. TCMC remains positive about the mid-to-long-term fundamentals of the market, being well-positioned to take advantage of a rally in molybdenum prices.

The Endako deposit is centrally located within the northwest trending Endako quartz monzonite at the southeastern edge of the François Lake Plutonic Suite. The François Lake Suite is a Middle-to-Late Jurassic component of the Endako Batholith which intruded a zone of crustal weakness in the Stikine and Cache Creek terranes from the Late Triassic to Middle Eocene. The Casey Alaskite phase to the north, contiguous with the Endako phase, is considered the potential mineralizer; and the E-W striking South Boundary fault appears to be an important controlling structure. The Late Jurassic orebody occurs as a series of en-echelon flat-lying ribbon-textured quartz-molybdenite veins that rotate clockwise in strike from 110° to 170° across the deposit

TABLE 2. SELECTED EXPLORATION PROJECTS, OMINECA REGION, 2013

Property	Operator	MINFILE (BCGS Map)	Commodity	Deposit Type	Work Program
3Ts	Independence Gold Corp	093F 055, 068	Au, Ag	Low-sulfidation epithermal / vein	DD (7812 m), G, GC, MG, MS, P
Akie	Canada Zinc Metals Corp	094F 031	Zn, Pb, Ag	SEDEX	A, G, P, AB-EM (2795 line-km), DD (4855 m), GC (soil, hyd), EN
Aley	Taseko Mines Ltd	094B 027	Nb	Carbonatite-hosted	MS, PF, EN
Aspen East	Redhill Resources Corp	093F 004, 059	Au, Ag, Cu, Mo	Low-sulfidation epithermal, porphyry	DD (1785 m), GC (soil), P
Brenda	Canasil Resources Inc	094E 147	Au, Cu	Porphyry	DD (962 m)
Blackwater	New Gold Inc	093F 037	Au, Ag	Intermediate-sulfidation epithermal	CD, GD (20 000 m), EN, FS, MS
Blackwater West	RJK Explorations Ltd	(093F.015, 016, 005, 006)	Ag, Cu, Zn, Pb	Low-sulfidation epithermal	A, DD (1151 m), IP, MG
Capoose	New Gold Inc	093F 040	Ag, Au	Intermediate-sulfidation epithermal	A, DD (4200 m)
Captain	Orestone Mining Corp	093J 026	Cu, Au	Alkalic porphyry	A, DD (1554 m), MG (130 line-km)
Cirque	Teck Resources Ltd	094F 008	Zn, Pb, Ag	SEDEX	A, DD (2690 m), G, GC (soil)
Col-Later	Pacific Empire Minerals Corp	093N 101	Cu	Porphyry	A, G, GC (rock, soil), P, TR
Copley (and 2 X Fred)	Kootenay Silver Inc	093F 070, (093F.089)	Au, Cu	Low-sulfidation epithermal	GC, GP, P
Decar	Cliffs Natural Resources Inc	093K 039, 041, 072	Ni	Ultramafic	EN, MS, PEA

TABLE 2. CONT'D.

Property	Operator	MINFILE (BCGS Map)	Commodity	Deposit Type	Work Program
Fawnie Regional (Capoose South, Van Tine, Van Tine South, Fawnie)	New Gold Inc	093F 040, 043, 045, 050, 052, 053, 056	Au, Ag	Low-sulfidation epithermal, porphyry, skarn	G, GC (soil, till), IP, MG, P RC (18 250 m)
JD	Tower Resources Ltd	094E 171	Au, Ag, Cu	Low-sulfidation epithermal, porphyry	DD (2140m), IP (11 line-km), MS
Kechika Regional - Northern (Mt. Alcock, Kwad, Weiss, Bear/Spa, Driftpile South, Saint, and Thro)	Canada Zinc Metals Corp	094K 066, 068; 094F 003, 015, 021, 024, (094F.073, 094L.020)	Zn, Pb, Ag	SEDEX	G, GC (soil, hyd), AB-EM
Kechika Regional - Southern (Yuen, Cirque East, Pie, Fluke, Elf)	Teck Resources Ltd	094F 009, 013, 023, 037 (094F.055)	Zn, Pb, Ag	SEDEX	AB-EM, GC (soil)
Kemess Underground / Kemess East	AuRico Gold Inc	094E 021 (094E.007)	Cu, Au, Ag	Porphyry	A, DD (13 337 m), EN, G, GC (rock), P
Kliyul	Kiska Metals Corp	094D 023	Cu, Au	Porphyry	G, IP, MG, P
Kwanika	Serengeti Resources Inc	093N 073	Cu, Au, Ag, Mo	Porphyry	PEA
Ogden Mountain Jade	Green Mountain Gemstones Inc	093N 165	Nephrite	Ultramafic	A, G, DD, TR
Takla-Rainbow	Manado Gold Corp	093N 082	Au-Cu	Vein, porphyry	A, DD (1000 m)

Work Program Abbreviations:

A = access (trail, road construction on claims); AB-EM = airborne electromagnetics; AB-MG = airborne magnetics; AB-RD = airborne radiometrics; BU (X tonnes) = bulk sample (weight in tonnes if known); CD = condemnation drilling; 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, till, biogeochemical, hydrogeochemical etc.); GD = geotechnical drilling; GP = geophysics (general); IP (X line-km) = induced polarization (totalling X line-kilometres); MG = magnetics; MS = metallurgical studies; P = prospecting; PEA = Preliminary Economic Assessment, scoping study; PD = percussion drilling; PF = Prefeasibility studies; R = reclamation; RC = reverse circulation drilling; TR = trenching; TP = test pits.

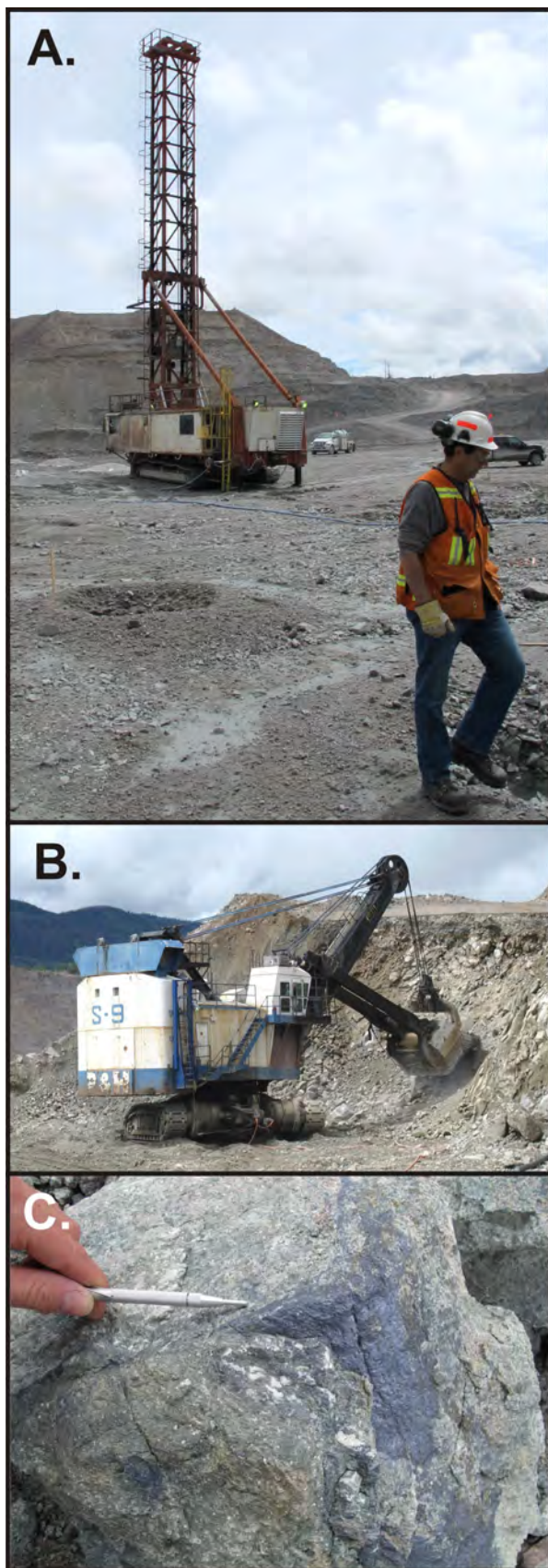


Figure 5. Endako Mine – **A.** Blast-hole drilling in West Denak pit; **B.** Mining in northeast corner of Endako Pit (grading 0.11% MoS₂); **C.** Molybdenite in Endako quartz monzonite, West Denak Pit.

from southeast to northwest. This change in orientation follows the Casey Alaskite contact to the north. Secondary vein structures are northeast striking. The combined orebody is about 4.8 x 0.75 km across the Endako, East Denak, West Denak, and Northwest Extension zones. Maximum depth is about 370 m.

Shasta Mine

Sable Resources Ltd placed their seasonal underground **Shasta Mine** (MINFILE 094E 050), 31 km northwest of past-producer Kemess South, and more regional **Toodoggone Gold/Silver** project on care and maintenance in 2013 as management investigated financing options. Production in 2012 between 10 000 - 20 000 tonnes generated \$1.27 M total revenue from sale of gold. Ore is processed 11 km from the mine site at the Baker Mill, which has an optimum feed rate of 180 - 200 t/d. Reserves are estimated at about 5000 tonnes, with an additional resource of 20 000 tonnes, enough to support about two more years of mining. An additional minimum 130 000 tonnes of historical resources are held nearby at the **Baker (Chapelle)** (MINFILE 094E 026) and **Mets** (MINFILE 094E 093) properties.

The Shasta property is underlain by upper Toodoggone Formation dacitic lapilli tuff and epiclastic rocks, and Takla Group andesites. A dacitic dome is situated east of the J1 fault and JM stope. Gold-silver mineralization occurs as argentite and electrum in calcite-rich stage-2 veins that cut across potassic alteration and quartz-rich veins of the preceding stage. Associated silicification has increased the competency of the rock, making it amenable to underground mining.

QUARRIES

Placer gold

Placer gold exploration and mining is a significant traditional and ongoing activity in the region. There were 49 notice-of-work (NOW) applications submitted to BC Energy and Mines for placer in 2013. From west to east and north to south these were located in three main general areas:

Manson Creek area:

- Kenny Creek, Kwanika Creek, Twenty Mile Creek, Germansen River, Jackfish Creek, Slate Creek, Manson River, Klawli Creek, Nation River;

Hwy 27 - 97 corridor:

- Sowchea Creek, Philip Creek, McLeod River;

Hixon area:

- Fraser River, Willow River, George Creek, tributary creeks of the Naver River, Ahbaw Creek, Cottonwood River.

These sites are located near the regional contact of the Quesnel terrane (Late Triassic to Early Jurassic) with



Figure 6. Ken Wasylyshen placer gold – Wash plant, Philip Creek area.

the Slide Mountain (Late Devonian to Middle Permian) and Cariboo/Cassiar (Upper Proterozoic to Lower Cambrian) terranes along the Manson-McLeod Lake fault system, and farther west into the Quesnel terrane. There was also placer mining in the Toodoggone district, 22 km southeast of the Kemess South, on McConnell Creek which follows a fault separating the Quesnel and Cassiar terranes. Placer mining is generally conducted on abandoned benches and abandoned channels above the current level of streams, or in side valleys. Medium-scale operations use power machinery such as hydraulic excavators and backhoes to excavate pay dirt, which is then either trucked or directly dumped into a wash plant for processing. Wash plants generally comprise a grizzly, trommel or screening plant, sluice box and jigs to concentrate gold. As an example of advanced exploration techniques, Saville Resources Inc used Mobile Metal Ion (MMI) soil sampling to follow up a hammer seismic survey that outlined buried channels at the **Bar** property near Germansen River.

Historic government statistics show the percent of placer gold production to total gold shipments in BC has been recorded at 1% since 1998. Placer gold value has oscillated dramatically since about 1978 as gold market value increased to match dollar inflation. From 1978 to present the annual value of placer gold in BC has averaged about \$5 M, but since 2007 has averaged \$2 - \$3 M.

Placer gold exploration in the region targets Tertiary, and pre-Late Wisconsinian, paleochannel and paleofan deposits. Older (Tertiary) gravels are coarse pebble-cobble gravels that were deposited during cool-temperate non-glacial intervals and rest on older bedrock. These gravels incorporated lode gold from locally weathered bedrock and were then overlain by Wisconsin glacial drift. The glacial deposits were subsequently downcut by post-glacial watercourses. Paleochannel systems can have little relation to modern drainage patterns, and be controlled by major long-lived faults. Subglacial-type deposits are found on the leeward side of bedrock highs, in the basal portion of lodgement tills, in boulder pavements,

and narrow gravel-filled notches. Postglacial type deposits formed in proximal gravels from the reworking of subglacial and older gravels and are typically lower grade. In BC Energy and Mines Bulletin 89, Levson and Giles (1993) suggest narrow channels oriented oblique to glacier flow, and supporting thin overburden, are the best targets. In 2013, Travis Ferby and Holly Arnold of the BCGS released a compilation of micro- and macro-scale ice-flow indicators for the Interior Plateau of Central BC (Open File 2013-03) that could be useful in placer gold exploration.

Nephrite jade

Green Mountain Gemstones Inc were exploring and mining for nephrite (amphibole jade) at their **Ogden Mountain** property (MINFILE 093N 165), 184 km northwest of Fort St James. Three target areas were being re-assessed. In the original Camp Zone, test pitting and trenching followed up 2012 drilling that suggested an increase in jade quality from north to south in the area. Both placer and in situ mining techniques are employed at the operation. In the Far North area, nephrite blocks were gently mined using Nonex, a pyrotechnic device that uses low yield gas cartridges ignited with an electric charge. Later in the season focus switched to an in situ high grade nephrite lens at the Japanese-site target near the camp. Prospecting for nephrite boulders continued along Squackbird and Ogden Creeks. Both loose boulders and in situ prospects are tested by hand drill with BQ diameter (36.4 mm) core before mining. Wire saws may be used to decrease the size of blocks and boulders for transport to camp where large diamond saws are used to further reduce size. Boulders generally range between 1 - 15 tonnes toward a seasonal target of about 200 tonnes of rough nephrite. Colour, size, and structure are important features in determining nephrite value. Massive, clear and bright coloured blocks are best. Green, blue, black, and grey-white nephrite has been found on site. Actual jade shipped from the site in 2013 was about 100 tonnes as extra time was required for cutting and trimming.

The Ogden Mountain property is underlain by metamorphosed Trembleur ultramafic rocks and serpentinite melange of the Mississippian to Late Triassic Cache Creek Complex. These rocks are NNW trending, moderately dipping, and locally intercalated with massive white medium-grained calc-silicate rock (Simandl et al., 2000). In the Granite Zone, a granodiorite intrudes the sequence and may be equivalent to Early Cretaceous granodiorite mapped near John's Lake, 3 km to the southwest. A terrane-bounding fault lies 9 km to the northeast separating the Cache Creek and Quesnel terranes. Thrust faults separating the Trembleur ultramafics and Cache Creek Complex rocks cut across the property. The host rocks are strongly sheared and foliated. They appear to grade from serpentinite to nephrite to soapstone (talc schist) with close proximity to calc-silicate rock. Nephrite and soapstone are derived from an ultramafic protolith that has undergone

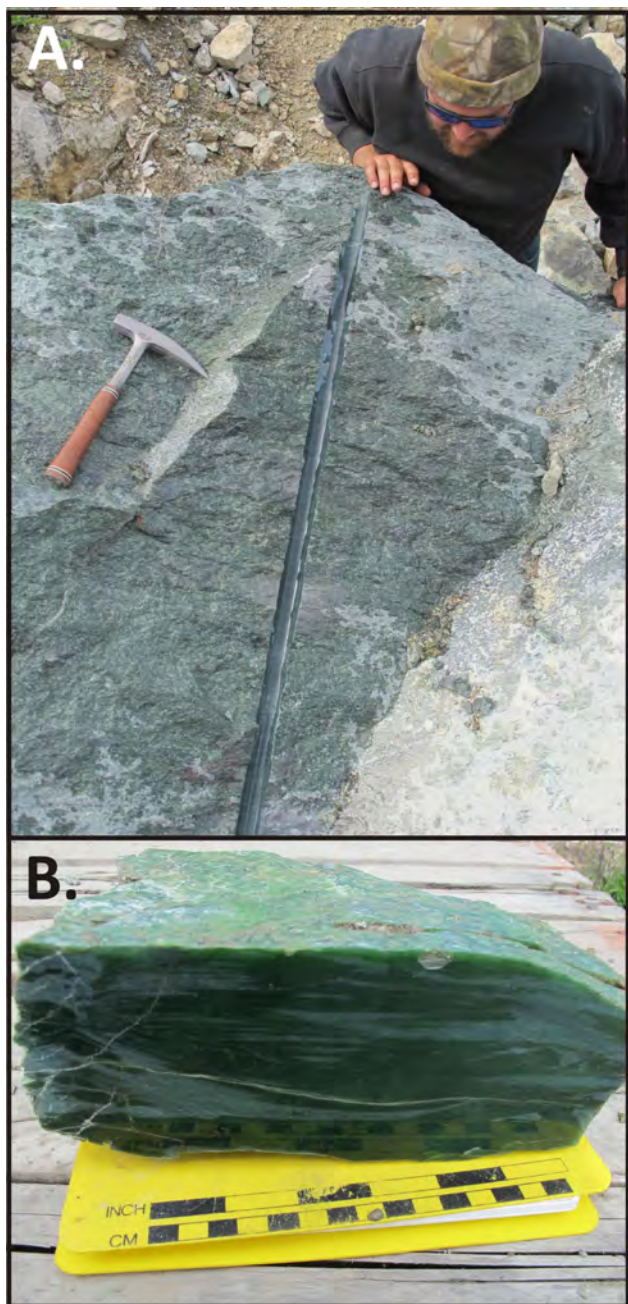


Figure 7. Ogden Mountain Jade – **A.** C- to C grade nephrite boulder in Far North area; **B.** High-grade Ogden Mountain nephrite.

dynamothermal metamorphism and metasomatic exchange in a subduction zone. A line of green altered peaks can be seen up the Axelgold Range, on strike to the northwest that represent this fossil subduction zone. The nephrite occurs as lenses that pinch and swell along the regional fabric, and locally have nodular “puddingstone” textures suggestive of boudins in tectonically stretched rock.

Green Mountain Gemstones Inc is the world’s largest supplier of nephrite jade. Approximately 90% of mined product is sold and exported to China where, depending

on its size on its size and grade, it is carved into statues and cabochons.

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. There were 10 NOW applications registered by the Prince George MEM office in 2013 from mining, lumber and construction companies, and private individuals: From west to east, these included:

- Kenny Dam Quarry (Rio Tinto Alcan) near Fraser Lake;
- Hill Pit near Vanderhoof and Nechako River;
- MacKenzie Causeway Pit (Dunkley Lumber) near Mackenzie and Parsnip Reach
- Sloan Road Pit near Prince George and Nechako River
- Clyde Creek Pit near McBride and Upper Fraser River
- Horsey Creek Pit and King Creek Pit (N.V. Construction) near Dunster and Upper Fraser River
- Lakewest Pit 1 (Lakewest Enterprises Ltd.) near Valemount and Thompson River.

MINE DEVELOPMENT AND EVALUATION

MINE DEVELOPMENT

Mt. Milligan Mine

Despite significant challenges from low molybdenum price, high turnover of skilled labour, and rising cost of supplies, Thompson Creek Metals Co Inc (TCMC) stayed on schedule with construction of the **Mt. Milligan Mine** (MINFILE 093N 194), 145 km northwest of Prince George. Mine construction began in mid 2010 at an estimated capital cost of \$915 M. It became clear in 2012 that cost inflation would push the cost toward \$1500 M necessitating debt and tangible equity unit offerings and additional arrangements with private equity investment partner Royal Gold Inc. Royal Gold has a 52.25% a stake in production through investment of \$781.5 M in the project. Addition of a 450-person permanent residence estimated at \$45 M and planned for completion in 2014, brought the total estimated capital expenditure above \$1570 M.

In 2012, \$679.0 M was spent on mine construction. In 2013 there was \$390.5 M in capital expenditures to the end of September. This covered construction of the

Tailings Storage Facility (TSF), mine facilities, plant site earthworks, cement works, steel erection, open-pit development, mining equipment, engineering design costs, construction camp costs, permanent residence, and commissioning activities. Major installations included the SAG mill, two ball mills, lines of rougher and cleaner flotation cells, and the concentrate load-out bay. A 92 km power line (230 kV) from Kennedy Substation, 32 km southeast of Mackenzie, and an on-site substation was also completed. In December 2012, a second 7495 electric shovel was commissioned, and both shovels were stripping overburden from the first pit area. Eight 793 haul trucks were running of the 13 truck fleet planned for full-scale operations. Last work in 2012 included finishing the steel cladding on the concentrator to allow indoor work during winter months, a 400-m conveyor line from the primary crusher to the mill, the pebble crushing circuit, truck maintenance shop and administrative building.

Work in 2013 continued on the West Separator Berm (TSF), recycle ponds, pebble transfer tower, lining of ball mills, installing flotation tanks, power connectivity, and personnel began moving into the administrative building in May. The mine boasts the largest diameter gearless SAG mill on the continent at 40' (12.2 x 6.7 m), and the Metso primary crusher is the tallest in Canada at 110' (33.5 m). The crusher has a gabion wall and truck ramp constructed to the height of the crusher tower. The phased start-up began with first feed to the concentrator on August 16, 2013. Routine testing and commissioning of all equipment and process circuits followed. Production of saleable Cu-Au concentrate started in September totalling 1600 tonnes for the month at a throughput rate of 1500 - 2000 t/h from the first ball mill and flotation circuit. Concentrate began moving to the load-out facility in Mackenzie in late September. October developments included start-up of the second ball mill and processing circuit, and first rail shipment from Mackenzie to Vancouver. Commercial production of concentrate was planned for Q4 2013 at a rate of 2750 t/h. Start-up activities are expected to continue into Q1 2014 towards a steady commercial production rate of 60% design capacity mill throughput. The first ocean shipment of concentrate weighing 5530 wet tonnes left Vancouver in November. A Dedication Ceremony was held on October 8th to recognize the opening of the mine.

The mine is unique in that construction material for the TSF, processing plant foundations, primary crusher ramp and other features is sourced from clay-rich glacial till overburden occurring as natural eskers on site, and the non acid-generating (NAG) component of the open-pit waste rock. This eliminates the need for large waste rock storage facilities. The segregated TSF is designed to contain 438 Mm³ of material and will require 70 Mm³ of construction material. It is designed for closure by minimizing the project footprint and providing for zero surface effluent discharge during operations. All mine water is to be recycled by pumping from the TSF back to



Figure 8. Mt. Milligan Mine – **A.** Gabion wall of above-ground gyratory crusher tower; **B.** Phase 1 mining in MBX zone, 7495 electric shovel; **C.** Copper-gold ore near the brecciated monzonite/andesite contact in the MBX zone; **D.** Mine dispatch and mill centralized control area.

the processing plant. Potentially acid-generating (PAG) and oxidized waste rock will be delivered to the TSF

scavenging, the residual ore will be further reduced to 20 µm before flotation. The 60 000 t/d of ore will produce 400 t/d (138 000 t/y) of concentrate grading about 24% Cu and 31 g/t Au. The concentrate will be trucked by private road to the leased Kemess Mine rail load-out facility in Mackenzie until the planned 2014 completion of a permanent load-out being constructed on a site purchased from Dunkley Lumber. The expected average annual production over the current 22-year mine life is 36.7 Mkg (81 Mlbs) of copper and 5514 kg (194 500 oz) of gold. Expected silver production of 10 129 kg (357 300 oz) was included in the 2009 Terrane Feasibility Update report. The first six years production will be higher averaging 40 Mkg (89 Mlbs) of copper and 7428 kg (262 000 oz) of gold. Life-of-mine strip ratio is 0.84 : 1. Mining will start in the North Pit, where ore is closer to surface, capturing the DWBX, WBX, MBX, and 66 mineralized subzones. After about 14 years, mining will dogleg into the South Pit capturing the unnamed stock and Southern Star subzones. The combined Main and Southern Star deposits have a resource of:

- 706.7 Mt at 0.33 g/t Au and 0.18% Cu - containing 212 621 kg (7.50 Moz) Au, and 1288 Mkg (2840 Mlbs) Cu (Measured and Indicated);

Inclusive reserves are reported at:

- 482.4 Mt at 0.39 g/t Au and 0.20% Cu - containing 170 664 kg (6.02 Moz) Au, and 963 Mkg (2124 Mlbs) Cu (Proven and Probable).

The mineral resource was determined from 220 286 m of drilling (969 holes) from 1987 - 2007. Once achieving design production capacity, the mine is expected to account for 50% of TCMC's revenue, and will diversify the company from being a pure-play molybdenum producer, adding copper and gold as a hedge against commodity price cycles.

At the height of construction there were over 1100 people, including contractors, working on site daily. An average of 950 personnel working 77 000 hrs/week continued into 2013. A 1075 man camp provided lodging for construction workers. The permanent operations full-time workforce is estimated up to 450, including 50 support staff and 200 expected to live on-site. On opening day there were 350 mine employees. In December 2012, the company had partnered with Globe 24-7 HR & Recruitment to manage a Recruitment Process Outsourcing program to deliver 200+ jobs across processing, mining, health and safety, administration, HR, environmental and technical services through 2013. In June, the mine construction project won the John Ash Safety Award for achieving the lowest injury frequency rate for mines with over one million worker hours. Staff and contractors had worked over 5 million person-hours without lost time injury. For 2012, Initiatives Prince George reported an estimated \$124.4 M in purchased goods and services from over 200 businesses came from the local economy, of which \$61 M was spent in Prince George.

Mt. Milligan is a tabular, near-surface, alkalic copper-gold porphyry deposit that measures about 2.5 x 1.5 km and 400 m depth. The deposit is underlain by basaltic-andesitic rocks of the Late Triassic Witch Lake volcanic succession (Takla Group) and moderately west-dipping monzonitic stocks, the MBX and Southern Star. Copper-gold mineralization in sulfide veinlets and disseminations is hosted in the stocks, their brecciated margins, and in the adjacent hornfelsed and variably altered volcanics. Alteration and mineralization is concentrated along horizons in the volcanic stratigraphy and the monzodiorite Rainbow Dike, which has combined sill-dike geometry suggestive of a cone sheet. In the Main deposit, magnetite-rich potassic alteration and Cu-Au mineralization gives way to Au-only mineralization and iron carbonate-rich phyllic and/or intermediate argillic alteration in the 66 zone, southeast of the Rainbow Fault. Brownfields exploration targets include five coincident airborne HeliGEOTEM and ground IP chargeability anomalies defined by Terrane Metals Corp in 2008 in the North and South Grid areas, 4 km northwest and 2 km south of the mine, respectively. Three proximal magnetic anomalies, the Snell, Mitzi and D3 targets, are suggestive of additional mineralized alkalic porphyry stocks within the Heidi Lake cluster.

MINE EVALUATION

Kemess Underground (KUG)

At the end of March, intermediate gold producer AuRico Gold Inc reported the results of a positive Feasibility Study on the **Kemess Underground (KUG)** (MINFILE 094E 021) project in a NI-43-101 Technical Report prepared by SRK Consulting (Canada) Inc. The project is located 6.5 km north of the past-producing Kemess South mine and 294 km northwest of Mackenzie. The report describes an underground block cave operation that would utilize existing infrastructure at the Kemess South mine (now on care and maintenance) to process 24 600 t/d (or 9 Mt/y) of mill throughput. An anticipated 22% Cu concentrate would be produced at recoveries of 91% Cu and 72% Au. Only half of the original milling circuit from the Kemess South concentrator is required for ore processing. Flotation, thickening and concentrate handling facilities would remain the same. Tailings would be pumped to the Kemess South pit, as they were towards the end of Kemess South operations in 2010. The mine would operate for 12 years. Reserves are reported at:

- 100.4 Mt at 0.28% Cu, 0.56 g/t Au, and 2.05 g/t Ag - containing 280.9 Mkg (619.2 Mlbs) Cu, 51 029 kg (1.8 Moz) Au, and 187 106 kg (6.6 Moz) Ag (Proven and Probable).

The resource exclusive of reserves is reported at:

- 65.4 Mt at 0.24% Cu, 0.41 g/t Au, and 1.81 g/t Ag - containing 157.2 Mkg (346.5 Mlbs) Cu, 24 210 kg (854 000 oz) Au,

and 107 728 kg (3.8 Moz) Ag (Measured and Indicated);

- 10.0 Mt at 0.21% Cu, 0.39 g/t Au, and 1.57 g/t Ag - containing 20.9 Mkg (46.1 Mlbs) Cu, 3544 kg (125 000 oz) Au, and 14 260 kg (503 000 oz) Ag (Inferred).

This represents a higher-grade deep portion of the open-pit mineable Kemess North reserve that in a 2004 revised Prefeasibility study by Northgate Minerals Corp was reported at 414 Mt at 0.16% Cu and 0.31 g/t Au, containing 1.46 Blbs Cu and 4.1 Moz Au. A decision was made in 2007 by a joint federal-provincial panel not to issue Kemess North an EA Certificate on account of environmental and cultural values concerning Amazay Lake (Duncan Lake) and the proposed mine design.

The KUG orebody sits 150 m beneath two north-facing cirques (Central and the East Cirque) along an E-W oriented ridge. It has dimensions of 540 x 230 m, extending to more than 600 m depth. The mine would establish a single extraction level with 640 drawpoints. Caving would initiate in the highest grade ore in the northeast part of the orebody and progress to the southwest and lower grade ore over the mine life. A 3.4 km conveyor would carry crushed material from a centrally-located gyratory crusher south of the orebody to a transfer station at surface, where a second conveyor will carry it another 4.6 km down-slope to the mill stockpile. Twin 3.25 km long declines would be driven for the conveyor and for general access. For safety, these would have separate ventilation from the intake and exhaust raises designed for circulating 400 m³/s of air to the underground mine. SRK also noted a higher pyrite/chalcopyrite ratio and finer disseminated nature of copper and gold compared to ore from Kemess South, which will necessitate the addition of a stirred mill at the regrind circuit stage (to 15 µm or finer) of ore processing. Construction of the mine is expected to take 5 years until commissioning and commercial production. Pre-production capital cost is estimated at \$502 M. The mine is expected to create between 100 - 400 full-time jobs.

Existing surface infrastructure at the Kemess South mine includes the grinding and flotation circuit, coarse ore stockpile area, maintenance facility, administration buildings, 300-personnel accommodation, and a 380 km power line (230 kV) with associated transformers. Since completing acquisition of the project in late 2011, the company has made significant investment in reclamation and closure work at Kemess South including a final spillway for the previous tailings facility. The KUG project, essentially an underground extension of the earlier mine to access a deeper part of the mineralized district (similar to New Afton and Mt. Polley mines elsewhere in BC), has a large volume of environmental data to support the project even as baseline studies continue. The company plans to submit a Project Description and initiate the EA process in 2014.

AuRico plans to enhance the intrinsic value of the project with additional exploration and infill drilling outside existing reserves. In 2013, this included a 9-hole program using two drill rigs that targeted the Kemess Offset area east of Kemess North, and also the **Kemess East** target to follow up 2007 exploration drilling. Drill holes targeted a similar deposit style and size as **KUG** within horst-and-graben fault blocks constrained by N-S and E-W trending faults. Holes were collared on either side of a N-S trending cross ridge of Toodoggone volcanics and tested for indications of fault displacement

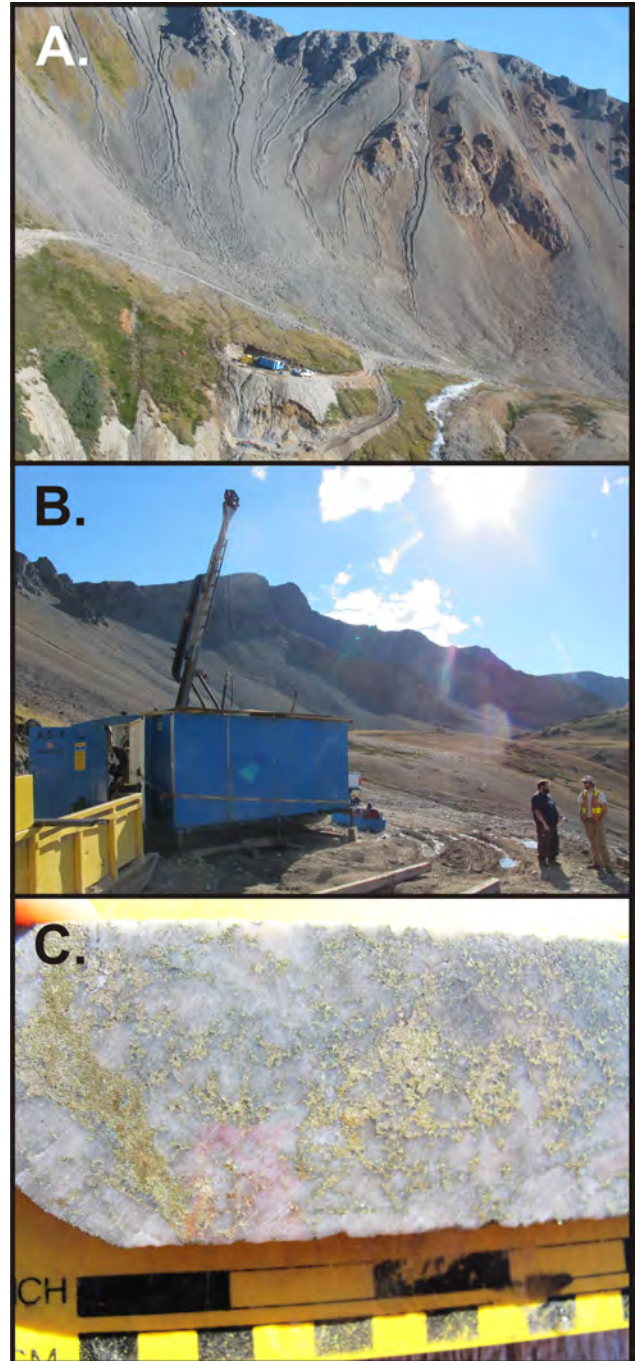


Figure 10. Kemess East – A. drilling KN-13-02 (075, -80), view south; B. Drilling ENE into Kemess East. Hole is collared in the Offset area; C. Pyrite-chalcopyrite-molybdenite mineralization in strongly QSP altered quartz monzodiorite (KN-13-02).

of mineralization. Drilling in Kemess East intersected similar lithology, mineralization and alteration as historic holes KH-07-04, 10, and 24. Assays from the 2013 drill program are still pending and will be released once finalized. Kemess East has displayed some different characteristics than Kemess North. Based on historic drilling there is an outer zone of lower Au/Cu ratio and higher molybdenum values lies within the phyllic zone. Within the potassic zone, gold and copper values increase with decreasing molybdenum, and Au/Cu ratios vary from 1:1 to 3:1 from the outer margin to the core of the zone. Magnetite content is also lower than Kemess North. The N-S trending Kemess East Offset Fault truncates the property on the east.

The Kemess Underground deposit is centered on the Kemess North pluton, a quartz (monzo)diorite of the Early Jurassic Black Lake intrusive suite that follows an E-W striking, south dipping thrust fault, the Kemess North fault. The fault separates Late Triassic Takla Group basaltic-andesites from a barren wedge of Early Jurassic Toodoggone dacitic lapilli tuffs (Saunders member) to the north, and cuts off the pluton and mineralization at depth. A north-dipping secondary normal fault beneath the ridge to the south suggests a rotated thrust panel with tilted volcanic stratigraphy. Towards the west the pluton becomes a series of WSW oriented dikes. An 80 m deep oxidized sulfate leach zone of clay-rich hematite-stained broken rock overlies the deposit. Subjacent QSP (phyllic) alteration with pyrite-anhydrite/gypsum veining is dominant in the Takla volcanics until quartz-magnetite ± biotite alteration becomes prevalent at depths mantling the pluton. Auriferous chalcopyrite-pyrite with trace molybdenite occurs as disseminations, fracture fillings and quartz ± magnetite veins in the pluton, and less so in hanging-wall Takla volcanics. It forms an E-W striking tabular orebody that dips 20° to the south over 400 m. The western part of the orebody is shallower (150 m below surface) and lower grade. The KUG project would capture the deeper (300 - 500 m below surface) mineralization on the eastern side, and could potentially extend to the Kemess East target if economic grades are proven there.

Blackwater

In the first quarter of 2013, intermediate gold producer New Gold Inc commenced the Feasibility Study (FS) phase for the **Blackwater** project (MINFILE 093F 037), 110 km south of Vanderhoof in the Fawnie Range on the north slope of Mt. Davidson. All exploration work in support of the FS was completed by April, including over 20 000 m of geotechnical and condemnation drilling for proposed site facilities north of the deposit, 10 drill holes of oriented core for structural analysis in the proposed pit area, and pump and piezometric well installations. Additional work throughout the year included: geological block model completion; mine design and production scheduling; metallurgical testwork and flowsheet design; mill and related facility design and layouts; grinding circuit design studies; TSF and water

management designs, and construction scheduling; power supply connection study and transmission line routing; geotechnical testing for road and air access layouts; and layout designs for construction and permanent camps.

In early April, the company announced an increase in measured and indicated resources with the addition of 89 infill holes (22 220 m) from the 2012 drilling that brought the basis for the resource estimate to 1002 holes (309 509 m) in total. The updated total resource was stated at:

- 396.9 Mt at 0.74 g/t Au, 5.5 g/t Ag - containing 295 483 kg (9.50 Moz) Au and 2.18 Mkg (70.13 Moz) Ag (Measured and Indicated);
- 17.6 Mt at 0.66 g/t Au, 4.0 g/t Ag - containing 10 773 kg (0.38 Moz) Au and 64 070 kg (2.26 Moz) Ag (Inferred).

This estimate, to be used in the FS, was based on metal prices of \$1400/oz Au and \$28.00/oz Ag. It incorporated more detailed geological and geostatistical modelling of the deposit than previous estimates to maximize profitability, and a larger block size to match envisioned operations.

The FS built upon the positive PEA study released in September 2012. The PEA study describes an open-pit mining operation with 60 000 t/d (21.9 Mt/y) processing plant and a mine life of 16.4 years. Annual production would be 14 373 kg (507 000 oz) of gold and 57 805 kg (2.04 Moz) of silver for an initial 15 years. Production in the first five years would be higher at 16 896 kg (569 000 oz) Au with average feed grade of 0.95 g/t. The life-of-mine stripping ratio would be 2.36:1. The processing plant, about one kilometre north of the open-pit, would utilize conventional crushing (to 80%), grinding (to 80% and <150 µm), leaching, and a carbon-in-pulp (CIP) extraction circuit. Extracted gold and silver will be released from carbon in stripping columns, recovered by electrowinning, and smelted to produce a gold-silver doré product. Expected recoveries are 87% for gold and 53% for silver. Leach CIP residue would report to an SO₂/air circuit for cyanide conversion to cyanate, and then to the TSF where cyanate would break down to ammonium and carbonate ions. A dual cut-off strategy is planned for segregating mill feed into material for direct processing (above 0.4 g/t AuEq.), and material to be stockpiled (0.3 - 0.4 g/t AuEq.) immediately north of the open-pit. The stockpiled material will be divided into two streams: low-grade material to be used at the end of the mine life, and high Ag/low Au mill feed (avg. 45.5 g/t Ag, 0.067 g/t Au) from the northern part of the deposit to be processed through years 8 - 14. The open-pit would reach a maximum depth of 400 m over the mine life.

Similar to the Mt. Milligan Mine, benign waste materials from on site would be used for TSF construction with the TSF located near the open-pit (about 3 km to the north) to minimize the project footprint and provide more effective water management after closure. The TSF would

be designed to contain 509 Mm³ of material and require 78 Mm³ of construction material, of which about 97% would be derived from initial stripping and open-pit waste rock. This would minimize the volume of peripheral waste rock storage facilities to about 101 Mm³ of material. As at Mt. Milligan, TSF embankments would be engineered with zoned earthfill/rockfill and compacted till core using a centerline construction method. Site runoff water would be collected and stored within the TSF and recycled to the processing plant. Some years would require pumping of additional input water from Tatelkuz Lake, 15.7 km to the northeast, to support Davidson Creek and sustain fisheries.

Other requirements for the proposed mine include a 133 km long, 230 kV transmission line to follow existing logging roads from the GLN Substation near Fraser Lake, and a construction camp for 1500 personnel to be refitted into an operations camp for about 400 personnel. Completion of the FS was scheduled for end-2013, and was announced on December 12th. The open-pit design was adjusted to lower metal prices (\$1300/oz Au and \$22/oz Ag) and lower strip ratio (1.88 : 1). Life-of-mine gold and silver production decreased from the PEA by about 12% and 8% respectively to 7.0 Moz Au and 30 Moz Ag over 17 years. The total estimated cost of design, construction and commissioning of the mine increased 2.8% to \$1865 M. The project is in the Pre-Application stage of environmental assessment. A draft EA Application is planned for early 2014 submission. Upon permitting approval, construction would start in early 2015, and ore extraction by 2017. The economic benefit to the economies of Vanderhoof and Prince George is estimated at \$75 M/y during construction and \$25 M/y during operations. In January, New Gold received the 'Developer of the Year' award at the 10th annual BC Natural Resource Forum and Economic Summit in Prince George for focusing on hiring of local employees (66% in 2012) and contractors, and for communication protocols and participation agreements with First Nations (24% of employees in 2012). Of note, in 2013 the company acquired the **Rainy River** gold project in northwestern Ontario which has a 4.0 Moz Au reserve (Proven and Probable) and 6.2 Moz Au resource (Measured and Indicated) inclusive of reserves, and a completed FS that is being updated by New Gold. The company plans to decide on the sequencing of the Blackwater and Rainy River projects in 2014.

The Blackwater gold-silver deposit is interpreted as an intermediate sulfidation epithermal system. Mineralization is hosted by Late Cretaceous Kasalka Group rocks in a complex assemblage of andesite flows, lapilli tuffs and volcanic breccias; flow-banded and tuffaceous rhyodacites; heterolithic breccia containing altered fragments of other units; and intensely silicified hydrothermal breccias. Strata are discontinuous over short distances but are more discernible in the southeast corner of the deposit and are thought to dip generally northwest. Andesite host rock lies outside of the silicified zone and

may represent the protolith for much of the orebody, particularly in chlorite-sericite altered portions. Alteration and mineralization is hosted in a large upright funnel-shaped fragmental zone that averages 350 m thickness and tapers to 600 m depth in a low-grade core. It is characterized by pervasive silica-muscovite-illite \pm chlorite accompanied by disseminated and replacement pyrite-sphalerite-chalcopyrite-galena \pm marcasite. Native gold and electrum as micron scale grains (approx. 25 - 50 μ m) are associated with sulfide and silicification, and silver with argentite occurring with galena. Local Mn-rich spessartine garnet, an important indicator mineral, occurs with pyrrhotite-bearing potassic alteration in the western part of the deposit. The mineralized zone (above 0.2 g/t Au) strikes E-W and dips shallowly NNW over an area measuring 1250 x 1000 m. It is continuous across the central and southeastern parts of the deposit and extends to the north and northwest where a zone of higher grade silver lies along the outer portion of the 2012 drilling grid. Mineralization remains open at depth in the southwest and in the north and northwest of the deposit. Steep, north-plunging high-grade ore shoots are thought to be associated with subvertical structural intersections. Highest grades (up to 47.49 g/t Au over 15 m) are localized along the margins of silicified breccia bodies. The silicified mass has moderate resistivity-chargeability and increasing chargeability marginal to silicification. The large fragmental zone of seriate subangular clasts (some glassy or devitrified shards) in a finer-grained matrix and pervasive silicification with minor quartz veinlets suggests a widespread metasomatic event in receptive host rock, possibly related to phreato-magmatic volcanism. The recent identification of ammonium-bearing clay alteration indicates a late volatile phase common to shallow hydrothermal systems. A potential source intrusion has been identified in a feldspar-porphyrific monzonite several kilometres south of the deposit area where regional magnetics (first vertical derivative) show a 6.2 km diameter ring-shaped high. Topographically, the deposit forms an S-shape due to resistive silicification and inferred glacial scour within a cirque valley on the north side of Mt. Davidson. The Blackwater wedge occupies a roughly 5 km square area and is juxtaposed against Ootsa Lake Group rocks across steeply dipping normal faults on the west and north, implying the Blackwater block is a high-standing remnant or horst in the region, preserving a Late Cretaceous volcanic edifice. Overburden thickness typically ranges from 5 - 10 m but is as high as 80 m on the east side of the deposit. Other sizeable Late Cretaceous ore deposits in the broader plateau district include the calc-alkaline Huckleberry and New Prosperity porphyry deposits to the west and south.



Figure 11. Blackwater – On-site core storage facility for the 2012 drilling program of 700 holes and over 245 000 m of core.



Figure 12. Blackwater – **A.** Schematic N-S cross section through the Blackwater deposit (Section 5200 E from the 2012 New Gold Inc Preliminary Economic Assessment); **B.** Discussing the Almonte saw used on a 30 000 m core backlog in 2012; **C.** BW-917 at 435 m with sphalerite-pyrite-galena replacing mafic domains in pervasively sericite-chlorite altered volcanic breccia (3.37 g/t Au, 12.3 g/t Ag).

EXPLORATION HIGHLIGHTS

PORPHYRY COPPER PROJECTS

Porphyry copper prospects in North-Central BC are hosted in the Quesnel terrane, a volcanic island arc that accreted to ancestral North America in the Early-to-Middle Jurassic, and the Stikine terrane, the eastern margin of which represents the Toodoggone district and the Nechako Plateau area west of Vanderhoof. Due to Late Paleozoic to Mesozoic oroclinal tectonics of the Quesnel-Stikine superterrane, the Quesnel and Stikine arc terranes are opposite facing (Mihalynuk et al., 1994). The Omineca Region hosts the northern 500 km of this intermediate volcanic belt, which extends over 1000 km throughout much of central BC. The arc had a two-phase development above Late Paleozoic basement rocks with probable rifted crustal fragment roots (Nelson and Bellefontaine, 1996). The Late Triassic Takla Group phase comprises basal sedimentary rocks that grade upward through interfingering volcanic successions, including the Inzana Lake and Witch Lake successions in the Quesnel Trough. These are overlain by a phase of Early Jurassic, partially subaerial volcanic suites laid down on a more mature arc, such as the Chuchi Lake succession and the Toodoggone Formation (Hazelton Group). Coeval intrusions, including the 170 x 40 km Hogem intrusive complex (Quesnel terrane) and Black Lake intrusive suite (Toodoggone district), are distributed throughout the region along structural trends. The Hogem intrusive suite generally shifts from more alkaline compositions in the Early Mesozoic to more subalkaline in the Cretaceous (Garnett, 1978). The northwest trending Manson-McLeod fault system and Pinchi fault bound the northern Quesnel terrane on the east and west sides, respectively. The Finlay-Ingenika and Moosevale fault systems bound the Toodoggone district on the east. Cretaceous to Tertiary second order transcurrent and normal faults, with local pull-apart basins, resulted in

variably tilted, rotated and down-dropped structural blocks within the terranes. Copper-gold \pm molybdenum porphyry deposits of both alkalic and high-potassic calc-alkaline affinity are known in the region.

Quesnel Terrane

In February, Serengeti Resources Inc announced the results of a positive PEA study for the **Kwanika** property (MINFILE 093N 073), 140 km northwest of Fort St. James. The study, prepared by Moose Mountain Technical Services was based on 69 389 m of drilling in 168 holes drilled between 2006 and 2010. The study investigated a medium-capacity (15 000 t/d; 5.5 Mt/y) mining operation focused on the higher grade portion of the resource. Two open-pits areas are proposed to mine the Central Zone and South Zone deposits, and series of two block caves below the Central Zone pit to access deeper mineralization. The mine would use a conventional copper-gold flotation process and have a 13.5 year mine life. The first years of production would focus on the Central Pit with concurrent development of the underground mine. Access to underground would spiral down from the bottom of the Central Pit. Block caving would commence at the completion of mining in the Central Pit. Development of the deeper block cave would be concurrent with mining the higher block cave stope. Production would shift to the lower block cave and South Pit sequence toward the end of the mine life. Tailings would be pumped to a TSF southwest of the Central Pit. A 70 Mm³ waste rock storage facility would be located northeast of the Central Pit. Other requirements would include a diversion of Kwanika Creek, a contact water storage pond, and a 75 km connection from the Kemess Power Line. A large mineralized envelope not included in the mine plan provides opportunity for brownfields expansion. The estimated initial capital cost is \$364 M. The report recommended further optimization of the mine plan to improve project economics. The resources given for the open-pit areas and block cave sequence are as follows:

- *Central Pit:* 19.90 Mt at 0.33% Cu, 0.28 g/t Au, 0.86 g/t Ag (Indicated); 0.90 Mt at 0.33% Cu, 0.21 g/t Au, 0.84 g/t Ag (Inferred);
- *First block cave:* 19.92 Mt at 0.46% Cu, 0.47 g/t Au, 1.36 Ag (Indicated); 0.05 Mt at 0.33% Cu, 0.42 g/t Au, 1.79 g/t Ag (Inferred);
- *Second block cave:* 7.82 Mt at 0.47% Cu, 0.47 g/t Au, 1.27 g/t Ag (Indicated);
- *South Pit:* 25.07 Mt at 0.32% Cu, 0.12 g/t Au, 1.84 g/t Ag, 0.016% Mo (Inferred).
- *Central Zone:* 243.6 Mt at 0.23% Cu, 0.21 g/t Au, 0.69 g/t Ag - containing 558 Mkg (1230 Mlbs) Cu, 47 060 kg (1.66 Moz) Au, and 154 221 kg (5.44 Moz) of silver (Indicated);
- *Central Zone:* 55.2 Mt at 0.14% Cu, 0.14 g/t Au, 0.42 g/t Ag - containing 76 Mkg (168 Mlbs) Cu, 7087 kg (0.25 Moz) Au, and 20 979 kg (0.74 Moz) Ag (Inferred);
- *South Zone:* 240 Mt at 0.20% Cu, 0.09 g/t Au, 1.49 g/t Ag, 0.007% Mo - containing 490 Mkg (1081 Mlbs) Cu, 18 711 kg (0.66 Moz) Au, 326 020 kg (11.5 Moz) Ag, and 17.1 Mkg (37.6 Mlbs) Mo (Inferred).

The Kwanika Project consists of two porphyry deposits, the Central Zone (Cu-Au) and the South Zone (Cu-Mo-Au-Ag), separated by about one kilometre along a NNW trend paralleling the Pinchi Fault. Both are associated with potassically altered rocks of diorite to monzonite composition of the Hogem intrusive suite. The Central Zone is a NNE-striking, roughly 1250 x 600 m pear-shaped zone in plan. It is characterized by two major and several minor intrusive bodies hosted in Takla Group andesites. Both intrusive and volcanic rocks are mineralized, with higher copper-gold grades in the intrusives. The NNW trending Pinchi Fault and an associated ~415 m wide conglomeritic sedimentary basin truncates the Central Zone on the west. Mineralization occurs as chalcopyrite-pyrite-quartz \pm anhydrite-magnetite-bornite veins, vein stockwork and disseminations with potassic alteration. Later stage dolomite-ankerite and quartz-sericite-tourmaline-hematite veins are associated with phyllic alteration that variably overprints the potassic. A supergene enrichment zone follows the sedimentary basin contact for up to 500 m and extends to 70 m depth below the unconformity. Both native copper and sulfides (chalcocite, covellite) are observed with grades commonly above 1% CuEq. In the South Zone, mineralization occurs in strongly-altered monzonitic rocks within a 2.9 x 0.5 km NNW trending fault-bounded corridor about 750 m east of the Pinchi Fault. There is more arsenic anomalism in the South Zone.

The property hosts several additional exploration targets as the system remains open to the north and at depth. Geochemical analysis of historic drilling data in early 2013 showed a Fe-Zn-W anomaly in the Northwest Central Zone (hole K07-42) that coincides with a zone of strong phyllic alteration (quartz-sericite-pyrite \pm magnetite-anhydrite) at about 400 m depth. This overlies and is slightly offset northwest from a Cu-Au-Ag anomaly at 500 m depth that may represent the mineralized cupola of a deep porphyry stock. This deep target is untested by drilling. A weakly mineralized comminuted breccia in phyllic-altered monzonite also occurs above the deep target at depths less than 200 m in K08-122. Drilling 800 m north of the Central Zone encountered mineralized monzonite in faulted rock that

Over the mine life, production would be 247 Mkg (545 Mlbs) of copper, 13 863 kg (489 000 oz) of gold, 69 456 kg (2.45 Moz) of silver and 2.38 Mkg (5.25 Mlbs) of molybdenum.

At a \$7.50/tonne cut-off, the total resource estimate for property as of March 2011 is:

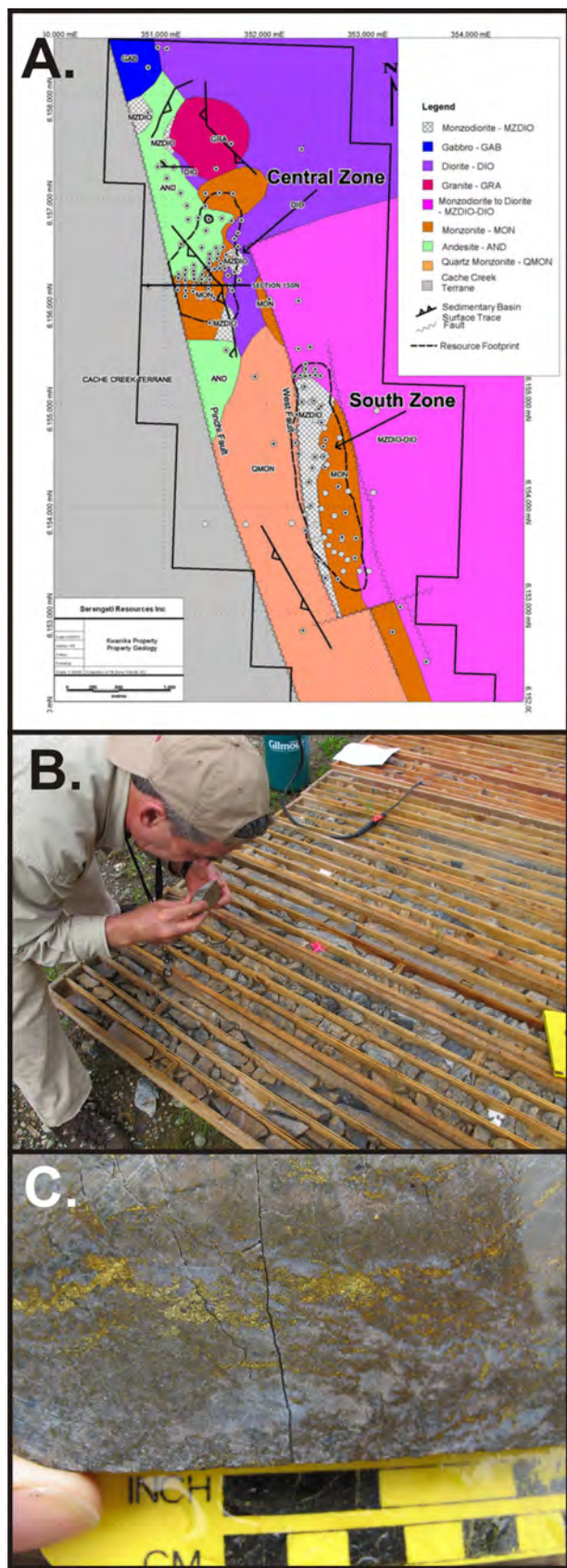


Figure 13. Kwanika – **A.** Plan view of Kwanika project area with geology; Serengeti Resources Inc; **B.** Reviewing some key holes of the historic drilling; **C.** K07-15 at 258.2 m with quartz-pyrite-chalcopyrite-magnetite veining in potassically altered monzonite.

may represent domains of the Central Zone translated northwards in the Pinchi fault zone. A series of sedimentary basins extending for 25 km to the south of the deposit area may host additional supergene-enrichment zones.

In addition to near-deposit target identification work and selective core relogging at Kwanika, Serengeti conducted grassroots exploration on other properties in the Quesnel terrane and Toadoggone district. At **Osilinka**, 75 km northwest of Kwanika in the Omineca Mountains Hogem Range, reconnaissance soil sampling identified anomalous copper associated with a 3 km long northwest-trending aeromagnetic anomaly about 4 km east of the Pinchi Fault. One sample returned anomalous Cu-Au-Pd from an area of extensive overburden. At **Rottaker**, 25 km southeast of Kwanika, a northwest-trending magnetic high area was mapped and sampled. Three select outcrop and float samples ranged from 0.38 - 6.6% Cu, 0.1 - 1.0 g/t Au, 73 - 141 g/t Ag. At **SYL**, 25 km northwest of the Mt. Milligan Mine, two Ah and selective extraction soil transects were completed above a prospective magnetic anomaly. At **Fleet**, 50 km south of the past producing Kemess Mine, soil (Ah and B-horizon) and rock float sampling identified a 750 x 600 m geochemical (Cu-Au-Mo-W) anomaly. Follow up is planned for 2014.

In November 2012, Orestone Mining Corp initiated a 3-hole drill program at **Captain**, (MINFILE 093J 026), 41 km north of Fort St. James, and began site preparation for over 38 newly approved drill sites. In December, the company reported 487 m of sulfide mineralization in vertical hole C12-05 that encountered two intervals of elevated gold grading 0.65 g/t Au, 0.06% Cu over 118.8 m (upper zone) and 0.41 g/t Au, 0.07% Cu over 164.6 m (lower zone). The hole was drilled along the southern flank of the 1 x 1.5 km Admiral target within the 1 x 3 km East Magnetic target area. Alkaline porphyry-style alteration included sericite-carbonate and potassically altered volcanic rocks with monzonite porphyry dikes. Intensity of magnetite and copper sulfide bearing potassic alteration increased down-hole remaining open at depth. Hole C12-03 was drilled 500 m to the east and encountered potassically altered monzonite dikes grading 0.13 g/t Au, 0.05% Cu over 70 m suggesting another mineralized system.

In January 2013, a 50 line-km ground magnetic survey was conducted to better define the Admiral target and Southeast aeromagnetic anomaly. Two E-W trending 1500 x 100-1000 m magnetic highs separated by 600 m were detailed. The smaller anomaly on the south correlates with mineralized dikes in DDH C12-05, and the larger anomaly was untested by drilling. By late March 130 line-km of ground magnetic survey in the East Magnetic and West Magnetic target areas was completed at 100 m line spacing (Admiral Target) and 200 m spacing (West Magnetic). Both targets areas lie outboard of a large (+4.5 x 1.8 km) northwest trending magnetic feature interpreted to be a main diorite/monzodiorite

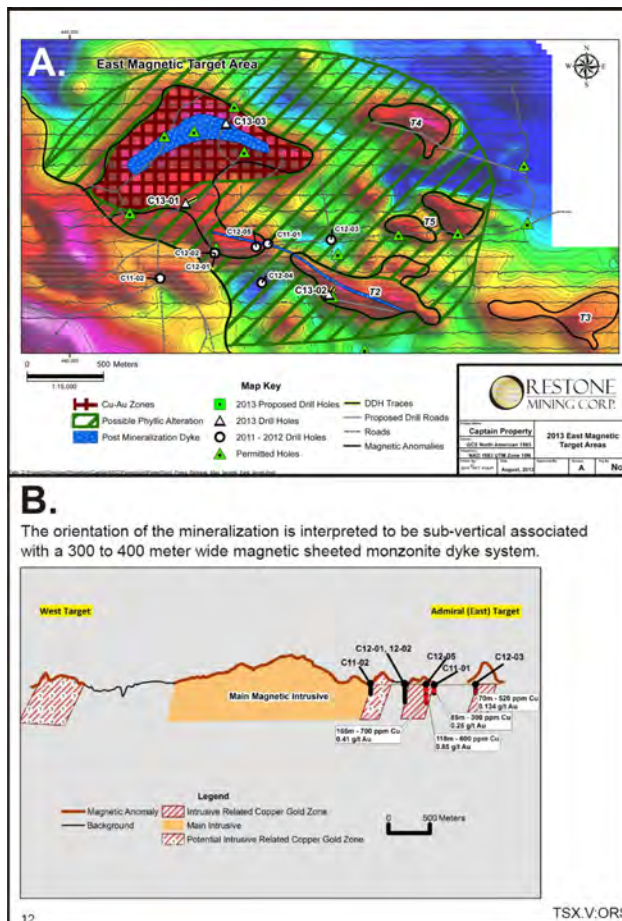


Figure 14. A. Plan view of East Magnetic Target area with drill hole collar locations; B. Cross section through the Magnetic Target areas with select drill holes and assay intervals; Orestone Mining Corp.

intrusive and have small central magnetic highs with moderate-to-high peripheral IP chargeability signatures suggestive of derivative dikes or plugs. Data generated from the survey defined nine such anomalies as attractive drill targets. These included the Admiral target, five additional targets east and southeast of Admiral within a 200 x 700 m area, and three larger magnetic highs within the 3.8 x 1 km northwest trending West Magnetic target area where there has been no drilling to date.

In July 2013, a 3-hole drill program was completed in the East Magnetic target area. Hole C13-03, drilled at the center of the Admiral target, intersected a northeast trending 1000 x 50 m post-mineral gabbro dike with a xenolith of altered monzonite porphyry over 3 m from 204.9 m depth that assayed 1.90 g/t Au and 0.23% Cu. The xenolith is thought to be derived from host rock adjacent to the dike where a large IP anomaly is observed. The company plans to drill north and south of the dike in future programs. Hole C13-02, drilled 500 m southeast of mineralized hole C12-05, intersected 34.0 m and 48.8 m of mineralized monzonite dikes at 32.4 m and 121.3 m depth. Average grade within the dikes was 0.20 g/t Au, 0.073% Cu and 0.35 g/t Au, 0.055% Cu, respectively.

Hole C13-01, drilled 500 m northwest of hole C12-05, intersected phyllic-altered volcanics on the south margin of the Admiral target and returned anomalous gold-copper.

The Captain property is underlain by Late Triassic basaltic-andesite volcanics of the Takla Group covered by 20 - 60 m of overburden. The property is thought to contain a large (7 x 14 km) intrusive system with gold-copper alkalic porphyry mineralization. The East Magnetic target area represents a northeast offshoot to the dominant northwest magnetic trend and central dioritic intrusive. Mineralization is interpreted as sub-vertical and associated with a 300 - 400 m wide series of N-S trending alkalic porphyry dikes. There is apparent similarity of geophysical signature with the mineralized MBX zone at the Mt. Milligan Mine.

In November 2013, Manado Gold Corp ran a 10-hole shallow drilling program at **Takla-Rainbow**, (MINFILE 093N 082) 151 km NNW of Fort St. James. The program aimed to confirm historic drilling results and test along-strike and down-dip extensions of the West and East zones. A series of structurally-controlled subvertical auriferous quartz veins trend northwest along the Twin Creek Fault, an apparent high angle normal fault. The shear zone cuts across an E-W trending contact between Early Jurassic Twin Creek Formation volcanics (Takla Group) and diorite of the Hogem intrusive suite within a kilometre wide embayment in the east margin of the batholith. Sheared quartz syenite-to-granite porphyry dikes of probable Early Cretaceous age appear to be genetically linked to gold mineralization. The 183 x 130 x 140 m West Zone comprises five parallel gold-bearing structures within a broader elongate pyrite halo. The 289 x 100 x 140 m East Zone comprises two or more similar structures. Mineralization occurs as disseminated sulfide and native gold with silica-carbonate alteration. The Red Zone alkalic copper-gold porphyry target lies 1.2 km to the northwest. A historic preliminary resource estimate (non 43-101 compliant) by Imperial Metals Corp was calculated at 291 298 tonnes at 7.81 g/t Au.

At the **Col-Later** project (MINFILE 093N 101), 106 km west of Mackenzie, Pacific Empire Minerals Corp followed up historic exploration work, most recently done by Solomon Resources in 2007-08. The program focused on an area 500 m north of the historic Solomon drilling. Surface trenching and sampling tested a coincident large IP anomaly and 2 x 5 km soil anomaly overlapping a 2007 Airborne DIGHEM conductive signature with resistive halo. The Col prospect is situated near the southern margin of the Hogem intrusive complex within alkaline rocks (monzonite, syenite, aplite, pegmatite) in contact with volcanic flows of the Lower Jurassic Chuchi Lake succession. Northwest-striking steep parallel fractures with potassic alteration envelopes host chalcopyrite, bornite and malachite mineralization. A non 43-101 compliant resource estimate of 1.8 Mt grading 0.6% Cu (Indicated) was provided by Kookaburra Gold Inc in 1989.

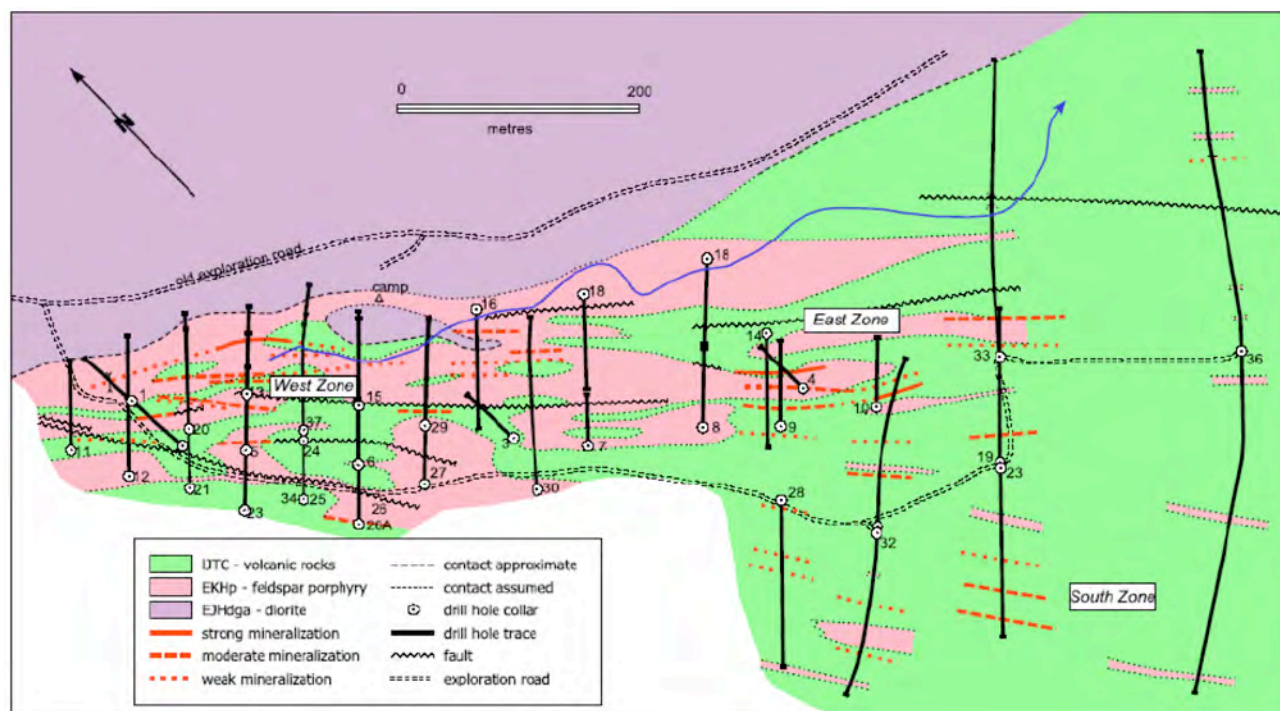


Figure 15. Takla-Rainbow – Drill plan with geology and mineralization, from 2013 technical report prepared for Rainbow Gold Resources Ltd.

In December 2012, Rich Rock Resources Inc announced the results of a follow-up program of ground 3D-IP (20 line-km) and magnetic (55 line-km) surveys that were completed on the Freegold, West, and Ridge zones at the **Tas** property (MINFILE 093K 110), 50 km north of Fort St. James. The survey consisted of infill lines in the eastern half of a 2011 grid and five new lines towards the northwest. It was designed to provide better near-surface resolution and define resistivity-chargeability anomalies to 350 m depth. As a result, several controlling geologic structures were remapped. NNW trending faults in the Ridge zone were extended southward to intersect the Freegold fault, and a previously unmapped E-W trending fault appears to crosscut the West and Ridge zones. These structural enhancements fit with intrusives indicated by magnetic highs underlying the West, Ridge, and Southeast zones. The 3D-IP modelling also showed deep chargeability highs generally align with faults identified in the resistivity model. The company is focused on the outer, lower-chargeability envelopes of these features as similar features at surface are related to auriferous sulfide mineralization proximal to the Freegold and Ridge zone faults. The combined geochemical and geophysical signatures suggest widely disseminated porphyry-style mineralization with local high tenor gold zones.

The **Tas** property is underlain by cherty tuff and argillite of the Inzana Lake Formation (Takla Group) and the coeval **Tas** pluton, an oval-shaped (3 x 4 km) augite diorite of Late Triassic age. A kilometre north of the pluton, the E-W oriented Ridge zone (1200 x 600 m) consists of hornfelsed volcanics cut by northeast-trending

monzonite porphyry dikes and associated breccias, and gold-enriched massive sulfide lenses (pyrite-pyrrhotite-chalcopyrite-arsenopyrite-magnetite) less than a metre wide in sheared host rock. Within the West, 19, 21, and East subzones, mineralized shear structures trend northwest to north. The Freegold zone hosts visible gold in the silica-carbonate altered northern margin of the **Tas** pluton. The Southeast zone is a deep porphyry target related to an intrusion breccia at the pluton margin. A genetic model by Dr. Peter Fox suggests an alkalic copper-gold porphyry system associated with dikes derived from the **Tas** pluton. The dike-porphyry complex tilted northward as dike emplacement continued to late stage. Fault-controlled massive sulfide replacement bodies formed with shearing as ambient fluids overrode the system. Mineralized rocks, as indicated by chargeability data, extend from surface to several hundred metres depth paralleling erosional remnants of the dike complex. The system remains open to the east and west. The property has a historic (non 43-101 compliant) preliminary resource estimate of 86 700 tonnes at 6.86 g/t Au for the combined East and West zones.

After a prolonged 15 months of negotiations and antitrust reviews, Glencore International plc completed the \$30 B acquisition of Xstrata plc in early May 2013 to form the world's fourth largest mining company, Glencore Xstrata plc. In February, Xstrata Canada Corp had notified Strongbow Exploration Inc that it would not be continuing the option on the **Inza** property, part of the **Quesnel Trough (QUEST)** regional project of optioned properties from BC junior exploration companies including Kiska Metals Corp, and the QUEST joint venture of Fjordland Exploration Inc (35%) and Serengeti

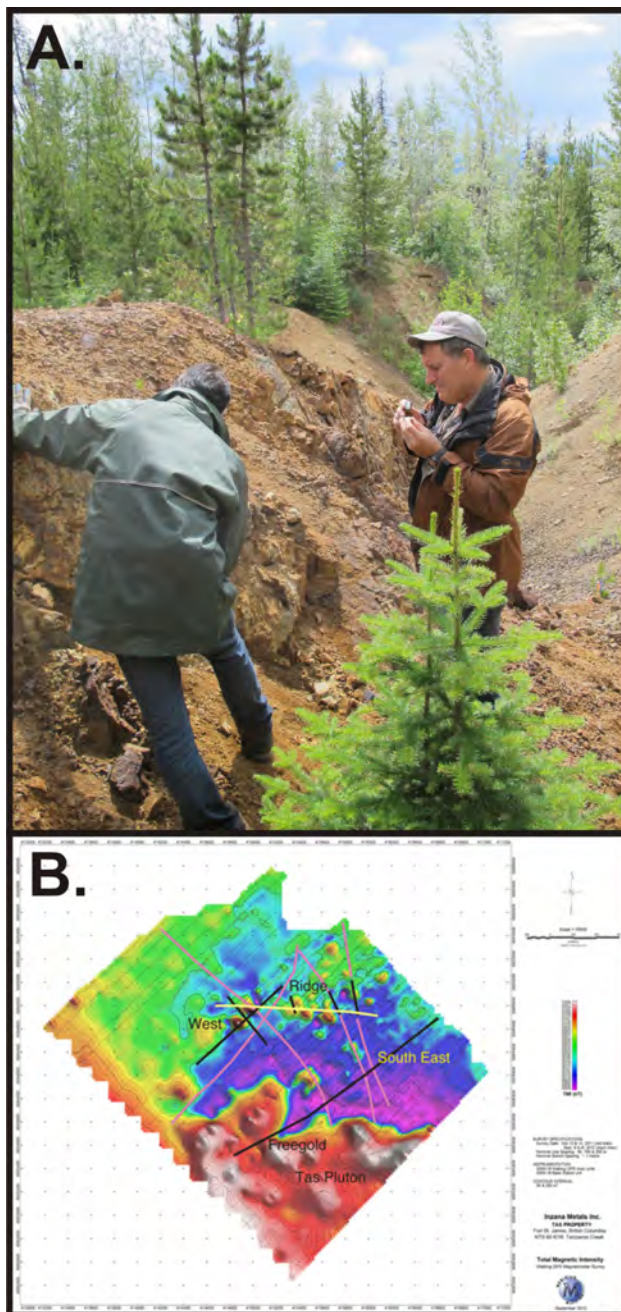


Figure 16. Tas – A. Examining historic trench in East zone; B. Total magnetic map with faults derived from SJ Geophysics resistivity model; Rich Rock Resources Inc.

Resources Inc (65%). Also in February, Xstrata returned the **MP**, **PG**, **Reid Lake**, **Rob**, and **ST** properties to Fjordland and Serengeti. In early March, Serengeti reported that Xstrata had elected to continue the option on the **Ping** property with plans to drill at least one target associated with an IP anomaly in Spring 2013. The Ping property, 49 km northwest of Prince George, is underlain by Witch Lake Formation volcanics (Takla Group) and lies close to a northwest trending fault that cuts across the Quesnel terrane. However, shortly after the merger the new company began cutting into Xstrata projects. In June, the QUEST option agreement was terminated and the

Ping property returned to Serengeti. During an Investor Day webcast meeting in early September, the company confirmed that Xstrata greenfield projects had been “deprioritized with a material reduction in scope and costs”, that the new company would be focusing mainly on brownfields projects, and that it would cut capital spending by \$3500 M by 2015. At the end of July subsidiary company Xstrata Canada Corp had been renamed Glencore Canada Corp.

At the north end of the Omineca Mountains, 230 km northwest of Mackenzie and 66 km southeast of Kemess South Mine, Kiska Metals Corp conducted a helicopter-supported exploration program at their **Kliyul** property (MINFILE 094D 023) in September. The program consisted of ground IP and magnetic surveys, core re-logging, and geological mapping. It was designed to follow up an IP survey from 2011 and drilling by Geoinformatics in 2006 when two deep holes (over 300 and 400 m) were drilled below a shallow magnetite breccia zone. The 2006 drilling encountered several mineralized intervals and ended in above-gram gold mineralization at depth. The most significant interval in hole KL06-30 returned 0.52 g/t Au, 0.23% Cu over 217.8 m from 22 m depth. In 2009 Kiska determined the mineralization was consistent with a porphyry model. The objective of the 2013 program was to generate and validate porphyry targets and improve understanding of geological controls in the Kliyul Zone. At the end of September, the company entered into a Participation Agreement with Teck Resources Ltd whereby Teck would provide \$500 000 as a convertible grid promissory note to fund the 2013 program. Teck can elect to take up an option to earn 51% interest in the property with the note considered as initial expenditure.

The Kliyul property is located within a strong copper-gold anomaly in the BC Regional Geochemical Survey (RGS) dataset comparable to anomalies that host the Mt Milligan Mine and past-producing Kemess South. It is underlain by Late Triassic volcanoclastic and mafic volcanic rocks of the Kliyul Creek and Goldway Peak units (Takla Group) and coeval pyroxenite/diorite intrusive rocks of the Kliyul Creek Complex (KCC). Middle Jurassic and Early Cretaceous granitoid rocks also occur. The intrusive rocks are peripheral to the Hogem intrusive complex which lies 8 km to the south. The N-S trending Dortatelle and East Dortatelle faults, separated by about 5 km, cut across the property. These bracket a northwest-trending fault jog or linkage structure where the Kliyul Zone surface showing is found. Local airborne magnetic highs, a zoned chargeability anomaly (1.1 x 1.8 km), Cu-Au soil anomalism, and strong phyllic alteration are all centered on this structure over a 6 km length. Mineralization occurs as disseminated auriferous copper sulfide with silica-magnetite-chlorite alteration surrounding a core zone of banded quartz-magnetite veins and vein stockwork. Exploration potential remains high to the east and west of the main zone. The project is within 5 km of the Omineca Resource Road and Kemess

Powerline.

Canasil Resources Inc carried out assessment work to follow up remote sensing anomalies on their **Vega** property (MINFILE 094C 021), 170 km northwest of Mackenzie. The property is located on the west margin of the Manson Fault zone and is underlain by Takla Group volcanics that are intruded by dikes and sills peripheral to the Hogem intrusive complex. Pyrite-chalcopyrite-magnetite mineralization occurs in brecciated shear zones hosted in altered basaltic-andesite and syenite. A broad deformation zone (2100 x 490 m) with close-spaced fracture mesh has been observed, as well as lenses of massive sulfide.

Mapping and rock sampling by West Cirque Resources Ltd confirmed two zones of historic mineralization and discovered two new zones at **Heath** (MINFILE 093N 072), 109 km north of Fort St. James. Three grab and chip samples at each of the historic Central and A Zones averaged 1.13% Cu, 0.71 g/t Au, 3.2 g/t Ag and 0.71% Cu, 0.38 g/t Au, 19 g/t Ag, respectively. Northwest-trending mineralization in the A zone is approximately 450 m SSE of the West Target in the 1700 x 500 m Central zone. The new discoveries are located 180 m southwest of the A zone and 600 m southeast of the Central zone (Trench-C), and four samples from each averaged 2.51% Cu, 0.79 g/t Au, 34 g/t Ag and 1.15% Cu, 0.19 g/t Au, 27.8 g/t Ag, respectively. The property is underlain by ultramafic to granodioritic phases of the Hogem intrusive suite, 3 km east of the Pinchi Fault zone. Mineralization occurs as copper sulfides and pyrite with magnetite-rich potassic and carbonate alteration. Anomalous platinum and palladium values have also been reported.

Several other grassroots level programs were conducted late in 2012 and in 2013:

- Far Resources Ltd collected soil samples on their **Tchentlo Lake** property (MINFILE 093N 021), 100 km northwest of Fort St James in the Pinchi Fault zone. A 400 x 300 m copper anomaly was outlined in the North Block and strong As ± Au, Sb values were returned on the South Block. The property is underlain by carbonate rocks, gabbro and diorite of the Pennsylvanian to Triassic Cache Creek Complex and is considered prospective for Cu-porphyry and gold vein type mineralization.
- About 25 km to the north at the **Indata** property (MINFILE 093N 192), Eastfield Resources Ltd carried out grassroots sampling and prospecting. The project is underlain by carbonate, mafic volcanic and granodiorite intrusive rocks of the Cache Creek Complex and is prospective for mesothermal Au-Ag veins, Cu-porphyry, and serpentinite-hosted nickel deposit types.
- At their **Redton** property, 128 km NNW of Fort St. James, Kiska Metals Corp relogged key sections of historical drilling through the Falcon

zone and developed a geological cross-section. The 22.7 km² property hosts the Red Zone Cu-porphyry and Falcon Mo-Cu porphyry prospects (MINFILE 093N 068), and is predominantly underlain by Hogem intrusive rocks and Inzana lake Formation volcanoclastics of the Takla Group.

- Chumar Exploration conducted a trenching program at the **Koko** property, 41 km west of Mackenzie, in a recently logged area of the Manson Fault zone. The area is underlain by paragneiss of the Wolverine Metamorphic Complex separated from Takla Group volcanics on the east by a N-S trending fault. The Nat platinum-gold showing (MINFILE 093O 051) lies 4.5 km to the NNE in a small Late Triassic to Early Jurassic ultramafic intrusive at the Cariboo/Cassiar terrane boundary.
- Doubleview Capital Corp undertook an MMI soil sampling program to verify biogeochemical anomalies on its **Mt. Milligan North** property, 66 km west of Mackenzie near the Nation River. The property is underlain by Witch lake Formation volcanoclastics of the Takla Group.
- BC Gold Corp conducted an MMI soil sampling program at their **Rainbow** property (MINFILE 093N 205), 68 km WSW of Mackenzie and 3 km south of the Mt. Milligan Mine. Sampling identified a 350 x 250 m copper-gold soil anomaly that remains open in all directions and is associated with a stream sediment anomaly that drains a topographic high.
- Rich Rock Resources Inc had a follow-up magnetic gradiometer and radiometric survey flown over their **Eagle** property (MINFILE 093N 091, 092, 139, 185), 93 km north of Fort St. James, south of Tchentlo Lake. The survey identified several target areas featuring coincident magnetic-radiometric anomalies near cross-cutting structural features. The property is underlain by diorite to quartz monzonite of the Hogem intrusive complex and hornfelsed Inzana Lake Formation volcanoclastic rocks. Alkaline Cu-Au porphyry and shear-hosted Au-Ag prospects are known.
- At **Cat Mountain** (MINFILE 094C 069), 163 km northwest of Mackenzie, Rift Valley Resources Corp completed a small mapping and sampling program on the southern grid area, and preliminary metallurgical test work began on a sample from the No. 1 Magnetite Vein. A combined gravity and cyanide leach process recovered 97.9% of the gold from an 11.9 kg sample grading 59.7 g/t Au, 8.5 g/t Ag. Davis tube magnetic separation recovered 65% of the sample assaying 65.4% iron. The property is situated near the east margin of the Hogem

intrusive complex and is underlain by Takla Group volcanoclastic rocks that host small syenite intrusives. Steeply east and NE dipping copper-gold bearing magnetite rich veins occur in an area of complex syn- and post-mineral faulting.

Toodoggone District (Stikine Terrane)

In September, Canasil Resources Inc drilled at the **Brenda** property (MINFILE 094E 147), 30 km north of past-producing Kemess South mine, and 317 km northwest of Mackenzie. The objective of the program was to drill an extension of two holes from 2007 that returned increasing grades with depth and ended in mineralization at 562 m depth. In the 2007 drilling, five combined intercepts above 450 m depth graded 0.48 g/t Au, 0.79% Cu over 393.7 m; and below 450 m graded 0.68 g/t Au, 0.12% Cu over 92.8 m. A twin hole BR-13-01 was collared 2.5 m from BR-07-04 and drilled to 962 m with sampling starting below 500 m. In October, assay results returned 0.38 g/t Au, 0.07% Cu over 68 m from 504 - 572 m. Grades below 572 m were relatively low. A northwest trending, steeply dipping gold-copper mineralized zone has been outlined by previous drilling and 3D-IP programs over an area of about 400 x 350 m and 550 m depth within the historic White Pass zone. A chargeability anomaly indicates a potential strike length of a kilometre.



Figure 17. Brenda – Driller and helper retrieving 20' core tube. View is south towards Drybrough peak, Black Range.

The deep porphyry target area is underlain by a sequence of moderately SSW dipping porphyritic volcanics of the Early Jurassic Toodoggone Formation (Metsantan Member) that are andesite to latite in composition. Mineralized rocks have a thin fracture net or crackle breccia and are pervasively affected by potassic (biotite, K-feldspar) alteration overprinted by magnetite-quartz-sericite-chlorite and local phyllic alteration. Quartz-magnetite-sulfide veins and low density stockwork host copper-gold mineralization. Post-mineral brick red monzonite dikes/sills cut the host rock seemingly along fault planes or interflow horizons and dip moderately to the west. There is southwest directed offset to mineralization at the top of the zone where barren monzonite intrudes. Across the Pillar fault, a normal block fault structure about a kilometre southwest of the property, a 1.75 km diameter subcircular granitoid stock of probable Black Lake suite is hosted Late Triassic Takla volcanics. Immediately northeast of the White Pass zone, a N-S trending 2000 x 750 m advanced argillic zone with strong illite clay alteration and quartz-alunite has been mapped suggesting a high sulfidation lithocap. Combined alteration forms a 2.5 km N-S trend across the property and is thought to be controlled by tensional fractures associated with the NNW trending Pillar fault. No causal intrusive or deep-seated core of the mineralized system has been identified.

At the end of January, International Samuel Exploration Corp reported the results of a 2012 grassroots exploration program at the **Frog** property (MINFILE 094L 014, 094E 030), 107 km NNW of past-producer Kemess South. The program consisted of prospecting and sampling on the eastern half of the property and three areas of interest were identified in the southern portion. At the Forax prospect, a Cu-Au-Ag anomaly with overlapping Mo-Rh anomaly was outlined over a 6 x 4.6 km area. Of 430 rock samples collected, 23% assayed higher than 0.1% Cu. Nine ranged between 1.09 - 4.28% Cu, 0.5 - 4.0 g/t Au, 0.3 - 55.1 g/t Ag; and 28 samples between 0.01 - 0.42% Mo (avg. 0.07% Mo) with elevated rhenium between 0.04 - 1.25 ppm. The Forex prospect is fault bounded on the east, west and south and underlain by penetratively-foliated biotite hornfels schist, and a multi-phase pluton ranging from diorite to granite/syenite composition. Mineralization as copper sulfide is noted along the schist foliation, in miarolitic cavities, within joints and cleavages, and as disseminations. Alteration consists of main stage silica-magnetite-biotite and a limited muscovite-pyrite-magnetite overprint. Oxidized copper minerals malachite, azurite, chrysocolla and chalcantite are also present. West of Forax, sampling at the Whoa prospect outlined a copper-silver anomaly over 2.8 x 1.5 km. Seven of the 57 samples assayed between 0.10 - 0.61% Cu, 0.55 - 18.45 g/t Ag. Whoa is underlain by geology similar to Forax but also hosts skarn along biotite schist contacts. The company plans to investigate other gossans within the area. Regionally, the area is situated in the Quesnel terrane north of the Toodoggone district, and is underlain

by the Early Jurassic granodioritic Pitman Batholith bound by the Kechika Fault on the east and Kutcho Fault on the west. Minfile TK 43 suggests the schist bodies on the Frog property are Devonian to Permian metamorphic roof pendants caught up in the Early Jurassic pluton.

Twelve kilometres to the west at the **Lunar** property (MINFILE 094E 060, 061), Stratton Resources Inc completed an airborne magnetic and radiometric survey in June 2013. In late 2012, a grassroots geological mapping, prospecting and sampling program identified an area of anomalous copper-gold in the southeast corner of the claim block. Of 67 rock samples taken, ten ranged from 0.38 - 10.60% Cu, 0.70 - 5.37 g/t Au. The historic Mack and Earl showings describe copper sulfide and malachite disseminations in a quartz monzonite phase of the Early Jurassic Pitman Batholith along its western margin near the Kutcho Fault. Local skarn horizons and paragneiss are also noted. The Middle Triassic Lunar Creek ultramafic complex lies 900 m to the southwest, separated from the batholith by a lens of Takla Group volcanic rocks.

EPITHERMAL GOLD-SILVER AND VEIN-TYPE PROJECTS

Nechako Plateau (Stikine Terrane)

The Nechako Plateau, part of the Interior Plateau physiographic province, is an area of moderate relief bound to the north by the Skeena Arch, to the west by the Coast Mountains, and to the east by the Cache Creek terrane. The area is underlain by Early to Middle Jurassic Hazelton Group island-arc volcanic rocks of the Stikine Terrane. Following structural onlap of the Cache Creek terrane onto Stikinia, Bowser Lake Group sedimentary and volcanic rocks were deposited from Late Jurassic to Early Cretaceous alongside uplift of the Skeena Arch. Continental arc volcanism with intrusion of granodioritic plutons, including the Late Cretaceous Capoose Batholith, culminated in a Late Cretaceous orogenic event (Diakow et al., 1997). The combined Laidman and Capoose batholiths extend for close to 50 km along a NNW trend between Tsacha Lake (south) and the northeast trending Natahkuz Fault (north). Episodic volcanism continued into the Middle Eocene with eruption of the intermediate Kasalka (Late Cretaceous), felsic Ootsa Lake, and intermediate Endako Groups. Eocene volcanism appears to be closely linked with regional crustal trans-tension and basin-and-range style block faulting. North-to-northwest trending structures and cross faults are considered an important control on mineral showings and deposits developed during Late Cretaceous to Eocene uplift and extension. The Chilcotin Group represents Miocene and younger volcanism forming lava fields of transitional basalts. Glacial till, colluvial and fluvial deposits cover the area with bedrock exposures generally restricted to higher elevations.

In April, New Gold Inc switched its exploration focus from **Blackwater** to the broader mineral tenure (over 1000 km²) where multiple targets were generated during

the 2012 regional exploration program. The regional exploration strategy combined a suite of techniques including regional mapping, soil sampling (A- and B-horizon, MMI), ground IP and magnetics survey, till sampling for indicator mineral analysis, and RC drilling through overburden to sample bedrock. The four drills that had completed the geotechnical and condemnation drilling for Feasibility at Blackwater were moved to the **Capoose** project, 21 km northwest of Blackwater, as well as other target areas including **Capoose South**, **Van Tine**, **Van Tine South**, and **Fawnie**, from 27 to 15 km west of Blackwater. Other regional properties include **Emma**, **Blackwater South/East** and **Auro** on the west to east side of Blackwater within 10 km. To help guide regional exploration, a structural study of Mt. Davidson and the greater Fawnie Range area was completed in early summer by SRK Consulting. By July, all exploration crews were mobilized. One core drill at Capoose focused on resource expansion laterally and at depth; two RC drills were active within the broader Capoose property and Van Tine; infill soil sampling was conducted at Capoose, Van Tine and Fawnie; and geophysical surveying continued at Capoose and Fawnie. By late October over 4200 m drilling was completed on Capoose and over 18 250 m in first pass drill testing on seven regional targets. The program wrapped up in November for the season, and preliminary results were reported as encouraging.

The **Capoose** property (MINFILE 093F 040) is located in the middle of a 10 km long NNW trending ridge between Fawnie Nose (south) and Tutiai Mountain (north). At end-2012 the resource was stated at:

- 14.2 Mt at 0.43 g/t Au, 20.8 g/t Ag - containing 5557 kg (196 Koz) Au, 269 235 kg (9.50 Moz) Ag (Indicated)
- 64.1 Mt at 0.29 g/t Au, 23.2 g/t Ag - containing 16 868 kg (595 Koz) Au, 1.35 Mkg (47.79 Moz) Ag (Inferred).

An updated resource estimate was scheduled for the end of Q4 2013. The property is underlain by moderately-to-steeply southwest dipping Hazelton Group andesite flows, andesite-dacite tuffs, and argillite/siltstone. These are intruded by quartz monzonite of the Capoose Batholith that dips gently eastward to about a kilometre depth below the deposit. The batholith is mapped over a 7 x 18 km area west of the deposit and spans the Late Jurassic to Late Cretaceous from its west to east margins. Apparent fragmental rhyolite sills with sheared contacts are the prime host of mineralization and are intensely altered with a silica-sericite-clay and garnet-bearing assemblage similar to the Blackwater deposit. The sills or “undifferentiated silicified volcanics” cut across the biotite hornfels aureole at the upper contact of the batholith and based on garnet geochemistry are similar in age to the east margin of the batholith (Green and Diakow, 1993). The deposit is elongated NNW parallel to stratigraphy over an 850 x 1000 m surface area, and dips

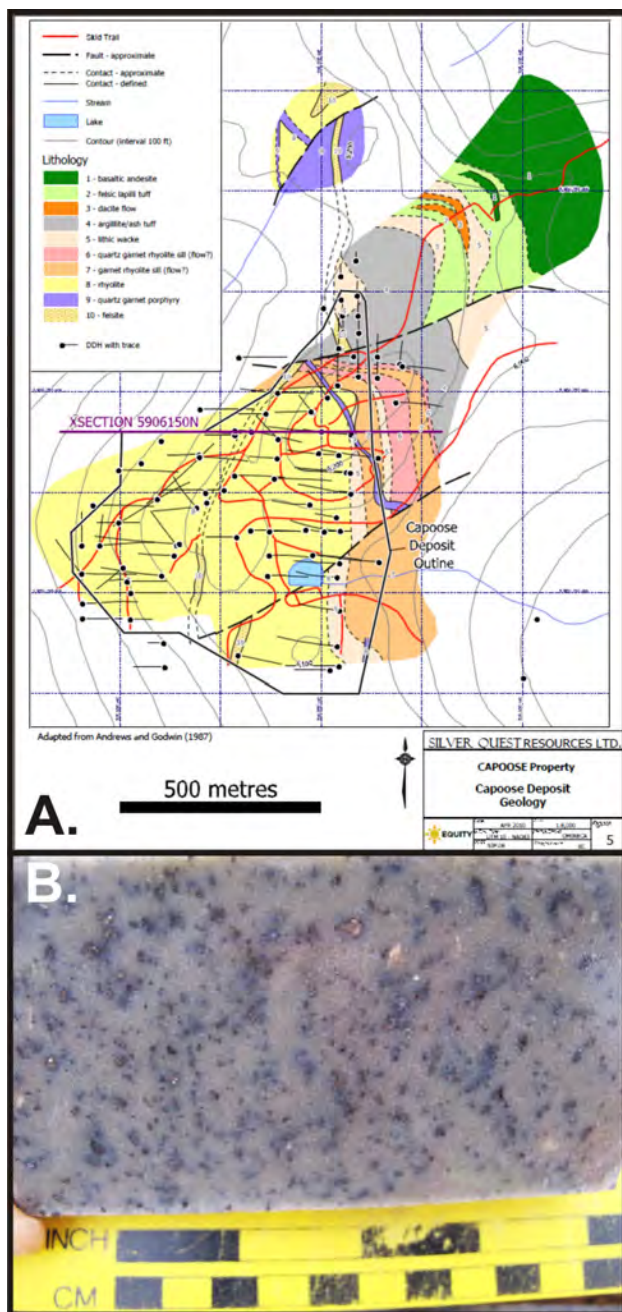


Figure 18. Capoose – **A.** Plan view of geology with historic drilling; from Silver Quest Resources Ltd 2010 technical report; **B.** D-13-194 at 512 m with galena-pyrrhotite-pyrite-sphalerite mineralization and trace garnet in undifferentiated silicified volcanic rock.

to the west below 300 m depth. Mineralization occurs as pyrite-sphalerite-galena-chalcopryrite-arsenopyrite disseminations, aggregates, and lesser veinlets. Gold grade increases toward structural intersections with northwest trending linears that are first derivative magnetic features. A late northeast dipping clay-altered rhyolite dike cuts mineralization, with later northeast trending faults offsetting the dike. TerraSpec analysis of alteration sericite crystal structure indicates higher temperatures than at the Blackwater deposit. Both

andradite and spessartine garnets occur with the magmatic-to-hydrothermal transitional early potassic assemblage and have been subsequently replaced by sulfide. These mineralogical features along with the proximal and coeval nature of the sills to the batholith and structurally confined mineralization suggest the Capoose deposit represents a deeper, hotter feeder system to a Blackwater-style deposit.

New Gold crews engaged in mapping the **Fawnie Regional** area were focused on the potential for various deposit types. Several historic showings have been documented in the area. At the **Fawnie** property, stratabound and breccia-hosted low-sulfidation epithermal showings (Buck, Malaput, and Fawn from east to west; MINFILE 093F 050, 056, 043) have been described with pyrite-sphalerite \pm galena, chalcopryrite, pyrrhotite, arsenopyrite, pyrrargyrite (Ag_3SbS_3) mineralization and silica-sericite \pm clay, carbonate, barite alteration. At the east margin of **Van Tine**, the Fawn 5 (MINFILE 093F 053) showing consists of copper-gold mineralized garnet-pyroxene-epidote skarn with minor sulfide in hornfelsed volcanics. Magnetite-rich iron skarn is also documented. Near the south margin of **Van Tine South**, the Wolf and Paw showings (MINFILE 093F 045, 052) host low-sulfidation Au-Ag epithermal and Cu-Mo porphyry style mineralization, respectively. Host rocks across the area include Hazelton Group volcanic and sedimentary rocks, felsic volcanoclastics, and Middle Eocene Ootsa Lake group rhyolites. Feldspar \pm quartz porphyry dikes or sills are associated with some of the epithermal showings (Buck, Wolf), as is proximity to the Laidman batholith (Malaput).

In late January, Independence Gold Corp announced the results of a 17-hole drilling program completed in November 2012 at the **3Ts** project, 15 km SSW of Mt. Davidson. Drilling tested the 230 m gap area that offsets the Mint and Ted veins, both N-S striking subvertical veins on the historic Tam property (MINFILE 093F 068). Seven holes followed up discovery hole TT12-64 and intersected the mineralized quartz-carbonate vein with grades up to 6.08 g/t Au, 62.0 g/t Ag across 10 m core length, including 28.5 g/t Au, 162 g/t Ag over 2 m in hole TT12-71. The Ted and Mint veins are thought to be segments of a single vein structure with an apparent right-lateral offset. The total strike length of the Ted-Mint vein is over 900 m and remains open at depth and along strike. Additional drilling tested the Ted and Mint vein beneath a gently dipping microdiorite sill that crosscuts the vein structure. Intercepts below the sill are generally between 250 - 330 m depth from the surface. Grades below the sill included 1.79 g/t Au, 3.0 g/t Ag over 2 m in the Mint vein and 0.69 g/t Au, 13.1 g/t Ag over 10.5 m in the Ted vein.

From February to April, an additional 12-hole drilling program tested the Ted-Mint gap area and Ted vein on the Tam property, and the Larry and Tommy vein structures on the historic Tsacha property (MINFILE 093F 055) about a kilometre to the west. Six holes were drilled in the Ted-Mint gap with the best intercept 50 m



Figure 19. 3Ts – **A.** Examining Ted Vein outcrop on Tam property; **B.** Ringer Zone boulder with crustiform and silicified lattice textures; **C.** TT13-80 at 259.7 m, Mint vein. Quartz-adularia vein with late calcite fill is mineralized with pyrite-chalcopyrite-galena-sphalerite and Ag sulfosalt. Grade from 253.0 to 264.3 m is 3.19 g/t Au, 33.5 g/t Ag.

along strike from TT12-71 grading 3.19 g/t Au, 33.5 g/t Ag over 11.3 m, including 15.77 g/t Au, 93.8 g/t Ag over 2.1 m. Drilling below the microdiorite sill in the Ted vein intercepted 1.11 g/t Au, 11.6 g/t Ag over 6.4 m. Three holes were drilled at the Larry vein returning a best grade of 2.09 g/t Au, 5.0 g/t Ag over 1.0 m. The Larry vein remains open along strike and at depth. At the Tommy vein, 200 m west of the Larry vein, only a partial intercept of the vein was recovered due to bad ground conditions. This graded 2.74 g/t Au, 45.7 g/t Ag over 6.7 m and is located 80 m along strike from 2005 hole TS05-108 that graded 10.89 g/t Au, 60.2 g/t Ag over 8.86 m.

In July, the company reported the results of an initial scoping-level metallurgical study on a composite sample of mineralized Ted-Mint vein material from the 2012 drilling that graded 2.28 g/t Au, 66.5 g/t Ag. A combination of gravity separation, flotation, and cyanide leaching yielded the best recovery at 97.3% Au, 94.9% Ag. On site, continued mapping, prospecting, and geochemical sampling aimed to determine the bedrock source areas for mineralized float boulders and develop additional drill targets, particularly west of the Tommy vein. Additional ground magnetic surveying expanded the existing coverage; the magnetic data is being used to identify fault structures.

The 3Ts property is underlain by Hazelton Group volcanics (Entiako Formation) less than 700 m north of an 8 x 2 km E-W trending granodiorite assigned to the Capoose Batholith. South of the pluton and the Blackwater River, local Oosta Lake volcanics give way to regionally extensive flood basalts of the Chilcotin Plateau. The 3Ts project is a low-sulfidation epithermal vein system hosted in rhyolite lapilli tuffs with more than a dozen mineralized veins, ranging up to 900 m in length and 20 m true width. The subvertical veins are N-S striking and appear to have formed by open space filling along faults within a roughly 1 x 3 km E-W elongate area. The veins have quartz-carbonate ± sericite-adularia-amethyst gangue cementing wall rock fragments, and feature open cavities, crustiform banding, and comb crystal structures. Brecciation-silicification appears to have been episodic and extends into bleached wall rocks for up to 10 m outside the veins. Mineralization occurs as pyrite and Cu-Ag sulfosalt disseminations and sooty hairline veinlets with accessory chalcopyrite-sphalerite-galena. A Late Cretaceous microdiorite sill cuts across the vein system and averages 80 m thickness. The current resource estimate for the combined Tommy, Ted, and Mint veins is:

- 3.61 Mt at 3.39 g/t Au, 85.15 g/t Ag - containing 11 181 kg (394 383 oz) Au, 280 380 kg (9.89 Moz) Ag (Inferred).

This Inferred resource does not include 2012-13 drilling results. The bedrock source of mineralized vein boulder float in the Ringer Target area and other parts of the property remains unknown. Eight samples from the

Ringer Target boulders averaged 19.01 g/t Au, 140.1 g/t Ag.

In January, Parlane Resource Corp reported the results of a 6-hole drilling program completed in 2012 at **Big Bear**, 19 km north of Mt. Davidson, which tested moderate-high chargeability targets with coincident geochemically anomalous soils near the claim boundary with New Gold Inc. Two holes returned several mineralized intercepts at the Black Bear anomaly. Hole BB12-4 averaged 0.26 g/t Au, 2.67 g/t Ag, 0.21% Zn over its 330.7 m entirety, including 2.14 g/t Au, 12.64 g/t Ag, 0.76% Zn over 9 m at 195 m depth. Hole BB12-6, 200 m to the west, included a shallow intercept starting at 7 m depth of 0.67 g/t Au, 4.99 g/t Ag, 0.67% Zn over 8 m. Other target areas on the property include the 700 x 500 m Brown Bear anomaly, 2.6 km south of the Black Bear, with coincident Ag-Cu-Zn-Pb soil and strong chargeability anomalies; and the Medley Zone, west of Black Bear, where a north-trending silver-copper mineralized zone over 700 m is hosted in quartz-epidote veins at surface. The Black Bear anomaly is underlain by moderately northeast dipping intermediate-to-felsic fragmental Hazelton volcanics. It is located within a northwest-trending 2.8 km wide aeromagnetic high anomaly (first vertical derivative) between the Blackwater and Capoose deposits of New Gold Inc. Outcrop is limited.

In March, Venerable Ventures Ltd reported the results of the 2012 exploration program at the **Trout** property (MINFILE 093F 044), 60 km southwest of Vanderhoof. Four of seven priority targets were tested by trenching and a 10-hole drilling program. At the Camp zone, trenching returned two mineralized intervals up to 0.41 g/t Au over 21 m in vuggy silicified and brecciated volcanics, and drilling intercepted up to 0.33 g/t Au, 1.8 g/t Ag over 47.8 m. At the Camp (North) zone, 425 m to the northeast, trenching returned 2.13 g/t Au over 2 m from limited bedrock exposure. Mineralized drill intervals ranged up to 0.44 g/t Au, 2.4 g/t Ag over 16 m in a 300 x 200 m quartz cemented trachyte breccia unit that varies up to 27 m depth. The breccia target has a moderate IP resistivity signature and is open in three directions. Drilling at the Cap zone tested a 300 x 300 x 75 m chargeability-resistivity anomaly below 150 m depth and intercepted barren pyritic quartz feldspar porphyry which the company feels could be a driver of the epithermal system. Drilling in the Discovery zone returned 65.7 m of lower grade mineralization at 0.17 g/t Au, 2.2 g/t Ag. The Discovery and Camp zone showings are thought to occur within the fault-bounded Trout graben. Target areas follow the northeast and northwest boundaries of the graben over 2019 m in brecciated, silica-clay altered rhyodacitic-to-trachytic volcanic rocks of probable Late Cretaceous Kasalka Group. The Discovery Zone occurs at a mineralized contact between underlying volcanic breccia and overlying polymictic conglomerate. Banded chalcidonic quartz-adularia veins host very fine pyrite-argentite-gold.

At the end of 2012, RJK Explorations Ltd had completed a Phase-2 drilling program at **Blackwater East**, 18 km northeast of Mt. Davidson; and Phase-1 drilling at **Blackwater West**, 15 km southwest of Mt. Davidson. Three holes at Blackwater East followed up a high-grade silver intercept from 2012. The steeply northeast dipping, pyrite mineralized structure was again intersected but no economic values were returned. Further microscopic and X-ray examination of pulps from the high grade interval in BWE12-06 indicated that silver solder had been released from a compromised drill bit. At Blackwater West, drilling focused on two targets including a N-S trending area (1200 x 300-500 m) of coincident MMI soil geochemical and moderate-high chargeability anomalies called the West Grid 4. Two holes on the east and west margins of target returned anomalous Ag-Cu-Zn-Pb over 37 m and 136 m, including 23 g/t Ag, 0.22% Cu, 0.64% Zn, 0.12% Pb over 2 m. Following this program, the company decided to continue exploring the West Grid 4 target area. By March 2013, additional ground IP and magnetic survey was completed to close out the West Grid 4 anomaly on the north in preparation for Phase-2 drilling. By November, an additional three holes had been completed. The target area comprises gently dipping rhyolitic flows and crystal tuff overlying andesite, and is cut by steeply west and east dipping faults on either side of an apparent horst block.

In June, Redhill Resources Corp had completed a 13-hole drilling program at its **Aspen East** property, 34 km northeast of Mt. Davidson, to test ground IP anomalies generated in 2012 in the Chutanli and Leszek target areas, as well as historic IP anomalies. Drilling returned sub-economic values. Two higher grade intervals included 1.0 g/t Au, 0.26% Cu over 6 m. Clay-carbonate-pyrite altered volcanic rocks of the Hazelton Group included rhyodacite flows, felsic tuff, tuffaceous siltstone, and fault breccias. The company decided to stop drilling the area. Instead, a prospecting and sampling program was conducted on the northern part of the property where auriferous boulders have historically been reported and surface sampling has returned values up to 3.7 g/t Au. The Chutanli and Leszek zones are located within an apparent NNW trending fault block.

In mid January, Troymet Exploration Corp reported the results of a 16-hole reverse circulation drilling program at the **Key** property, 5 km south of Mt. Davidson. Four coincident IP and gold-in-soil anomalies were drilled including the Buzz, SGN, Blue, and P1A targets in the East Central Area. Ten holes were drilled on the northwest-trending Buzz anomaly west of the GN Fault. Hole RC-10 intersected a mineralized zone grading 0.38 g/t Au, 0.50 g/t Ag over 13.7 m starting at 3 m depth in subcrop. The zone remains open in three directions and at depth. Several anomalous intercepts of silver, zinc and molybdenum were also returned. East of the GN Fault at the NNW trending SGN anomaly, results from three IP survey lines suggested an east dipping structure. Two follow-up drill holes returned anomalous Au \pm Ag



Figure 20. Aspen East – Drilling on the Chutanli Zone target in early April, 2013.

intervals in silica-hematite altered andesite with quartz veining and pyrite. At the P1A VTEM anomaly on the GN Fault, two holes returned anomalous zinc in andesite. At the northeast-trending Blue anomaly near the East Fault, two holes were drilled that included a 1.34 g/t Ag, 0.12% Cu intercept over 23.2 m in hornfelsed volcanics with quartz veinlets and trace copper sulfide. The Key property is underlain by Hazelton Group volcanic rocks (Naglico Formation) and is cut by three NW-NNW trending faults (Valley Fault, GN Fault, and East Fault from west to east) and a NE trending cross fault. A 2012 technical report describes potential for Mo-Cu porphyry (West Central and East Central zones), epithermal Au-Ag (proximity to Blackwater and 3Ts), and massive vein sulfide (Ram claims on Tsacha Mountain; MINFILE 093F 069) deposit types. In November, the company entered an agreement to sell the property to New Gold Inc.

In late 2012, Deveron Resources Ltd conducted an initial grassroots exploration program at the **Nechako** property, 24 km north of Mt. Davidson, following up a 2010 airborne geophysical survey that generated 13 target areas. Grids were established over eight of the targets in an area of limited outcrop. Two grab samples from a recently identified showing in Grid 10 returned 0.59 and 1.54 g/t Au, 51.2 and 85.7 g/t Ag with anomalous copper and zinc. Nearby soil sampling was also anomalous with the three highest samples ranging from 0.16 - 2.70 g/t Au,

121.5 - 225.2 ppm Cu. Two northwest-trending subvertical dacitic dikes (1 - 4 m wide) cut Middle Jurassic greywacke and volcanoclastic rocks. Pyrite-chalcopyrite-sphalerite mineralization is associated with quartz-carbonate/ankerite veins. A silt sample a kilometre downstream of the showing returned anomalous gold.

Kootenay Silver Inc engaged in grassroots prospecting, geochemical sampling and some geophysics on their **Copley** (MINFILE 093F 070) and **2 X Fred** properties, 63 km and 30 km southwest of Vanderhoof. At Copley, the roughly 200 x 100 x 50 m auriferous Smoking Pipe target dips to the west and remains open in three directions. Previous exploration on the property has suggested a large 7 x 2 km low-sulfidation epithermal system. Three northeast-trending topographic domes (Smoking Pipe, 45 Road and East Dome) are underlain by hydrothermally brecciated, silica and clay altered rhyolite of the Eocene Oostsa Lake Formation. Mineralization occurs near surface as disseminated and vein pyrite and appears to strengthen to the northeast.

In 2013, Amarc Resources Ltd, associated with Hunter Dickenson Inc (HDI), focused on relationship building with local communities and First Nations in regard to its **Galileo** project, a broad 1138 km² land package extending from 16 km to 62 km southwest of Mt. Davidson, surrounding the 3Ts project of Independence Gold Corp. The company began looking for a JV partner on the project as part of a capital conservation strategy responding to challenging equity market conditions. Airborne geophysical surveys over the property have identified several Au-Ag epithermal and Cu-Au porphyry targets for ground follow up. The company's other Blackwater District properties, **Hubble** and **Franklin**, are 44 km northeast and 21 km north of Mt. Davidson. In July, an agreement was announced wherein Geoscience BC would purchase airborne magnetic data from surveys recently flown over Galileo and Hubble. The data purchase extends the boundaries of the TREK airborne magnetic survey to the west and northwest.

At the end of March, Geoscience BC announced the launch of the **TREK** (Targeting Resources through Exploration and Knowledge) project. The multi-year, multi-disciplinary project is focused on the northern interior plateau region of BC, overlapping with much of the Nechako Plateau district of the Omineca region. Project partners include the BC Geological Survey (Ministry of Energy and Mines), Mineral Deposit Research Unit (UBC), PK Geophysics, and Noble Exploration Services Ltd. The \$3.9 M Phase-1 of the project covers 20 000 km² and includes updates to airborne geophysics, regional geochemical sampling (stream, lake, soil, till), biogeochemical sampling, geological mapping, mineral deposit studies, and geothermal potential studies. Data from a fixed-wing geophysical survey flown over the TREK area in the summer and fall will be merged with the Amarc's Galileo and Hubble data and released publicly in early 2014. The BC Geological Survey collected over 800

geochemical samples in 2013 and is producing a basal till map (first derivative glacial till) for the area to assist future exploration. Mineral discoveries in previous regional mapping programs by the BC Geological Survey (Diakow and Webster, 1997) include the Tsacha Au-Ag epithermal vein system at the 3Ts property, and the Malaput showing now within the Fawnie project of New Gold Inc. The plateau region is considered a challenging area for mineral exploration due to complex geology and an abundance of glacial till and Miocene basalt that blankets prospective lithology. However, the recent success at Blackwater has highlighted the area's mineral potential.

Toodoggone District (Stikine Terrane)

At the **JD** project (MINFILE 094E 171), 54 km northwest of past producer Kemess South, Tower Resources Ltd followed up results from their 2012 Phase-1 drilling program in the historic Finn Zone that returned 48 near surface gold-silver mineralized intervals ranging from 0.31 - 9.49 g/t Au, 0.10 - 64.54 g/t Ag over widths of 1.0 - 31.5 m. Step-out drilling had extended the gently-to-moderately NNE dipping tabular mineralized zone 350 m to the north and eastward into the footwall of the controlling structure.

In February, the company reported widespread mineralization beyond the Finn Zone indicated by extensive geochemical sampling in 2012. The soil sampling program defined the Finn zone at values above 200 ppb Au over a width of 1.2 km. Other areas where gold-in-soil anomalies were identified included: the Creek zone (2.7 km west of the Finn zone), the Wolf zone (1.5 km west of the Finn zone), the Schmitt zone (1.3 km northwest of the Finn zone), and the Crown/Tarn zone (1.5 km southwest of the Finn Zone). A contiguous soil anomaly extends 2.2 km between the Wolf and Finn zones, including the AG Carbonate zone (920 m west of the Finn zone), and could represent a western extension of Finn Zone mineralization. New anomalies were identified between the Creek and Wolf zones, 500 m north of the Creek zone, 1.3 km north of the Wolf zone, and 1.3 km southeast of the Finn Zone. Mineralized outcrop was sampled over a 3.0 x 1.7 km area with anomalous soil geochemistry. Two new target areas, the Wolf zone and MVT zone (630 m southwest of the Finn zone) were identified. A grab sample of quartz-carbonate stockwork veining from a historic trench at the Wolf zone returned 35.4 g/t Au, 44.8 g/t Ag. The MVT zone features 300 m of structurally hosted gold-silver mineralization within historic trenching. A 1.5 m chip sample assayed 7.59 g/t Au, 16.6 g/t Ag. Select grab samples from oxidized silicified breccias at the Ag Carbonate and Schmitt zones also returned near half ounce gold values.

In July, a follow-up drill program was conducted to test areas peripheral to the Finn zone where mineralization remains open, and to determine its continuity along the controlling structure. An IP survey was also completed over a 2 x 1.6 km area to investigate

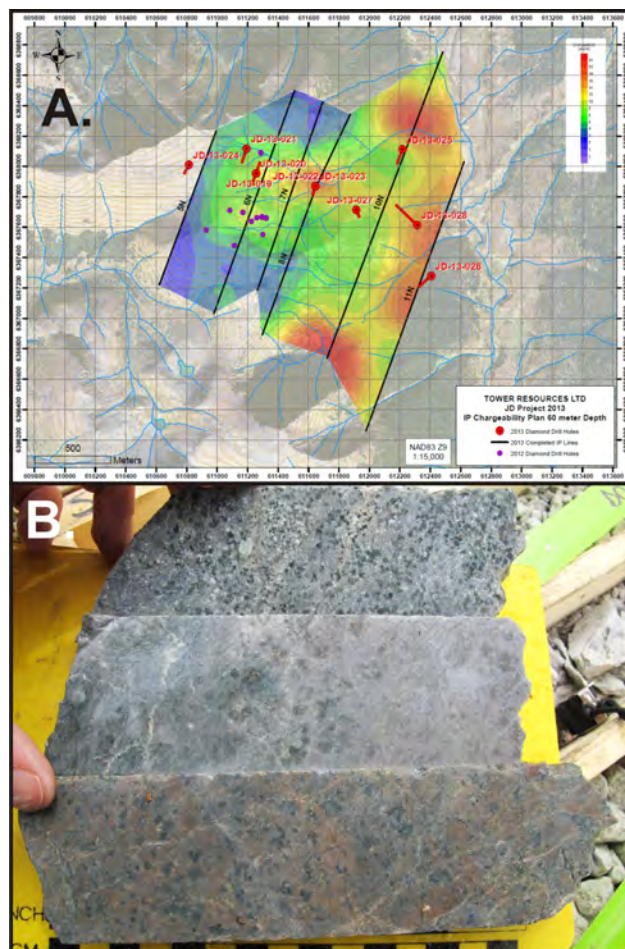


Figure 21. JD – A. IP Chargeability plan to 60 m depth with drillhole locations; Tower Resources Ltd; **B.** Comparing alteration in samples of JD-13-025 from 150 - 220 m (top to bottom) in porphyritic latite/andesite of apparent Takla Group. Potassic alteration (K-feldspar, biotite, magnetite) increases downhole after 205 m with chalcopyrite evident at 228 m.

the potential for mineralization at depth. Eleven total NNE oriented IP lines were run across the Finn zone at 200 m spacing, upslope of the zone, and down-slope to the southeast below the zone at 400 m spacing where a ring-shaped multi-element (Cu-Au-Ag-Te-Bi-Sb) soil anomaly surrounds a magnetic high anomaly (800 x 800 m). The first three holes were drilled to expand the Finn zone to the north and at depth, and to infill the gap between the Finn zone and the 2012 north extension hole. Anomalous gold, silver and copper intervals were returned. West of the Finn zone by 400 m, mineralization grading 2.89 g/t Au, 32.5 g/t Ag over 7 m was intercepted at the modelled depth in an area of historic trenching. The system remains open to the west toward the Ag Carbonate zone. Drilling then moved down-slope of the Finn Zone where low grade historic step-outs suggest fault displacement of mineralization. Two holes tested a down-drop of the Finn zone to the east. One drill hole intercepted footwall-style mineralization at anomalous values within a chargeability anomaly. The other was collared on a northeast striking

cross ridge in hanging wall rock and drilled to locate the controlling unit but ended short. Further down-slope over 900 m southeast of historic drilling, the last three holes tested a deep chargeability high partially coincident with the combined magnetic/soil anomaly along an 850 m N-S strike length. Hole JD-13-25 intercepted porphyry-style phyllic and potassic alteration over 200 m and 10 m respectively with disseminated and vein hosted pyrite \pm chalcopyrite in augite phyrlic volcanics of apparent Takla Group. The hole bottomed in 1.4 m of mineralization grading 0.47% Cu, 3.4 g/t Ag. The holes to the south encountered widespread phyllic alteration, copper anomalism, and a short interval of 6.03 g/t Au over 2 m.

As part of a Multi-Year Area Based permit received in June, the company obtained approval to complete a 34 km road upgrade through Lawyers Pass, bridge installation at the Toodoggone River crossing, and an additional 24 km of new road construction up the Moosehorn valley to the property. This would eliminate the high cost of helicopter supported exploration. In addition, 30 000 m of drilling approved over 5 years will enable the company to develop a long term strategy and drill test many of the identified target areas.

In September, Tower reported the results of preliminary metallurgical test work done on a composite sample from the Finn zone grading 1.25 g/t Au, 24.70 g/t Ag. The sample was selected from low-to-moderate grade material with variable alteration and lithology. Results indicated high recoveries of gold and silver can be attained by conventional cyanide leach and sulfide flotation methods. Follow up test work on the higher grade material was planned.

The Finn zone lies within a southeast facing cirque valley at the east end of a 2.8 km ENE trending ridge on the JD property. It is underlain by plagioclase porphyritic andesite, latite, and crystal tuff of the Lower Jurassic Toodoggone Formation (Metsantan Member). Mineralization is focused along a gently-to-moderately NNE dipping polymict volcanic breccia unit that locally crops out at surface and could represent an unconformity in the volcanic stratigraphy and/or a reverse fault. Within the tabular body, pyrite-sphalerite-galena \pm chalcopyrite is hosted in silica-sericite-clay altered hydrothermal breccias and quartz-calcite veins. Pyrite-sericite-chlorite alteration occurs peripherally and in the footwall of the zone with vein hosted sphalerite-galena. The company believes the JD property has discovery potential for a low grade, bulk tonnage epithermal Au-Ag deposit, and also for Cu-Au porphyry mineralization lower in the sequence towards McClair Creek.

In August, Guardsmen Resources conducted a soil geochemical survey at the **Ranch** property, 64 km northwest of past producer Kemess South. The survey consisted of an E-W elongate 1200 x 700 m grid to infill historic soil sampling on the south flank of Albert's Hump. Grassroots reconnaissance work was also carried out on other showings in the area. Nineteen showings,

prospects, developed prospects and small-scale past producers occur within the 25 km² property (MINFILE 094E 079, 099, 191). In general terms, high sulfidation Au \pm Ag-Cu mineralization, often associated with barite, occurs in NW-SE trending steeply dipping to subvertical zones that are thought to be fault related. Intense vuggy silica-clay \pm alunite alteration, local brecciation, and outward argillization are also present. An NI 43-101 technical report released in May 2012 recommends additional drilling, trenching, and deep penetrating 3D-IP. The area is underlain by dacitic and andesitic rocks of the Toodoggone volcanics, Adoogacho and Metsantan Members.

Cache Creek Terrane

In September, private company 0902744 B.C. Ltd resumed trenching at the **Green Gold** property, 36 km southwest of Prince George, to follow up a 2012 airborne geophysical survey. Three 50 m long trenches and test pits were excavated within a 100 m long northwest-trending target area near Henry Lake. Test-pitting was also done to the northwest in the Kellogg Creek area. Clay-rich zones with quartz vein fragments and silicified volcanics were encountered, similar to material from the 2011 discovery trench. The zone can be followed for over 200 m. Twenty kilometres southeast at the **PG** property (41 km southwest of Prince George) Porpoise Bay Minerals Ltd continued exploring a gold-in-soil geochemical anomaly that returned assays up to 0.6 g/t Au in 2011. Eight or more test pits were dug to test for extensions to mineralized bedrock zones with gold bearing quartz. Both properties are located within the Pinchi Fault zone, 2 - 3 km southwest of Takla Group volcanoclastics of the Quesnel terrane. Green Gold is underlain by basalt, limestone and fine clastic rocks of the Pennsylvanian to Triassic Cache Creek Complex, and PG by serpentinitized ultramafics and fine clastics. Rare outcrops of quartz-carbonate-sericite altered rocks and listwanite have been observed in the predominantly till covered area.

Quesnel Terrane

Angel Jade Mines Ltd continued trenching to bedrock and sampling at **Blackjack**, 78 km west of Mackenzie near Porcupine Lake. Test pits were excavated and sampled at **Jackfish**, 103 km northwest of Mackenzie in the Germansen River area. These properties are located in a well-established placer gold district immediately west of the Manson Fault zone. Trenching and test pitting was also completed at the **GPV** property, 125 km NNW of Fort St. James near Indata Lake in the Pinchi Fault zone. The company focused more on their placer operations in 2013.



Figure 22. Green Gold – Trenching to bedrock in the Pinchi Fault zone, 36 km southwest of Prince George.

Cariboo/Cassiar and Slide Mountain Terranes

Canasil Resources Inc carried out assessment work to follow up remote sensing anomalies on their **Lil** property (MINFILE 094C 079), 198 km northwest of Mackenzie at the southeast end of the Lay Range in the Cassiar terrane. Narrow argentiferous quartz veins and breccia zones extending for 300 m are hosted in quartzite and a granitic dike near fault intersections. Silver mineralization consists of argentite, pyrrargyrite [Ag_3SbS_3] and fribergite [$(\text{Ag}, \text{Cu}, \text{Fe})_{12}(\text{Sb}, \text{As})_4\text{S}_{13}$]. The property has potential for a high-grade silver vein/breccia deposit as well as carbonate replacement mineralization. It lies along the east margin of the Manson Fault zone and is underlain by fine clastic rocks of the Swannell Formation (Ingenika Group). Fault contacts with Ordovician to Lower Devonian dolomites (Echo Lake Group) and Upper Devonian to Permian siliclastics (Big Creek Group) lie immediately to the west and south. The Early Jurassic Polaris ultramafic complex lies 2.2 km to the southwest.

Other grassroots programs included Saville Resources Inc at their **Wolf** property, 97 km WNW of Mackenzie in the Manson Fault zone where prospecting along a 2012 soil anomaly looked for extensions of a gold and silver-bearing galena vein. The area is underlain by Early Mississippian to Late Permian Wolf Ridge gabbro/diorite and Nina Creek Group siliclastics of the Slide Mountain terrane. Killdeer Minerals Inc at their **Osilinka** property, 144 km northwest of Mackenzie, did preliminary soil sampling near the Childhood Dream prospect (MINFILE 094C 029) where massive pyrite with galena and sphalerite occurs as breccia infillings and replacement mineralization along a steeply dipping fault

in Middle Ordovician to Early Devonian dolomites (Echo Lake Group) of the Cassiar terrane.

SEDIMENTARY EXHALATIVE (SEDEX) PROJECTS

The Kechika Trough is a regionally elongate southern extension of the Paleozoic Selwyn Basin of the Yukon and Northwest Territories, a prolific sedimentary basin for Ordovician to Early Devonian sedimentary exhalative (SEDEX) deposits. The **Akie**, **Cirque** and **Kechika Regional** projects together comprise mineral claim blocks extending over 135 km following northwest-trending panels of siliceous and carbonaceous shale of the Devonian-Mississippian Gunsteel Formation (Earn Group) within the Ancestral North American margin. The Gunsteel shale panels are preserved in a series of thrust plates and synformal keels of northwest-trending regional folds and are thus repeated from west to east. A broad antiform fold structure defines the Akie property, and the southwest limb of this structure hosts the Cardiac Creek deposit. Cross structures appear to offset blocks of stratigraphy. The Cirque deposit occurs within a separate, more west-lying panel of Gunsteel shale, and also lies along the southwest limb of an anticline. The deposits are thought to have originally formed from vent activity along regional growth faults in second order sub-basins within the Kechika Trough, bounded on the northeast by Early-to-Middle Devonian platform reefs, as represented by the regional Kwadacha limestone (MacIntyre, 1998).

Ancestral North America

At the end of 2012, Canada Zinc Metals Corp (CZM) reported the results of a hydrogeochemistry program at their **Akie** (MINFILE 094F 031), **Pie** (MINFILE 094F 023), and **Mt. Alcock** (MINFILE 094F 015) properties. The Akie property is located 251 km NNW of Mackenzie in the Kechika Trough. Pie and Mt. Alcock are 11 km and 48 km northwest of Akie. The hydrogeochemical survey technique provides real-time results for visually measuring elevated sulphate downstream of baritic mineral occurrences. The program tested primary, secondary, and select tertiary drainages that cross prospective Gunsteel Formation shale. On the Akie property, anomalous $\text{Zn} \pm \text{Pb}$ signatures came from Silver Creek and the GPS showing. On the Pie property, the north end of Central Pie showed anomalous signatures and elevated sulphate, whereas the West Pie target was more moderate. At Mt. Alcock, anomalous sulphate and zinc values were associated with an eastern panel of Gunsteel Formation shale and the Main Barite showing. Follow-up sampling was planned within tertiary drainages to pinpoint sulphate sources and metal anomalies.

In February, CZM reported excellent correlation between known geology and conductivity response in the preliminary interpretive results of a deep-penetrating airborne VTEM survey flown by Geotech Ltd in 2012. Results show the Gunsteel Formation shale and western

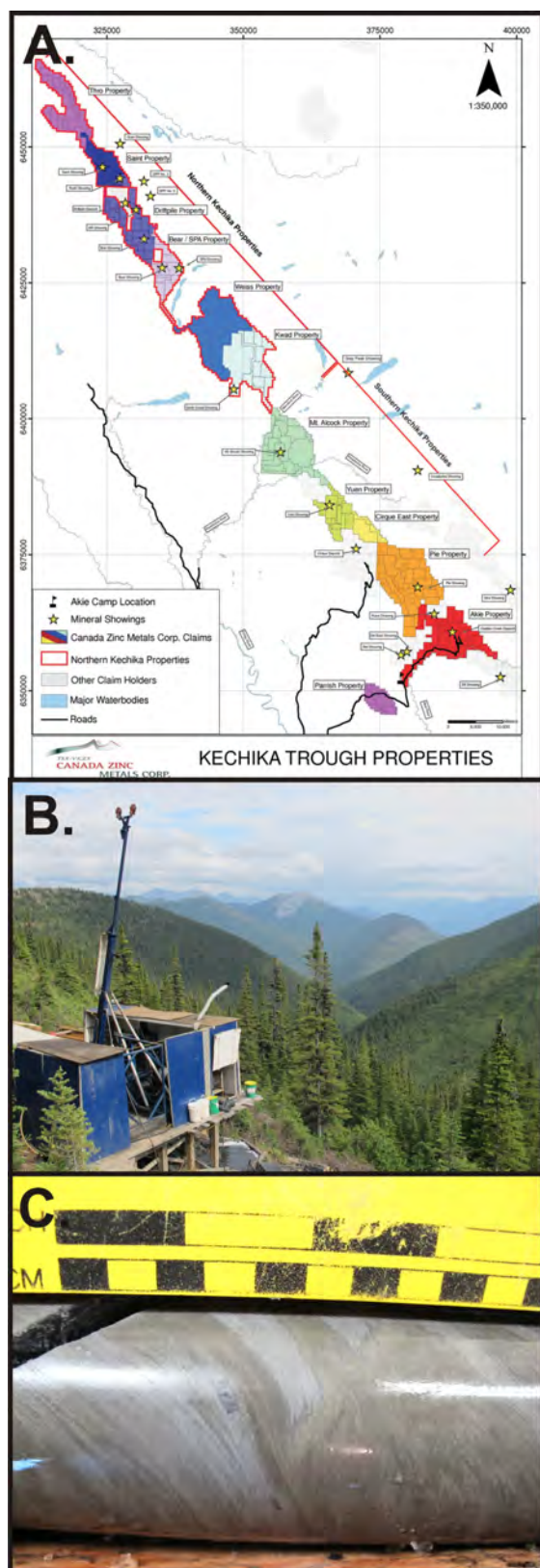


Figure 23. Akie – A. Plan view of Kechika Regional and Akie properties extending over 135 km; Canada Zinc Metals Corp. The Yuen, Cirque East, and Pie properties have been optioned to Teck Resources Ltd. **B.** Drilling at the North Lead Anomaly; **C.** Cardiac Creek drillhole A-13-105 at 400 m with fine-grained grey sphalerite and pyrite banding.

thrust panel on Akie and Pie properties are both distinct conductors. The Mt. Alcock results indicate greater structural complexity than prevailing mapping suggests, and a prominent EM lineation southeast of the Main Barite showing outside historical exploration. Comprehensive analysis and interpretation of the VTEM data was then completed by Condor Consulting Inc, and a deposit signature defined from the geophysical response of the Cardiac Creek deposit and other mineralized occurrences. This work indicates mineralization occurs in areas of elevated conductivity with coincident magnetic lows. The analysis generated 25 high ranking target areas. On the Akie property these included areas northwest and southeast of the Cardiac Creek deposit, the eastern panel of Gunsteel Formation, the South Zinc anomaly, and the eastern side of Silver Creek; on the Pie property, the GPS showing and the West Pie target; and on the Mt. Alcock property, northwest of the Main zone. Many of these target areas remain untested. The Condor Consulting interpretation was then combined with a digital GIS compilation for the three properties to generate high priority targets for 2013. The GIS compilation began in November 2012 and combines recent data with historic geological, geochemical, geophysical, and drilling data from over 35 years of assessment reports in the Kechika Trough, and is completed for the key properties.

In May, CZM received multi-year exploration permits for the **Yuen** (MINFILE 094F 013) and **North Kechika Regional** properties. The North Kechika Regional properties, 12 - 71 km NNW of Mt. Alcock, include **Kwad** (MINFILE 094F 021), **Weiss**, **Bear/Spa** (MINFILE 094F 024, 003), **Driftpile South** (MINFILE 094K 066, 085), **Saint** (MINFILE 094K 068), and **Thro**. Yuen, 20 km northwest of Pie, has seen little exploration since 1979 - 1981 when limited drilling tested soil anomalies. The other properties are similarly under-explored since that time. Drill targets are being developed through the digital GIS compilation program. With extensions on existing multi-year permits and a new exploration camp planned for Mt. Alcock, CZM is developing a long-term exploration strategy.

Exploration in 2013 started with a 2795 line-km expansion of the airborne VTEM survey to include the remaining eight core properties of the **Kechika Regional** group at 200 m line spacing. The process of combining historical data with the VTEM survey results for target generation is to continue regionally. The hydrogeochemistry program also continued from 2012 and focused on identifying anomalous areas in the under-explored **Kwad** and **Weiss** properties 12 - 23 km NNW of Mt. Alcock. Several prominent anomalous trends were identified in the field.

A 9-hole exploration drilling program on the **Akie** property tested the:

- down-dip extension of the GPS showing (West Akie GPS zone) in an interpreted western panel of Gunsteel Formation shale;

- down-dip extension of mineralization at the North Lead Anomaly, a 1000 x 200 m lead-in-soil anomaly 2.3 km northwest of the Cardiac Creek deposit;
- South Zinc Anomaly, a 1700 x 300 m zinc-cadmium anomaly southeast of the Cardiac Creek deposit that coincides with VTEM geophysical targets;
- and northwest and southeast margins of the Cardiac Creek deposit to infill and expand known mineralization.

Two holes in the West Akie GPS zone intersected Earn Group black shale with minor nodular-to-laminar barite and bedded pyrite, and narrow zones of anomalous Zn-Pb \pm Ni, Tl. One hole in the North Lead Anomaly intersected Gunsteel Formation shale with thick intervals of laminar-to-bedded pyrite and nodular barite. Assays of 0.19 - 0.24% Zn+Pb, 1.70 - 2.43 g/t Ag were returned over three intervals ranging from 27.8 - 75.3 m width. Mineralization-style is similar to Cardiac Creek and shows continuity along strike and down-dip. Drilling in the South Zinc Anomaly returned a 0.5 m interval of 'Nick-Style' mineralization assaying 0.4% Zn, 0.9% Ni with anomalous Pb, Mo, As, U, V, P, La, Cr, Hg, and Se at the contact between Kwadacha Limestone and Road River Group siltstone. The samples were rerun to assess gold and PGE potential. Drilling at the margins of the Cardiac Creek deposit demonstrated the continuity of high-grade mineralization in a thick package of Gunsteel Formation shale. In the southeast, a 40.1 m interval returned 3.24% Zn+Pb, 5.35 g/t Ag (including 8.89% Zn+Pb, 11.09 g/t Ag over 6.0 m). In the northwest up-dip portion of the deposit, a 10.6 m interval returned 7.53% Zn+Pb, 10.70 g/t Ag (including 10.53% Zn+Pb, 13.69 g/t Ag over 6.6 m). In addition, a similar 1.2 m interval of Nick Style mineralization was encountered. Widely-spaced intercepts of this mineralization in three separate holes suggests it could be continuous across the property associated with the subjacent Paul River Formation rocks.

Soil sampling in 2013 comprised four separate grids on Akie and two grids on Mt. Alcock covering 24 km² in total. At **Akie**, extensive sampling in the South Zinc Anomaly covered VTEM anomalies in a more flat-lying eastern panel of Gunsteel Formation shale. A prominent zinc-lead anomaly (2.25 km x 600 m) was defined. Sampling southeast of the GPS barite showing identified a large Pb-Th-Mo \pm Zn-Ba-Ag anomalous zone (1.3 km x 300 m) in black shale. Three soil lines at the Cardiac Creek deposit were designed to test different soil horizons and lab techniques for refining the geochemical signature of known mineralization. At **Mt. Alcock**, sampling covered VTEM anomalies along strike of the Main Barite showing and expanded the historic zinc-lead anomaly to 3.25 km x 600 m. Geologic mapping was completed with soil work across the Akie targets, and also

on the **Weiss**, **Kwad**, and **Mt. Alcock** properties in areas of high potential.

In August, the company announced a new discovery called the **Sitka** showing within the eastern panel of Gunsteel Formation shale at Akie. Massive barite with coarse galena and sphalerite was found in a locally brecciated 6 m-wide vein or fault structure near the Silurian siltstone thrust contact. A similar 3 m-wide structure is located 10 m northeast. Rock saw channel sampling, detailed mapping and soil sampling along strike of the showing followed. Anomalous assay results suggest another northwest-trending baritic SEDEX horizon and included four channel samples ranging from 0.6 - 5.1% Zn and up to 1.8% Pb, 4.0 g/t Ag over 0.7 - 2.4 m width. Thirteen grab samples collected within a 2.1 km strike length of the showing returned values of 1.6 - 43.55% Zn, 2.2 - 48.95% Pb, and anomalous silver. Mineralization extends beyond the structures into host rock and remains open in all directions. An open-ended linear silver anomaly (1.4 km x 300 m) is evident in soils down-slope from the showing in the Silver Creek grid which may link to another anomalous silver trend a kilometre to the southeast along strike.

In September, the company announced an option agreement with Teck Resources Ltd wherein Teck could gain up to 70% interest in the **Pie**, **Cirque East** and **Yuen** properties of the **South Kechika Regional** group. The properties lie 9 km southeast, 5 km NNW, and 11 km northwest of the adjacent Cirque property of Teck and Korea Zinc within a mountainous block bound by the Kwadacha River on the north and Del Creek on the south. The companies will form a joint venture with Teck as exploration manager and operator. Teck commenced exploration on the properties by early October.

The Cardiac Creek deposit is zone of baritic zinc-lead-silver SEDEX mineralization within the **Akie** property. It is a moderate-to-steeply southwest dipping tabular mineralized body that extends over 1300 m of strike length, at least 800 m below surface, and averages 20 m in thickness. The deposit remains open in all directions. At a 5% zinc cut-off, the current resource estimate is:

- 12.7 Mt at 8.4% Zn, 1.7% Pb and 13.7 g/t Ag - containing 1067 Mkg (2352 Mlbs) Zn, 214 Mkg (472 Mlbs) Pb, and 158 620 kg (5.6 Moz) Ag (Indicated);
- 16.3 Mt at 7.4% Zn, 1.3% Pb and 11.6 g/t Ag - containing 1202 Mkg (2650 Mlbs) Zn, 218 Mkg (481 Mlbs) Pb and 171 600 kg (6.1 Moz) Ag (Inferred).

Mineralization is characterized by a top down stratiform sequence of: fine nodular barite; fine banded barite-pyrite; fine banded proximal pyrite (0.5 - 3% Zn); grey-white sphalerite bands with pyrite (up to 10% Zn); mottled sphalerite-galena-pyrite with increasing barite-calcite; bedded to massive barite. The company has an approved underground exploration permit and intends to

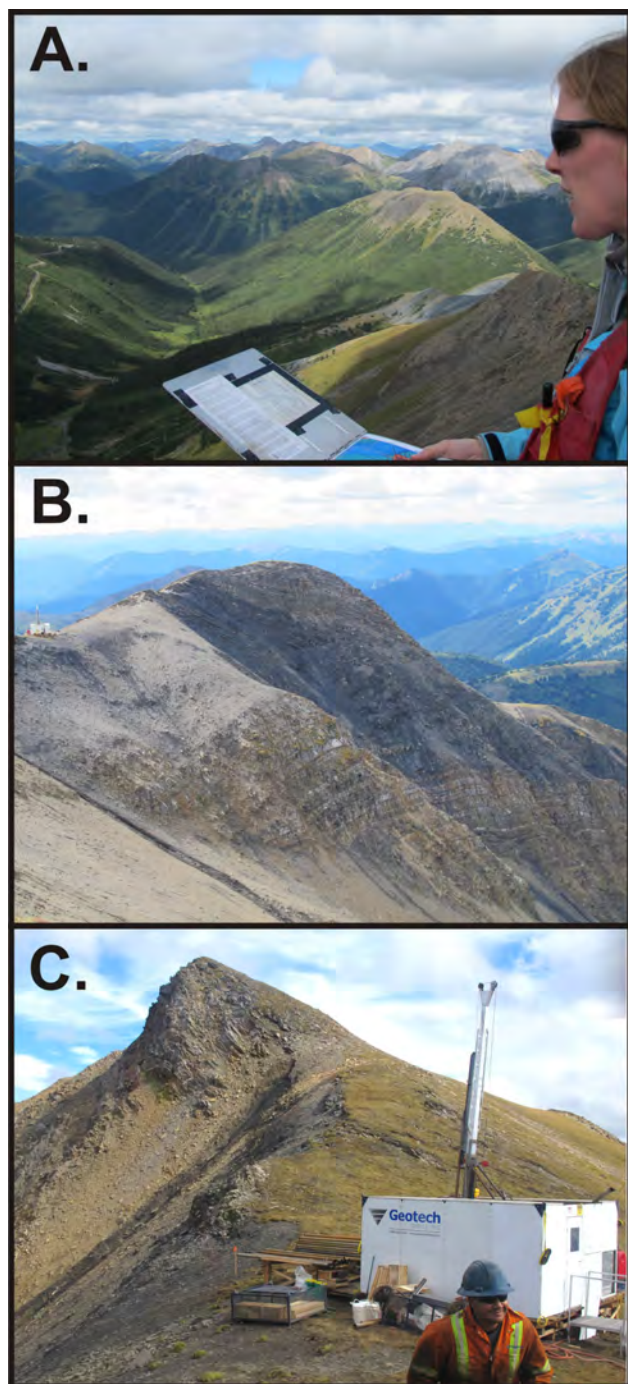


Figure 24. Cirque – A. Teck Resources Ltd project geologist overlooking North Cirque. Kwadacha limestone and Gunsteel Formation shale outcrops are in the background, view is to the northeast; B. Drilling deep target from saddle above Road River Group rocks at South Cirque. View is west; C. Same as previous but at the drill, looking south.

construct portal and waste rock storage sites in preparation for underground infill and expansion drilling. Environmental baseline studies are ongoing.

In 2013, Teck Resources Ltd returned to their **Cirque** property (MINFILE 094F 008), a joint venture with smelting company Korea Zinc Co Ltd. The last work on

the property, located 20 km northwest of Akie and 270 km NNW of Mackenzie, was in 1995 when a Prefeasibility study was completed for an open-pit mine operation with a 7.3 : 1 stripping ratio and reserves of 18.5 Mt at 8.1% Zn, 2.2% Pb. The 2013 program was the first year of a multi-year exploration program in the area, and re-establishing the Cirque camp demanded much of the first half of the season. This included replacing the cribbing for the bridge on Cirque Mine Road, installing a new bridge to camp, and a spur road upgrade. Two core drills were turning in mid August and focused on deep targets in the North Cirque and South Cirque deposit areas. Drill holes were planned between 550 - 1000 m in length. Three holes were completed, and downhole magnetics and resistivity was measured on two of these. New concepts were being tested including the possibility of a westward extension of mineralization at North Cirque cut off by steep faulting and down-dropped relative to the east beneath an overriding thrust plate of Ordovician and Silurian rocks. Drilling at South Cirque aimed to better define the shape (tabular or folded) and structural controls of that mineralized zone. The mapping program covered several areas of interest to improve understanding of stratigraphy and regional structure. Mapping coverage included a property-wide transect from South Cirque to the northeast part of the property informally called the Flying V zone; the Gap zone valley separating North and South Cirque, and one transect up Elk Creek. The soil geochemical survey program aimed to develop a multi-element baseline signature and verify historic soils data. Sampling covered North and South Cirque in NE-SW oriented lines, and a series of lines in the Flying V zone. The program was also extended to the companies' other Kechika Trough properties **Fluke** (MINFILE 094F 009) and **Elf** (MINFILE 094F 011), located 15 km and 32 km SSE of Cirque on either side of CZM's Akie property. Two lines on Fluke covered the Main showing, plus one to the southeast for baseline data. Several lines on Elf covered three lead anomalies (Ian Creek, Joel Creek and Big Elf) over a 5 km NW-SE trending area south of Akie River.

The North Cirque deposit is a moderately southwest dipping, east-tapering lensoid stratiform mineralized body that is 1000 x 300 m and up to 60 m thick. The northeastern margin is exposed at surface. Mineralization from highest to lowest grade is comprised of three major facies: pyritic, baritic, and laminar banded pyrite. The pyrite facies is dominant in the north part of the deposit and the baritic facies in the south. Previous work used metal grade distribution, metal ratios, and deposit thickness to suggest a feeder zone in the north (Pigage, 1986). However, in re-examining the structural setting and deposit characteristics, and looking for expansions, the company remains open to the possibility of an alternate feeder zone. The South Cirque deposit, a kilometre to the southeast, is a partially-delineated apparent tabular mineralized body with similar features to North Cirque, but does not outcrop at surface. The Fluke showing similarly comprises pyrite-sphalerite-galena

mineralization in a southwest-dipping panel of Gunsteel Formation shale within a structurally complex rock package.

Other grassroots exploration work in the Kechika Trough included a program by Asia Base Metals Inc at their **Gnome** zinc project (MINFILE 094F 016), 24 km southeast of Akie, and southeast of Elf. Mapping and sampling was completed in early 2013 followed by an updated geological report, data evaluation and assessment. Massive pyrite and three barite horizons in Gunsteel Formation shale have historically been reported.

ULTRAMAFIC-HOSTED PROJECTS

Cache Creek Terrane

In January, First Point Minerals Corp (FPM) received assay results for the last eight holes of the 34-hole drilling program conducted in 2012 at the **Decar** project (MINFILE 093K 039, 041, 072), 88 km northwest of Fort St. James. The project is managed and operated by Cliffs Natural Resources Exploration Canada Inc, an affiliate of Cliffs Natural Resources Inc. Cliffs has 60% interest in the project, and FPM has 40%. The drilling program was conducted by Caracle Creek International Consulting Inc. These final holes represented a northwest step-out of the Baptiste deposit, and a hydrological hole drilled outside the northeast boundary of the deposit. The NW extension drilling added 580 m to the strike length of mineralization, returning intervals grading between 0.116 - 0.152% DTR nickel over 220 - 492 m. Except for one hole where grades weakened below 360 m depth, the deeper holes were mineralized to at least 460 m depth. The zone narrows to a width of 150 m in the northwest corner but remains open. The 75 m vertical hydrological hole that stepped out from the northeast boundary returned 0.121% DTR nickel over 64.8 m.

In February, FPM released an updated resource estimate for the Baptiste deposit that would be incorporated into the PEA study. The resource was significantly increased and upgraded from the April 2012 estimate. At a cut-off grade of 0.06% Ni (DTR), the resource now stood at:

- 1159.5 Mt of 0.124% Ni (DTR) - containing 1437.8 Mkg (3169.7 Mlbs) Ni (Indicated);
- 870.4 Mt of 0.125% Ni (DTR) - containing 1088.0 Mkg (2398.6 Mlbs) Ni (Inferred).

The estimate, prepared by Caracle Creek, added data from 32 drill holes (16 347 m) completed in 2012, and was based on a total of 28 917 m drilling in 74 holes. The Davis Tube magnetically-recovered (DTR) method is an industry standard metallurgical test for magnetic recovery operations in which the magnetic component of a geological sample is separated and assayed. Nickel mineralization at the Decar property occurs as fine-grained pervasively disseminated nickel-iron alloy called awaruite (Ni_{2-3}Fe). Nickel is typically mined from Ni-sulfide magmatic deposits or lateritic nickel deposits

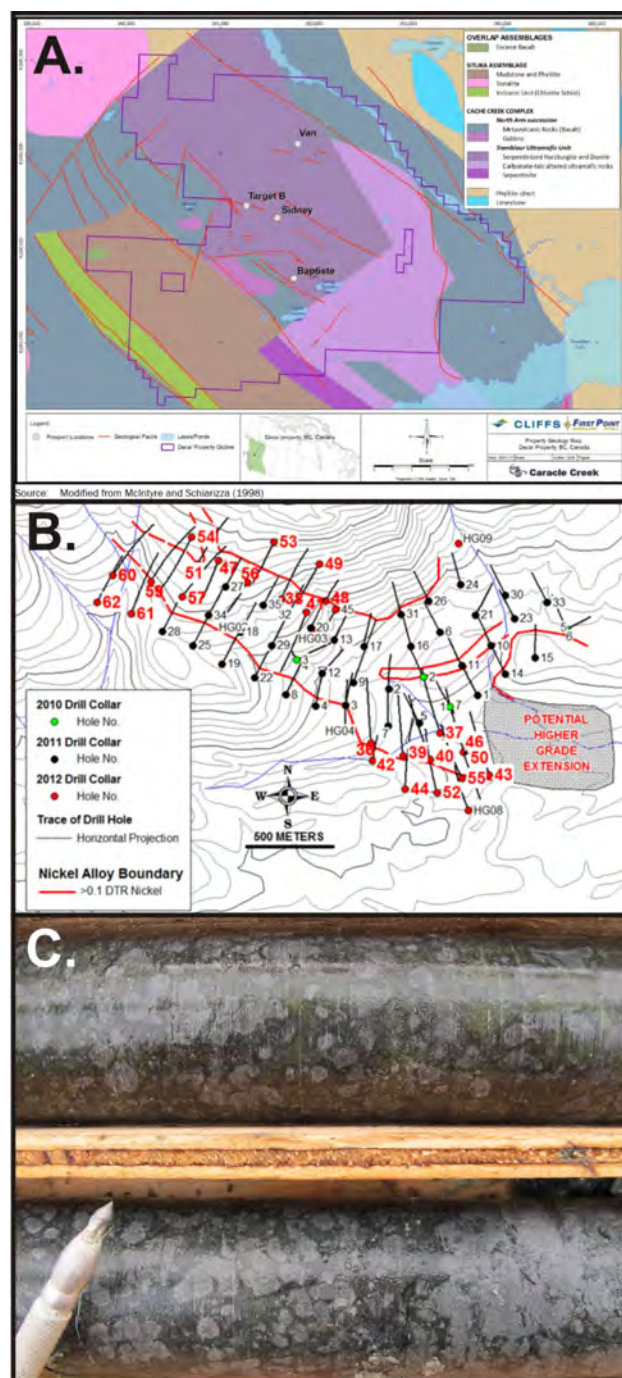


Figure 25. Decar – **A.** Property geology map from the 2013 Amended PEA report; Cliffs Natural Resources Exploration Canada Inc and First Point Minerals Corp; **B.** Baptiste 2012 drillhole location map; First Point Minerals Corp; **C.** 12-BAP-041 serpentinized peridotite with mottled pseudo-breccia texture and fine disseminated awaruite.

formed by tropical weathering of ultramafic rocks. The Decar project is the first to assess this Ni-Fe alloy as an economically viable mineral for commercial production.

In March, FPM announced the results of a positive PEA study prepared by Tetra Tech Inc. The PEA describes a greenfield open-pit mining operation with 114 000 t/d (40 Mt/y) milling rate that would produce an

average 82.4 Mlbs of nickel annually over a 24 year mine life. Processing would use on-site magnetic separation and gravity concentration, and conventional technology and equipment, to produce a 13.5% nickel concentrate with iron (45 - 50%) and chromium (about 2%) by-products. The mine as proposed would comprise a four-stage open-pit, progressing from east to west across the Baptist deposit at a low average stripping ratio of 0.17 : 1. The size of this ultimate pit design is 2.60 x 1.15 km, with a maximum depth of 970 m. The pit would capture only 730 Mt of the Indicated resource at 0.119% Ni (DTR), and 195 Mt of the Inferred resource at 0.114 Ni (DTR), leaving room for the mine to grow with improved economics. According to the proposed processing flow diagram, three balls mills would be required to process the material flow and 24 trains of magnetic separators are suggested. Knelson concentrators would recover the final nickel-rich component of the slurry. Water recovered from tailings would be recycled back to the process. The Tailings Management Facility (TMF) proposed site is in an alpine valley 2.5 km northwest of the plant site. It would contain 300 Mm³ of milled tailings from the first 19 years of operation. A quarry would be developed to supply rockfill material for ongoing TMF construction, and serve as a storage area for 110 Mm³ of tailings from the last 5 years of operation. A standard earthfill retention structure with low permeability core is proposed for the TMF. Similar to Mt. Milligan, the mine would have no waste rock dump as all excavated material from the open-pit and quarry would be used as construction material. A unique advantage of a metal alloy mine is that the tailings material has virtually no acid rock drainage potential.

Other requirements stated in the PEA include: a new bridge crossing near Dzitl'ainli (Middle River) and 7 km of new road connecting existing FSRs to reduce drive time from Fort St. James to two hours; a concentrate transload facility adjacent to the CN Railway near Middle River and 85 km of rail line improvement to Fort St. James; a 140 km power transmission line (230 kV) from the BC Hydro Glenannan substation; and a 275 person camp during operations to accommodate shift employees and 60% of staff employees. It is anticipated that 60% of employees would come from the Fort St. James area. The total project capital cost is estimated at \$2147 M.

To identify technical, economic, and marketing considerations for a non-conventional Ni-Fe alloy concentrate in the prevailing nickel market, Cliffs commissioned a Value-in-Use study and smelting test work. The first study concluded that a Decar product between 12.5 - 15.0% Ni could be a desired feed for any ferronickel plant, and is also suitable for sulfide smelters. In August, FPM sent a 6-tonne bulk sample for metallurgical testing and the production of a Ni-Fe-Cr concentrate. Preliminary lab scale smelting test results showed high-grade ferronickel could be produced from Decar concentrate on a stand-alone basis at 35 - 50% Ni with recoveries of 94 - 99% and 31 - 46% for nickel and iron, respectively. Blending of Decar concentrate with

laterite (saprolite-type) ore produced 17 - 19% Ni and 69 - 76% Fe with recoveries of 95 - 99% and 86 - 95% for nickel and iron. Chromium content was 1.4 - 1.9%. While demonstrating a Decar concentrate would be amenable with ferronickel processing, the tests also indicated that preparatory agglomeration or sintering would be required due to its fineness. In September, Cliffs elected to proceed with the Prefeasibility study phase, scheduled for completion by August 2015, and was determining the scope of work for 2014. On completion of the PFS, Cliffs would attain a 65% interest in the project.

The **Decar** property lies within the Late Pennsylvanian to Late Triassic Trembleur ultramafic complex, representing the upper mantle to lower crustal portion of an obducted ophiolite sequence in the oceanic Cache Creek terrane (Schiarezza and MacIntyre, 1998). The complex trends northwest and averages 15 km x 5.5 km in area. The peridotite (harzburgite) intrusive rock is in fault contact with two northwest-trending metavolcanic basalt panels of the Permian to Triassic Sitlika Assemblage. Two broad northwest-trending mineralized zones occur on the property, and within these are four zones of relatively coarse (50 - 500 µm) disseminated awaruite referred to as the Baptiste, Sydney, Target B, and Van targets. Below the southern flank of Mt. Sydney Williams, the Baptiste orebody consists of a large curved sub-vertical volume of tectonically foliated and serpentinitized peridotite. It is 3 km long, 600 - 1500 m wide and as deep as 600 m. Subvertical foliation is thought to parallel diffuse shear zones that developed prior to and during serpentinitization (the seawater alteration of olivine to hydrous minerals). Fine disseminated awaruite and magnetite are alteration products from the serpentinitization of nickeliferous olivine. Mineralization is continuous over the volume, particularly in the west and central parts, with highest grades trending NW-SE. The deposit remains open along strike in both directions, to the southeast in the central area, and at depth over the entire system. It is bound on the southwest by a northwest-trending subvertical fault and is cut by minor ENE trending barren gabbro dikes ranging from 2 - 15 m thickness. Overburden thickness averages 13.9 m.

SPECIALTY METAL PROJECTS

Cache Creek Terrane

In September, Teck Metals Ltd received the Jake McDonald Mine Reclamation Award for decommissioning and reclamation of the past producing **Pinchi** mercury mine (MINFILE 093K 049), 24 km NNW of Fort St. James, on the north side of Pinchi Lake. The Cominco operation was in production from 1940-44 as an underground mine, and again from 1968-75 as two open-pits. Reclamation commenced in 1996 and was completed in 2013. Monitoring of the site and surrounding area for environmental stability will be ongoing. The mine was located on a prominent limestone

hill and associated with a northwest-trending strand of the Pinchi fault called the South fault. Cinnabar ± stibnite mineralization occurred as open-space fillings and veinlets in breccia zones, and along bedding planes in dolomitized limestone and mica schist host rocks.

Ancestral North America

In late February, Taseko Mines Ltd reported that metallurgical tests on mineralized samples from their **Aley** niobium project (MINFILE 094B 027), 130 km north of Mackenzie, had succeeded in producing a niobium concentrate. Work in 2013 aimed at finalizing the process flowsheet for a Prefeasibility study, and baseline studies continued on site. The current resource estimate stands at:

- 286 Mt at 0.37% Nb₂O₅ - containing 739 Mkg of niobium (Measured and Indicated);
- 144 Mt at 0.32% Nb₂O₅ - containing 323 Mkg of niobium (Inferred).

The company envisions a long-life, low-cost mining operation. Niobium is used in the manufacture of corrosion-resistant, high-strength low alloy steels (HSLA) specifically used in green technologies, turbines, aerospace, automobiles, and oil and gas pipelines. Ferro-niobium (FeNb) prices fell modestly from about \$42 to as low as \$40/kg in 2013. There are only three major producers of FeNb worldwide accounting for about 99% of total reported production: two Brazilian companies and IAMGOLD which operates the Québec-based Niobec underground mine.

The Aley Carbonatite Complex is a 3 - 3.5 km ovoid-shaped alkalic ultramafic intrusion emplaced in Cambrian to Early Devonian sediments of the Northern Rocky Mountain fold and thrust belt, close to the Late Proterozoic rifted margin of ancestral North America. The carbonatite has been divided into a 50 - 200 m deep zone containing disseminations, aggregates and fragmented cumulate (phoscorite) bands of Nb-enriched magnetite-apatite-baddeleyite (ZrO₂)-forsterite ± pyrite, and a deeper sodic-calcic amphibole bearing zone to about 300 m depth. Niobium occurs in the minerals pyrochlore and columbite, and secondary fersmite. The intrusive has historically been divided into a rauhaugite (dolomitic carbonatite) core zone with local “sweats” of soivite (calcitic carbonatite), but petrographic work by the company suggests post-ore dolomitization occurred that remobilized niobium to a more uniform distribution and may have left relict soivite domains. Offshooting carbonatite dikes interfinger with an amphibolitic fenitized breccia zone that mantles the carbonatite intrusion, and some syenite xenoliths have been noted. Fenitization is a type of alkalic metasomatism associated with carbonatites. The deposit remains open at depth in the east and to the south. A noteworthy paper by D.F. McLeish and S.T. Johnston, published by the University of Victoria Library in 2013 as part of the McLeish M.Sc. thesis, suggests the carbonatite was emplaced as a syn-

kinematic sill during a Late Devonian compressive tectonic event, possibly a Cordilleran wide Antler orogeny. The carbonatite is presented as an overturned erosional remnant of the sill within a recumbent-folded crustal scale nappe.

INDUSTRIAL MINERAL PROJECTS

Slide Mountain Terrane

In June, Graymont Western Canada Inc, a subsidiary of Graymont Ltd, the second largest producer of lime (calcium oxide, CaO) in North America, announced it was conducting an Environmental Impact Assessment and consultation process in regard to building a lime plant and quarry at **Giscome** (MINFILE 093J 025), 34 km northeast of Prince George near Eaglet Lake. High quality limestone would be quarried and calcined (heated to about 1095°C) in lime kilns to produce high calcium quicklime. As a past producer, the Giscome quarry supplied high-calcium limestone to pulp mills in the area. The company first proposed the project in 2007 as a 600 000 t/y quarry operation to produce 200 000 t/y of lime from a single lime kiln. A potential later phase would add a second kiln, depending on market conditions. Close proximity to rail would enable the company to ship lime product from site to customers throughout Western Canada and the North. In December 2007 the company suspended the environmental assessment process due to concerns over tightening government policy around greenhouse gas emissions and offsetting. The original proposal used thermal coal to calcine the limestone. Graymont has since investigated other potential fuel sources including pulverized petroleum coke and wood waste biosolids. The company hopes to receive permitting approval in 2014, and envisions start of construction in early 2015 with production in 2016. A minimum 25 year mine life is expected. The property area is underlain by basaltic volcanics of the Mississippian to Permian Antler Formation of the Slide Mountain terrane, with fossiliferous limestone outcrops. High quality limestone grades of about 98% CaCO₃ have historically been reported. Quicklime is used as a chemical base and acid neutralizing agent in industrial and agricultural applications and requires limestone with less than 5% magnesium carbonate for its production. It is used in steel and specialty steel manufacturing, cement production, environmental and wastewater treatments, soil stabilization, as well as a component in the production of fibreglass, pulp and paper, and metals (aluminum, uranium, gold, copper).

OUTLOOK FOR 2014

Thompson Creek Metals Co Ltd will complete their first full year of production at the **Mt. Milligan Mine** in 2014, and final construction projects will be completed including a permanent residence at the mine and rail load-out facility in Mackenzie. The **Endako Mine** will

continue to optimize production activities and continue the Super Pit expansion. New Gold Inc will continue to move the **Blackwater** project through the EA and Mines Act Permit review stages, and decide on the sequencing of the Blackwater and Rainy River projects. AuRico Gold Inc will continue drilling at **Kemess East** to increase reserves and enhance the intrinsic value of the **Kemess Underground** project. Canada Zinc Metals Corp and Teck Resources Ltd will continue exploration for baritic SEDEX deposits in the Kechika Trough on their separate **Akie** and **Cirque** properties, and on joint venture projects. Cliffs Natural Resources Exploration Canada Inc will begin Prefeasibility level studies on the Baptiste deposit at **Decar**. Taseko Mines Ltd will advance the Prefeasibility work at **Aley**. There is considerable mineral potential across the region in a variety of commodities and several attractive projects with potential for further discovery. The success of the Mt. Milligan Mine and Blackwater projects could drive more grassroots and early-stage exploration in the Quesnel terrane and Nechako Plateau given improved venture capital accessibility. A forecast deficit in global zinc supply by 2020 will continue to drive exploration in the Kechika Trough.

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EXPLORATION AND MINING IN THE SKEENA REGION, BRITISH COLUMBIA

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Regional Geologist, Smithers

SUMMARY AND TRENDS

The Skeena Region experienced fair levels of mineral exploration and mining in 2013 (Map 1). Financial markets were not readily available to junior explorers resulting in tight budgets all around unless funding was achieved through private placement, line of credit or other methods of creative debt financing. Access to exploration capital through Initial Public Offerings and regular financing methods were severely constricted due to various global financial reasons. However, many junior explorers have shown their resilience by conserving cash, partnering with each other and major miners to execute high value – low cost projects to keep at least eighty-two projects active throughout the region. Total exploration expenditures were down by approximately 29.5% to \$201M (Fig. 1). Total metres drilled were also down approximately 30% to 249 420 m (Fig. 2). Mine development expenditure increased by 112% to \$282M. Hydro power plant and transmission line expenditures are estimated to be in excess of \$750M. These high levels of infrastructure development remain unprecedented for the region and confirm northwest BC remains a stable investment destination for responsible exploration and long term development.

2013 SIGNIFICANT EVENTS

1. Imperial Metals Red Chris Mine in full scale construction and on schedule to be commissioned by May 2014
2. Northwest Transmission Line and Iskut Extension construction continues aiming to meet the commissioning of Red Chris (Fig. 3)
3. Colorado Resources discovers alkalic copper-gold porphyry system at North ROK, ~ 15 km NW of Red Chris
 - Drill Hole NR13-001; 242 m grading 0.63% Cu and 0.63 g/t Au (Fig. 4)
4. Seabridge Gold confirms high grade copper-gold core zone at the Kerr deposit at their KSM project and submits Environmental Assessment application package to government
 - Best intercept: 640 m grading 0.85% Cu and 0.42 g/t Au (Fig. 5)
5. Pretium Resources discovers Cleopatra Vein and intercepts 69 intervals grading over 1000 g/t Au.
 - A feasibility study outlines probable reserves at 15.1 million tonnes grading 13.6 g/t Au and 11.0 g/t Ag from the Valley of the Kings deposit
 - A 10 000 tonne underground bulk sample returned 5865 ounces gold and 4950 ounces silver
6. Banks Island Gold starts underground bulk sampling at Yellow Giant

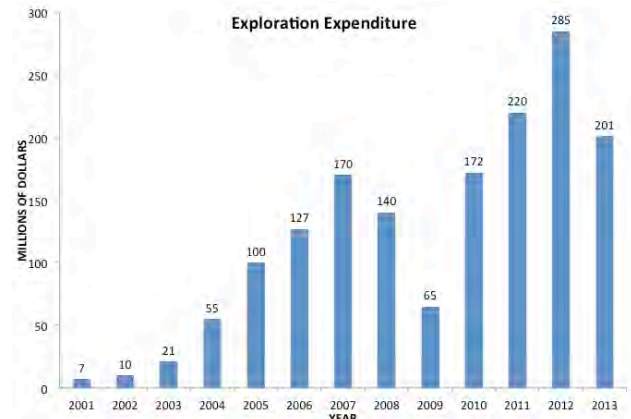


Figure 1. Estimated regional total exploration expenditures.

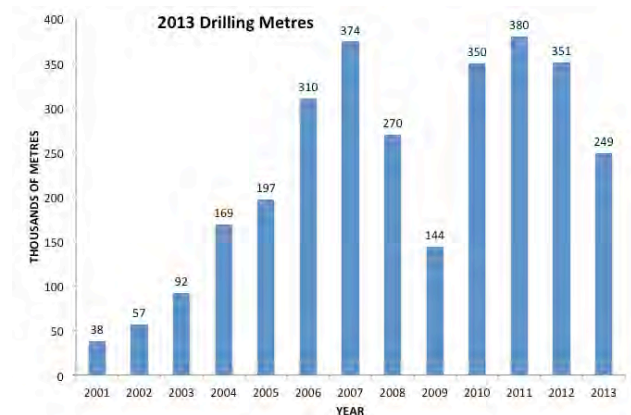
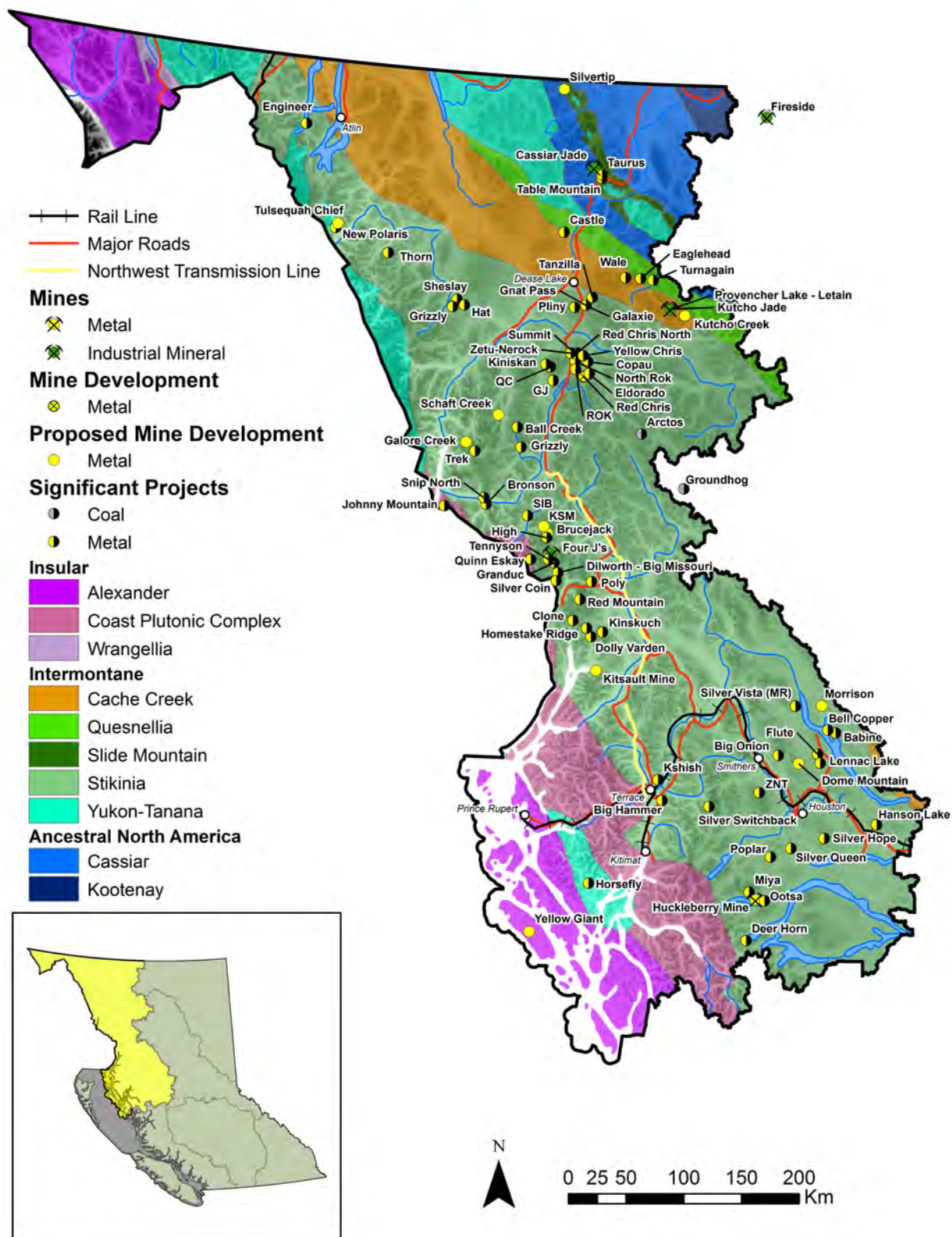


Figure 2. Estimated regional total exploration drilling metres.



Map 1. Active exploration and mining projects in the Skeena Region during 2013.



Figure 3. Newly constructed Northwest transmission line tower with recently hung insulators with folded Bowser Lake Group sediments in the background.

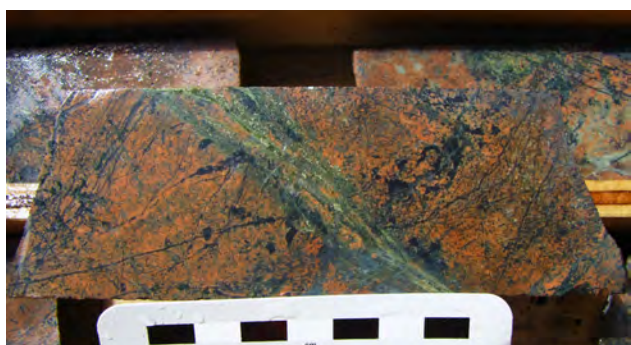


Figure 4. The first drillhole from Colorado Resources North ROK property, NR13-001, returned 242 m grading 0.63% Cu and 0.63 g/t Au in fine to medium grained, brecciated in part, strong, pervasive potassic altered monzonite with common disseminated, blebby, fracture fill and interstitial magnetite, pyrite and chalcopyrite.



Figure 5. Drilling at Deep Kerr successfully followed up a high-grade copper gold core zone. Hole K-13-29 692.4 m showing very strong pervasive silica replacement with abundant interstitial chalcopyrite and bornite. Photo Credit Mike Savell, Seabridge Gold.

7. Gold Reach Resources intercepted best grades to date at the Ootsa Project
 - East Seel Drillhole S13-155: 160.0 m @ 0.44% Cu and 0.53 g/t Au from 30 m depth
8. Copper Fox Releases Feasibility Study for Schaft Creek: 940.8 million tonnes Proven and Probable Reserve grading 0.27% Cu, 0.0176% Mo, 0.19 g/t Au and 1.72 g/t Ag
9. Teck Resources Ltd. Takes control of 75% of Schaft Creek project and re-ignites exploration
10. Chieftain Metals receives permits to begin road and mine construction at Tulsequah Chief
11. Avanti receives Environmental Assessment Certificate for their Kitsault molybdenum – silver mine
12. Agnico Eagle intercepts bonanza silver grades at newly discovered Slide zone at Homestake Ridge
13. Mining at Huckleberry continues as well as development of their Main Zone Optimization plan
14. High ranking anthracite coal projects in the Bowser basin are moving towards an Environmental Assessment application at Arctos and mine evaluation at Groundhog.
 - BC Government imposes a one year deferral on all new coal licences in the Klappan area, existing licences will not be affected
15. An unconformity has been identified that is at least spatially and temporally coincident with most significant metal mines in the northwest (Fig. 6)



Figure 6. Jurassic Hazleton Group grey-green, andesite block breccia unconformably overlying Triassic Stuhini Group maroon thinly laminated lithic lapilli ash tuff at the Horn showing (MINFILE 104G 035), Iskut region.

MINES AND QUARRIES

MAJOR METAL MINES

Huckleberry

The **Huckleberry** copper-gold-silver-molybdenum mine (MINFILE 93E 037) located 123 km southwest of Houston BC is operated by Huckleberry Mines Ltd. Ownership is divided between Imperial Metals Corp (50%), Mitsubishi Materials Corporation (32%), Dowa Mining Co. Ltd (6%), Furakawa Company Ltd. (6%) and Marubeni Corporation (6%). 2012 metal production totalled 15 926 tonnes copper, 80 kilograms gold, 5965 kilograms silver, and 2.0 tonnes molybdenum from 5 876 900 tonnes of ore mined from the Main Zone Extension pit (Table 1). Grades averaged 0.301% Cu and 0.007% Mo. Copper recovery was 90%. Non mining activities included construction of a new tailings storage facility (TMF-3), waste mining as part of the Main Zone Optimization project and near-mine exploration.

Construction of the Starter and Saddle dams required for TMF-3 were completed in August and are now operating to contain new tailings and potentially acid generating rock. New infrastructure required included new power, piping, pumping and cyclone facilities.

The Main Zone Optimization project continued to remove legacy tailings and waste rock from the former Main Zone Pit (Fig. 7). The MZO extends the mine life to 2021 with reserves totalling 39.7 Mt grading 0.343% Cu and 0.009% Mo at a 0.20% Cu cut-off grade.

Exploration activities were driven by 2012 drilling results and a comprehensive geophysical model which included data from historical magnetometer and IP surveys and 2011-2012 Titan-24 DC-IP/MT surveys. Drilling totalled 5242 m in 18 holes, assays are pending. In addition, a soil sample program was completed on the Huckleberry North claims.

Huckleberry is a copper porphyry deposit related to the late Cretaceous Bulkley intrusions. In the Main zone, mineralization occurs in hornfelsed and fractured Hazelton Group volcanic rocks adjacent to a 500 m diameter granodiorite stock. The arcuate ore zone is 150 to 200 m wide by 600 m long and rims the contact of the



Figure 7. Active mining at the Main Zone Extension Pit in the foreground and excavation of the former Main Zone Pit at for the Main Zone Optimization project at the Huckleberry Mine.

stock. The mined-out East zone was larger, measuring 150 m wide by one km long, and centred on a fault-controlled 40 m wide granodiorite dike that trends 105°. Ore in both zones is a stockwork of quartz, pyrite and chalcopyrite, crosscut by gypsum-filled fractures. The Main and East zones are disrupted by the 105 Fault resulting in ~100 m of dextral offset of ore. The Main Zone Extension is the faulted portion of the Main Zone north of the 105 Fault.

QUARRIES

Fireside

Fireside Minerals Ltd continued to mine barite from its summer-seasonal **Fireside** barite operation (MINFILE 94M 003) located 125 km east of Watson Lake. Barite production totalled 24 000 tonnes from 26 000 tonnes milled. Fine ground barite is bagged at a facility located at the mine site as well as in Watson Lake YT. Bags of powdered barite are sold on site to various consumers utilizing it as a heavy additive in drilling fluids in the oil and gas industry.

Steeply-dipping barite veins at Fireside are associated with a gabbro dike of inferred Paleozoic age emplaced into Kechika Group strata, possibly related to rifting of the early Paleozoic North American continental shelf (Wojdak, 2008).

TABLE 1. MINE PRODUCTION AND RESERVES, NORTHWEST REGION

Mine	Operator	Production (2012)	Tonnes milled (2012)	Reserves	Grade
Huckleberry	Huckleberry Mines Ltd. (2012)	15 926 tonnes copper, 2.0 tonnes molybdenum, 80 kg gold, 5965 kg silver	5 876 900	49 907 500 tonnes @ 0.334% Cu, 0.009% Mo (December 31, 2012)	0.334% Cu, 0.009% Mo
Fireside	Fireside Minerals Ltd. (2013)	24 000 tonnes	26 000	95 400 (not NI 43-101 compliant)	

Jade

There has been significant increase interest in BC jade deposits largely from Asia. Nephrite jade mining occurred at seasonal operations in the Dease Lake area at least four quarries: Provencher Lake (MINFILE 104I 073, 092), Kutcho (MINFILE 104I 078), Cassiar (MINFILE 104P 005) and Dynasty (MINFILE 104J 057). Total production numbers for the gemstone are not available. Jade sales are by private arrangement and range from small, highly polished pendants to multi-tonne rough boulders (Fig. 8). Buyers of the raw boulders generally ship the stones off-shore for sculpting.

Jade is generally mined from placer tenures as most boulders are not found in place. The exception is Dynasty where the jade is mined from an exposed shear zone within serpentinite. Nephrite jade is formed at the contact between tectonically-emplaced serpentinite and argillite of the Cache Creek terrane east of Dease Lake, and of the Slide Mountain terrane at Cassiar.

INDUSTRIAL QUARRIES

Industrial quarries in the Prince Rupert and Stewart areas provided material for major infrastructure upgrades at the Ridley Island terminal expansion (Fig. 9), the port of Stewart and the Canadian National Railway between



Figure 8. Nephrite jade boulder from the past producing Cassiar asbestos mine.



Figure 9. Ridley Island Coal terminal is expanding onsite storage capacity from 1.2 million tonnes to 2.5 million tonnes by 2014.

Terrace and Prince Rupert. The Ridley Island quarry produces amphibolite-grade metasediments to be used at the port expansion. The Tyee quarry (MINFILE 103I 202) produces epidote-bearing granite for dimension stone. The Kwinitsa quarry (MINFILE 103I 011) produces sillimanite-grade gneiss for CN rail-bed material and rip-rap stone used to protect Highway 16. At least one quarry in the Stewart area produced granitic material interpreted to be associated with construction activities at Stewart Bulk terminals.

MINE DEVELOPMENT AND EVALUATION PROJECTS

Red Chris

The Red Chris copper-gold mine (MINFILE 104H 005) located 80 km south of Dease Lake, has morphed from a defined deposit to a mine site (Fig. 10). Construction began May 2012 and peaked this summer with over 500 workers on site. Mine engineering is largely complete (> 94%) and several mine site buildings have been enclosed. Construction efforts will continue through the winter focusing on electrical and piping of the mill building, tailings system pipeline and the northern / Iskut extension of the Northwest Transmission line. A target date for commissioning of the mill is set for May 2014.

Significant milestones this year include completion of the main access road from highway 37, concrete and steel works of the main processing building, primary crusher building, truck shop, and overland conveyor. Work in the tailings impoundment area included dam construction, stripping and aggregate production. Total construction costs have risen 12.7% from previous estimates and now total \$500 M. Extra expenditures are a result of increasing the footprint of the process building to provide a more functional layout and include the concentrate thickener indoors. The increased size and geotechnical requirements increased concrete volumes by 70%. Other cost increases came from labor costs (30%) and the switch from Harmonized Sales Tax to Provincial Sales Tax. Cost savings were realized by clever use of



Figure 10. Mine construction at Imperial Metals Red Chris.

shipping containers for maintenance complex construction and efficient employment of used pit equipment.

The 93 km long Iskut extension power line connecting the mine site to the substation at Bob Quinn is also in full scale construction. Ninety percent of the engineering design is complete and approximately 60% of the right of way and access roads have been cut. A 100 person camp and laydown area established along the route and will remain highly active through the winter to meet the commissioning goal of the mill. Imperial Metals formalized an agreement with BC Hydro whereby Imperial will finance and construct the Iskut extension and BC Hydro will buy the infrastructure back upon completion. The Iskut extension line will provide an estimated 600 jobs during construction and 300 full time jobs for the area.

Proven plus probable reserves remain at 301.549 Mt with an average grade of 0.359% Cu and 0.274 g/t Au. Measured plus indicated resources (inclusive of reserves) total 1218 Mt grading 0.327% Cu, 0.327 g/t Au and 1.114 g/t Ag using a 0.2% eCu cut-off grade. Additional inferred resources total 785 Mt grading 0.333% Cu, 0.347 g/t Au and 1.145 g/t Ag at a 0.2% eCu cut-off grade.

The Red Chris deposit comprises the adjoining Main, East and Saddle zones within a 204Ma monzodiorite stock. The stock intrudes Stuhini Group volcanic rocks to the north and is overlain by, and faulted against, Bowser Lake Group sedimentary rocks to the south.

The East zone fault controls both the east-northeast trending Red stock and the most intense quartz vein development, which, in turn, corresponds with the best copper and gold grades. At depth in the porphyry system, alteration comprises K-feldspar, biotite, magnetite and anhydrite. Closer to surface within the planned open pit, alteration comprises sericite, pyrite, quartz, hematite, ferrodolomite and chlorite. The occurrence of volcanic rocks between the Main and East zones suggest the Red stock has at least two intrusive centres. Zoning of gold to copper ratio and interpretation of a deep penetrating induced polarization survey suggest a third intrusive centre may lie west of the Main zone, beneath the Gully zone.

Northwest Transmission Line and hydro projects

Construction continues on the 344 km Northwest Transmission Line (NTL) that will provide 287 kilovolt service from Terrace to Bob Quinn Lake substation where the NTL will connect to the Iskut extension. Valard Construction and Burns & McDonnell are the prime contractors tasked with construction and have brought in a myriad of subcontractors to achieve construction timelines. Various factors including the cost of labour and materials have contributed to an approximate 33% cost increase from \$546M to an estimated \$746 M. Construction progress is visible from highway 37 and highway 16 where some of the 1100, 27 m tall

transmission towers can be seen (Fig. 11). Construction remains active into the winter months with at least 280 people directly employed. Several hydro power projects throughout the northwest are also under construction to feed into the NTL. Most recently commissioned is the 31 megawatt Long Lake Hydro project located 25 km north of Stewart jointly owned by Regional Power Corporation and Premier Power Corporation. Veresen Inc has secured the necessary contractors to complete the Dasque Middle run-of-river facility by mid 2014. The former primary sub-contractor went into receivership. Alta Gas Ltd is constructing three run-of river projects in the Iskut River area including the 195 MW Forrest-Kerr project (Fig. 12) scheduled to be completed by mid-2014. Other Alta Gas projects include McLymont Creek and Volcano and are under construction.

KSM (Kerr-Sulphurets-Mitchell-Iron Cap)

The Environmental assessment office officially accepted Seabridge Gold's application package for technical review on June 4th for the KSM project located 65 km north of Stewart. KSM consists of four defined



Figure 11. Northwest Transmission Line tower installation along Highway 37 near Bell 2.



Figure 12. Turbine installation at Alta Gas's Forrest Kerr run-of-river 195 MW hydroelectric power plant which will feed into the Northwest Transmission Line. Photo credit Lorne Kelly, Alta Gas.

deposits spread across approximately 10 km north-south strike-length. From south to north they are: Kerr, Sulphurets, Mitchell and Iron Cap. Combined, these form one of the largest undeveloped gold-copper porphyry resources in North America with proven plus probable reserves totalling 2164 Mt averaging 0.55 g/t Au, 0.21% Cu, 2.74 g/t Ag and 44.7 ppm Mo. Measured plus indicated resources (inclusive of reserves) total 2780 Mt grading 0.55 g/t Au, 0.21% Cu, 2.9 g/t Ag and 55 ppm Mo. Inferred resources total 1127 Mt grading 0.41 g/t Au, 0.17% Cu, 3.0 g/t Ag and 50 ppm Mo.

The KSM project is projected to operate over a 55 year mine life with an estimated capital cost of \$5.3 billion. The initial 25 years would be an open pit mining operation processing 130,000 t/d decreasing to 90,000 t/d for the remaining 30 years. Ore would be fed to a flotation mill and produce a gold-copper-silver concentrate and then trucked to the Stewart port facility. Metallurgical testing indicates a salable, clean 25% copper concentrate can be produced as well as a separate molybdenum concentrate and gold-silver doré.

Drilling in 2013 focussed on defining higher grade copper-gold mineralization at Deep Kerr and follow up targets at Iron Cap, McQuillan and camp zones totalling 32 274.25 m in 40 holes. Total drilling at Deep Kerr was 23 822.45 m in 29 holes (Fig. 13) of which 25 hit their target. Two were lost due to hole deviation while the other two were terminated due to weather and are available for re-entry. As most holes are over 1 kilometre in length, wedges and directional drilling technology helped achieve efficiency. Fifteen wedges were completed at Deep Kerr. Secondary holes deviated from a



Figure 13. Directional deep drilling at the KSM project Deep Kerr zone with Sulphurets zone in the background. Photo credit Mike Savell, Seabridge Gold.

primary “mother” hole to avoid re-drilling un-mineralized upper sections. Best intercepts are reported in Table 2.

TABLE 2. HIGHLIGHT DRILLING RESULTS FROM THE KSM PROJECT

Zone	Hole ID	From (m)	To (m)	Width (m)	Au (g/t)	Cu (%)	Ag (g/t)
Deep Kerr	K-13-23	1066.2	1362.4	296.2	0.4	0.73	1.15
	K-13-23B	953	1249.4	296.4	0.59	0.65	1.1
	K-13-23C	908.9	1224.4	315.5	0.45	0.65	1.2
	K-13-24	807	929.7	122.7	0.86	0.85	2.64
	K-13-24C	825	1053	228	0.96	0.72	2.6
	K-13-25	928	1171	242	0.26	0.61	2.28
	K-13-25C	1103	1278	175	0.39	0.62	1.5
	K-13-30	326	645.7	317.7	0.33	0.53	1
	K-13-31	519.2	624.4	105.2	0.66	1.11	2.2
	K-13-34	496	1136.5	640.5	0.42	0.85	1.9
Iron Cap	IC-13-048	346.5	839.8	493.3	0.3	0.3	3.2
	IC-13-049	9	1032.4	1023.4	0.77	0.24	5.15
Camp Zone	C-12-04	353	375.5	22.5	3.02		12
	C-12-06	358.5	376.5	18	3.15		7.7
	C-12-12	69	108.2	39.2	2.23		10.6

Results from Deep Kerr have significant potential to alter the current mine plan positively (Fig. 14). An updated resource estimate is scheduled for release in early 2014. Ideally, grades and tonnages will support an underground block-cave mining operation at Deep Kerr. This mining method would also decrease impacts regarding some of the most significant concerns over water management and mitigation measures surrounding the KSM project.

Additional exploration drilling was completed at Iron Cap. Six drillholes totaling 5400.8 m tested high grade core zone hypotheses and returned broad intervals of copper-gold mineralization greater than current average reserves. Results are summarized in Table 2.

Other exploration targets generated from geophysical surveys conducted in 2011 were also tested including four holes totalling 1820.7 m at the Camp zone and one hole totalling 1230.3 m at McQuillan. The discovery of the Camp Zone, located between the Kerr and Sulphurets deposits, included epithermal-style, polymetallic mineralization. Additional 2012 results at the Camp zone support interpretations of a preserved, down-dropped block of higher stratigraphic level and higher gold grade mineralization, similar in some aspects to neighboring

Brucejack property. Grades at the Camp zone are well above KSM reserve grades and summarized in Table 2.

The KSM porphyry deposits are associated with the Mitchell intrusions; high level diorite to monzonite plugs and dikes that intrude folded and faulted volcanic and sedimentary rocks of the Hazelton and Stuhini Groups. The principal Mitchell zone is exposed in an erosional window below the Mitchell thrust fault; the upper fault sheet contains the displaced segment of the deposit, the Snowfield zone, 2 km east on the adjoining property owned by Pretium Resources. The KSM deposits show broad metal zonation: high copper and low gold grades in the south at Kerr to the inverse at Mitchell and Iron Cap. The Mitchell zone comprises schistose rocks with abundant sericite, disseminated pyrite and a strongly deformed quartz-pyrite-chalcopyrite stockwork containing remarkably uniform copper and gold grades.

Iron Cap is in the upper sheet of the Mitchell thrust fault, and below the Sulphurets thrust. Chalcopyrite occurs as fine disseminations and quartz-pyrite veins. Epithermal-style mineralization in quartz stockwork and breccias containing higher gold and silver grades are also present at Iron Cap. Original lithology textures are usually

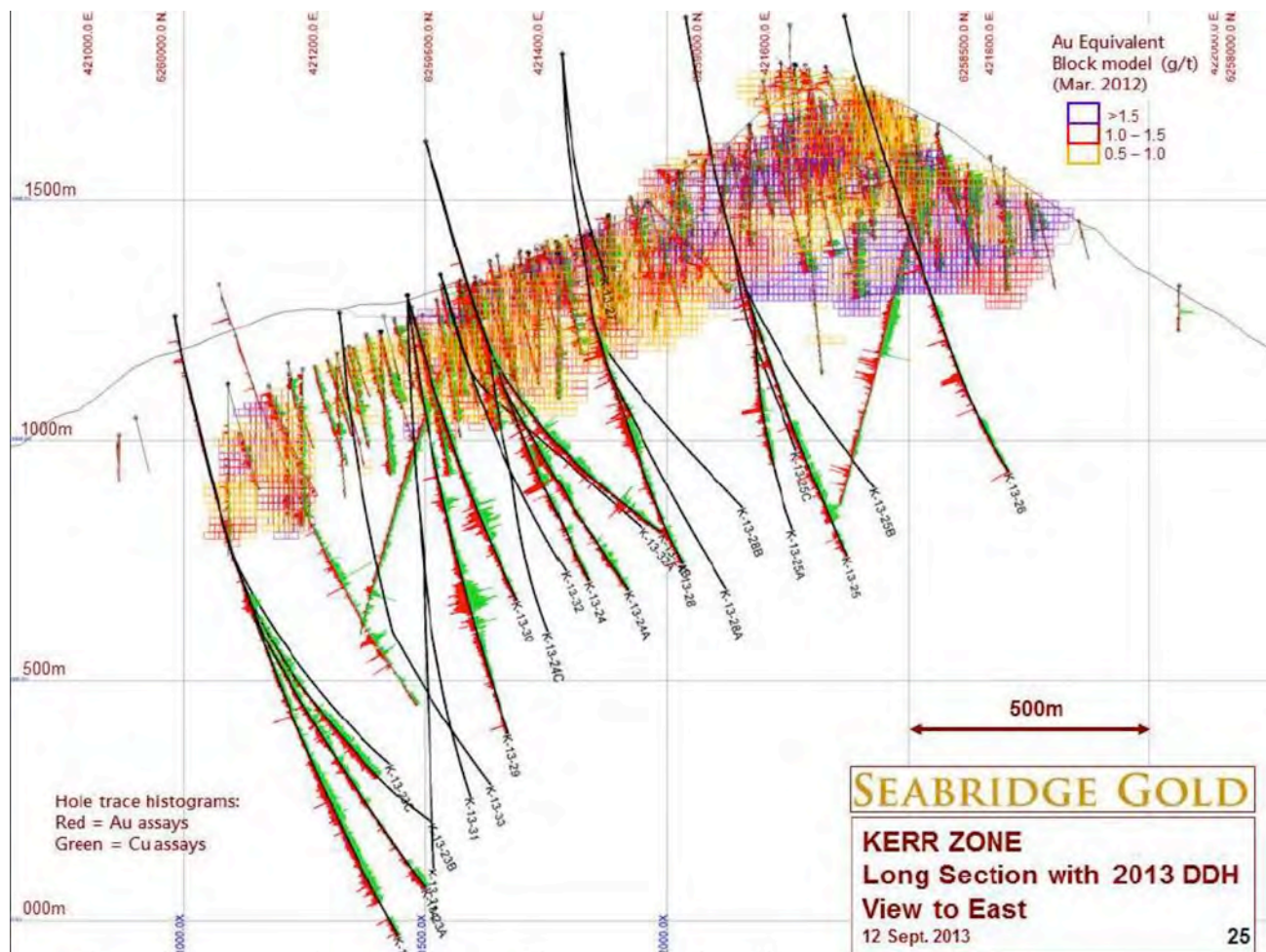


Figure 14. Long section of the Kerr zone with resource block model with drillhole traces of Deep Kerr drilling that have not yet been incorporated into the resource. Courtesy of Seabridge Gold.

obliterated by intense, pervasive silica-pyrite alteration. However, discrete windows of weaker alteration do allow some preservation of primary textures including porphyritic intrusives and screens of pebble conglomerate. The sediments identified within Iron Cap are interpreted to be part of the Lower Jurassic Jack Formation which was focus of a detailed study conducted this summer by the BC Geological Survey. Interpretations suggest certain iterations of the Jack Formation locate key structures hosting late Triassic – Early Jurassic porphyry systems; in the case of KSM, the Sulphurets fault.

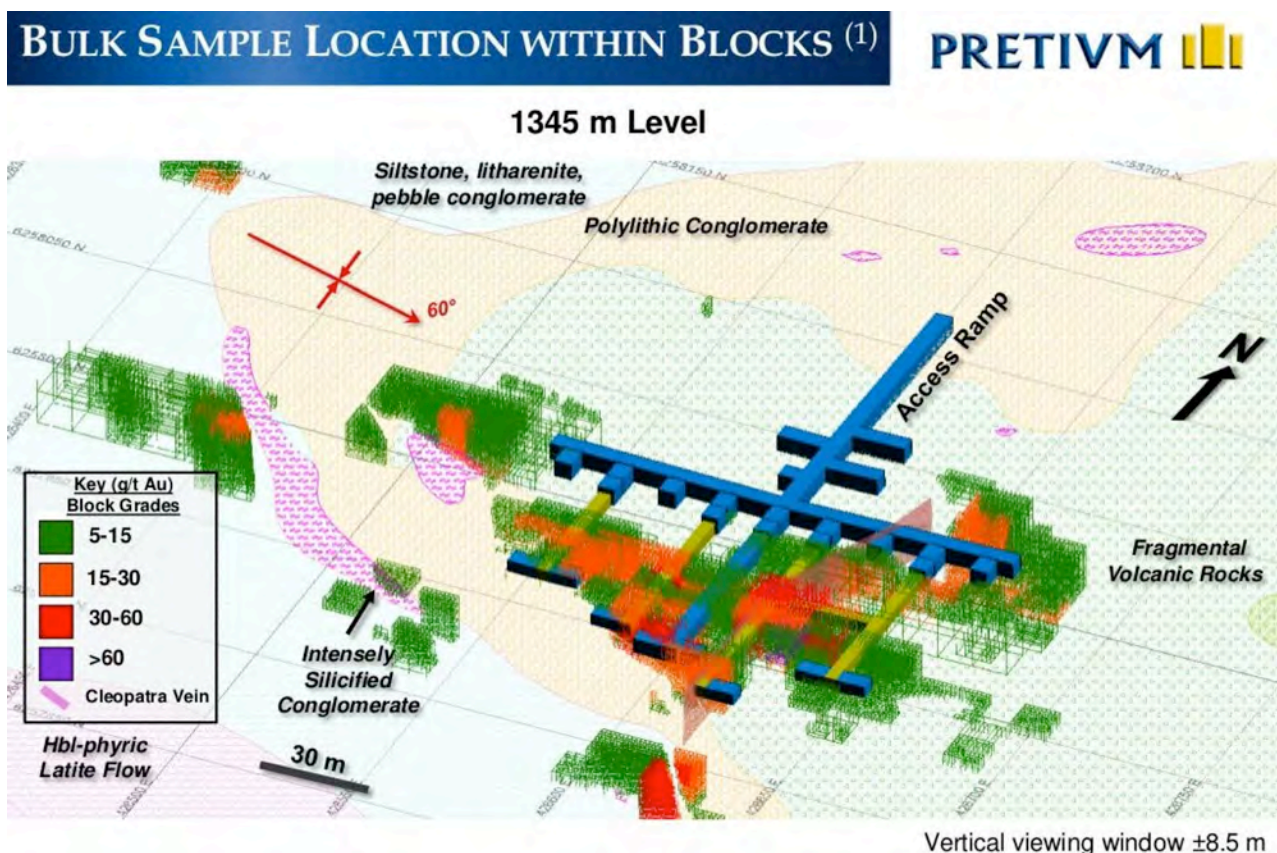
Brucejack

Pretium Resources Inc has completed another year of outstanding productivity and results at their high-grade gold Brucejack project 65 km north of Stewart and adjacent to the KSM project. The primary focus during 2013 was to further validate the deposit by completing a 10 000 tonne underground bulk sample from the **Valley of the Kings (VOK)**. Other major achievements included filing a positive feasibility study, significant advances in deposit geology, discovery of the Cleopatra vein, approximately 1.2 km of underground development,

completion of 44 601 metres of combined underground and surface drilling, and commissioning a 75 km site access road from highway 37.

Excavation of the underground bulk sample program was enabled via re-commissioning of workings at the **West Zone** (MINFILE 104B 345) and an additional 546 m of new ramp development to the 1345 level of the **VOK** zone. The 10 000 tonnes were excavated from four 5 x 5 m crosscuts averaging approximately 75 m long and one ~ 25 m long lateral drift (Fig. 15). The sample was designed to represent grades across the deposit, including areas outside the projected November 2012 resource block model. Target material ranged from 0 g/t Au to 60 g/t Au. Excavation was completed in roughly 100 tonne rounds, crushed on site, processed through a sample tower assembly and shipped to a custom mill in Montana.

In order to gain the most information from the bulk sample program, two sampling methods were employed: 1) sample gravity separated splits from the sample tower resulting in assaying 0.014% of the total mass, and 2) bulk accounting of the entire 10 000 tonnes by total gold from combined gravity and flotation concentrates and residual tailings. Results from each method were designed



⁽¹⁾ 10m x 10m x 10m Indicated blocks greater than 5 g/t AuEq shown from November 2012 Mineral Resource estimate

Figure 15. Brucejack Valley of the Kings zone 1345 m level, bulk sample map and relative resource block model and geology. Courtesy of Pretium Resources.

to be complimentary in order to deliver the most information about the deposit. However, upon initial bulk sample results, it became apparent that the two methods were generating significantly different values where the bulk accounting was achieving 94% more gold than the sample tower method predicted. It is possible that the reliance on gravity and the limited sampling of the exhaustive sample tower process may have played a role in separating some coarse gold and under appreciating discrete high grades thereby yielding a different prediction than the actual returns from complete milling. Preliminary bulk sample results have exceeded expectations of recovered gold totalling **5865 ounces gold (182 421.9 grams) from 10 302 dry tonnes averaging ~17.7 g/t Au** plus 4950 ounces silver (153 962 grams) averaging 14.9 g/t Ag. Final results will be reported upon completion of cleaning of processing equipment.

Due to the high variance in gold grades, standard estimation techniques cannot accurately estimate the deposit. The extreme gold grades (up to 41 582 g/t Au) and the majority of the metal are contained within less 5% of the data resulting in two mineralized populations: 1) pervasive background mineralization grading up to 5.0 g/t Au and 50 g/t Ag and 2) discrete, high-grade mineralization. Background mineralization is estimated using ordinary kriging into 10 x 10 x 10 m blocks and validates well against input data. Discrete high-grade mineralization is estimated using multiple indicator kriging to and used to populate small scale blocks which are then proportionally incorporated into larger parent blocks. The resulting estimation is therefore inclusive of extreme gold grades but limiting of their overall influence of the parent block grade estimation. For example, if a block had a probability of 5% high grade then the final block grade would combine 95% of the low grade estimate with 5% of the high grade estimate. The influence of the high-grade population is therefore greatly restricted.

Drilling was divided between the underground bulk sample program (16 789 m), underground exploration (22 041 m) and surface exploration (5771 m). Despite challenging geology, the number of 1000 g/t Au intercepts has risen with each year since 2009 with 69 intercepts in 2013. Thus, demonstrating increased deposit control and understanding. The VOK deposit is currently defined over 1200 m in east-west extent, 600 m in north-south extent and to 650 m depth. Final drilling and bulk sample results have been compiled into an updated resource estimate with measured plus indicated resources totalling 15.3 Mt grading 17.6 g/t Au and 14.3 g/t Ag using a 5.0 g/t Au Eq cut-off grade. Additional inferred resources total 5.9 Mt grading 25.6 g/t Au and 20.6 g/t Ag. A sensitivity resource estimate of the Cleopatra vein structure (not meant to replace or supersede the VOK resource estimate) totals 0.06 Mt grading 38.8 g/t Au and 23.2 g/t Ag. An updated feasibility study is expected in 2014 as well as filing application for an Environmental Assessment Certificate.

A feasibility study published in June 2013 details a 2700 t/d milling operation fed by underground transverse – long-hole open-stope and longitudinal hole open stope mining methods. Processing would employ conventional floatation and gravity circuits to produce a gold-silver concentrate and gold doré. Hydro power would be brought to site from the recently commissioned Long Lake Hydropower plant approximately 40 km to the southeast. Capital costs are estimated to be \$663.5 M. VOK zone probable reserves total 15.1 Mt averaging 13.6 g/t Au and 11 g/t Ag. Additional West zone proven plus probable reserves total 3.8 Mt averaging 5.8 g/t Au and 243 g/t Ag.

Brucejack sits on the eastern limb of the broad northerly trending McTagg anticlinorium; a regional scale, mid-Cretaceous structural culmination in the Western Skeena Fold Belt. Brucejack property stratigraphy comprises of Triassic Stuhini Group sediments and volcanics unconformably overlain by Jurassic Hazelton Group volcanics followed by Bowser Lake Group sediments. Property lithologies generally dip moderately and young to the east and are variably altered. Lithologies are cut on the west side of the property by a topographic lineament, the Brucejack Fault of uncertain displacement and with interpreted history of long-lived re-activation and possibly extensional origin. Alteration is dominated by pervasive strong to intense quartz-sericite-pyrite replacement up to several hundred metres wide and approximately 5 km strike length. Most of the five defined mineral resources (West Zone, Valley of the Kings, Bridge Zone, Gossan Hill and Shore Zone) are within the intensely altered zone and associated with vein-stockwork systems of varying intensity. Stockworks display good continuity and in rare cases range up to 10 m wide. High-grade zones (Fig. 16) are either on the margins or contained within a zone of bulk low-grade mineralization up to several grams per tonne gold. Bulk low-grade mineralization tends to be associated with disseminated anhedral pyrite.

Mineralization at the Brucejack property is hypothesized to represent a deformed transitional meso – epithermal stockwork in pervasively altered lower Hazelton Group rocks; likely associated with the high levels of the multi-phase Mitchell intrusions.

Tulsequah Chief

The **Tulsequah Chief** mine (MINFILE 104K 002) located 100 km south of Atlin, is fully permitted and Chieftain Metals Inc. is gearing up for construction in 2014. The lengthy process of acquiring the Mines Act Permit, Environmental Assessment Certificate and Special Use Permit and amendments for each, concluded in February. Funding sources are secured to support the \$450 M capital expenditure with an additional \$45 M reserve through off-take agreements.

After a thorough compilation and re-interpretation of historical data, several new VMS exploration targets have

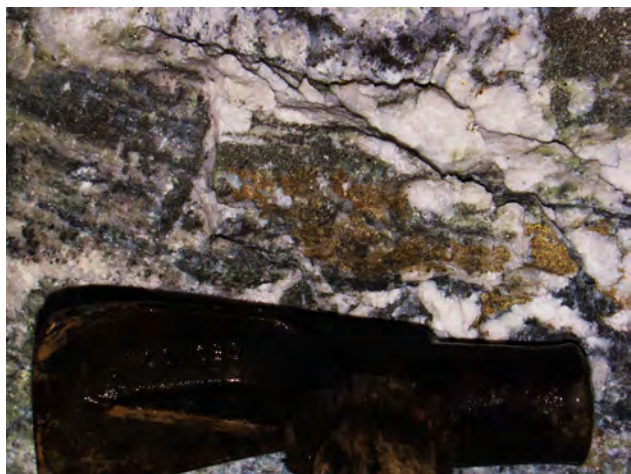


Figure 16. Slickensided coarse gold within sheared quartz vein stockwork at the Brucejack project Valley of the Kings zone, 1345 m level.

been identified in the Tulsequah district including extensions to known reserves. Targets were largely generated by indentifying 3D chargeability anomalies with similar characteristics and geometries as known mineralization. Drilling totalled 3540 m in 9 holes and successfully indentified massive sulphide poly-metallic mineralization 350 m northeast of existing Tulsequah reserves. Notable intercepts include 0.45 m grading 3.28% Cu, 10 g/t Ag and 0.223 g/t Au from 399.17 m in drillhole TC13064. Drillhole TC13062 targeted a strong chargeability anomaly approximately 50 m from the Tulsequah ore body and intercepted wide zones of massive sulphide with local high grade base metals and strong VMS alteration. Multiple high-grade intercepts confirmed stacked lenses typical in Kuroko type VMS systems. Highlight true width intercepts from drillhole TC13062 include 0.66 m grading 0.53 g/t Au, 9 g/t Ag, 2.51% Pb and 5.51% Zn from 89 m and 1.08 m grading 0.16 g/t Au, 14.6 g/t Ag and 12.99% Zn from 112.59 m and 1.05 m grading 1.61 g/t Au, 21.93 g/t Ag, 1.14% Cu, 0.96% Pb and 12.78% Zn. Other targets at past producing **Big Bull** (MINFILE 104K 008) and **Banker – Sparling** (MINFILE 104K 007) deposits have been identified and are scheduled to be followed up with drilling in 2014.

A feasibility study released in December 2012 outlines a 2000 t/d underground mining operation with a 9.5 year mine life. Mining would be conducted primarily by sub-level stoping with minor mechanized cut-and-fill stoping followed by paste and waste-rock backfill. Probable reserves total 6.45 Mt grading 2.30 g/t Au, 81.38 g/t Ag, 5.59% Zn, 1.12% Cu and 1.04% Pb. Processing will consist of a primary crushing plant, grinding and flotation plant, effluent treatment plant, and backfill plant. Production of copper, lead and zinc concentrates and gold doré would be achieved on site. Road and plant site construction is scheduled to commence in early 2014 aiming to start commissioning by Q2 of 2016.

Tulsequah Chief is a Kuroko-type volcanogenic massive sulphide deposit in which numerous stacked

sulphide lenses are present within a rhyolite-dominated sequence of volcanic flows and fragmental units. Mineralization in all lenses consists of massive to semi-massive pyrite, chalcopyrite, sphalerite and galena. Accessory ore minerals include tetrahedrite-tennantite and rare native gold. Gangue mineralogy consists of barite, chert, gypsum, anhydrite, carbonate quartz, chlorite and sericite and silicified volcanoclastics.

Kitsault

On March 20th, Avanti Mining Inc. received an Environment Assessment Certificate (EAC) for its **Kitsault** molybdenum-silver mine (MINFILE 103P 120) located approximately 115 km NNW of Terrace. After a thorough review, the Ministers of Environment and Energy, Mines and Natural Gas concluded that the project “is not expected to result in any significant adverse effects based on the mitigation measures and conditions in the EAC”. However, the Nisga’a First Nation has filed a Federal Court application challenging the decision citing the “Crown breached its obligation to evaluate the environmental impacts of the decision and consult with the Nisga’a Nation”. A federal environmental assessment decision is pending.

Activities during 2013 focussed on securing debt financing for construction, corporate re-organization and optimization of a feasibility study initially released in February. The optimized feasibility study released in November details a \$126 M reduction of capital expenditure from \$938 M to \$812 M for a 45,500 t/d milling operation over a proposed 14 year mine life. Open pit, conventional truck and shovel mining methods would be employed followed by conventional floatation and five-stage cleaning to produce a molybdenum - silver concentrate. Molybdenum recoveries are forecasted to be approximately 89% and 39% for silver. Proven plus probable reserves total 226.3 Mt averaging 0.083% Mo and 5.3 g/t Ag.

Kitsault operated from 1967–72 and again from 1981-82, milling a total of 13.4 Mt grading 0.101% Mo. Total past production was 13.6 t Mo. The site is still serviced by a mine access road and power.

The Kitsault property is located within the western margin of the Bowser Basin as part of the Intermountain tectonic belt a few kilometres east of the Coast Plutonic Belt contact within the Lime Creek Intrusive Complex. Mineralization is hosted within multiphase diorite, quartz monzonite and younger felsic units. Cross-cutting relationships indicate multiple mineralizing events occurred. Geometry of mineralization appears to be annular in plan and arcuate in section.

Schaft Creek

Teck has opted back into the **Schaft Creek** copper-gold-silver-molybdenum project (MINFILE 104G 015) with Copper Fox Metals to form the Schaft Creek Joint Venture. Teck now owns 75% and is operator of the

project while Copper Fox retains a 25% interest. The joint venture was made effective from July 15th and shortly thereafter, crews and four drill rigs mobilized to the property (Fig. 17) located approximately 60 km south of Telegraph Creek. Drilling focused on testing eastern extensions of mineralization at the Paramount Zone and geotechnical studies of the proposed pit wall. Results are being compiled and a work plan for 2014 is under review.

Prior to the joint venture partnership, Copper Fox completed a feasibility study in late 2012. The study details road access and infrastructure linked from the project to the Galore Creek mine road at kilometre 65. An open pit, truck and shovel mine and 130 000 t/d milling operation for a 21 year mine life would produce separate copper-gold silver and molybdenum concentrates using conventional grinding and flotation circuits. Estimated initial capital expenditure totals \$3.256 billion. However, a request for information requirements (the initial step for an environmental assessment) has not been submitted. Proven and probable reserves total 940.8 Mt grading 0.27% Cu, 0.0176% Mo, 0.19 g/t Au and 1.72 g/t Ag.

Galore Creek

The **Galore Creek** alkalic copper – gold porphyry project (MINFILE 104G 090), owned equally by Teck and Nova Gold, is located approximately 150 km northwest of Stewart and operated by the Galore Creek Mining Corporation. Drilling in 2012 totalled 27 900 metres and confirmed the presence of significant copper mineralisation adjacent to the defined Central Pit. Highlight intervals included 1.3% Cu, 0.46 g/t Au and 6.0 g/t Ag over 86 m returned from GC12-0849 and 229 m grading 0.84% Cu, 0.15 g/t Au and 7.2 Ag from GC 12-886. 2013 drilling (Fig. 18) defined the new Legacy zone for 700 metres along strike and remains open in all directions. Drilling totaled 11 600 m. Plans to include the Legacy zone into future mine design are under way alongside an updated resource and reserve estimate and ultimately an updated feasibility study. Baseline monitoring and project engineering continue to develop an envisioned 80 000 tpd conventional milling operation



Figure 17. The Schaft Creek camp (foreground) and resource areas (background) prior to 2013 drilling activities.

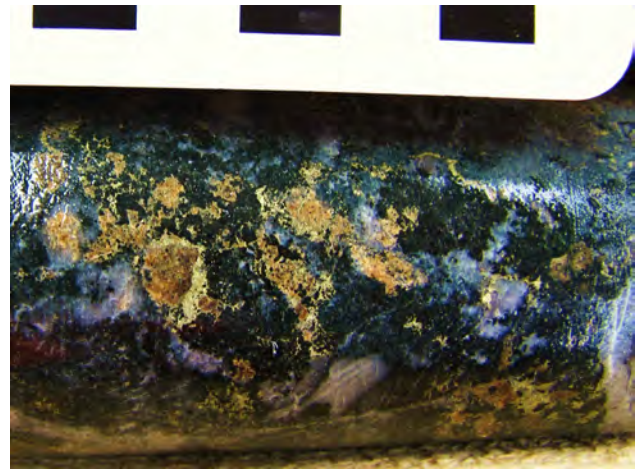


Figure 18. Chalcopyrite rimming garnets at Galore Creek Legacy zone.

for an 18 year mine life. Current proven plus probable reserves total 528 Mt averaging 0.59% Cu, 0.32g/t Au and 6.02 g/t Ag.

Morrison

Following refusal of an Environmental Assessment Certificate for the proposed **Morrison** copper –gold project (MINFILE 93M 007), Pacific Booker Minerals Inc. has successfully challenged the decision in the Supreme Court of British Columbia. The case made by the company is that despite an overall supportive report written by the Environmental Assessment Office, the decision was not in favor of the project due to a “risk versus benefit” test introduced after the assessment report was completed. The test was not included in the Terms of Reference established for the assessment process and therefore “failed to comport with requirements of procedural fairness (Justice Kenneth Affleck, Q.C.)”, resulting in a ruling in favor of Pacific Booker and effectively “quashing” the former Minister’s decision. An order has been given that the application be remitted to the current Minister for reconsideration and Pacific Booker and be provided with a copy of the recommendations sent to Ministers and opportunity to respond to prior to a decision.

Measured plus indicated resources total 206.869 Mt grading 0.39% Cu, 0.20 g/t Au and 0.005% Mo. Inferred resources total 56.524 Mt grading 0.40% Cu, 0.21 g/t Au and 0.005% Mo. The deposit is hosted in an Eocene biotite-feldspar porphyry within the Babine Intrusions.

Kutcho Creek

Capstone Mining Corporation has ceased most activities at their **Kutcho Creek** copper-zinc project (MINFILE 104I 060) located 100 km east of Dease Lake. Modest care and maintenance and baseline monitoring continued at the project during the first half of 2013 while company focus was largely aimed at internal

reorganization and acquisition of the producing Pinto Valley copper-molybdenum mine in Arizona.

Probable mineral reserves total 10.44 Mt of averaging 2.01% Cu, 3.19% Zn, 34.61 g/t Ag and 0.37 g/t Au. Measured and indicated resources total 11.28 Mt averaging 2.19% Cu, 3.28 % Zn, 36.7 g/t Ag and 0.39 g/t Au. Additional inferred resources total 1.09 Mt averaging 1.74% Cu, 2.04% Zn, 30.7 g/t Ag and 0.35g/t Au. Proposed mine life is 12 years with a processing capacity of 2500 t/d producing separate copper and zinc concentrates. Capital costs are an estimated \$213.5 million, which includes a liquefied natural gas power plant making the project independent of the Northwest Transmission Line.

The Kutcho property contains three known Kuroko-type volcanogenic massive sulphide (VMS) deposits. These are aligned in a westerly plunging linear trend and from east to west they are referred to as the Main, Sumac, and Esso deposits. The largest of the three, the Main deposit, is exposed near the eastern end of this trend, whereas the Esso deposit occurs at depths about 400-600 metres below surface at the western or down plunge end of the trend. The Sumac deposit lies between the Main and Esso deposits both laterally and vertically, but has seen only cursory drilling. The mineralized trend is open down plunge but is poorly explored.

Granduc

Castle Resources Inc. released a preliminary economic assessment in February for their **Granduc** copper-gold-silver massive sulphide deposit (MINFILE 104B 021) located 35 km north of Stewart. The PEA outlines an 8500 t/d underground mine over a 15 year mine life. Initial capital expenditure is estimated to be \$494 million. Proposed drill testing of strong, extensive (1.5 and 2 km strike length) conductive zones were not carried out due to lack of exploration funding.

At 0.8% CuEq cut-off grade of the combined Main and North Zones Measured plus indicated resources total 11.32 Mt grading 1.47% Cu, 0.17 g/t Au and 12.4 g/t Ag. Additional inferred resources total 44.63 Mt grading 1.43% Cu, 0.19 g /t Au and 10.7 g/t Ag. The Main Zone contains measured resources totalling 5.16 Mt averaging 1.58% Cu and an indicated resource of 2.95 Mt grading 1.39% Cu. Main Zone inferred resources total 30.52 Mt grading 1.40% Cu. The North Zone inferred resource is 14.11 Mt grading 1.49% Cu.

Granduc is a Triassic, Besshi-type volcanogenic massive sulphide deposit with tabular ore zones deformed by at least three phases of folding. Massive sulphide assemblages consist of pyrite, pyrrhotite, chalcopyrite with lesser interstitial sphalerite and galena. Massive sulphides occur at the contact between mafic pillow basalts and tuffs and overlying chert and argillite.

Dome Mountain

Metal Mountain Resources Inc., wholly owned subsidiary Gavin Mines Inc., continued preparation of a Mines Act permit amendment for the **Dome Mountain** gold mine (MINFILE 93L 276) located approximately 38 km east of Smithers. They anticipate delivery of the amendment application package to government by the end of the year. When accepted, it would allow a 250 t/d onsite mill and thickened tailings storage facility to be constructed. Underground development has completed 75% of necessary workings to achieve full scale production and will resume approximately two months before completion of the onsite mill.

Dome Mountain comprises of at least eight gold-bearing orogenic quartz veins within volcanic and sedimentary rocks of the Hazelton Group. The Boulder quartz-sulphide vein is fault hosted and shows evidence of shearing itself. Principal ore minerals are pyrite and sphalerite with minor chalcopyrite, galena, arsenopyrite and tetrahedrite. Gold occurs in native form but is rarely visible and is generally associated with pyrite.

Yellow Giant

Banks Island Gold Corp maintained 100% ownership of the Yellow Giant gold project (MINFILE 103G 021) located approximately 120 km south of Prince Rupert. Significant exploration and development have been ongoing during 2013 including commissioning of a dense media separation plant. Banks Island purchased their own company drill rig and have completed 18,250 m of diamond drilling in 93 holes on multiple structural targets across the property. The company has staffed up an eighteen person floating camp to conduct all aspects of exploration and development and limiting contractor dependence. New road construction totalled 6.8 km and linked together the five known prospects: Bob, Tel, Discovery, Englishman and Kim. Four portal sites have been prepared (Fig. 19) with the Bob portal development underway and approximately 100 m completed in preparation for an underground bulk sample. New prospective structural zones have also been identified.

Definition drilling at the Kim and Bob zones increased mineralized trends both along strike and below previously reported resource domains. Highlight results include KIM 13-07; 5.1 m grading 15.5 g/t Au from 47.3 m depth and KIM 13-05; 12.7 m grading 9.8 g/t Au from 78.3 m depth. Additional exploration drilling at Discovery and Englishman zones also identified significant gold-silver mineralization including: DIS-13-33; 14.4 m grading 3.7 g/t Au and 7 g/t Ag and DIS-13-23; 2.9 m grading 13.4 g/t Au and 21 g/t Ag.

Activities will continue throughout the winter months with continued exploration drilling and underground development at the Bob Zone. The company is aiming to process bulk sample material from the Bob zone with the dense media separation plant constructed onsite and commissioned using stock pile material from historic



Figure 19. Mines inspectors and project geologist discuss the proposed portal site at Banks Island Gold Corp's Yellow Giant gold project, Tel zone.

mining at the Bob zone in 1986. An offtake agreement has been established with Metallica Commodities Corp. who are expecting shipment of sulphide concentrate to commence by year's end. Metallurgical tests on composite samples from the Bob, Tel and Discovery zones returned 90% average gold recovery from an average 109 g/t Au concentrate.

Mineralization occurs as quartz-carbonate bearing pyrite-pyrrhotite massive sulphide veins with minor amounts of interstitial native gold, sphalerite and galena. Higher grade shoot geometry measures up to 50 m apparent strike length and over 150 m deep. Veins are controlled by steeply dipping first and second order shear structures and range from 0.5 to 5.0 m wide. Known mineralization is closely associated with the Arseno and Hepler regional faults which separate Ordovician to Triassic metasediments from mid-late Jurassic intrusives.

MINERAL EXPLORATION

PORPHYRY COPPER PROJECTS

"Porphyry copper deposits in the northwest commonly contain significant gold or molybdenum. Few deposits contain all three metals in economically significant amounts. Prospects in the Iskut-Stikine district developed in late Triassic to early Jurassic intrusions within the Stikine terrane prior to accretion to North America. Pre-accretion porphyry prospects are primarily copper-gold deposits; molybdenum is significant only at Schaft Creek. The intrusions are sub-alkalic, potassium

rich and intermediate composition, typically monzonites and their volcanic equivalent. Potassium feldspar porphyritic rocks are common. Alkalic rocks, syenite and pseudoleucite-bearing trachyte characteristic of the Galore Creek deposit represent an end-member composition. Some porphyry deposits in the Stikine district have an extremely high gold to copper ratio and are referred to as gold-copper porphyries. This includes the porphyries at KSM and Bronson Slope deposits (Table 11 at end of paper).

Porphyry copper-molybdenum prospects predominate in the Skeena district. Some copper-gold prospects occur but the gold content is appreciably less relative to the Iskut-Stikine district. Skeena district porphyry prospects are all contained in post-accretion intrusions including the extensive late Cretaceous Bulkley and more localized Eocene Nanika and Babine calkalkaline intrusions. The three suites have separate distribution patterns but all occur within the transverse geologic feature known as the Skeena Arch. The Huckleberry deposit is related to a Bulkley intrusion." (Revised from Wojdak, 2010).

Porphyry Copper-Gold Projects in Stikine Terrane, Iskut District

As production at Red Chris and the promise of hydroelectric power to the region move closer to reality, exploration for similar gold-rich high potassic, calc-alkaline porphyries also continues. The understanding of these atypical porphyry systems has evolved substantially with the published data from Red Chris and the prospect of higher copper-gold grades at depth, especially at known showings that were previously explored only to shallow depths.

Colorado Resources Ltd kicked off the exploration season with extraordinary results from the first drillhole into the **North ROK** property located approximately 70 km south of Dease Lake. Colorado workers followed up the **Mabon** (MINFILE 104H 035) showing initially identified in 1994 during a BC Geological Survey regional mapping program by an anomalous rock chip sample returning 0.33% Cu and 0.42 g/t Au. The low lying outcrop (Fig. 20) is within 1 km of highway 37 and less than 20 m vertically above the highest glacial terrace. At first glance, the outcrop doesn't appear economically significant. However, the strong, pervasive potassic alteration and fine disseminated magnetite with interstitial chalcopyrite recognized by Colorado workers focussed initial geochemical and geophysical surveys in 2012 and drilling in April 2013. Drillhole NR13-001 returned top – to-bottom copper-gold mineralization (2.0 - 333 m) averaging 0.51% Cu and 0.67 g/t Au. The top 242 m averaged 0.63% Cu and 0.85 g/t Au. Additional highlight intercepts are summarized in Table 3. Various exploration activities followed including geological mapping, soil sampling, airborne and ground geophysics and three phases of drilling were completed during the 2013 season. Drilling totalled 11 448 m in 29 holes. To date, deposit dimensions measure approximately 900 m strike length



Figure 20. The Mabon showing (MINFILE 104H 035) was initially sampled by Chris Ash during a BC Geological Survey.

and 200 m wide and remain open to the southeast and at depth. Several proximal exploration targets remain to be drill tested including an undercover chargeability anomaly of slightly longer strike length and similar orientation located approximately 500 m southwest of known mineralization.

Colorado Resources and joint venture partner Sunrise Resources also completed 1431 m in five drillholes at the **Eldorado** (MINFILE 104H 026) property approximately 10 km northeast of Red Chris. Drilling targeted magnetic – chargeability anomalies coincident with copper-gold soil anomalies previously tested by shallow drilling by Esso Minerals in 1980. Thick accumulations of glacial overburden and post mineral sediments hampered drilling efforts and resulted in two holes not achieving their target. Two of the completed 3 holes successfully identified chalcopryrite bearing potassic altered monzonite similar to Red Chris style mineralization at the overburden – bedrock interface. Drillhole EL13-004 returned the most significant intercept: 71.3 m grading 0.14% Cu and 0.33 g/t Au from 52 m depth.

To the south towards Red Chris and adjacent to North ROK, Oz minerals optioned the **ROK – Coyote** property (MINFILE 104H 001 and 104H 012) from

Firesteel Resources and completed the first phase of a two year commitment. Oz minerals agreed to spend \$3M on exploration over two years at which time they will earn 51% ownership. Phase one drilling totalled 1750 m in three holes. Airborne magnetic and radiometric geophysical surveys as well as ground based 3D IP were also completed to generate phase two drill targets.

Pistol Bay Mining optioned the **Summit B** property (MINFILE 104H 015) to Revolver Resources who are seeking to earn a 60% project interest located immediately north of North ROK. Initial 2013 ground work validated historical rock chip samples while later work completed 22.5 line km of IP geophysical survey and identified a northwest trending, strong ($> 35\text{mV/V}$) chargeability anomaly measuring 2.3×0.5 km. A winter program is underway targeting the anomaly with 1000 m of drilling. Pistol Bay Minerals also completed minor groundwork programs on their **Summit A** and **D** properties. Serengeti Resources also completed geochemical soil and silt sampling on their northern adjacent **Red Chris North (RCN)** property.

Freeport MacMoRan partnered with West Cirque Resources to fund exploration at **Castle** (MINFILE 104G 076), **Tanzilla** (MINFILE 104I 023) and **Pliny** (MINFILE 104I 026). Drilling efforts focussed at Castle totalled 1859 m in four holes, mainly targeting coincident magnetic and chargeability anomalies. Drilling intercepted magnetite-rich, potassic altered monzodiorite with quartz-magnetite-chalcopryrite veining that returned elevated copper-gold grades over wide intervals. Highlight results include: 274 m averaging 0.28 g/t Au, 0.10% Cu and 0.7 g/t Ag from 14 m depth in drillhole CA 13. Drillhole CA 13-03 targeted a low magnetic anomaly coincident with a chargeability high and intercepted strong phyllic alteration and high copper-gold silver values: 4 m grading 2.14% Cu, 4.88 g/t Au and 73.2 g/t Ag from 154 m depth as well as 32 m grading 0.13% Cu, 1.28 g/t Au and 2.2 g/t Ag from 308 m depth. Additional geochemistry at Castle East identified porphyry style alteration and anomalous copper-gold values over 600 m strike length but otherwise the zone remains untested. Groundwork at Tanzilla included structural and alteration geological

TABLE 3. HIGHLIGHT 2013 DRILLING INTERCEPTS AT COLORADO RESOURCES NORTH ROK PROJECT

Hole ID	From (m)	To (m)	Width (m)	Cu (%)	Au (g/t)
NR13-001	2	335	333	0.51	0.67
including	2	244	242	0.63	0.85
NR13-003	43.2	95.2	52	0.31	1.04
NR13-004	158.8	364	205.2	0.4	0.5
NR13-028	4	135.2	131.2	0.39	0.56

mapping and 4.4 line km of IP geophysical surveying. Complimentary to alteration mapping, 175 rock samples (Fig. 21) were analyzed using a Terraspec mineral identifier to differentiate clay minerals and delineate prospective assemblages in the litho cap known as Silica Ridge. Advanced argillic assemblages including quartz, pyrophyllite, diaspore, alunite, kaolinite, dickite, topaz, and dumortierite were confirmed from Silica Ridge extending 3 km southeast to the Gopher zone. Phyllic assemblages and possibly gusano textures indicative of proximal porphyry systems were also identified. Drill targets at Tanzilla may be tested in 2014 as part of the three year funding agreement with Freeport. Groundwork at Pliny included soil sampling, geological mapping and rock sampling. Two sizable copper in soil anomalies were identified measuring 250 x 480 m and 1100 x 300 m.

Victory Ventures completed a single drillhole at their **Copau** property (MINFILE 104H 036) located 11 km northwest of Red Chris. The 472 m hole targeted a strong chargeability anomaly but did not return any significant intercepts. A thick interval of graphitic mudstone was likely the source of the chargeability anomaly.

Teuton Resources conducted geochemical sampling and geological mapping at their **Yellow Chris** property and are currently seeking joint venture partners for several claim blocks containing intriguing magnetic anomalies. Redhill Resources has an opportunity to earn 60% of one such claim block and completed soil sampling, prospecting and geological mapping this year.

To the west of Kinaskan Lake, Teck Resources completed drilling, geophysics and geological mapping at **GJ** (MINFILE 104G 034) on track to earn 75% of the property optioned from NGEx Resources. Crews investigated beyond the well defined Donnely zone and ventured out to **QC**, (MINFILE 104G 033), **Wolf** (MINFILE 104G 045) and **Seestor** (MINFILE 104G 170). Other companies active in the plateau included New Chris Minerals Ltd, and Colorado Resources.

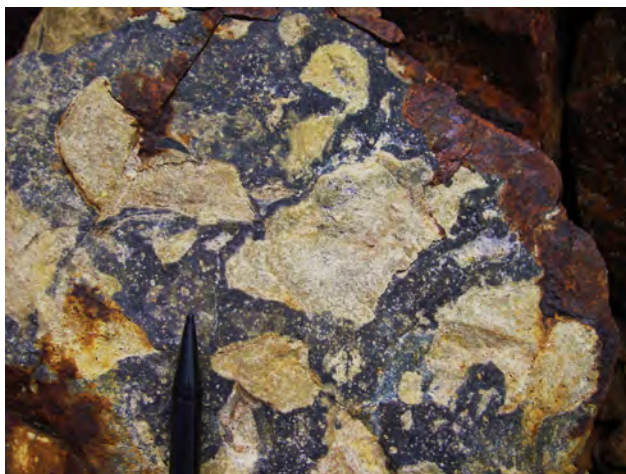


Figure 21. Hydrothermal breccia: white-cream, fine grained, strongly altered clasts appearing to be partially digested in silica-pyrite matrix at West Cirque Resources Tanzilla prospect. Photo Credit John Bradford, West Cirque Resources.

Further west, Prosper Gold Corp reignited exploration at the **Sheslay** project (MINFILE 104J 005) formerly known as **Copper Creek**, located approximately 105 km west-southwest of Dease Lake. Prosper optioned the property from Firesteel Resources and can earn up to 80% ownership by spending \$5M on exploration over four years. Firesteel was last active on the property in 2007 where 19 of 23 drillholes ended in mineralization. Activities this year included 2339.74 m of drilling in six holes, airborne magnetic and radiometric geophysical surveys, a ground based IP survey and geochemical soil sampling. Drilling validated known copper-gold porphyry mineralization at the **Star** zone (MINFILE 104J 035) and identified the deepest mineralization encountered to date below 500 m depth in drillhole S027. Highlight results are summarized in Table 4 and display the uniform grades. Mineralization consists of disseminated and fracture fill chalcopyrite and quartz-pyrite-chalcopyrite veins hosted in variably altered Stuhini Group andesite and related volcano-sedimentary rocks. Four additional prospective zones scheduled to be drill tested in 2014 include Star North, Star East, Copper Creek and Pyrrhotite Creek. Adjacent claim holder Garibaldi Resources also carried out airborne magnetic and radiometric geophysical surveys on their **Grizzly** project (MINFILE 104J 004) located immediately west of the Sheslay project and east of the inactive Golden Bear mine access road. Two prospective faults have been identified and are interpreted to be related known mineralization at Sheslay. Further ground reconnaissance and sampling are planned for 2014. Doubleview Capital Corp also conducted 2581.3 m of exploration drilling in 11 holes at the **Hat** prospect (MINFILE 104J 021) as well as 15 line km of IP geophysical surveys. Drilling targeted chargeability anomalies coincident with elevated copper values in soil. Highlight results from phase one drilling returned 110.1 m grading 0.21% Cu and 0.015 g/t Au. Phase two drill results are pending.

Late 2012 work by HDI Amarc and HDI Quartz Mountain Resources on the **Galaxie** project defined new porphyry targets and tested the historical **Gnat Pass** Cu-Au porphyry system. A comprehensive suite of geophysics (IP and magnetics), geochemical and geological surveys were compiled in early 2013 to identify 6 prospects including Hu, Pallen North, Pallen South, Silver Lode, Hotai and Nup. Ground work at Galxie included geological mapping, 10 line km of IP geophysical surveying, 96 rock chip samples and 246 soil samples. No immediate drill targets were identified however a series of alkali intrusions were observed around the Hu target and may warrant further exploration. Drilling at Gnat Pass totalled 1164 m in two holes designed to test and expand historic mineralization. Highlight results include 149 m grading 0.28% Cu from 95 m in drillhole GT12001 and 91 m grading 0.37% Cu in drillhole GT12002. Historic Gnat Pass resources are estimated to be 30 Mt grading 0.39% Cu. Mineralization remains open to the northwest and west, however faulting

complicates the deposit. Operatorship of both the Galaxie and Gnat Pass projects will pass back to Quartz Mountain.

Romios Gold Resources continued to explore their **Newmont Lake** and **Trek** properties comprising approximately 70 000 hectares located between the past producing Eskay Creek gold mine and the proposed Galore Creek copper-gold deposit. Limited ground work included the discovery of a new zone measuring 300 x 225 m of porphyry-related copper-gold mineralization now named **Burgundy Ridge** (Fig. 22). Mineralization consists of porphyry hosted chalcopyrite and bornite. Systematic hand sampling at 15 to 30 m spacing across the Burgundy zone averaged 0.47% Cu, 0.27g/t Au and 3.77 g/t Ag from 100 samples. High grade results returned up to 26.6% Cu, 1.48 g/t Au and 128 g/t Ag.

Porphyry Copper-Molybdenum-Gold Projects in the Skeena Arch

Gold Reach Resources Ltd have found the best copper-gold grades to date at their wholly owned Ootsa project located 6 km southeast of the producing Huckleberry mine. The Ootsa project consists of multiple



Figure 22. Romios Gold discovered the gold bearing Burgundy zone where record snow melts have allowed unprecedented exposures.

deposits including Ox, East and West Seel and several exploration targets. Early in 2013, an updated resource estimate incorporating 2012 drilling dramatically increased tonnages at both Ox and Seel deposits summarized in Table 5. Exploration activities during 2013 focussed on finding higher grades and increasing known resources. Drilling totalled 36 165 m of in 147 holes, 60 line km of IP geophysics and 1330 soil samples. Drilling confirmed shallow higher grade zones at Ox and East Seel deposits which will be incorporated into an updated resource estimate by early 2014. Highlight drilling intercepts are summarized in Table 6. Preliminary metallurgical testing of material from the Seel deposit yielded excellent recoveries of copper, molybdenum and gold from a conventional rougher flotation circuit. All values were above 90% and were not affected by any significant complexities or deleterious elements. Additional preliminary engineering work, environmental baseline studies and archeological assessment work was also completed. Tasks to be completed over the winter months include a preliminary economic assessment and further metallurgical work.

New Nadina Explorations Limited funded by Intrepid Mines Limited, completed a six drillhole program at the **Itsit** porphyry project (**Silver Queen** MINFILE 93L 002) located 43 km south of Houston. Drilling totalled 4413.3 m targeting TITAN IP geophysical anomalies and returned significant gold values. Highlight results include 144 m grading 0.379 g/t Au, 0.279% Cu and 0.041% Mo from 306 m depth in hole 12S-05. In an access dispute the Surface Rights board recently ruled in favor of New Nadina stating not all of the ground was being actively cultivated and mineral exploration was allowed to continue but is restricted to winter in areas of concern. Several chargeability targets remain to be drill tested.

The **Poplar** copper-molybdenum project reverted back to 100% Lions Gate Metals ownership after Canadian Dehua International Mining formally ended their purchase agreement. Poplar is located 45 km south of Houston and contains estimated indicated resources totalling 171 Mt averaging 0.28% Cu, 0.08 g/t Au, 2.3 g/t Ag and 80 g/t Mo.

TABLE 4. HIGHLIGHT DRILLING INTERCEPTS AT PROSPER GOLD CORP SHESLAY PROJECT

Hole ID	From (m)	To (m)	Width (m)	Cu (%)	Au (g/t)	Ag (g/t)
S024	4.88	317.04 (EOH)	312.16	0.37	0.24	0.69
S025	7	276	269	0.42	0.198	0.61
S026	11	274 (EOH)	263	0.35	0.15	0.63
S027	7	341	334	0.35	0.11	0.84
S027	504	576	72	0.27	0.1	0.57
S028	8	152	144	0.45	0.26	0.8
S029	11	263	252	0.34	0.21	0.71

TABLE 5. ESTIMATED RESOURCES AT THE OOTSA PROJECT USING 0.20 CUEQ CUT-OFF GRADE

Deposit	Category	Tonnes (million)	Cu %	Au g/t	Mo %	Ag g/t
Seel	Indicated	67.7	0.21	0.17	0.015	2.02
Seel	Inferred	410.88	0.16	0.11	0.018	1.95
Ox	Inferred	52.6	0.21	0.03	0.022	1.25

TABLE 6. 2013 DRILLING HIGHLIGHTS FROM THE OOTSA PROJECT

Hole ID	From (m)	To (m)	Width (m)	Cu %	Mo %	Au g/t	Ag g/t
Ox13-46	5.1	167	161.9	0.36	0.028	0.06	1.85
including	19	97	78	0.49	0.035	0.08	2.15
Ox13-62	5.8	86	80.2	0.43	0.035	0.07	1.73
including	44	86	42	0.51	0.041	0.09	1.99
Ox13-70	11.1	202	190.9	0.29	0.035	0.05	1.97
including	144	158	14	0.81	0.03	0.14	6.66
Ox13-80	18.3	246	227.7	0.34	0.032	0.05	1.73
Ox13-110	5.4	108.7	103.3	0.44	0.04	0.06	1.89
Ox13-112	10	125	115	0.39	0.024	0.08	1.91
S13-166	61	179	118	0.33		0.42	2.4
S13-169	18	44	26	0.92	0.009	0.42	28.19

Metal Mountain Resources completed a sixteen hole drill program at the **Big Onion** copper-molybdenum project located 16 km east of Smithers. Approximately 4000 m of drilling aimed to increase confidence in the historic resource and test a strong IP chargeability anomaly immediately southeast of the resource area. Results are pending.

Riverside Resources Inc and strategic alliance partner Antofagasta plc continued exploration of the **Flute** (MINFILE 93L 167) and **Lennac** (MINFILE 93L 190) properties located west of Granisle. Due to extensive till cover, they employed reverse circulation drilling (RC), to collect top-of bedrock chip samples. Seventy-seven drillholes tested 11 targets at Lennac and 66 at Flute. Targets followed up areas of prospective porphyry systems identified in 2012 RC results and airborne magnetic survey targets. Other ground work included IP geophysical surveying, geological mapping, rock sampling and Ah horizon soil sampling. At Flute, efforts were rewarded with the discovery of three intrusive

centres with porphyry-style alteration and accompanying anomalous copper-gold values. One new discovery named the Massive Sulphide Zone, is located adjacent to a circular magnetic feature at a fault junction of regional north-south and northwest trending faults. RC drilling identified intrusive hosted, quartz stockwork veining and potassic alteration with disseminated pyrite.

East of the Massive Sulphide Zone and on the eastern margin of the circular magnetic anomaly, RC drilling discovered a second intrusive centre displaying porphyry-style alteration and disseminated pyrite. RC drilling identified anomalous copper over 1.5 km of strike length, a target for follow up work in 2014. At Lennac, RC drilling identified a zone of anomalous copper bearing quartz-stockwork veining and potassic alteration in hornfelsed volcanics. Ah horizon soil sampling results identified four target areas for future work including a 1.2 km copper anomaly over 120 ppm at the **Red Top** prospect. At the **Mouse** zone, RC drilling identified a 1 km wide zone of pyrite bearing altered volcanics and intrusives immediately east of the Skinbone fault; a

structure interpreted to project through to the past producing Bell and Granisle copper-gold mines.

Astorius Resources Ltd has acquired additional claims to their **Babine Lake** (MINFILE 93L 209) in the immediate vicinity of the past producing Bell and Granisle copper-gold mines. Ground work was limited to 24 line km of IP geophysical surveys designed to complement a 2011 heli-borne magnetometer survey to refine drilling targets planned for 2014.

NICKEL IN ULTRAMAFIC ROCKS

First Point Minerals Corp continued exploration for nickel-iron-alloy at the **Wale** and **Orca** prospects (MINFILE 104I 128) located 45 km and 34 km east of Dease Lake, respectively. Groundwork during 2013 included a 36 line km magnetometer survey at Orca on 200 m spaced lines which increased line density and extended the 2012 grid 2 km to the southeast into covered area. Results indicate a 4.8 km long corridor of strongly magnetic features extending northwest and southeast of the prospect area undercover material. Winter compilation work will involve petrographic studies of surface samples and compilation and interpretation of all data collected to date, aiming to increase understanding of grade distribution. Activities at Wale included detailed mapping, sampling and ground magnetometer surveys. Awaruite (Ni_{2-3}Fe) is hosted in serpentinized ultramafic rocks of the Cache Creek Terrane. The mineral is integral to an emerging style of nickel deposit being evaluated by First Point and Cliffs Natural Resources at the advanced exploration stage Decar project located in the Omineca Region. Advantages of this deposit type are suggested through mechanical separation of awaruite grains using gravity and magnetic recovery methods versus sulphide flotation.

Hard Creek Nickel Corp is investigating controls and speciation of platinum mineralization at their 100% owned **Turnagain** ultramafic nickel-copper-cobalt project 75 km east of Dease Lake. Studies have been initiated with the BC Geological Survey to increase understanding and economic prospectivity of platinum group elements of the Attic zone. The Attic zone is the interpreted roof of the ultramafic system and independent of the known resource area which contains measured plus indicated resources totalling 865.4 Mt grading 0.21% Ni and 0.013% Co and additional inferred resources totalling 976.2 Mt grading 0.20% Ni and 0.013% Co.

MASSIVE SULPHIDE PROJECTS

“Massive sulphide deposits in the Northwest region comprise of volcanogenic deposits, skarns, mantos, and some of undefined deposit type. Volcanogenic deposits occur in strata of varying ages and terrane affiliation. The Tulsequah Chief deposit is in Paleozoic strata; Kutcho Creek is hosted in early Triassic rocks, and important deposits in the Stewart district are hosted in Jurassic

volcanic rocks. The latter include Eskay Creek, Granduc and Anyox. Manto and Skarn deposits occur where Paleozoic limestone of the ancient continental margin are intruded by Cretaceous to Tertiary plutons.” (revised from Wodjak, 2010)

Stewart District

Agnico Eagle Mines Limited completed their first exploration season as operator of the **Homestake Ridge** gold-silver-copper project (MINFILE 103P 216) located approximately 35 km southeast of Stewart. Agnico signed an option agreement to earn up to 65% of the project from Homestake Resource Corporation by spending \$25.4 M on the project staged over 5 years. Compilation of 2012 drilling results yielded an updated indicated resource estimate totalling 604 Kt averaging 6.4 g/t Au, 48.3 g/t Ag and 0.18% Cu. Additional inferred resources total 6.7 Mt grading 4.2 g/t Au, 93.6 g/t Ag and 0.11% Cu. Both use \$85 NSR cut-offs.

Drilling in 2013 totalled 3947 m in 10 drillholes and examined several new areas and deposit types on the property. Most significant was the discovery of the **Slide** zone located approximately 400 m south of the known Homestake silver deposit. Drillhole HR13-253 returned **18.6 m grading 101.8 g/t silver from 364.4 m, including 0.5 m averaging 1675.0 g/t silver from 364.4 m depth.** Two additional drillholes testing the up-dip projection of the bonanza intercept returned elevated silver values and anomalous pathfinder elements including antimony, barium and arsenic; a similar signature to the Homestake Silver deposit. Mineralization occurs as multiple, epithermal colloform banded quartz-carbonate veins with galena, sphalerite, chalcopyrite and sulphosalts. Other ground work completed this year included geological mapping, soil sampling and 18.9 line km of geophysical surveys. Mapping has identified an interpreted Eskay Creek equivalent horizon in the upper Hazleton Group stratigraphy in two areas on the property. Four holes tested one of these areas located south of the Homestake deposit of which, drillhole HR 13-252 returned 82.5 m grading 1580 ppm Zn and may be indicative of a nearby undetected VMS system. Drilling also targeted a geophysical anomaly adjacent to the Homestake zone, stratigraphy east of the deposits, the Notre Dome area and the stratigraphy to the northwest of the South Reef deposit. Initial metallurgical work results are positive with 80-90% recoveries for both copper and gold and 85-90 for silver. Baseline environmental studies are underway.

Homestake Resource Corporation remains very active in exploring their 100% owned, 68 207 ha claim block named **Kinskuch**, which contains 58 different mineral occurrences and dominates the claim holdings southeast of Homestake Silver. Several targets including the Illiance River Trend, Goldstream, North Lahte Creek, Illiance South, Theophilus Creek and Skuch await further exploration.

Dolly Varden Silver Corp partnered with Hecla Mining and continued re-examining the past producing **Dolly Varden** silver project (MINFILE 103P 188) located 45 km southeast of Stewart. Results from late 2012 drilling confirmed historical high-grade silver including two intercepts grading over 1000 g/t over 1 m and 1.4 m resulting in follow up drilling in 2013 (Fig. 23). Work focussed on the past producing **Torbit** mine (MINFILE 103P 191) and included underground chip sampling from historical workings and 3063 m of drilling in 14 holes. Drill fans were completed from four drill pads and returned significant high-grade silver values summarized in Table 7. Five drillholes validated historical resource areas, the remaining nine holes successfully targeted extensions to the northwest and southeast. Non 43-101 compliant resources compiled in 1986 at Torbit total 786 531 tonnes grading 312 g/t Ag and could at least in part be validated and possibly expanded with most recent drilling. Geological interpretation of the property suggests a silver-rich variety of an Eskay Creek like rift system.

Banks Island Gold Corp validated historical gold values at **Red Mountain** (MINFILE 103P 086) located 18 km east of Stewart. Three drillholes totalling 625 m targeted the high-grade core of the Marc zone aiming to determine grade distribution and acquire material for metallurgical testing. Results returned 71 m grading 4.4 g/t Au and 16 g/t Ag from 130 m depth in drillhole RM13-01 including higher grade intervals up to 21.6 g/t Au over 11 m. Drillhole RM13-03 returned 52.5 m grading 6.3 g/t Au and 16 g/t Ag from 166 m depth including 32 g/t over 7.2 m. Additional work completed included a 66 km² Lidar survey to assist with future site layout and road design. Banks Island intends to re-establish the former Bitter Creek road access in 2014.

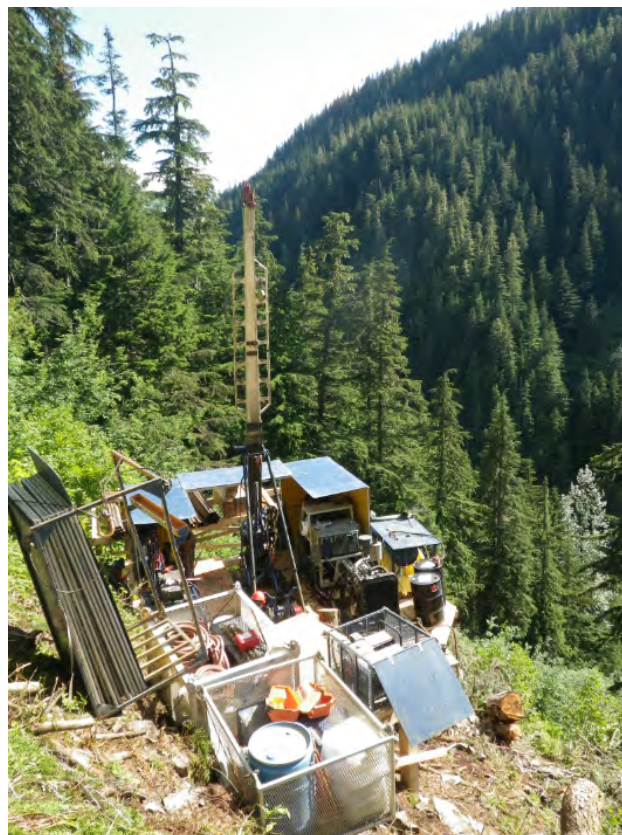


Figure 23. Drilling at the Dolly Varden silver project. Courtesy of Dolly Varden Silver Corporation.

The four defined zones of mineralization include the Marc, AV, JW and 141. Measured plus indicated resources are reported from the all but the 141 zone and total 1.6 Mt grading 8.4 g/t Au and 38 g/t Ag. Inferred resources from all zones total 0.87 Mt grading 5.4 g/t Au and 10 g/t Ag.

TABLE 7. HIGHLIGHT 2013 DRILLING FROM DOLLY VARDEN

Hole ID	From (m)	To (m)	Width (m)	Ag g/t	Pb %	Zn %
TB13-02	92.8	134	41.2	198	0.56	0.41
TB13-03	126.5	143.6	17.1	509	0.73	1.2
including	140.4	143.6	3.2	1458	0.77	1.74
TB13-06	123.7	131.4	7.7	620.5	0.7	0.11
including	123.7	126.6	2.9	1327.4	0.94	0.08
TB13-07	157.2	178.9	21.7	150.4	0.5	0.4
TB13-11	153.5	170.7	17.2	155.3	1.4	1.65
including	153.5	158.1	4.6	244.1	3.44	2.67
TB13-14	211.1	222.6	11.5	673.9	0.41	0.48

GOLD SILVER PROJECTS

“Gold-Silver projects in the region targeted mainly orogenic and intrusion-related veins. In some cases veins have associated base metal values. Gold-silver projects occur in various geologic terranes and are currently concentrated in four areas: the ‘Golden Triangle’ (Stewart district) where most are related to Jurassic intrusions of Stikine terrane; the Atlin area where they are related to orogenic emplacement of Cache Creek terrane, and to the terrane-bounding Llewellyn fault; the Cassiar area where gold veins are related to orogenic emplacement of Slide Mountain terrane; and, the Skeena Arch where gold veins are mainly related to Cretaceous-Tertiary intrusions and secondarily to Cretaceous orogenic events.” (Revised from Wojdak, 2010).

Epithermal and Orogenic veins in the Atlin district

Brixton Metals Corporation continued to define high-grade silver at the **Thorn** silver-gold-copper-lead-zinc project (MINFILE 104K 031) located approximately 130 km southeast of Atlin. Drilling focussed on following up extreme silver grades at the **Oban** zone while complementary property wide exploration techniques included detailed structural mapping, soil sampling and prospecting. Highly anomalous (up to 2.39 g/t Au) gold-in-soils have defined a 2.5 x 0.9 km area at the **Outlaw** zone (Fig. 24) where five samples returned over 1 g/t Au. Additional high gold-in-soil values were returned from the **Camp Creek Corridor** including 9 samples over 1 g/t Au and a maximum value of 13.5 g/t Au and 81.1 g/t Ag collected approximately 550 m northeast of the Oban breccia. Drilling was completed in two phases and concentrated at the Oban zone and totalled 6078 m in 35 holes. Highlight intercepts are summarized in Table 8. Drilling results from phase two including untested structural and IP targets at Oban East, Talisker and Glenfiddich zones are pending.

BC Gold Corp has signed a letter agreement with Blind Creek Resources to option mineral claims adjacent to the past producing **Engineer** mine (MINFILE 104M 014) from located 32 km west of Atlin. Several gold bearing structures extend from the Engineer mine onto the optioned claims and will be the focus of exploration activities planned for 2014. No ground work was carried out at the property during 2013.

Epithermal and Orogenic veins in the Stewart District

Ascot Resources has extended their option agreement with Boliden Ltd until 2015 to purchase all of the **Premier** gold-silver project assets and continued an aggressive drilling program 13 km north of Stewart. Company owned drilling rigs managed costs and completed 25 742 m in 145 holes spread between Premier, Martha Ellen, Province, S1 and Unicorn zones. Drilling successfully expanded and confirmed bulk-tonnage and high-grade underground gold-silver targets with highlight results summarized in Table 9. In February,



Figure 24. Structural Geologist Joel Angen investigates the Bungee prospect at Brixton Metals Thorn project.

Ascot released an increased resource estimate for the **Big Missouri** (MINFILE 104B 046), the **Martha Ellen** (MINFILE 104B 092) zones incorporating all of the 2012 drilling. Indicated resources total 89.4 Mt grading 0.77 g/t Au and 5.3 g/t Ag with additional inferred resources totalling 20.4 Mt grading 0.67 g/t Au and 4.5 g/t Ag.

Teuton Resources remained active in the Stewart region by completing five drillholes at the **High** property (Fig. 25) located approximately 57 km north of Stewart and on the southern margin of Pretium Resources Brucejack project. Drilling logistics were complicated by poor weather conditions, challenging setup locations and other technical difficulties. Two of the five collared holes did not achieve target depth. Total drilling equated to 306 m and returned one highlight intercept: 0.7 m grading 4.12 g/t Au from 36.15 m depth in drillhole 2013-2.

The **Tennyson** copper-gold property (MINFILE 104B 167), located 38 km north-northwest of Stewart, was sold to privately backed HDI Brigade Resources and evaluated with the adjacent **Tide** copper-gold-silver – molybdenum property (MINFILE 104B 129). Sixteen exploration drillholes targeted the Main and Skarn zones



Figure 25. Looking south towards Teuton Resources High Property.

TABLE 8. HIGHLIGHT 2013 DRILLING FROM THE THORN PROJECT

Hole ID	From (m)	To (m)	Width (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
THN13-89	38.2	151.7	113.5	0.14	58.65	0.01	0.13	0.37
including	49	50	1	0.41	1060	0.02	2.78	0.17
THN13-90	5.4	167.03	161.63	0.38	62.15	0.02	0.29	0.79
including	78	105.68	27.68	0.87	108.7	0.04	0.47	2.16
THN13-93	10.27	84	73.73	0.19	21.56		0.13	0.32
THN13-101	0	17.13	17.13	0.22	165.53		0.06	0.02
including	12.19	13.5	1.31	0.66	1275	0.01	0.44	0.01
THN13-112	94.75	100	5.25	0.25	47.32	1.32	0.16	0.43
including	95.4	99	3.6	0.32	66.83	1.91	0.2	0.48

following up 2011 drilling results and 2012 compilation of geological mapping, sampling and geophysics. Drillhole TN13-09 collared in the Main zone returned the best results: 205.54 m grading 0.227 g/t Au, 0.3% Cu and 1.8 g/t Ag. Several discrete intervals of Cu-Au mineralization were also encountered and summarized in Table 10. Brigade does not have further exploration plans for Tennyson and have initiated talks with Teuton to return the property.

Snip Gold Corp acquired additional mineral claims to include a newly constructed all-weather road network and completed limited reconnaissance work at their **Iskut** copper-gold property located 110 km northwest of Stewart. The Iskut property includes the past producing **Johnny Mountain** gold mine (MINFILE 104B 107), the **McFadden** zone (MINFILE 104B 260), **Bronson Slope** gold-copper porphyry prospect (MINFILE 104B 077), and is adjacent to the past producing **Snip** gold mine (MINFILE 104B 250). Highlight hand samples returned 155 g/t Au from the McFadden zone and over 100 g/t Au (assay upper limit) from a sulphide shear vein on strike with the Johnny Mountain mine. Geological mapping also followed up a 1200 x 400 m gold-in-soil anomaly at the **Khyber Pass** (MINFILE 104B 138). Mineralization is interpreted to be related to both the **Pyramid Hill** copper-zinc-gold-silver prospect (MINFILE 104B 207) to the east and the **Inel** (MINFILE 104B 113) gold-copper-silver intrusion related prospect to the north. Compilation of historic work at Inel included 1085 m of underground development as 192 drillholes is ongoing.

Intrusion Related Gold-Silver in the Skeena Arch

HDI Amarc Resources partnered with HDI Quartz Mountain Resources to explore the **ZNT** copper-silver-molybdenum property located 15 km south of Smithers.

The project area was staked on the basis of elevated zinc concentrations in regional till samples reported by Geoscience BC and includes the **King** (MINFILE 093L 041), **Rainbow** (MINFILE 093L 044), and **Colorado** (MINFILE 093L 043) copper-silver-gold past producers. Late 2012 work included soil sampling and 20 line km of IP geophysical surveys and identified coincident silver-in-soil and chargeability anomalies. Activities in 2013 included 170 rock samples and 36 soil samples from 62 pits and trenches which identified silver-rich volcanogenic sandstones. A two hole, 600 m drilling program tested deposit extensions without success. No further work is planned.

HDI Amarc also conducted early stage exploration at their 100% owned **Silver Vista** silver project located approximately 55 km northeast of Smithers where volcanogenic sandstones returned up to 569 g/t Ag and 14.7% Cu (Fig. 26). Sixty-eight pits and trenches were completed around on the previously drilled **MR** showing (MINFILE 093M 195) and concluded that large bulk tonnage silver mineralization is limited. However, several targets on the property remain to be further investigated including two silver targets and a copper-molybdenum porphyry target.

COAL IN THE BOWSER BASIN

The Bowser Lake Group is a Middle Jurassic to Lower Cretaceous sedimentary sequence sourced from the northeast and in-fills the area between the Stikine Arch and the Skeena Arch (Fig. 27). It consists of nine different sedimentary assemblages; of which five are known to be coal bearing and three of those are deltaic facies containing prospective high ranking anthracite coal. The Groundhog-Gunanoot assemblage hosts Canada's only known anthracite reserves in thirty-three coal seams

TABLE 9. HIGHLIGHT 2013 DRILLING FROM PREMIER - BIG MISSOURI

Hole ID	From (m)	To (m)	Width (m)	Au (g/t)	Ag (g/t)
PR-13-433	28.23	117.85	89.62	1.06	2.7
including	100	101	1	71.6	30.9
PR-13-439	161.5	306.17	144.67	1.37	3.3
including	185	186	1	230	44.3
PR-13-451	174	207.57	35.57	9.66	6.6
PR-13-470	25	96.5	71.5	1.07	4.4
PR-13-473	18	62.5	44.5	1.1	5.7
PR-13-493	229.5	320.23	90.73	1.25	4.4
PR-13-507	123.64	181	57.36	1.68	8.1
PR-13-537	20	85.51	65.51	1.24	7.2

TABLE 10. HIGHLIGHT 2013 DRILLING FROM THE TENNYSON PROJECT

Hole ID	From (m)	To (m)	Width (m)	Cu (%)	Au (g/t)	Ag (g/t)
TN13-02	183.54	311.59	128.05	0.388	0.256	1.3
including	247.56	280.11	32.55	0.686	0.537	2.3
TN13-04a	90.24	96.34	6.1	0.021	2.21	10.8
TN13-06	312.5	330.79	18.29	0.026	1.367	0.7
TN13-09	46.9	252.44	205.54	0.3	0.227	1.8
including	69.51	81.71	12.2	0.783	0.334	4.5
including	148.78	191.46	42.68	0.473	0.361	2.1
TN13-12	36.58	140.2	103.62	0.246	0.129	0.6
including	95.19	115.82	20.63	0.538	0.198	1.1

within the Klappan Formation. True thicknesses range up to 11 metres while twenty eight of the coal seams average 0.5 metres true thickness.

Exploration interests in all coal bearing stratigraphy of the Bowser Lake Group have been renewed with the advancement of existing coal projects in the region. However due to overlapping high cultural and environmental values, the BC government has placed a one year deferral on granting any new coal tenures in the

Klappan Coal License Deferral Area (Map 2). Existing tenures such as those at Actos and Groundhog, will not be affected.

The **Arctos Anthracite** project (formerly Mount Klappan, MINFILE 104H 022) located approximately 160 km NNE of Stewart is jointly owned by Fortune Minerals (80%) and Posco Canada Ltd. (20%). There are four resource areas including Lost Fox, Hobbit Broach, Summit and Skeena. The Lost Fox deposit (Figs. 28, 29)



Figure 26. Volcanogenic sandstones at HDI Amarc Silver Vista property returned to 569 g/t Ag and 14.7% Cu. Courtesy of HDI Amarc.

is the most studied and contains Proven plus Probable Reserves totalling 124.9 million tonnes. Collectively between the deposits, indicated resources total 231 million tonnes and inferred resources total 359 million tonnes. All 2013 activities were conducted around the Lost Fox resource area and designed to acquire environmental, geotechnical, archeological, and hydro-geological data to support an Environmental Assessment application scheduled to be submitted in 2016. Seventeen drillholes were completed and two partially drilled but halted due to protester disruption. A November 2012 Feasibility Study proposes a 3 million tonne per year production rate yielding 10% ash (air dried basis) clean coal over a 25 year mine life.

Approximately 60 kilometres southeast of Arctos, Atrium Coal continued evaluating coal resources at the **Groundhog** deposit (MINFILE 104A 078). Multiple thick, near surface, flat lying, continuous, high ranking anthracite coal seams have been identified and a prefeasibility study is underway. Definition drilling totalled 64 holes aiming to achieve reserve definition and acquire material for advanced material testing including bulk sampling. Drilling consistently intercepted the #70 coal seam in thicker intervals (up to 6.8 m thick) and shallower than expected. An updated JORC (Joint Ore Reserves Committee) compliant resource estimate incorporating historical and 2012 drilling increased

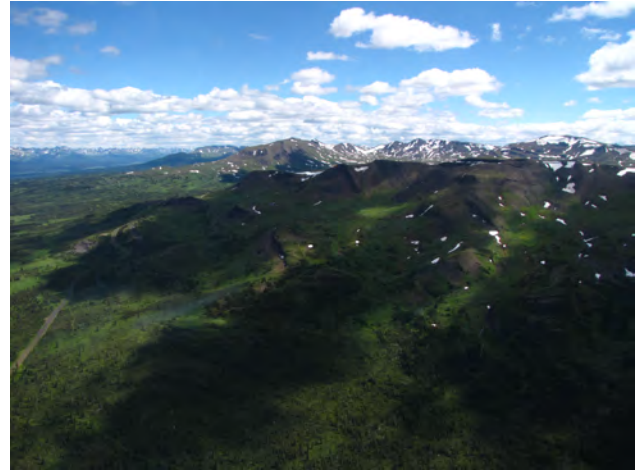


Figure 28. Overlooking the Lost Fox resource area of the Actos Anthracite coal project.

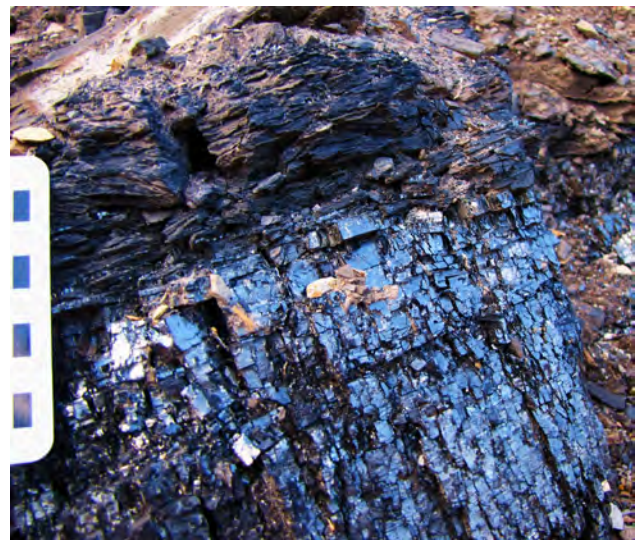


Figure 29. High rank anthracite coal seam in contact with overlying mudstone in the Mount Klappan formation, Gunanoot-Groundhog assemblage, Bowser Lake Group.

measured plus indicated resources to 569 Mt with additional inferred resources totalling 998 Mt of pure anthracite using cut-off parameters of 0.3 m coal

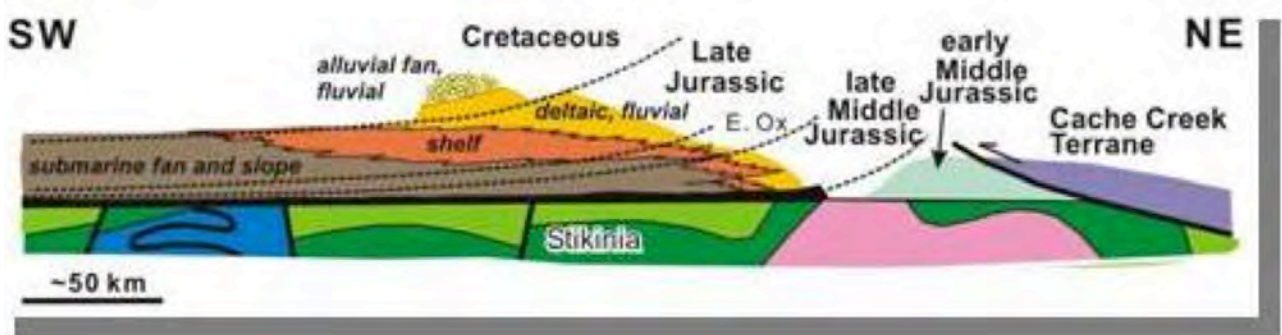
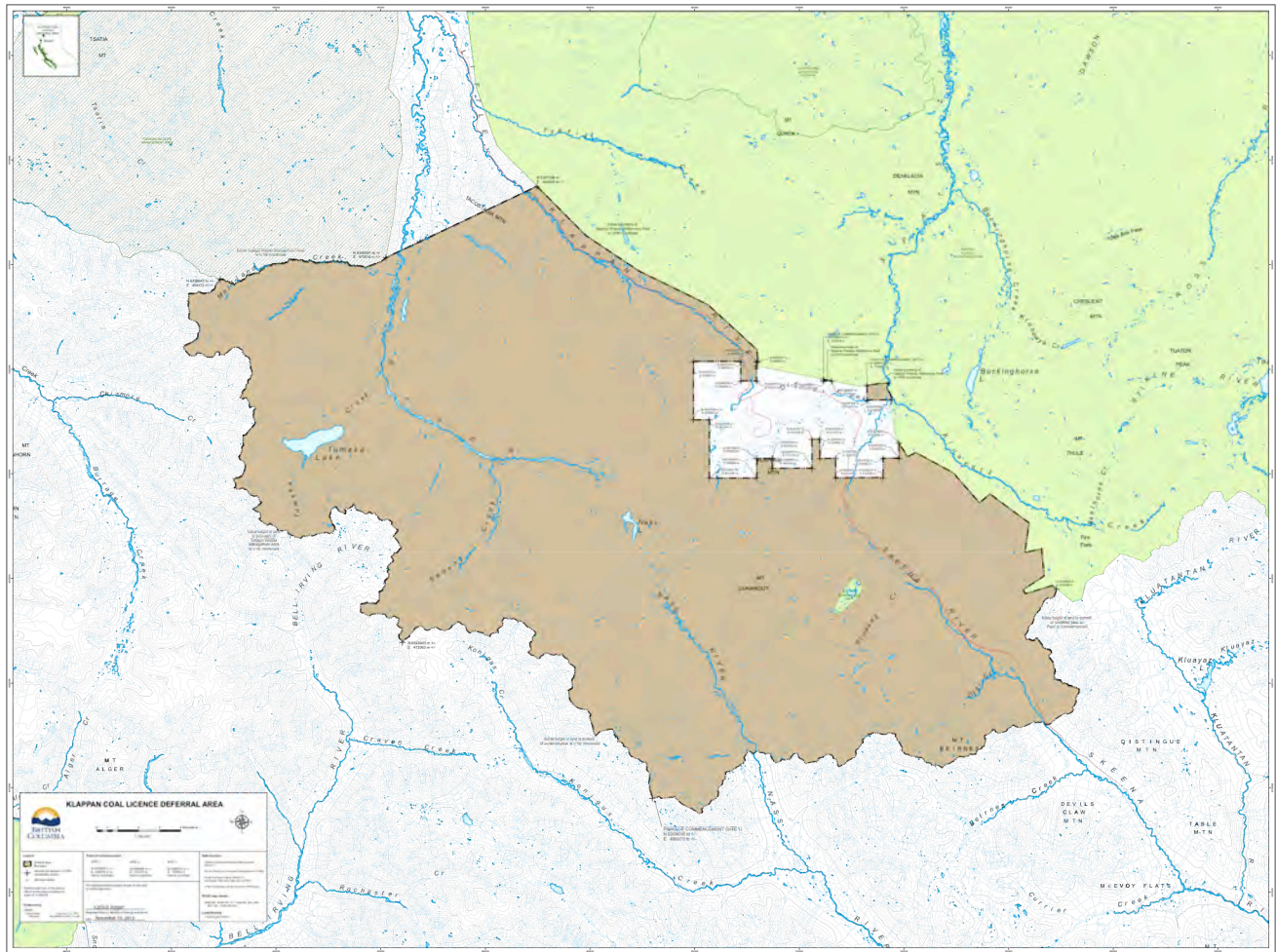


Figure 27. Schematic facies assemblages of the Bowser Lake Group. From Evanchick and Thorkelson, 2003.



Map 2. One year coal licence deferral zone in the Klappan area.

thickness and 100 m setbacks from rivers. A scoping study released in August focuses on the northwest zone and a 1.8 Mtpa run-of-mine operation and an initial capital expenditure of a modest \$62M. Planning for a 10 000 tonne bulk sample from the #70 seam is underway alongside off-take agreements and environmental baseline monitoring. Coal will be transported initially by truck to Stewart Bulk Terminals where storage and shipping arrangements have been made. The existing BC rail grade near the property allows for potential future growth to rail transport to Prince Rupert or Vancouver.

rest of the Smithers Mines Office, JoAnne Nelson, Tian Han and Lauren Wilson and the BC Geological Survey, Regional Hydrologist Scott Jackson, The Smithers Exploration Group, Jim Logan, Tom Schroeter, Paul Wojdak, Regional Geologists Paul Jago, Bruce Northcote, Fiona Katay, Mineral Development Geologist Bruce Madu, GIS support from Cindy Barden, Blair Ells, Andy Muma and Gabriel Li. Errors or omissions remain the responsibility of the writer.

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TABLE 11. SELECTED EXPLORATION PROJECTS, SKEENA REGION, 2013

Property	Proponent	MINFILE	Deposit Type	Commodities	Work (Proposed) Actual
Babine (Astorius)	Astorius Resources Ltd	093L 209	Porphyry	Cu	GP (IP, 24 Line km), GC (Soils), G
Ball Creek	Blue Gold Mining	104G 018	Porphyry	Cu, Au	C
Bell Copper	Glencore Canada Corporation	093M 001	Porphyry	Cu, Au	C, Environmental, Water Treatment,
Big Onion	Metal Mountain Resources	093L 124	Porphyry	Cu, Mo, Au Ag	DD (4000 m, 16 holes)
Big Hammer	Doug McRae / Jetgold option			Au, Ag, Te	G, GC
Bronson (Snip 1)	Snip Gold Corp.	104B 077	Porphyry	Au, Cu, Ag	G, GC
Brucejack	Pretium Resources Inc.	104B 193	Porphyry	Au, Ag	underground development ramp to VOK zone, 10,000 tonne bulk sample from 4 cross cuts, 16,789 m u/g drilling in 201 holes and in 17 fans, 16,500 m u/g exploration drilling, 5,000 m surface exploration drilling, 2 raise developments on Cleopatra vein,
Castle	West Cirque resources / Freeport MacMoran	104G 076	porphyry	Au, Cu, Mo, Ag	DD (1859 m, 4 holes)
Clone	Teuton Resources Corp & Canasia Industries Corp	103P 251	Vein / Breccia	Au	G
Copau	Victory Ventures	104H 036	Porphyry	Cu, Au	(drilling IP anomalies, 5 DD, ~ 2000 - 2500 m)
Copper Creek / Sheslay	Firesteel Resources Inc. JV with Prosper Gold	104J 035	Porphyry	Cu, Au	DD (2339.74 m, 6 holes), GC (3565 Soils), GP (29 line km IP, 1462 line km airborne MAG and RAD)
Deer Horn	Deer Horn Metals Inc.	093E 019	Vein / Breccia	Au, Ag, Te	PEA released March 2013 for 74,000 T / yr milling op; SUB EA threshold; \$27.8 M Capex; 14 year Mine Life;
Dilworth - Big Missouri	Ascot Resources Ltd.	104B 044	Vein / Breccia	Au, Ag	DD (25,742 m, 145 holes), G,GC
Dolly Varden	Dolly Varden Silver Corporation (Carrington Acquisition Corp)	103P 188	Vein / Breccia	Ag	DD (3036 m, 14 holes), G, GC,
Dome Mountain	Metal Mountain resources / Gavin Mines Ltd	093L 022	Vein / Breccia	Au	Mine permit ammedment
Eaglehead	Carmax Explorations Ltd.	104I 008	Porphyry	Cu, Mo	G, GC,
Eldorado	Colorado Resources Ltd JV with Sunrise Resources		Porphyry	Au, Cu	DD (1431 m, 5 holes)
Emerald Glacier (Miya)	Lowprofile Ventures Ltd	093E 001	Vein / Breccia	Zn, Ag, Pb, Cu, Au	G, GP, GC
Engineer	BC Gold Corp.	104M 014	Vein / Breccia	Au	
Flute	Riverside Reources	093L 167	Porphyry	Cu, Au, Ag, Mo	RC (66 holes), GC (725 Ah Soils), G, GP (IP)
Fireside	Fireside Minerals Ltd.	094M 003	IM_Rock	Barite	DD (5200 m, 78 holes)
Four J's	Rotation Minerals Ltd	104B 128	Massive Sulphide	Au, Ag	
Galaxie	HDI - Amarc + Quartz Mountain		Porphyry	Cu, Au, Ag, Mo	G, GC (Rock Chips & Soils), GP (IP, 10 line km)

TABLE 11. CONT'D.

Property	Proponent	MINFILE	Deposit Type	Commodities	Work (Proposed) Actual
Galore Creek	Galore Creek Mining Corp.	104G 090	Porphyry	Au, Cu	DD (11 400 m), G, GC
GJ	Teck Resources Limited	104G 034	Porphyry	Cu, Au	DD, G, GC
Gnat Pass	HDI - Amarc + Quartz Mountain	104I 001	Porphyry	Cu, Au	DD (1164 m, 2 holes), G, GC, GP
Granduc	Castle Resources Inc.	104B 021	Massive Sulphide	Cu, Ag, Au	C
Grizzly	Garibaldi Resources	104G 079	Porphyry	Cu, Au	G, GP (Airborne MAG & RAD)
Groundhog	Atrum Coal	104A 078	Metallurgical Coal	Anthracite Coal	DD (36 holes), G, GC, C, EM
Hanson Lake	John Chapman / Gerry Carlson		Porphyry	Mo, Cu	G, GC,
Hat	Tom Lisle & Erik Ostensoe / Doubleview Capital Corp.	104J 015	Porphyry	Cu, Au, Ag	DD (2587.3 m, 11 holes), GP (15 line km IP)
High	Teuton resources		Vein / Breccia	Au, Ag	DD (306 m, 5 holes)
Homestake Ridge	Agnico Eagle Mines + Homestake Resource Corporation	103P 216	Vein / Breccia	Au, Ag, Zn	DD (3947 m, 10 holes), GP (IP, 18.9 line km), G, GC (soils)
Horsefly	Winrock Resources Inc.	103H 013	Vein / Breccia	Au	G, GC (Rock chips)
Huckleberry Mine	Huckleberry Mines Ltd.	093E 037	Porphyry	Cu, Mo, Au Ag	11 DD, 3462 m (7DD , 1750 m Q4) soils, Mining
Iskut (Johnny Mountain)	Spirit Bear Minerals Ltd.	104B 107	Vein / Breccia	Au, Ag, Cu	G, GC
KSM	Seabridge Gold Inc.	104B 103	Porphyry	Au, Cu, Mo, Ag	DD (32,274 m, 40 holes) IP (10 line km), MAG (4.7 line km), EM (8.6 line km), G, GC
Kinskuch	Homestake Resource Corporation		Massive Sulphide	Au, Cu	
Kiniskan	Colorado Resources Ltd		Porphyry	Au, Cu	G, GC (Soils, Rock Chips)
Kitsault Mine	Avanti Mining Inc	103P 120	Porphyry	Mo	Permitting
Kutcho Creek	Capstone Mining Corp.	104I 060	Massive Sulphide	Cu, Zn, Ag, Au	C
Kutcho Jade	The Continental Jade Ltd	104I 078		Jade	Mining
Kshish	Jet Gold Corp.	103I 034		Mo	G
Lennac Lake	Riverside Resources	093L 190	Porphyry	Cu, Mo	RC (11 holes), G, GC (Ah soils), IP
Morrison	Pacific Booker Minerals Inc.	093M 007	Porphyry	Cu	C
Mount Klappan / Actos	Fortune Minerals Limited	104H 022		Anthracite Coal	DD (1800m, 17 holes), ENV,
New Polaris	Canarc Resource Corp.	104K 003	Vein / Breccia	Au	C
North Rok	Colorado Resources Ltd	104H 035	Porphyry	Cu, Au	DD (11,448 m, 29 holes), IP (69 line km), MAG (101 line km), AB (208 line km), G (10 km mapping), GC (1,572 soils)
Ootsa	Gold Reach Resources Ltd.	093E 004	Porphyry	Cu, Au, Ag, Mo	DD (36,135 m, 147 holes), IP (60 line km), GC (1330 soils)

TABLE 11. CONT'D.

Property	Proponent	MINFILE	Deposit Type	Commodities	Work (Proposed) Actual
Pliny	West Cirque resources / Freeport MacMoran	104I 026	Vein / Breccia	Cu, Au	GC, (148 soils), G,
Poly	Frontline Gold Corp	104A 177	Massive Sulphide	Au, Ag	(1500 m DD)
Poplar	Lions Gate Metals Inc.	093L 239	Porphyry	Cu, Mo	C
Provencher Lake - Letain	Glenpark Enterprises Ltd.	104I 092		Jade	Mining
QC	Teck Resources Limited		Porphyry	Cu, Au	G, GC
Quinn Eskay	Cache Exploration	104B 342	Vein / Breccia	Au, Ag, Cu, Zn	G,GC (Rock chips) (IP, Driling)
Red Chris	Imperial Metals Corp. (Red Chris Development Company Ltd.)	104H 005	Porphyry	Cu, Au	Mine Construction
Red Chris North	Serengetti Resources		Porphyry	Cu, Au	GC, (62 RC, 83 Soils, 84 silts), G
Red Mountain	Bank Island Gold	103P 086	Other	Au	DD (685 m, 3 holes), G, GC, Lidar (66 km2)
ROK (Coyote)	OZ Minerals JV with Firesteel	104H 012	Porphyry	Mo, Cu	DD (1740 m, 3 holes) 315 line km airborne MAG and Radiometrics, 26.5 line km 3D IP, , Geological mapping,
Schaft Creek	Copper Fox Metals Inc.	104G 015	Porphyry	Cu, Mo, Au, Ag	DD, G, GC, C
Silver Coin	Jayden Resources Inc - Mountain Boy Minerals Ltd JV	104B 150	Vein / Breccia	Au, Ag, Pb, Zn	G
SIB (Eskay)	Eskay Mining Corp & St. Andrew Goldfields	104B 376	Vein / Breccia	Au, Ag	C
Silver Hope	Finlay Minerals Ltd.	093L 256	Vein / Breccia	Ag, Cu	G, GC
Silver Queen	New Nadina Explorations Limited	093L 002	Porphyry	Cu, Mo	DD (4413.3 m, 6 holes), GC, G
Silvertip	Silvercorp Metals Inc. (New Pacific Metals Corp)	104O 038	Sedimentary Replacement	Ag, Pb, Zn, Au	C
Silver Switchback	Far resources Ltd	093L 195	Massive Sulphide	Ag, Cu	G, GC (Rock Chips, Soils)
Silver Vista (MR)	Amarc Resources Ltd.	093M 195	Sedimentary Replacement	Ag, Cu	G, GC (Rock Chips & Soils)
Snip North	Snip Gold Corp.	104B 312	Vein / Breccia	Cu, Au	G, GC
Summit A,B (Kitty),C,D	Revolver Resources	104H 015	Porphyry	Cu, Au	G, GC (RC), 3D IP,
Tanzilla	West Range Exploration Ltd	104I 023	Porphyry	Cu, Au	IP, G, GC
Table Mountain	China Minerals Corp.	104P 029	Vein / Breccia	Au	G, GC (Soils, Rock Chips)
Taurus	China Minerals Corp.	104P 012	Vein / Breccia	Au	G
Tennyson	Teuton Resources Corp. / Brigade Resources	104B 167	Unknown	Cu, Au	DD, (16 holes), G, GC

TABLE 11. CONT'D.

Property	Proponent	MINFILE	Deposit Type	Commodities	Work (Proposed) Actual
Thorn	Brixton Metals Corp	104K 031	Vein / Breccia	Au, Cu	DD (6078 m, 35 holes) GC (1386 soils, rock chips), G,
Trek	Romios Gold Resources Inc.	104G 022	Vein / Breccia	Au, Cu	G, GC (Rock Chips)
Tulsequah Chief	Chieftain Metals Inc	104K 002	Massive Sulphide	Cu, Zn, Ag, Au	DD (3540m, 9 holes), GP (IP), G,
Turnagain	Hard Creek Nickel Corp.	104I 119	Magmatic	Ni, Co, Pt, Pd, Cu	G, GC
Wale	First Point Minerals Corp.		Serpentine UTM	Ni, Fe	G, GC (Soils) GP (Ground mag)
Yellow Chris	Teuton optioned to Redhill Resources		Porphyry	Cu, Au	G, GC (454 soils)
Yellow Giant	Banks Island Gold	103G 021	Vein / Breccia	Au, Cu, Ag	(35 000 m DD, proposed 200 tpd milling and test mining
Zetu-Nerock	Ashburton Ventures Inc.		Porphyry	Cu, Au	G
ZNT	HDI Amarc		Porphyry	Cu, Au, Ag, Mo	DD (600 m, 2 holes), G, GC (soils, rock chips), GP (IP, 20 line km), T

Work Program Abbreviations:

A = access (trail, road construction on claims); AB-EM = airborne electromagnetics; AB-MG = airborne magnetics; AB-RD = airborne radiometrics; 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, soil, silt etc.); GD = geotechnical drilling; GP = geophysics (general); IP = induced polarization; 3D-IP; MG = magnetics; MK = marketing (primarily for industrial mineral products); MS = metallurgical studies; OB = overburden drilling; OP-BU = open pit bulk sample; P = prospecting; PD = percussion drilling; PF = pre-feasibility studies; PP = pilot plant; R = reclamation; RC (Xm) = reverse circulation drilling totalling X metres; TR = trenching; UG (Xm) = X metres of underground development; UG-BU = underground bulk sample; UT = UTEM;

EXPLORATION AND MINING IN THE NORTHEAST REGION, BRITISH COLUMBIA

By **C. Paul Jago, M.Sc., GIT**
Regional Geologist, Prince George

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 prodeltaic 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.

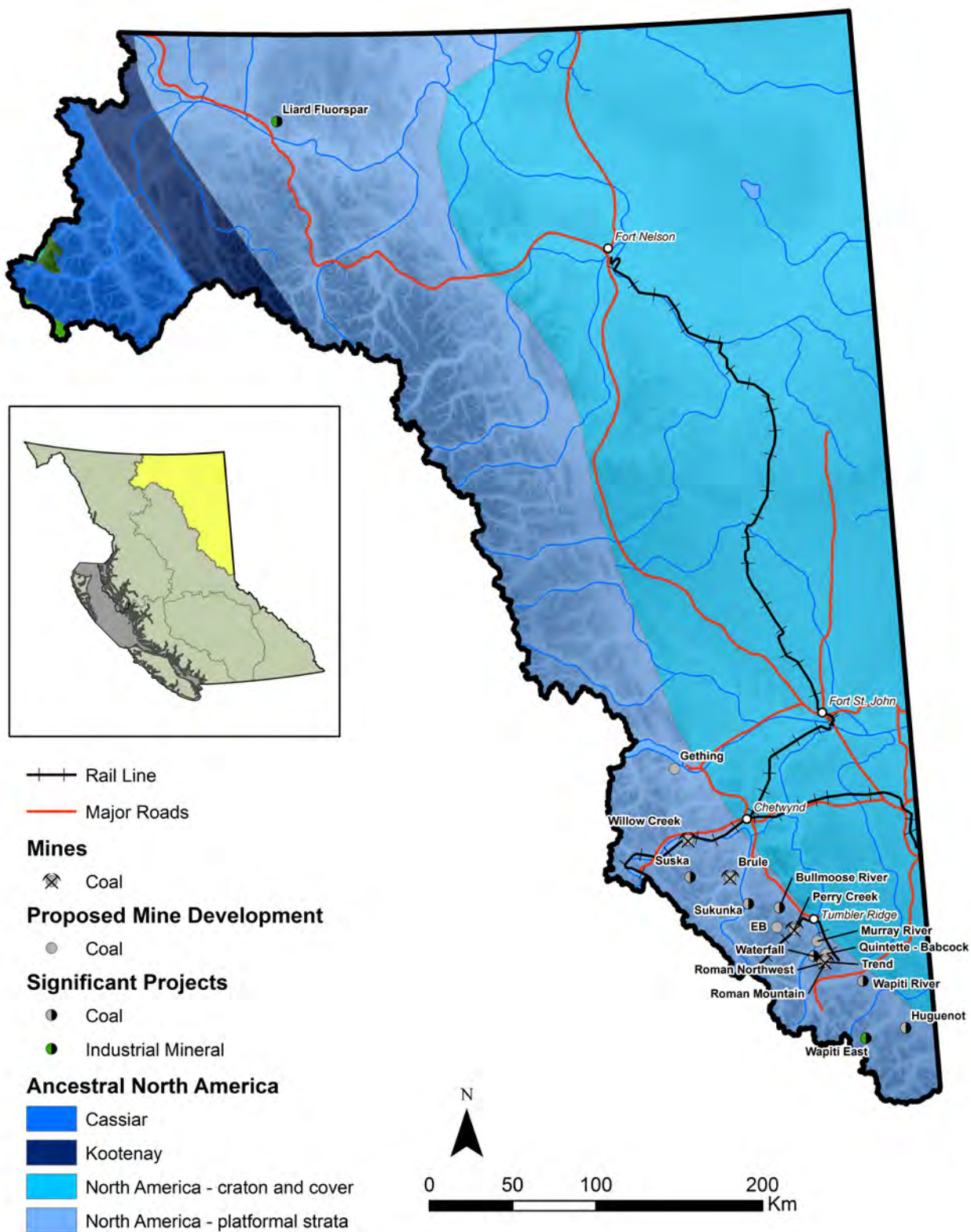


Figure 1. Mines and select exploration projects, Northeast Region, 2013.

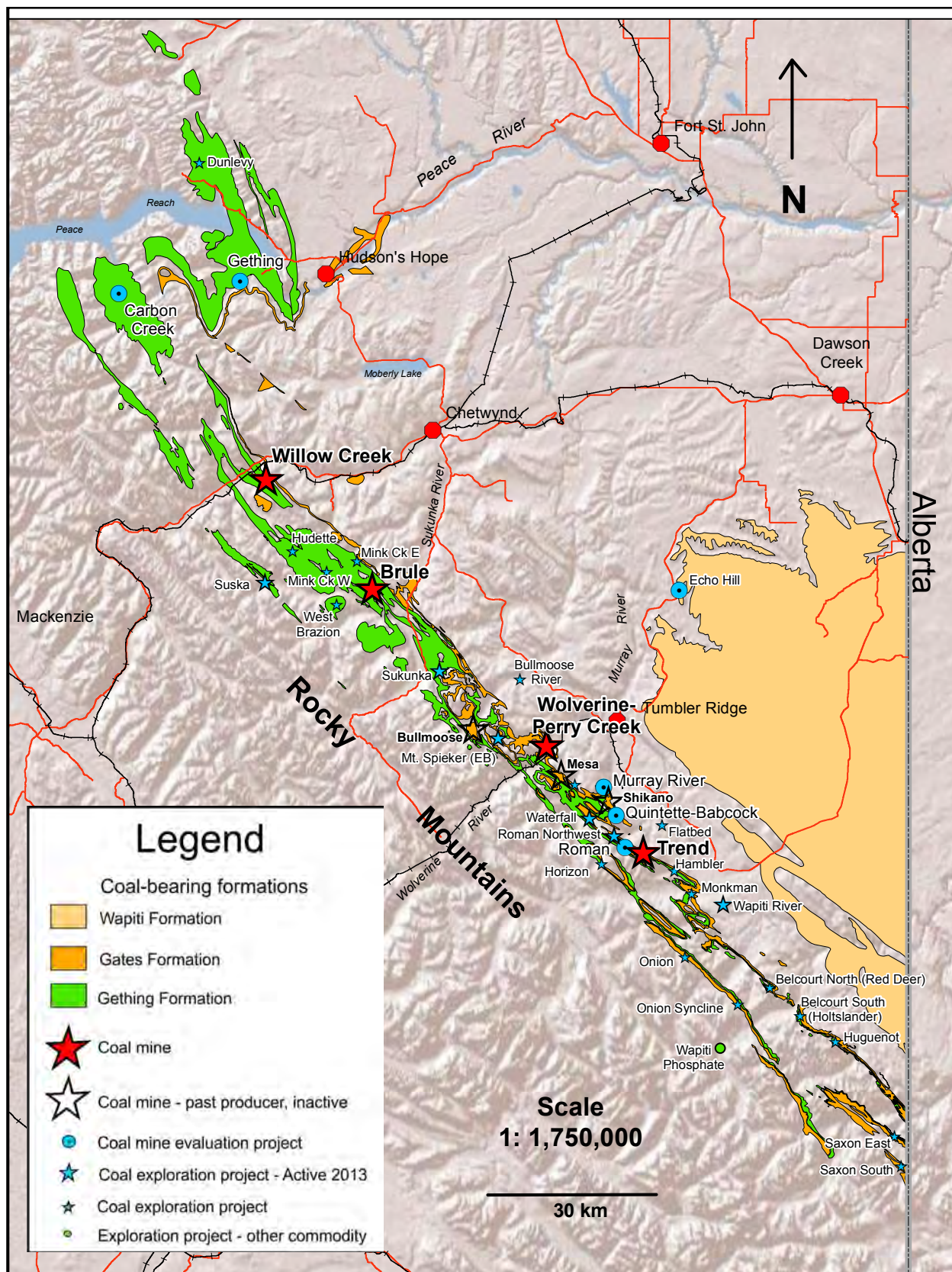


Figure 2. Map of Peace River Coalfield showing the distribution of economic coal-bearing geology, mines and exploration projects. Map by Janet Riddell, BC Senior Minerals Coal Geologist.

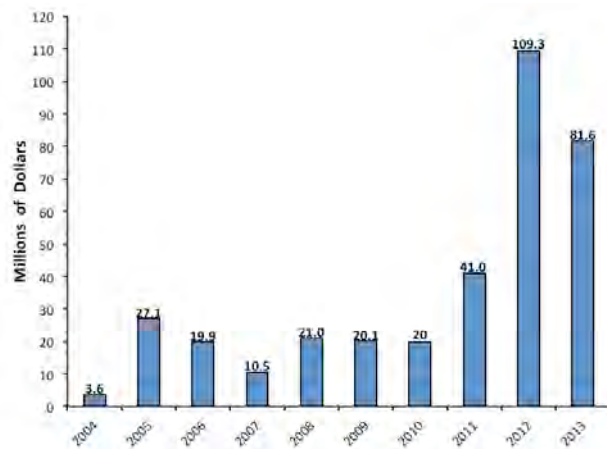


Figure 3. Annual exploration spending estimates in millions of dollars, Northeast Region (amount for 2010 is a rough estimate).

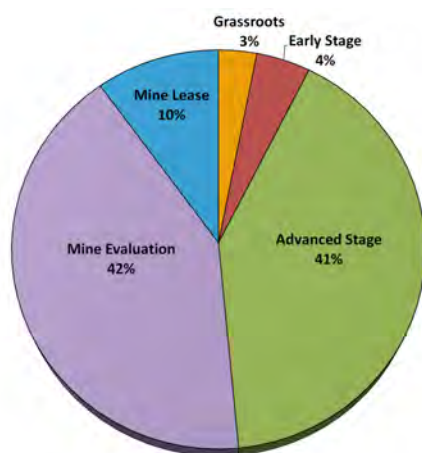


Figure 4. Exploration expenditures in 2013 by exploration stage (Grassroots: initial reconnaissance; Early stage: focused work on a target; Advanced stage: resource delineation, PEA and Prefeasibility; Mine Evaluation: focus on EA certificate, Feasibility studies, social license and government approval; 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

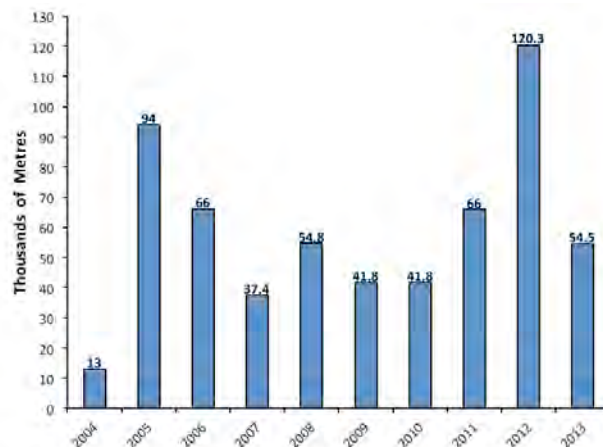


Figure 5. Annual exploration drilling estimates in thousands of metres, Northeast Region (amount for 2010 is a rough estimate).

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

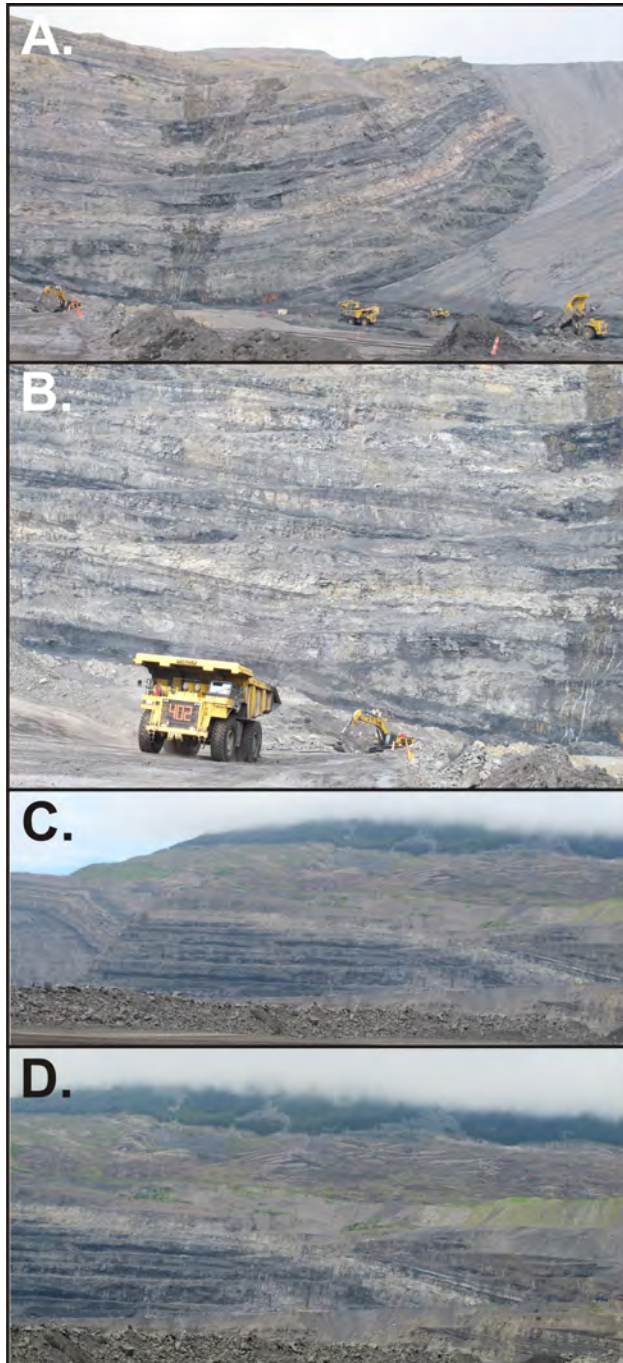


Figure 7. Perry Creek Mine – **A, B.** Mining full Middle Gates sequence A-J seams in Phase 3A. The rusty coals at bottom are the J2 seam, the J3 parting pinches out to the west; **C, D.** View southwest at Phase 4A drilling. Phase 4B is in the green area above the Armand sandstone unit (Upper Gates).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

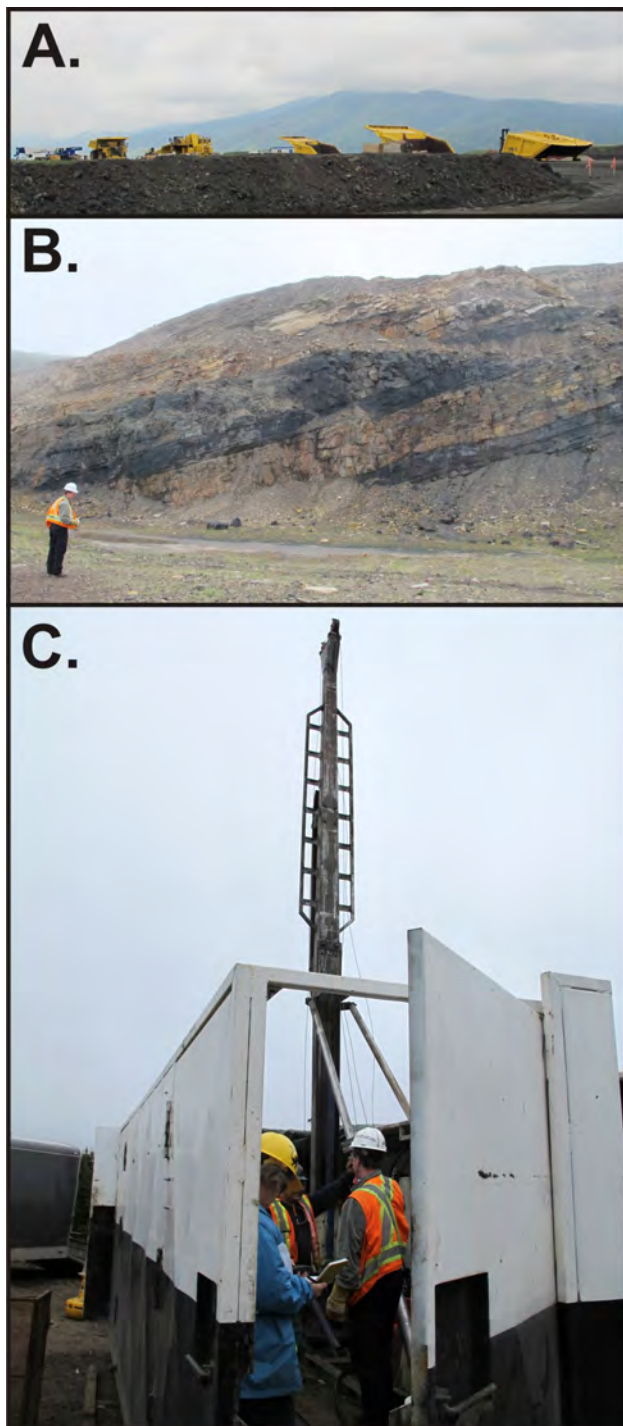


Figure 9. Quintette-Babcock – **A.** Laydown yard with new mining equipment; **B.** View SSE at gently-dipping D, E, and F seams in the Little Windy Pit area; **C.** Core drilling in the Northeast fault zone, Window Pit area.

\$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

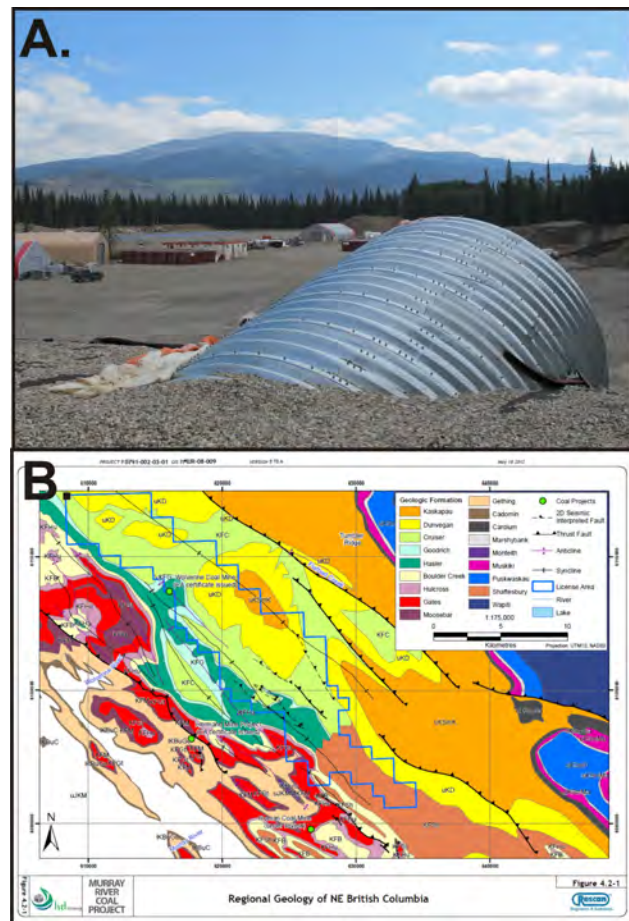


Figure 10. Murray River – **A.** View SSW across Murray River South Decline site with decline portal in foreground. The Quintette Shikano Pit and Mt Babcock (Windy and Window Pits) seen in background; **B.** Geology of the Murray River project area showing northwest trending 34 km long licensed area 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.

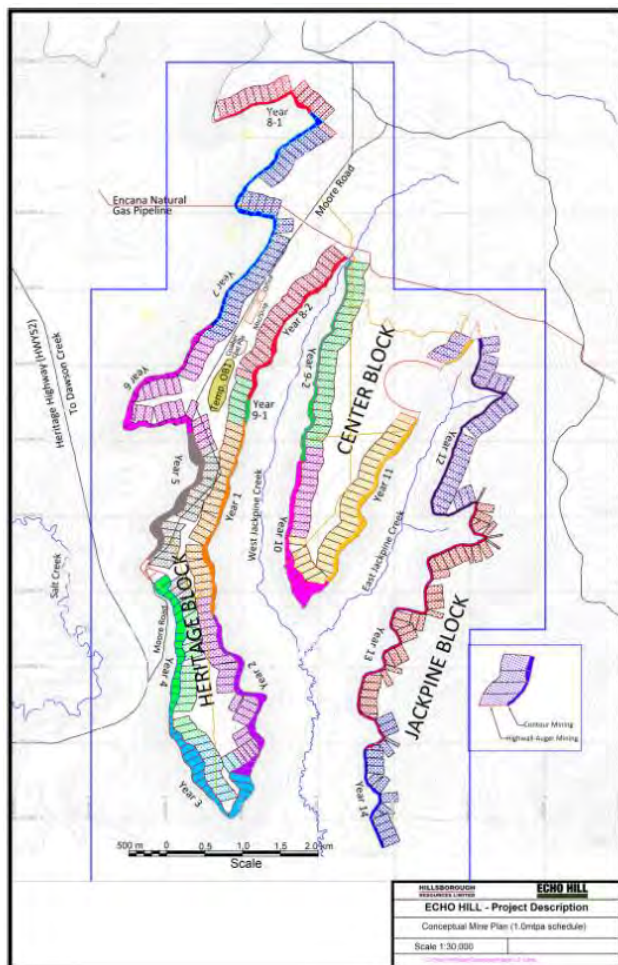


Figure 12. Echo Hill – Proposed Echo Hill Mine layout showing separate mining blocks. Image is from 2013 Project Description, Hillsborough Resources Ltd.

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 0930 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

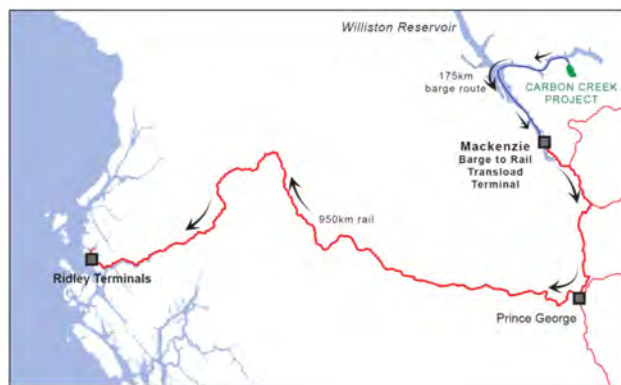


Figure 13. Carbon Creek – Proposed Carbon Creek Mine export route, Cardero Resource Corp.

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 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

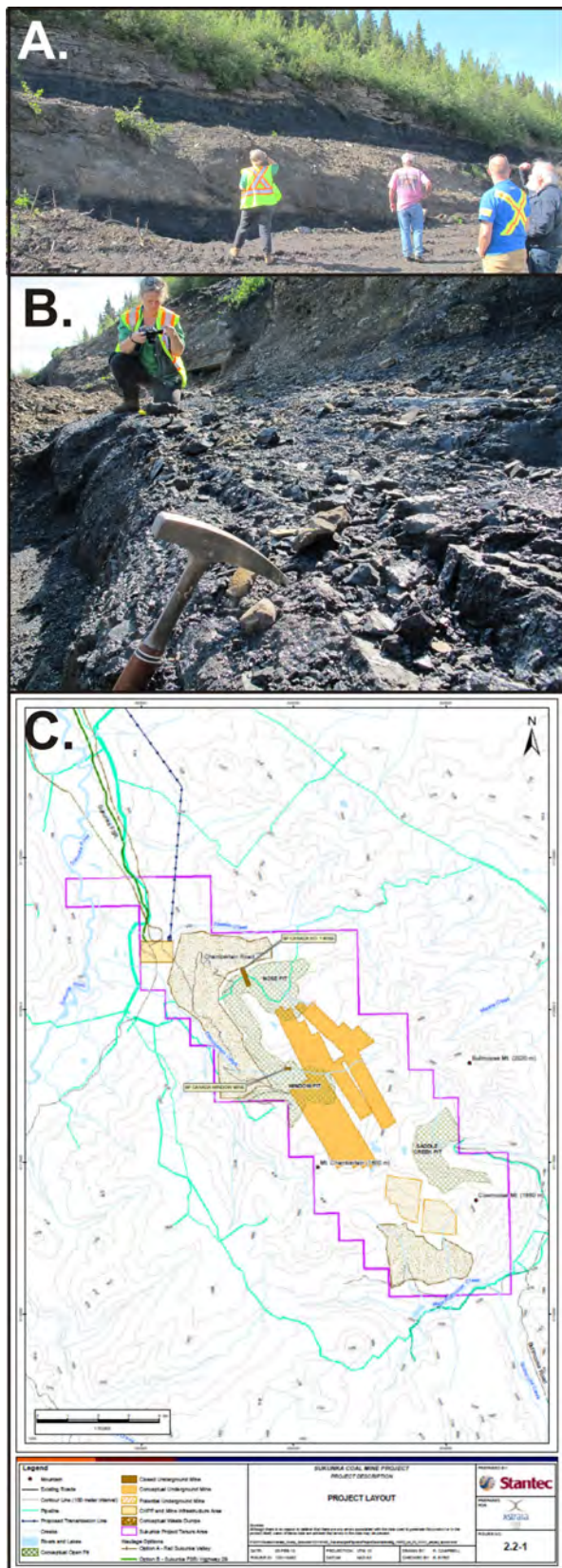


Figure 17. Sukunka – **A.** Examining flat-lying Chamberlain and Skeeter seams in Nose Pit area; **B.** Janet Riddell getting a closer look at the Chamberlain seam, Nose Pit area. The adit for the historic BP #1 Mine is seen in the background; **C.** Project layout from the 2013 Project Description,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

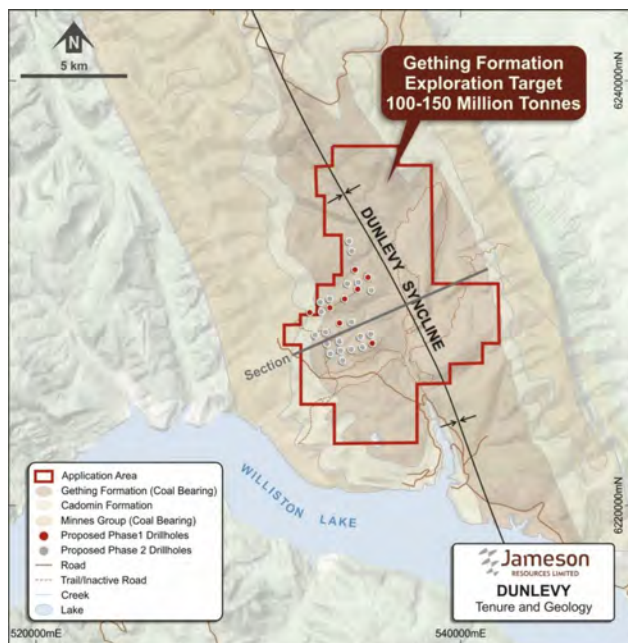


Figure 18. Dunlevy – Summary drilling plan for west limb of Dunlevy Syncline north of the Williston Lake Peace Reach, Jameson Resources Ltd.

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.

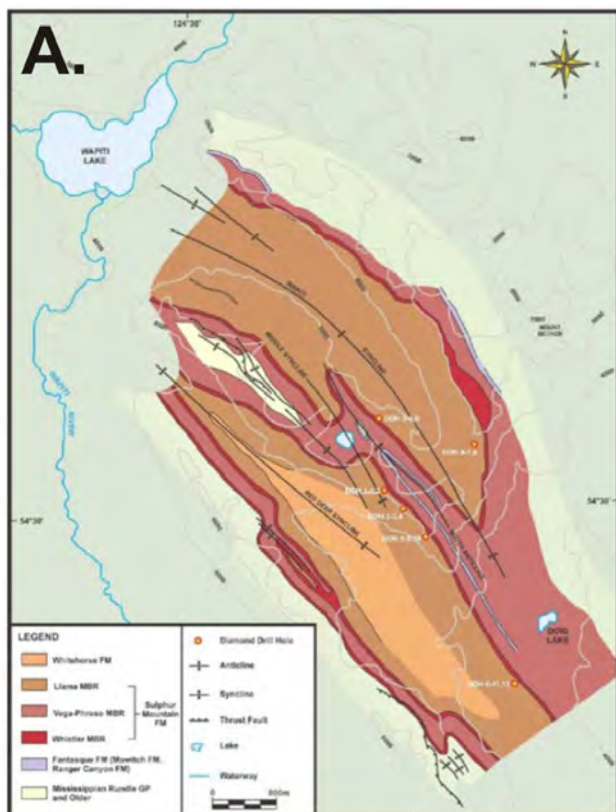
North of the Dunlevy Inlet of Peace Reach, the Dunlevy project extends NNW along the axial trace of the gently folded Dunlevy syncline for about 25 km between two marginal thrust-faulted anticlines. The western limb of the syncline hosts most of the Gething Formation coal exposures.

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-earth (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 fluoroapatite. 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

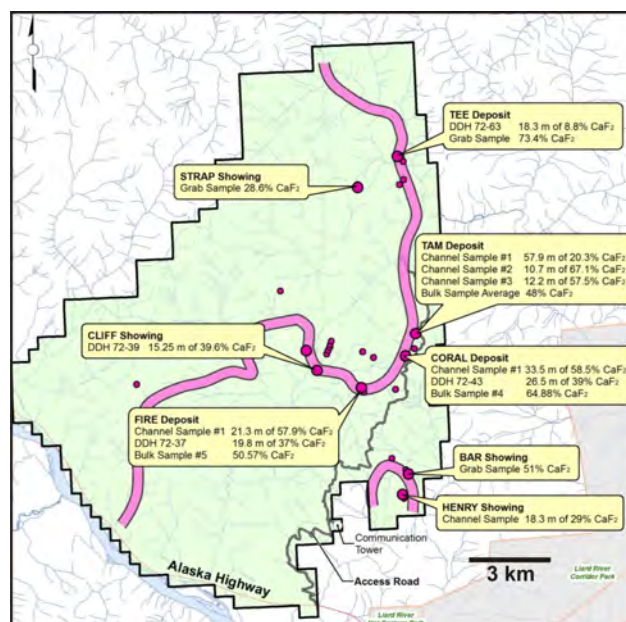


Figure 20. Liard Fluorspar – Map of Liard Fluorspar property showing distribution of prospects and showings with historic assay results. Image from Prima Fluorspar Corp Investor Presentation, March 2013. Scale added.

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.

ACKNOWLEDGMENTS

The information in this report has been sourced from news releases, quarterly reports, company websites, technical reports, MINFILE reports, coal assessment reports (COALFILE), Geological Survey of British Columbia publications, site visits and direct conversation with geologists, explorationists, and professionals who were generous with their time and resources. The writer again thanks those who provided statistical and related information, and exchanged ideas. Special thanks to Senior Coal Geologist Janet Riddell for valued discussion, companionship in the field, and insightful review of this report. Further thanks to the Regional Geologists and the Mineral Development Office for helpful support, including MDO Director Bruce Madu for reliable feedback, and Gabriel Li for GIS support. Continued thanks for the support of staff in the Prince George Regional Office. Any errors or omissions are the responsibility of the author.

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EXPLORATION AND MINING IN THE THOMPSON-OKANAGAN-CARIBOO REGION, BRITISH COLUMBIA

Regional Office, Kamloops

SUMMARY

The region saw two mines open (Basin; Treasure Mountain), major developments at two others (Highland Valley; Gibraltar), and steady progress on projects under environmental review.

The pace of exploration in 2013 was slower than in 2012. Many projects were inactive because operators were unable to raise venture capital or unwilling to spend it in the face of economic uncertainty.

Most exploration focused on defining or expanding porphyry and porphyry-related deposits (copper-gold; copper-molybdenum), gold deposits of various types, and stratiform base-metal deposits.

Note: Information in this chapter has been compiled from published materials (e.g., company web sites; news releases; reports submitted to regulatory authorities), supplemented by telephone or email inquiries and a few field visits.

MINES

Table 1 lists operating coal, industrial mineral and metal mines in the region. Figure 1 shows their locations.

COAL

In June 2013, Coalmont Energy Corporation commenced production at their **Basin** mine near Princeton. The mine's initial production rate is 250 000 tonnes per year of thermal coal but the company has permits to increase production to 350 000 tonnes per year, which they plan to do in 2014. Pre-stripping and development of the existing 1 km long open pit commenced in February 2013. About 1.8 million cubic metres of waste rock, soil and overburden were removed to waste dumps. The coal trench was extended to 1500 metres along the Main seam (Figure 2). Coal production continued until temporary shut-down in October 2013. The company reports that just over 100 000 tonnes of clean coal was produced between June and October. Mining is expected to restart early in 2014.

Construction of a new, 250 tonne per hour Parnaby wash plant began in October 2012. The plant was commissioned in June 2013 (Figure 3). The wash plant uses a filter-press method to separate coal from waste. This method is new to Canada but is well established in

other countries. Its advantage is that it eliminates the need for a tailings pond. Process water is recycled and reject material (filter cake) is placed in designated waste dumps.

Cleaned coal is moved by truck and barge to Texada Island for shipment to local and overseas markets. Initial power plant combustion tests in Japan were well received.

The Basin deposit occurs in an Eocene half graben. The Main seam totals ~ 32 metres in thickness, and comprises four coal units separated by thin layers of siltstone, tuff or ironstone. A Lower seam, some 27 metres below the Main seam, is 7 metres thick and was the focus of a test bulk sample. Step-out drilling tested continuity and quality of the Main seam.

INDUSTRIAL MINERALS

There are over fifteen industrial mineral quarries and processing plants in the region. These operations employ more than 250 people, most of whom live in nearby communities. There are opportunities for growth in this sector due to the region's diverse geology, good roads and power lines, and proximity to markets. Permits for industrial mineral operations are usually easier to obtain than they are for metal mines.

The **Kamloops** cement plant and **Harper Ranch** limestone quarry of Lafarge Canada Inc. continue to supply cement to meet demand in western Canada. Lafarge also draws materials from the **Falkland** and **Buse Lake** quarries, which provide gypsum and alumina-silica rock respectively.

The **Decor** pit of Pacific Bentonite Ltd. supplies alumina-rich burnt shale to the Lafarge cement plant in Kamloops. The shale beds occur directly above the Hat Creek coal deposit, located west of Cache Creek. Although most of the material is sold to Lafarge, other uses exist such as the crushed red gravel used on baseball diamonds. The property is also known to host a large bentonite deposit which is being investigated for municipal engineering and tile manufacturing applications. The company has patented a product ("Fibre-clay" panels) which combines pulp fibre and clay. The product is nearly impermeable and is suitable for liners and covers for mining and municipal water.

Also west of Cache Creek, Graymont Western Canada Inc. operates the **Pavilion** limestone quarry and lime plant on Indian reserves. The operation produces quicklime, high calcium limestone fines, screened high



Figure 2. Coal mining resumed at the Basin deposit in June 2013. View along 1.5 km working face, footwall to left. (Jim Britton photo)



Figure 3. New Parnaby wash plant, Basin coal mine. (Jim Britton photo)

calcium stone products, lime kiln dust and rip rap. Graymont has a forty-year lease with the Ts'kw'aylaxw First Nation, and most of the operation's employees are Ts'kw'aylaxw.

East of Ashcroft, IG Machine and Fiber Ltd, a subsidiary of IKO Industries Ltd, operates the **Ashcroft** basalt quarry and roofing granule plant. The granules are sized and coated with one of several distinct colours on site, and then shipped by rail and truck to IKO asphalt shingle plants in Calgary, Alberta; Sumas, Washington; Chicago, Illinois and to other plants in North America.

Imperial Metals Corporation has installed a recovery plant at its **Mount Polley** concentrator to capture magnetite from its tailings stream. The operation is intended to provide dense media for coal washing operations.

In 2012, Craigmont Mines Joint Venture ceased operations at the **Craigmont** magnetite operation located near Merritt due to depletion of economic

reserves. Since 1991 the mine produced 1 167 000 dry tonnes of magnetite. Mining equipment is now being sold and the site reclaimed.

At their plant in Kamloops, Absorbent Products Ltd manufactures cat litter, barn deodorizer, industrial absorbents and carriers for agricultural products. These are prepared from diatomaceous earth mined from the **Red Lake** quarry northwest of Kamloops and bentonite mined from the **Bud** quarry at Princeton.

Heemskirk Canada Ltd continues to market agricultural and absorbent products mined from their **Zeotech/Bromley Creek** zeolite quarry near Princeton. The material is transported to their plant in Lethbridge. The company also owns another deposit near Cache Creek, which is not currently in production, but contains an estimated 890 000 tonnes of zeolite (in situ, measured and indicated mineral resource)

Opal Resources Canada Inc produces attractive fire opal gemstones and jewelry from the **Klinker** property, located west of Vernon. Opal occurs as fracture and vesicle-fillings in andesitic to basaltic laharic breccia of lower members of Eocene Kamloops Group. Gemstone jewelry is sold to visitors and tourists from a retail store in Vernon. The company hopes to develop other North American markets.

Decorative rock and dimension stone are produced at numerous small quarries throughout the region. In 2012, Kettle Valley Stone Company of Kelowna sold its quarries to Kelowna Sand and Gravel Ltd in order to focus on processing and marketing. Kelowna Sand and Gravel continues to mine gneiss, dacite ash and basalt at the **Nipple Mountain, Kettle Valley, Canyon** and **Gemini** quarries and has been issued permits to explore other sites. Kettle Valley's processing facility produces flagstone, ashlar, facing stone and landscape rock. Markets include residential and commercial building projects in western USA and Canada.

In 2010, Spectral Gold Corp began developing the **Lady King Basalt** deposit, located near Vernon, selling slender basalt columns as landscape rock suitable for a variety of decorative and functional uses such as garden features, fountains, walls and stairs.

In 2013, Lithium Corporation of Nevada began prospecting for graphite on their **BC Sugar** property, a large block of claims the company staked between Mabel and Sugar lakes, 35 kilometres northeast of Lumby. Graphite occurs as disseminations and lenses in both calc-silicate and quartzofeldspathic gneisses of the Shuswap Metamorphic Complex.

ROCK QUARRIES, AGGREGATE PITS AND PLACER MINES

Ministry of Energy and Mines' tracking system reports that there are 56 quarries, 480 sand and gravel pits and 704 placer mines (701 surface operations and 3 underground) classified as "active". The "active"

classification refers to the status of the permit and therefore includes mines that are exhausted and undergoing reclamation and closure. It also includes many operations that are small, seasonal or intermittent, and which supply products on an as-needed basis.

Statistical information (e.g., production; reserves; employment) on these operations has not been obtained. Nevertheless the number of operations reflects the magnitude of often-overlooked types of mining. The number also indicates the diversity of opportunities for mineral resource development that exist in the region. One can infer that these types of mines make an important contribution to the region's economy.

METAL MINES (INCLUDING NEAR-MINE EXPLORATION)

With five major operating mines the Thompson-Okanagan-Cariboo region hosts roughly half of the province's metal mines.

New Gold Inc reported a very successful first full year of operation at their **New Afton** gold-copper mine, a block cave operation that opened in mid 2012. Production increased, reserves improved and head grades rose. By fall the company had achieved a targeted and sustainable increase in throughput to 12 000 t/d (surpassing its 11 000 t/d guidance) and had experimented with rates between 14 000 and 15 500 t/d. At present all ore comes from the B-zone. Exploration (mainly underground drilling) focused on two areas: the East Cave Extension and the C-zone. The East Cave Extension lies between the B-zone and the previously mined Afton open pit, whereas the C-zone is a down-plunge extension of the B-zone. The company reports positive results for both exploration targets. Increases in resource estimates for the East Cave Extension Zone will be published early in 2014; resources for the C-zone increased by an impressive 300%. C zone resources (measured and indicated) now stand at approximately 12.5 million tonnes grading 0.77 g/t Au, 1.50 g/t Ag and 0.77 % Cu.

The **Copper Mountain** copper-gold mine near Princeton has been in production since August 2011 and is operated by a partnership of Copper Mountain Mining Corporation (75%) and Mitsubishi Materials Corporation (25%). The rate of mining has met or exceeded guidance figures, but milling operations have struggled to achieve their target of 35 000 t/d. Rock hardness is one factor that has been cited for the lower throughput. Financing has been secured for a new secondary crusher that should be in operation by late 2014. A multi-year exploration program seeks to upgrade resources, test ore depths and find mineralization outside the current mine plan.

North of Williams Lake, the **Gibraltar** copper-molybdenum mine, operated by Taseko Mines Limited and Cariboo Copper Corp, celebrated a major milestone in September with the completion of the third phase of the Gibraltar Development Plan to modernize the mine. A

community event attended by more than 600 local residents, company officials and dignitaries was held on September 19 (Figure 4). By the end of the development plan, the company will have invested ~ \$700 million. The most recent phase included a new 30 000 t/d mill, a standalone facility that enhances operating flexibility and reliability, and additions to the mining fleet. Mine life has been extended to 2039.

The **Highland Valley Copper** copper-molybdenum mine near Logan Lake, operated by Teck Highland Valley Copper Partnership (97.5% Teck and 2.5% Highmont Mining Company Ltd.), is the largest base metal mine in Canada. Construction is nearing completion on a \$475 million mill modernization project that will help extend mine life to 2026 (Figure 5). The project includes new flotation and pebble crushing capacity near existing circuits. The new mill will improve plant availability and increase copper recovery by 2%, molybdenum recovery by 3%, and annual mill throughput by 10%. The facility is expected to be commissioned early in 2014. Mine production focused on the Valley pit as pre-stripping continued for the Lornex pit extension.



Figure 4. Celebrating a bright, new future for the Gibraltar mine, 19 September 2013. (Image courtesy of Taseko Mines Ltd)



Figure 5. New mill under construction at Highland Valley Copper mine. (Image courtesy of Teck Highland Valley Copper Partnership)

Following successful ground geophysical survey and drilling programs in 2012, Teck Highland Valley Copper Partnership aggressively explored targets near the past producing **Bethlehem** mine and their **Valley** pit. The company announced plans for 90 000 metres of diamond drilling in 2013 and later reported that up to nine drill rigs were active. 100 million tonnes of ore have been delineated at Bethlehem Phase 1. Engineering studies are underway.

Located northwest of Williams Lake, the **Mount Polley** copper-gold-silver mine of Imperial Metals Corporation continues to delineate resources outside the main producing Springer pit. Exploratory drilling at the Springer pit increased reserves, enabling further expansion of the pit, and extension of mine life by two years (to 2025). Drilling also found ore-grade mineralization extending hundreds of metres below the current pit shell. Wall pushback continued at the Caribou pit for most of the year allowing the pit to contribute ore to the mill in the third quarter. Over 500 metres of ramps, cross-cuts, and raises were constructed in the Boundary zone to allow for underground drilling and to prepare for test mining. The nearby Zuke zone was also explored by underground drilling. This recently discovered zone is modeled as a pair of steeply-dipping, mineralized breccia lenses, approximately 8 metres wide, 30 metres high and 75 metres long, are separated by a 5 metre thick, unmineralized core and cut by a post-mineral dike. The alkalic intrusive complex at Mount Polley has at least 8 discrete zones with a total resource inventory of ~ 411 million tonnes at 0.48% copper equivalent (measured and indicated; as of 1 January 2013). The discovery potential within this complex remains good.

The **QR** mine of Barkerville Gold Mines Ltd has operated sporadically in recent years due to depletion of sustaining quantities of ore. In December 2012, approximately 6000 tonnes of surface ore were extracted from the West zone and milled. Dore gold bars were poured in late January 2013. Underground mining resumed in January. By October, 15 000 tonnes of ore were produced for processing. The QR mill awaits shipments of new ore from the Bonanza Ledge mine, near Wells, which is under development.

In March 2013, Huldra Silver Inc achieved commercial production at their **Treasure Mountain** mine located west of Princeton, in upper Tulameen River. Unfortunately, in June the mine and mill were placed on care and maintenance due to market factors and the company subsequently sought protection under the *Companies' Creditors Protection Act*. The Treasure Mountain deposit is described as a stacked series of high grade silver-lead-zinc veins in Cretaceous sedimentary rocks of the Pasayten Group. Vein material was mined from a small open pit and four underground drifts. A resource estimate (indicated, but not compliant with NI 43-101 standards) prepared in 2009 was 33 000 tonnes grading 828 g/t Ag, 4.16% Pb, and 3.8% Zn, at a 311 g/t Ag cut-off. Exploration potential on the property remains

excellent. The veins are open to the east and to depth. Other targets on the claims have not been drilled but have returned high grade grab samples. The epithermal nature of the mineralizing system is evidenced by a spectacular hydrothermal breccia on Level 4 (Figure 6). Huldra's mill is located at the former Craigmont tailings facility, near Merritt, where a magnetite recovery plant operated until November 2012.

Bralorne Gold Mines Ltd has been milling approximately 80 t/d from stockpiled and underground resources at its **Bralorne** gold mine. The company is mining gold-bearing mesothermal quartz veins in relatively undeveloped areas between three former mines: Bralorne, King and Pioneer. The company is currently evaluating its existing resources to identify targets for future development and advance an objective of expanding the operation to more than 200 t/d. The company has been actively developing the BK-3 zone through drifting and underground drilling. The high-grade M vein, discovered by surface drilling in 2011, continues to be a focus of underground exploration using inclines, drifts and raises from BK-3. The M vein grades almost 140 g/t Au (uncut) over an average width of 0.3 metre (Tables 1, 2).

MINE DEVELOPMENT AND EVALUATION PROJECTS

MINE DEVELOPMENT

In December 2011, the **Bonanza Ledge** project of Barkerville Gold Mines Ltd received approval under the *Mines Act* to develop an open pit gold mine near Wells. The open pit site has been logged and grubbed in preparation for mining and an agreement has been reached with forestry operators to utilize the 500 Forest Service Road to truck the ore 100 km to the company's QR mine where it will be milled. The QR mine permit has been amended to accommodate the ore and the mill has been made ready. In 2009, the company had proposed mining approximately 73 000 tonnes per year of gold ore



Figure 6. Hydrothermal breccia at Treasure Mountain mine. (Bruce Northcote photo)

TABLE 1. THOMPSON-OKANAGAN-CARIBOO REGION MINE PRODUCTION, 2013

Mine	Operator	Deposit Type / Commodity	Production <small>(tonnes or kilograms; estimated by government for 2013)</small>	Number of Employees <small>(date)</small>	Proven and Probable Reserves <small>(tonnes; date published)</small>
Metals					
Bralorne	Bralorne Gold Mines Ltd	Vein Au	106 kg Au	55 (March 2013)	Not available
Copper Mountain	Copper Mountain / Mitsubishi Materials	Alkalic porphyry Cu, Au, Ag	28 800 t Cu; 710 kg Au, 8895 kg Ag	~400 (Dec 2013)	211 000 000 t at 0.36% Cu, 0.1 g/t Au and 1.38 g/t Ag (28 July 2009)
Gibraltar	Taseko Mines Limited / Cariboo Copper Corp	Calc-alkalic porphyry Cu, Mo	53 300 t Cu, 585 t Mo	~ 700 (Sept 2013)	790 000 000 t at 0.30% Cu and 0.008% Mo (31 Dec 2012)
Highland Valley Copper	Teck Highland Valley Copper Partnership	Calc-alkalic porphyry Cu, Mo	106 000 t Cu; 2660 t Mo	1267 (Nov 2011)	697 400 000 t at 0.29% Cu and 0.008% Mo (31 Dec 2012)
Mount Polley	Imperial Metals Corporation	Alkalic porphyry, Skarn Cu, Au, Ag	17 695 t Cu, 1470 kg Au, 2955 kg Ag	370 (Nov 2011)	93 078 000 t at 0.297% Cu, 0.299 g/t Au and 0.62 g/t Ag (1 Jan 2013)
New Afton	New Gold Inc	Alkalic porphyry Au, Cu	31 085 t Cu, 2570 kg Au	444 (Dec 2013)	52 500 000 t at 0.65 g/t Au, 2.3 g/t Ag and 0.93% Cu (31 Dec 2012)
QR (Intermittent)	Barkerville Gold Mines Ltd	Skarn Au	Not available (~15 000 tonnes of ore stockpiled by Oct 2013)	12 (mine); 6 (mill) (Oct 2013)	Not available
Treasure Mountain (April 2013 start up. July 2013 shut down / care and maintenance.)	Huldra Silver Inc	Vein Ag, Pb, Zn	Not available	~5 (Oct 2013)	Not available
Coal					
Basin (June 2013 start up. Oct 2013 shut down / care and maintenance.)	Coalmont Energy Corp	Thermal coal	>100 000 t (June to October)	102 (at shutdown)	Not available

Industrial Minerals

Ashcroft	IG Machine and Fiber Ltd (IKO Industries Ltd)	Basalt (roofing granules)	350 000 t	~55 (plant & quarry)	
Bud	Absorbent Products Ltd	Bentonite		see Red Lake	
Buse Lake	Lafarge Canada Inc	Volcanic ash (alumina-silica)		see Harper Ranch	
Craigmont (Mining ceased in 2012. Reclamation underway.)	Craigmont Mines Joint Venture	Magnetite tailings	0 t	Not available	
Decor	Pacific Bentonite Ltd	Alumina, landscape rock	100 000 t	~10 (including trucking)	
Falkland	Lafarge Canada Inc	Gypsum	6000 t	see Harper Ranch	
Harper Ranch	Lafarge Canada Inc	Limestone	220 000 t	34 plus 10 contractors (plant & 3 quarries)	
Kettle Valley quarries	Kelowna Sand and Gravel Ltd/ Kettle Valley Stone Ltd	Ashlar, flagstone, thin veneer		~ 40 (quarries & plant)	
Klinker	Okanagan Opal	Opal			
Lady King Basalt	Spectral Gold Corp	Basalt columns			
Pavilion	Graymont Western Canada Inc	Limestone	190 000 t	~ 34 (plant & quarry)	
Red Lake	Absorbent Products Ltd	Diatomaceous earth		~ 40 (plant & 3 quarries)	
Zeotech / Bromley (Princeton Zeolite Deposit)	Heemskirk Canada Ltd	Zeolite			550 000 t; (M+I resource estimate; 30 June 2013)

(grading 9.05 g/t Au) over a period of four years. Engineering consultants (retained by the company to address BC Securities Commission concerns) reviewed this plan and made slight revisions to the design of the starter pit that will supply the first year of mill feed. They also recommended completion of a new pre-feasibility study since the economic parameters of the 2009 one were out of date. The new study is expected to be completed early in 2014. Ore consists of native gold in quartz veins within carbonaceous and chloritic phyllite. Stated reserves (as of August 2009) include 130 724 tonnes grading 10.227 g/t Au in the proven category and 166 808 tonnes grading 8.114 g/t Au in the probable category.

MINE EVALUATION

In July a revised plan for the **New Prosperity** gold-copper mine of Taseko Mines Limited was reviewed by a Federal panel in accordance with the *Canadian*

Environmental Assessment Act, 2012. The plan proposed relocating a tailings storage facility (TSF) to an area 2.5 km upstream of Fish Lake and introduced a lake recirculation water management scheme. The proposed mitigations would cost about \$300 million. In October the review panel concluded that the revised plan would still result in a significant adverse impact to fish, fish habitat and water quality. The company challenged the panel's conclusion and it was discovered that the wrong TSF design was used by Natural Resources Canada in reaching their conclusions about adverse impacts. The issue remains outstanding. The Federal Cabinet is expected to make a final decision sometime in 2014.

The New Prosperity deposit is located 125 km southwest of Williams Lake. It is described as a gold-copper porphyry with proven and probable reserves of 830 million tonnes grading 0.42 g/t Au and 0.23% Cu.

Yellowhead Mining Inc continued to advance their **Harper Creek** copper-gold-silver deposit near

TABLE 2. SELECTED EXPLORATION PROJECTS, THOMPSON-OKANAGAN-CARIBOO REGION, 2013

Property	Operator	MINFILE	Commodity	Deposit Type	Work Program
Ajax	KGHM International Ltd	092INE 012, 013, 028, 030	Cu, Au, Ag, Pd	Porphyry	FS, ES, CD, GD
Baez	Tower Resources Ltd	092C 015	Au, Ag	Vein / Breccia	IP
Ben	Westhaven Ventures Inc	n/a	Au	Vein / Breccia	DD
Bethlehem / Highland Valley Mine (Exploration)	Teck Highland Valley Copper Partnership	092ISE 001	Cu, Mo	Porphyry	DD; IP
Bonanza Ledge (Barkerville Mountain)	Barkerville Gold Mines Ltd	093H 019	Au	Vein / Breccia	PFS; Preparations for mining
Bonaparte	WestKam Gold Corp	092P 050	Au	Vein / Breccia	3D-IP, MG
Bralorne Camp	Bralorne Gold Mines Ltd	092JNE 164, 001	Au, Ag	Vein / Breccia	DD
Cariboo Gold (Cow Mountain)	Barkerville Gold Mines Ltd	093H 019	Au	Vein / Breccia	Resource evaluation; TR
Dillard	Fjordland Exploration Inc / Sumac Mines Ltd	092HNE 042	Cu	Porphyry	GP, DD
Elk (Siwash North)	Gold Mountain Mining Corporation	092HNE 096	Au, Ag	Vein / Breccia	IP, DD, CD, BU
Fox / Ridley Creek	Happy Creek Minerals Ltd	093A 259	W, Mo, Ag	Skarn	DD, TR
Frank Creek	Barker Minerals Ltd	093A 152	Zn, Pb, Ag	Massive sulphide	DD, TR
Harper Creek	Yellowhead Mining Inc	082M 008, 009	Cu, Ag, Au, Zn, Mo	Stratiform Sulphide	PFS, EN, DD
Kamloops Gold Copper	First Americas Gold Corporation	092P 140	Cu, Zn, Pb, Ag	Massive sulphide	MS

Maggie	Constantia Resources Ltd	092INW 015	Cu, Mo, Ag	Porphyry	DD
Man-Prime	Sunrise Resources Ltd	092HNE 243	Cu, Au	Porphyry	DD
Miner Mountain	Sego Resources Inc	092HSE 078, 203	Cu, Au, Ag	Porphyry	PD
October Dome	Bearing Resources Inc	n/a	Cu, Au	Porphyry / Skarn	DD
Rabbit North	Tower Resources Ltd	n/a	Cu, Au	Porphyry	MG, IP, P
Ruddock Creek	Imperial Metals Corporation	082M 082	Zn, Pb, Ag	Massive sulphide	MS; PEA, EN
Shovelnose	Westhaven Ventures Inc / Strongbow Exploration Inc	092HNE 309	Au	Vein / Breccia	DD
Woodjam	Gold Fields Horsefly Exploration Corporation	093A 019	Cu; Au	Porphyry	DD

Work Program Abbreviations:

A = access; trail, road construction on claims; AB-EM = airborne electromagnetics; AB-MG = airborne magnetics; AB-RD = airborne radiometrics; BU (X tonnes) = bulk sample (weight in tonnes); CD = condemnation drilling; CQ = coal quality testing; CT = carbonization test (coal); DD (X m) = X metres of diamond drilling; EN = environmental baseline studies/monitoring, remediation work; FS = feasibility studies; G = geology, mapping, etc; GC = geochemical sampling (rock, soil, silt, etc); GD = geotechnical drilling; GP = geophysics (general); IP = Induced Polarization; 3D-IP; MG = magnetics; MK = marketing (primarily for industrial mineral products); MS = metallurgical studies; OB = overburden drilling; OP-BU = open-pit bulk sample; P = prospecting; PD = percussion drilling; PF = pre-feasibility studies; PP = pilot plant; R = reclamation; RC = reverse circulation drilling; TR = trenching, UG (X m) = X metres of underground development; UG-BU = underground bulk sample; UT = UTEM; VLF; WT = washability test (coal)

Vavenby, about 90 km north of Kamloops. The deposit is described as stratiform, disseminated and volcanogenic, within metamorphosed volcano-sedimentary rocks of the Eagle Bay Formation. In January 2013, the company released an amended feasibility study (NI 43-101 compliant; first released in March 2012). The study proposes a 70 000 t/d mine to exploit reserves of 704.4 million tonnes grading 0.26% Cu, 0.029 g/t Au and 1.14 g/t Ag (proven and probable; using a 0.14% Cu cut-off). In April, the company submitted an application for an Environmental Assessment Certificate and is now addressing government's comments. Late in 2012, the company commenced a 35 hole, 11 969 metre drill program. Results from this program, released early in 2013, confirm deposit continuity and grade. Public engagement included progress on memoranda of understanding with local First Nations with respect to their involvement in the environmental assessment process and future negotiations on benefit agreements.

The **Ruddock Creek** zinc-lead deposit is in the pre-application stage of the BC Environmental Assessment process. The project is owned by Imperial Metals Corporation (50%) and joint venture partners Mitsui Mining and Smelting Co Ltd (30%) and Itochu Corporation (20%). The operator and manager of the joint venture is the Ruddock Creek Mining Corporation. The deposit is described as sedimentary exhalative, Monashee or Broken Hill-type, within marble, gneiss and calc-silicate rocks. A mineral resource estimate, released in March 2012, reported 4.65 million tonnes grading 6.77% Zn and 1.38% Pb (indicated) and 5.38 million tonnes grading 6.69% Zn and 1.31% Pb (inferred), using a 4.0% combined Pb+Zn cut-off. Work conducted during 2013 included: site infrastructure studies; metallurgical testing; acid-base accounting; setting up humidity cells; collection of baseline environmental and geotechnical information; detailed geological and structural mapping; collection of samples

for radiometric age determination; construction of a higher capacity water control structure for the underground discharge; and consultation with First Nations.

KGHM Ajax Mining Inc continued work on their **Ajax** copper-gold porphyry deposit which lies on the southern outskirts of Kamloops within the Iron Mask Batholith, a multi-phase, alkaline intrusive complex. The proposal would see a 60 000 t/d open pit mine based on reserves of 503 million tonnes grading 0.27% Cu and 0.17 g/t Au. The site is a former open pit operation which was part of the Afton mine that closed in the mid-1990s. Work in 2013 included: geotechnical and condemnation drilling; various baseline and engineering studies (e.g., environmental; air and water quality; dust, noise and vibration; traffic and socioeconomic effects). Formal entry to the environmental review process is anticipated in 2014. Public engagement continues to be a high priority for the company. Arguments for and against the project regularly appear as editorials and letters in the local press.

Following the December 2012 release of a positive Preliminary Economic Assessment for the **Spanish Mountain** gold-silver project, Spanish Mountain Gold Ltd continued to advance resource definition and prepare for environmental review. In August, the company began a planned 10 000 metre reverse circulation drilling program within the “test block” area of their Main Zone (Figure 7). The purpose was to ascertain the potential for grade improvement and to address previously observed differences in assay results in samples obtained by reverse circulation drilling and diamond drilling, respectively. The drilling program at Spanish Mountain has been supervised by an independent consulting company. Preliminary results are encouraging. Final results will be released in 2014.

Located a few kilometres east of Likely, and 65 kilometres northeast of Williams Lake, Spanish



Figure 7. Preparing to collect samples from reverse circulation drilling at Spanish Mountain gold-silver project. (Jim Britton photo)

Mountain represents a relatively new class of deposits known provincially as shale-hosted vein deposits – although the gold is largely disseminated in the host rocks surrounding the veins. It is a low-grade, large tonnage gold and silver deposit within fine grained metasedimentary rocks. The company has utilized a resource of 216.2 million tonnes grading 0.46 g/t Au and 0.68 g/t Ag (measured and indicated) and 316.7 million tonnes grading 0.36 g/t Au and 0.65 g/t Ag (inferred) in its assessment. This supports a 40 000 t/d operation for up to 15 years at a capital cost of \$755.9 million. The operation would produce 2.8 million ounces of gold and 1 million ounces of silver over the life of mine at a cash cost of \$774/oz.

EXPLORATION PROJECTS

Projects are arranged by deposit type and geography. Table 2 lists selected exploration projects. Figure 1 shows their locations.

PORPHYRY PROJECTS

Thompson River - Shuswap Lake

Tower Resources Ltd acquired the **Rabbit North** project mid-year and completed a series of ground and airborne geophysical surveys as a first phase of exploration. The Rabbit North project is an alkalic porphyry copper-gold target located 15 km west of the New Afton mine. Mineralization is hosted in a zoned Triassic intrusion (Durand stock) and volcanic rocks of the Nicola Group.

The Guichon batholith saw relatively little activity apart from exploration at **Bethlehem** and **Valley** pits (see notes above).

Early in 2013, Happy Creek Minerals Ltd released encouraging results from a diamond drilling program they carried out late in 2012 at their **Rateria** property, a porphyry copper-molybdenum target located 12 km southeast of Highland Valley Copper mine. One hole drilled in Zone 2 returned 152.5 m with 0.35% copper and 0.57 g/t rhenium (including 32.5 m of 0.91% Cu, 0.010% Mo, 0.11 g/t Au and 1.83 g/t Re). Although unable to mount an exploration program this year, the company remains optimistic about the area. They increased their tenure holdings through staking and the Tyner Lake Option Agreement. The company now holds 100% interest in a contiguous property of over 200 square kilometres, linking Rateria with their **West Valley** project, four kilometres to the west.

At the southern end of the Guichon batholith, the past producing Craigmont mine and mineral tenure have been acquired (100%) by Huldra Properties Inc and renamed the **Thule** Copper-Iron Property. Huldra Properties is jointly owned by Huldra Silver Inc (50.1%) and Craigmont Mines Ltd (49.9%). A technical

report commissioned in 2013 recommended a \$2.3 million exploration program including data compilation, geophysics, rehabilitation and sampling of underground workings, and drilling. Execution of this program awaits improved corporate finances.

Cariboo

Bearing Resources Ltd returned to their **October Dome** project located 6 km west of Likely. Initial drilling in 2012 had tested a 4000 metre by 400 metre area with elevated gold and copper in soils, and a coincident IP chargeability anomaly. The 2013 program focused on the northern end of this trend, in an area with high gold and arsenic in soil. It included 1086 metres of drilling in 6 holes. Drilling encountered propylitically altered monzonite and diorite intrusive rocks with minor hornfelsed sedimentary rocks and dikes. One hole intersected 15 metres of massive magnetite with semi-massive pyrite layers accompanied by chalcopryite, epidote and garnet at a sediment/basalt contact. The property is extensively covered by glacial overburden but shows affinities with an alkalic porphyry system as well as skarn. Bearing's claims adjoin the Mount Polley mine property to the south, and the QR mine property to the northwest.

In the Takomkane batholith, the **Woodjam North** and **Woodjam South** properties located 50 km north-east of Williams Lake continued to be explored by Gold Fields Horsefly Exploration Corp. In May the company released updated resource estimates for the Southeast zone (within the Woodjam South property) as well as the Deerhorn and Takom zones (within the Woodjam North property). All resource estimates comply with NI 43-101 standards and are in the inferred category. The **Southeast** zone has 227.5 million tonnes grading 0.31% Cu (up from 146 million tonnes in 2012). The **Deerhorn** zone has 32.8 million tonnes grading 0.22% Cu and 0.49 g/t Au. The **Takom** zone has 8.3 million tonnes grading 0.22% Cu and 0.26 g/t Au. Gold Fields also conducted reconnaissance drilling on widespread targets on Woodjam South claims, as well as taking an option on the **Megaton** property which lies immediately to the east of the Southeast zone.

At the **Timothy** property east of Lac la Hache, Sunrise Resources Ltd drilled two diamond-drill holes totaling 648 m on Titan IP anomalies. Both holes encountered sporadic chalcopryite mineralization in Nicola volcanic and metasedimentary rocks adjacent to syenite - monzonite intrusives. Analytical results are pending. The company also plans an IP survey at their **Diplo** project east of 70 Mile House.

In the fall, Constantia Resources Ltd commenced Phase 1 drilling at the **Maggie** prospect, located 15 km north of Cache Creek. The company plans a multi-phase exploration program to verify historical drilling results and to evaluate opportunities for deposit expansion. Subsequent phases depend on results and finances.

Maggie is described as a typical, calc-alkaline porphyry deposit. Copper and molybdenum mineralization occur as stockwork veins and disseminations (Figure 8). The intrusive is a multi-phase, quartz monzonite porphyry of probable late Cretaceous age. Host rocks are Carboniferous to Permian Cache Creek assemblage, comprising deformed sedimentary and volcanic sequences of low metamorphic rank, intruded by pyroxenite dikes and sills.

Almost two years before drilling commenced, the company undertook a lengthy period of engagement with local First Nations and the communities of Ashcroft, Cache Creek, and Clinton. Exploration practices were changed to address concerns raised by First Nations and community members. Of particular interest is the use of water recycling and zero-discharge drilling techniques. Return water and rock flour (drill cuttings) are contained in custom-built settling tanks at each of the drill rigs in use. The rock flour is removed from the tanks daily and taken to an approved disposal site (Figure 9). Prior to drilling, detailed archeological surveys were conducted. To mitigate impacts, some drill sites were relocated to avoid artifacts (e.g., flint chips). Contracting, hiring and training policies ensure that local communities benefit



Figure 8. Quartz monzonite porphyry cutting Cache Creek Group, Maggie copper-molybdenum project. (Jim Britton photo)



Figure 9. Removing rock cuttings from a rotary drill at the Maggie project where zero-discharge drilling mitigates exploration impacts. (Constantia Resources photo)

from exploration spending. Approximately 50% of the local site team is comprised of First Nations members. Newsletters and a web site provide regular updates about the project.

Chilcotin

In December, Amarc Resources Ltd optioned the **Chilcotin Belle** (formerly **Tasco**) property from Oxford Resources Inc (formerly Highpointe Exploration Inc). This encouraging development may herald a revival of interest in the Taseko Lakes-Chilcotin Ranges area, 150 km southwest of Williams Lake. In 2011, Highpointe had reported positive results from reconnaissance drilling at **Tasco**. Two holes were drilled, totaling 683 metres. Hole 1 intercepted 216 metres grading 0.29% Cu, 0.02% Mo and 1.9 g/t Ag.

Two other properties in the Chilcotin Ranges may see exploration in 2014: the **Ridgestake** claims staked by American Copper Corporation in 2013 are located just north of Chilcotin Belle; and options may be taken on the nearby **Chita** copper-molybdenum project.

Similkameen River

Over the past few years, the southern end of the Quesnel terrane, between Aspen Grove and Princeton, has seen renewed exploration interest. From north to south, some of the larger properties (and their operators or owners) include: **Big Kidd** (Jiulian Resources Inc); **Par/Aspen Grove** (West Cirque Resources Ltd); **Man-Prime** (Sunrise Resources Ltd); **Dillard** (Fjordland Exploration Inc/Sumac Mines Ltd); **Allison Lake**; **Hit/Aspen Grove South** (Colorado Resources Ltd); **Axe** (70% Weststar Resources Corp / 30% Bearclaw Capital Corp); **Castle** (Blue River Resources Ltd); **Miner Mountain** (Sego Resources Inc); **Copper Mountain** mine (Copper Mountain Mining Corp); and **Princeton** (Anglo Canadian Mining Corp).

Fjordland Exploration Inc and Sumac Mines Ltd commenced a phased program on the **Dillard** porphyry copper-gold project, including mapping, geophysics and drilling. Sumac has an option to earn a 51% interest by spending \$3.5 million over 3 years. The property had not seen exploration for almost 20 years. Preliminary results from 2013 have been encouraging. Two target areas have been identified: Dillard East and Dillard West. A diamond drilling program completed 6 holes (2600 metres) on coincident geophysical (IP) and geochemical anomalies. One intersection at Dillard West returned 158.5 metres with 0.20% Cu and 0.01 g/t Au. Mineralization occurs as disseminations in Nicola Group volcanic rocks intruded by coeval diorite (Figure 10).

Sunrise Resources Ltd completed a small drilling program at the **Man-Prime** property, located west of Dillard. The company drilled 2 diamond-drill holes totaling 1289 m in an area of strong IP responses. The company reports that both holes were strongly



Figure 10. Disseminated chalcopyrite in Nicola Group, Dillard West zone. (Fjordland Exploration photo)

mineralized with disseminated and stringer pyrite throughout their entire lengths including extensive intervals containing chalcopyrite and bornite mineralization. The bottom intervals of both holes returned some of the better grades encountered in the drilling program. Hole PR13-01 assayed 24.6 m of 0.385% Cu equivalent within a broader interval of 123.6 m assaying 0.304 Cu equivalent. Hole PR 13-02 returned 12 m of 0.374 Cu equivalent within a broader interval of 153.0 m assaying 0.234 Cu equivalent.

In 2012, Xstrata Copper Canada optioned both the **Big Kidd** and **Axe** properties, but in 2013 returned them to their owners, respectively Jiulian Resources Inc and Weststar Resources Corp. In August 2013, Weststar signed a letter of intent to option the **Axe** property to Copper Mountain Mining Corp.

In May, Sego Resources Inc flew an airborne geophysical (magnetic and radiometric) survey over their **Miner Mountain** copper-gold porphyry project, located a few kilometres north of Princeton. Subsequently they combined their new data with Titan 24 data obtained in 2009. Eight separate target zones were identified for follow-up drilling or geophysical surveys. In July percussion drilling commenced on coincident magnetic, chargeability and soil geochemical anomalies at the Upper Regal, Cuba, Quintana zones as well as a possible new zone northwest of the Cuba zone. Approximately 1784 metres were drilled in 34 short holes using a self-propelled, track-mounted rig (Figure 11). Preliminary results have been positive, including up to 30 metres of 0.31% Cu and 0.15 g/t Au from a hole at the Upper Regal zone.

Anglo Canadian Mining Corp resumed diamond drilling on the Combination Zone of its **Princeton Copper-Gold** project adjacent to the Copper Mountain Mine. Four short holes (~ 675 m) were drilled in a limited area but they confirmed grade and continuity within the zone and extended it by 75 metres. Drill intersections of up to 0.5% Cu and 4.0 g/t Ag were reported over narrow



Figure 11. Percussion drill at Sego Resources Inc's Miner Mountain project. (Jim Britton photo)

widths (4-6 m). The company has permits for a further 10 000 metres of drilling. Future plans are to test three other targets derived from a 3D-IP/magnetics survey, completed in 2011. One of these targets (called the "Haul Road" target) is a high chargeability anomaly more than 900 metres long and 500 metres deep.

SKARN PROJECTS

Cariboo

At the **Fox** tungsten-molybdenum, property, 75 km northeast of 100 Mile House, Happy Creek Minerals Ltd reported completion of 1300 m of drilling in 18 holes on their RC (Ridley Creek) prospect. Three other mineralized zones (the 708, BN and BK) crop out over a distance of 3 km and may have a lateral extent of more than 1 km. The company also reported preliminary metallurgical tests on material collected in 2012 from trenches. Once zinc minerals were removed by flotation, gravitational separation yielded a 70% WO₃ product. Tests using other beneficiation methods are underway.

Skarn mineralization occurs in flat lying, Upper Proterozoic to Lower Paleozoic Snowshoe Group sedimentary rocks that have been intruded by the Deception stock, a mid-Cretaceous (106 Ma) pluton that ranges in composition from quartz monzonite to muscovite-biotite granite to aplite.

GWR Resources Inc was unable to mount an exploration program this year at their **Lac La Hache** Project. The project embraces a large area (400 sq km) with multiple deposit types and exploration targets, ranging from high grade, massive to semi-massive, skarns, veins, replacements and breccias to lower grade porphyries and disseminations.

VEIN AND BRECCIA PROJECTS

Thompson River - Shuswap Lake

Late in the year, WestKam Gold Corp commenced exploration on their **Bonaparte** property located 50 km north of Kamloops. Two targets have been identified. The first is the Discovery zone, which consists of shear-hosted gold-chalcopryite quartz vein networks. The goal is to test for extensions of mineralization. The second lies in the Cooler Creek area, east of the Discovery zone, and consists of a 2 km long anomalous geochemical trend with quartz vein float that assayed up to 74 g/t Au. The 2013 program consists of 3D-IP and ground magnetometer surveys, along with prospecting and sampling. Drilling is planned for 2014. The geological setting of the Bonaparte property is a series of en echelon quartz veins within the Thuya batholith.

Cariboo

Barkerville Gold Mines Ltd reported significant progress on their **Cariboo Gold Project** located about 85 km east of Quesnel and centred on the village of Wells. The project includes a block of claims covering more than 117 000 hectares, and includes three historic groups of Crown-grants named, respectively, the Cariboo Group, Island Mountain Group, and Mosquito Creek Group. In August 2012, the BC Securities Commission (BCSC) had issued a cease trade order citing concerns about technical disclosure of a resource estimate for the **Cow Mountain** portion of the Cariboo Group. Since that time the company has been working to address BCSC's concerns. The company retained Snowden Mining Industry Consultants Inc and APEX Geoscience Ltd as independent consultants to assist in preparing an updated technical report, in collaboration with Geoex Ltd who had done the earlier resource estimate.

In June 2013, the company released a new resource estimate for Cow Mountain in the area immediately surrounding the underground workings at the Cariboo Gold Quartz Mine. The Cow Mountain resource now stands at 17.7 million tonnes grading 2.00 g/t Au (indicated) and 49.2 million tonnes grading 2.74 g/t Au (inferred), using a cut-off grade of 0.012 oz/t (*sic*).

In mid July, the BCSC revoked their cease trade order. Since then the company has continued with data audit, review and verification. By October the company had collected ~ 7500 infill drill core samples from 155 previously drilled holes. Results will be released in the coming months. Consultants are also creating a

comprehensive digital database of all available historic and current information, and also collecting both channel samples (over 1000 samples from 48 trenches) and soil samples. Sampling is intended to corroborate previous work. The company remains optimistic about the Cariboo Gold Project and released separate, conceptual resource estimates for potential exploration targets at the Island Mountain and Barkerville Mountain areas.

Westhaven Ventures Inc commenced their inaugural drilling program at the **Ben** gold property, located 50 km north of Williams Lake, between Mount Polley and Gibraltar mines. Three holes, totalling 424 metres, were completed. Targets included: (1) a quartz-carbonate-mariposite-bearing structural corridor (listwanite) anomalous in Au, As, Sb and Hg; and (2) a high chargeability IP anomaly associated with a north-east trending structure. The company reports that the Ben property shows evidence of deep-seated faults associated with epithermal mineralization (and, potentially, mesothermal or shear-hosted gold mineralization).

Chilcotin

In February, Sona Resources Corp. announced discussions with China Machinery Engineering Corporation of Beijing toward completing an engineering, procurement and construction ("EPC") contract for the development of Sona's **Blackdome-Elizabeth** Project. The project includes the **Elizabeth** mesothermal gold-vein deposit (developed prospect) and **Blackdome** epithermal gold-vein deposit (past producer).

Tower Resources Ltd reports that their **Baez** property, located 125 km west of Quesnel, represents a shallow, gold-silver bearing epithermal target hosted in poorly exposed, banded and brecciated felsic volcanic rocks of the Eocene Ootsa Lake Group. Based on regional geophysics, the company interprets these rocks as part of a much larger, collapsed rhyolite dome. A reconnaissance IP survey (22 line km; 8 lines; covering a 25 square kilometre area) was completed in order to define the size and scale of the mineralized targets which include the Camp, Clusko, and newly identified Boulder Ridge South.

Amarc Resources Ltd reports that their **Newton** and **Galileo** properties have been placed on care and maintenance while the company seeks joint venture partners. The Newton gold discovery is located 40 kilometres north of the Taseko's New Prosperity copper-gold project. The Galileo claim package lies 16 kilometres west of New Gold's Blackwater gold deposit and comprises 1100 square kilometres in four, non-contiguous claim blocks (Galileo; Hubble; Darwin; Franklin).

At **Newton**, gold mineralization is similar in age and geological characteristics to mineralization at the Blackwater deposit. The company released an initial mineral resource estimate in mid June 2012, confirming that Newton is an important bulk tonnage gold discovery that remains open to further expansion. Using a 0.25 g/t

gold cut-off, inferred mineral resources comprise 111.5 million tonnes grading 0.44 g/t gold and 2.1 g/t silver, and would contain 1.6 million ounces of gold and 7.7 million ounces of silver (Amarc news release dated 26 September 2012). The company reports that this epithermal system formed contemporaneously with felsic volcanic and intrusive rocks that were emplaced into a structurally-active graben environment, approximately 72 million years ago. Mineralization accompanies extensive zones of strong quartz-sericite alteration.

At **Galileo**, extensive airborne and ground-based IP surveys have identified four high-quality, overburden-covered anomalies that potentially represent important sulphide systems. These targets are ready for drill testing.

Fraser River

Berkwood Resources Ltd was unable to explore their **Prospect Valley** property, located 30 km west of Merritt, but hope to resume work in 2014. Mineralization discovered to date is described as a low grade, epithermal gold system with potential for higher grade zones. Drilling has outlined an NI 43-101 compliant mineral resource. Taken together, the Discovery North and Discovery South zones have approximately 10 million tonnes grading 0.5 g/t Au (inferred; using 0.3 g/t Au cut off). A number of geophysical and geochemical targets remain to be tested.

Similkameen

Westhaven Ventures Inc is working to acquire a 70% interest in the **Shovelnose** property under an option agreement with Strongbow Exploration Inc. In 2013, Westhaven explored the Tower Creek zone, a newly recognized epithermal gold system. Au-Ag mineralization occurs in quartz stockworks and silicified zones within felsic tuffs. Mineralization extends over an area at least 2 km east-west and 100 metres north-south, and remains open in all directions. The company completed a 6 hole, 1043 metre diamond drilling program. Their best drill intersection was 50 metres grading 0.24 g/t Au and 2.32 g/t Ag. Host rocks are felsic volcanics of the Cretaceous Spences Bridge Group.

Okanagan

Gold Mountain Mining Corporation continued exploration at their **Elk** project, located 45 km east of Merritt and 2 km south of the Okanagan Connector (Highway 97C). Exploratory diamond drilling tested deep IP targets. Condemnation drilling evaluated an area proposed for waste rock storage located west of the existing pit. Reconnaissance work (mapping; soil sampling; prospecting) took place on the southern claims where a new mineralized zone, with high grade grab samples, was discovered in 2012. The company also reported successful processing of the initial 500 tonnes of their 10 000 tonne bulk sample. Gold recovery was 98%. Gold grade and tonnage from the sample matched within

5% of both mine site and drillhole estimates, boosting confidence in their mine model.

STRATIFORM SULPHIDE PROJECTS

Thompson River - Shuswap Lake

The Adams Plateau area, east of Barriere, has begun to see renewed interest after several quiet years. Exploration is anchored by continued work on Yellowhead Mining Inc's **Harper Creek** project, near Vavenby, which is now entering formal environmental review (see notes above).

In 2012, Astral Mining Corporation optioned the **Barrier Ridge** and **Honeymoon** projects but ownership of these projects appears to have passed to Orex Minerals Inc who acquired Astral in February 2013. Prospective lithologies include Eagle Bay Assemblage and contacts with the Cretaceous Baldy batholith.

In July, Victory Ventures Inc optioned the **Fortuna** claims located 12 km east of Louis Creek. Preliminary field work began in October with prospecting and sampling. The property is underlain by Devonian to Mississippian Eagle Bay assemblage comprising metamorphosed volcanic and sedimentary rocks. Some lead and zinc ore was shipped in the early 1900s but the property has not seen modern exploration.

Also in July, First Americas Gold Corporation concluded an option agreement for the **Kamloops Gold-Copper** property, a large (~ 11 500 ha) block of claims that surround the past producing Chu Chua mine. In September, the company reported positive results from rock and soil geochemistry sampling, as well as a very-low frequency (VLF) electromagnetic survey. Rock sampling defined a gold-rich zone, extending 6 km long and up to 1 km wide south of Chu Chua mine, in a quartz-pyrite-sericite-altered rhyolite porphyry. Reconnaissance soil sampling of the organic (Ah) layer, along with novel inversion techniques applied to the VLF data, produced overlapping anomalies on strike with the Chu Chua deposit, but 600 metres and 1000 metres south of it. The company hopes to test these anomalies by drilling in 2014.

In October, Newport Exploration Ltd acquired the **Chu Chua** massive sulphide deposit from Reva Resources Corp. The focus of work is to confirm historic resource estimates and evaluate metallurgical characteristics. Initial work has been awarded to APEX Geoscience Ltd of Edmonton who will start metallurgical testing on drill core and other stored materials. Exploration for extensions of the deposit may begin in 2014. Chu Chua was discovered in 1978 and mined in the 1980s. When it closed in the early 1990s, there was a commonly quoted "open pit reserve" of approximately 1 million tonnes grading 3% Cu, 10 g/t Ag, 0.5 g/t Au and 0.3% Zn. (NB: These figures are historical and do not meet NI 43-101 standards for reporting.) The Chu Chua deposit comprises two sub-vertical lenses of massive

pyrite, chalcopyrite and magnetite up to 40 metres thick with a strike length of 400 metres and depth of 250 metres.

Cariboo

Barker Minerals Ltd focused on their **Frank Creek** lead-zinc project, a volcanogenic massive sulphide target east of Likely and 77 km north-east of Williams Lake. Targets included an area of near-surface gold discovered in 2011 and precious-metal-rich VMS targets identified in past programs. Work included trenching and drilling short holes on Titan Trend "C" and Trend "A" conductors. Results are still being reviewed. Preliminary indications are that precious metal values are below expectations. However, the drilling has helped support an interesting geological model that the company has been developing for the property. The host rocks are a sequence of Cambrian(?) age volcanic and sedimentary rocks that have been regionally folded and are structurally overturned. Copper, zinc and lead sulphide minerals occur as massive and semi-massive lenses (Figure 12) and as stringers or stockworks. The latter are interpreted to be feeders to the former, but are situated higher in the local stratigraphy due to overturning.



Figure 12. Barker Minerals Ltd is exploring for stacked volcanogenic massive sulphide lenses at Frank Creek. (Jim Britton photo)

MAGMATIC PROJECTS

Thompson River - Shuswap Lake

Commerce Resources Corp. was unable to mount further exploration at its **Blue River** project, a tantalum and niobium bearing carbonatite, located 30 km north of Blue River. Resource updates expected in 2013 have been deferred while the company focused on a rare earth property in Quebec.

Similkameen River

Near Tulameen, private company Magnetite Ridge Metals and Minerals Ltd of Kamloops, continued to investigate a large magnetite deposit located at their

Magnetite Ridge project within the Tulameen Ultramafic Complex. Metallurgical studies have been conducted by UBC / BC Mining Research on a large composite sample that graded 30% magnetite. These studies indicate that this material could be used for steel smelter feed or coal cleaning heavy medium. The company has applied for a mining lease covering 1.5 sq km.

OUTLOOK FOR 2014

Mining operations should commence at the Bonanza Ledge project.

The Federal cabinet is expected to reach a decision on the New Prosperity project.

As mine evaluation projects submit required baseline studies, environmental review processes will continue, but no project is expected to complete formal review.

Most of the exploration projects that were active in 2013 have generated positive results and thus remain on track for advancement, barring further downturns in metal markets. If economic conditions improve, grassroots exploration should pick up in the Eagle Bay Assemblage near Barriere, the Quesnel terrane (in particular between Merritt and Princeton and between 100 Mile House and Quesnel), and the Chilcotin Ranges near Taseko Lake (e.g., **Chilcotin Belle (Tasco)**; **Ridgestake**; **Chita**).

EXPLORATION AND MINING IN THE SOUTH AND WEST COAST REGIONS, BRITISH COLUMBIA

By Bruce Northcote, P.Geo.,
Regional Geologist, Vancouver

SUMMARY AND TRENDS

This report covers the provincial government's Coast Area natural resource sector, comprising the South Coast and West Coast regions, including Haida Gwaii. The area has one major metal mine, Myra Falls, and one coal mine, the Quinsam Mine, which have been in operation for 47 years and 27 years respectively. Both had ongoing and active exploration programs in 2013, as they had in 2011-12. There are also numerous industrial minerals and aggregates operations in the region serving local and international markets. Nearly all major mines and quarries continued producing at or near recent levels, with some aggregate producers and industrial minerals quarries increasing production and sales over 2012 levels.

Large scale exploration programs in 2013, at least in terms of dollars expended and metres drilled, were limited to areas in and around operating mines. Estimated exploration expenditures in the Coast Area in 2013 are just over \$7 million (Figure 1). Efforts aimed at environmental certification of proposed mines accounted for nearly \$2 million.

Exploration drilling is estimated at over 30 000 m (Figure 2). A precise figure for underground exploration at Myra Falls was unavailable at the time of writing. As this was by far the largest program in the area, the overall figure is only approximate (Figure 2).

Expenditures broken down by exploration stage and target type are given in Figures 4 and 5. Exploration expenditures on advanced stage projects (other than at mine sites) fell the sharply in 2013.

MINES

The location of operating mines and selected exploration projects are shown in Figure 3. Mine production and reserves statistics are given in Table 1.

METALS

The South and West Coast Regions' one major metal mine, **Myra Falls Operations** (MINFILE 092F 071-73, 330), is a an underground polymetallic mine located in Strathcona-Westmin Class B Provincial Park, surrounded by Strathcona Provincial Park, a Class A park, and located on Buttle Lake, part of Campbell River's water

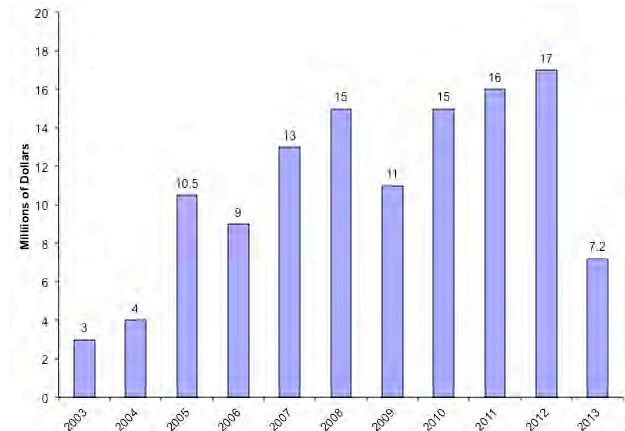


Figure 1. Exploration spending estimates for the Coast Area 2003-2013. The addition of Haida Gwaii to the region in 2010 had negligible impact on the statistics.

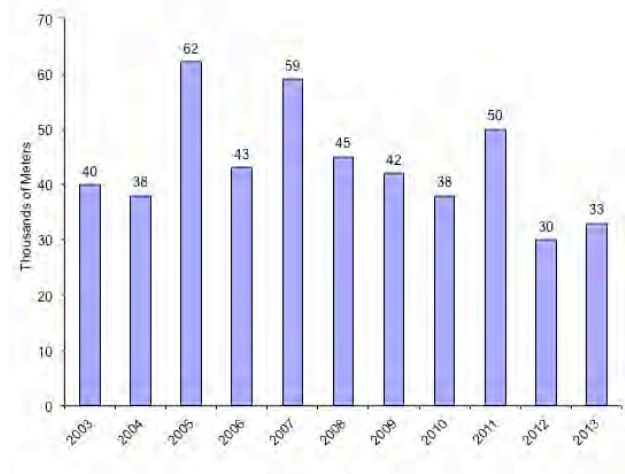


Figure 2. Exploration drilling in the Coast Area 2003-2013.

supply. At the end of a 90 km road that winds through the park, the operation generates hydroelectric and auxiliary diesel power as necessary. From this seemingly precarious position, it has operated through most of the past 48 years.

In the first 3 quarters of 2013, Myra Falls milled 387 000 t of ore, down approximately 10% from 2012. Nyrstar reported interruptions at the mill and hydroelectric power supply this year. Concentrate, zinc, copper and lead in concentrate were also lower. Typical annual throughput in recent years has been approximately 500 000 t. The company did not forecast whether and to

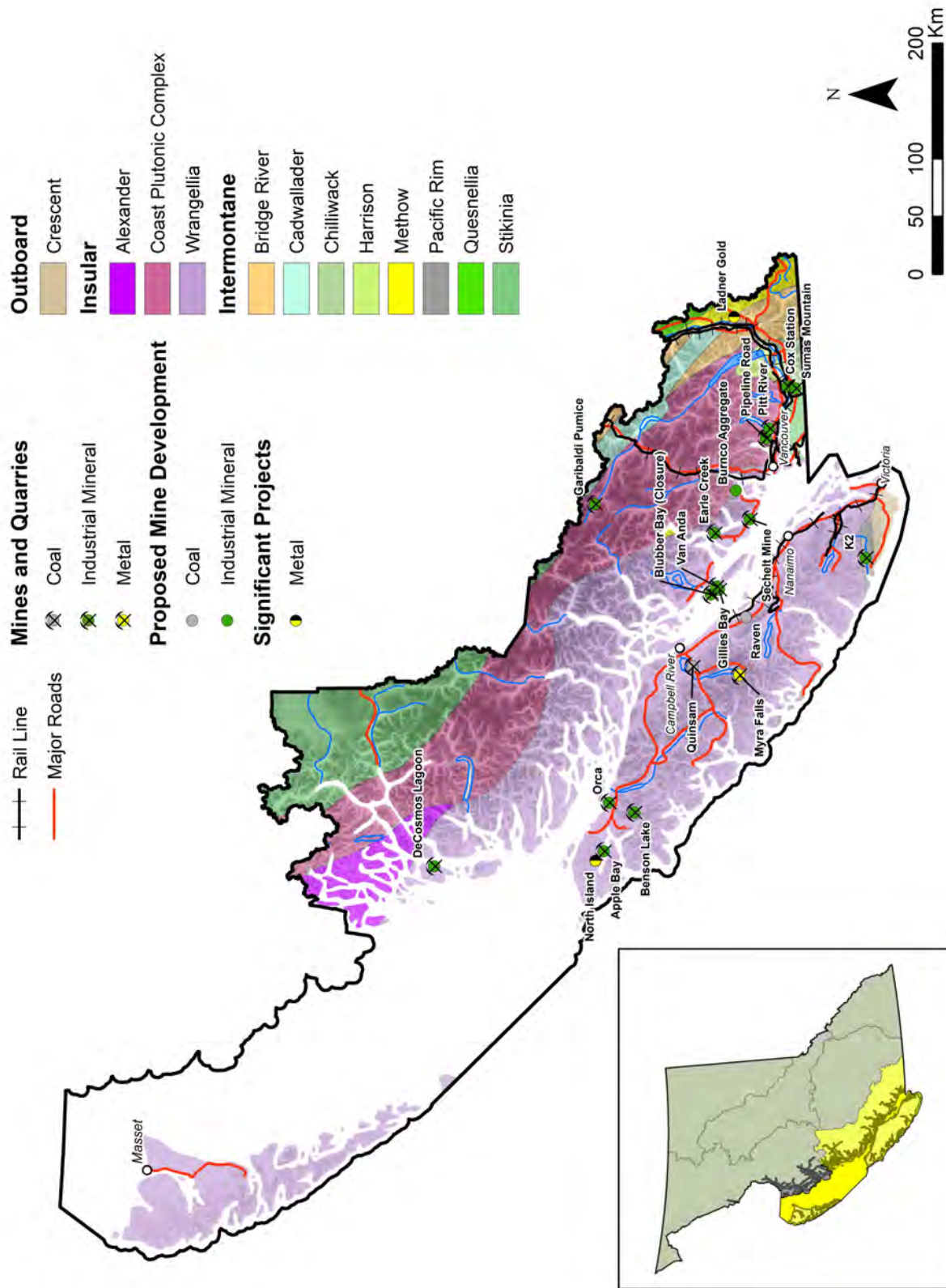


Figure 3. Operating mines and selected major exploration projects in the Coast Area, 2013.

TABLE 1. RESERVES, FORECAST MINE PRODUCTION, COAST AREA, 2013

Mine	Operator	Commodities	Mine Workforce	Forecast Production 2013	Production 2012	Reserves as of Dec 31, 2012
Metals						
Myra Falls Operations	NVI Mining Ltd (Nyrstar N.V.)	Zn-Cu-Pb-Au-Ag	315	Approx 0.5 Mt throughput 5.35% Zn (88.1% rec) 0.49% Pb (29.2% rec) 0.83% Cu (67.5% rec) 1.36 g/t Au (70.0% rec) 50.63 g/t Ag (80.2% rec) (average head grades and recoveries in first 9 m 2013)	Zn 32 000 t Pb 1100 t Cu 3800 t Au 423 kg Ag 18 040 kg (metal in concentrate)	5.43 Mt 5.62% Zn 0.56% Pb 0.94% Cu 1.6 g/t Au 58 g/t Ag
Coal						
Quinsam	Quinsam Coal Corporation (Hillsborough Resources Ltd)	Thermal coal	approx 140	Approximately 365 000 t clean coal	365 000 t clean coal	N/A
Industrial Minerals						
Apple Bay (PEM 100)	Electra Gold Ltd.	Chalky geyserite	8	Approx 75 000 t	40 301 t	~ 5 million t
Benson Lake	Imasco Minerals Inc.	White marble	4	50 000 t	36 300 t	100+ years
Blubber Bay	Ash Grove Cement Company	Limestone aggregate, dolomitic limestone	Care and Maintenance 2011-12			100+ years
Garibaldi Pumice	Garibaldi Pumice Ltd.	Pumice	2	5000 m ³	21 500 m ³	100+ years
Gillies Bay	Texada Quarrying Ltd. (Lafarge North America Inc)	Limestone, aggregate	70	4.0 Mt	4.2 Mt	100+ years
K2	K2 Stone Quarries Inc	Building Stone	5	15 400 t	16 000 – 18 000 t	N/A
Mount Meager	Great Pacific Pumice Ltd	Pumice	Care and Maintenance 2012-13			100+ years
Sumas Mountain	Sumas Shale Ltd. (Clayburn Industrial Group and cement manufacturer partners)	Sandstone and shale	10	420 000 t	~ 400 000 t	~ 70 years
Van Anda	Imperial Limestone Company Ltd (JA Jack & Sons Inc.)	Limestone	9	250 000 t	250 000 t	50+ years

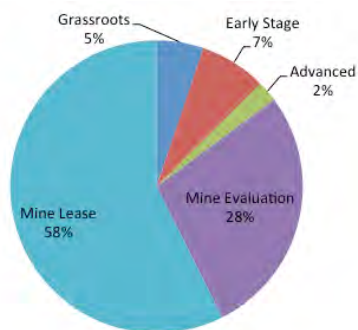


Figure 4. Coast Area exploration spending by exploration stage, 2013.

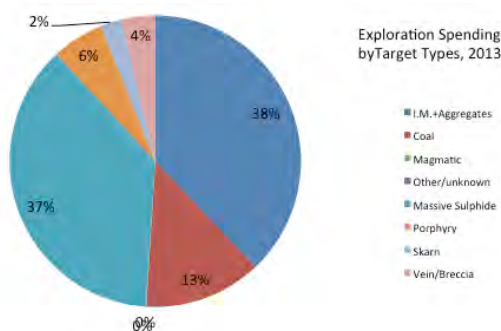


Figure 5. Coast Area exploration spending by primary target type.

what extent the 4th quarter would catch up, though there was an effort to do so. The mine employs 315 people (Figure 6).

On-lease exploration at the mine is typically one of the largest exploration projects in the South and West Coast Regions, and it was the largest again in 2013. Details are lacking at the time of writing, but underground exploration drilling exceeded 20 000 m in 2013.



Figure 6. Underground equipment maintenance area at Myra Falls. The mine is in a topographically challenging area surrounded by Class A Park. With limited underground access, mining equipment is assembled and maintained in workshops such as this.

Starting with a small open pit at the Lynx deposit in 1966, the long-lived operation has a history of success in replacing reserves. Limited tailings storage capacity is perhaps more likely to ultimately limit mine life than exhaustion of reserves.

The deposits at Myra Falls are hosted in the Middle Paleozoic Sicker Group volcanics, an oceanic arc assemblage that forms the basement of Vancouver Island. Devonian Myra Formation rocks host the mineralization at Myra Falls, which is in the Buttle Lake uplift, where Sicker Group basement is exposed along a northwest trending antiform roughly in the centre of Vancouver Island. Ore bodies are found in two horizons in the Myra Formation. The Myra Falls camp is generally considered a Kuroko type or bimodal felsic type VMS environment.

COAL

Vancouver Island has a history of underground coal mining dating back to 1849, and in terms of remaining resources it has the potential to continue for many more years.

Near the top of Vancouver Island stratigraphy, the **Quinsam** Thermal Coal Mine (MINFILE 092F 319) near Campbell River has been in operation since 1986 and is currently the only active coal mine in the South-West Coast Regions (Figure 7). It is the only underground coal mine in the province, though others are proposed, including the Raven underground metallurgical coal project near Comox.

The Quinsam Mine is operated by Quinsam Coal Corporation, a subsidiary of Hillsborough Resources Ltd., which itself is part of the Vitol Group, an international energy trading company. In operation since 1986, Quinsam expects to produce an amount similar to 2012, which was 365 000 t of clean thermal coal. Most of the product has gone to local cement plants in 2013, although the mine also supplies the circum-pacific energy market. Direct employment at the underground room and pillar operation is approximately 140 people (Figure 8).

In early 2012, Quinsam obtained a permit and began developing 7 South, a new area located approximately 3.5 km byroad from the previous mine site. This area is now in production. While commonly referred to as an expansion, 7 South essentially allowed the operation to continue producing at recent levels.

The Quinsam mine produces from coal seams of the Upper Comox Formation, which is part of the Upper Cretaceous Nanaimo Group. Historical production has focused on number 1, 2 and 3 seams, but current production at 7 South is from the number 4 seam. The mine is capable of producing over half a million tonnes a year. Mine site drilling in 2013 tested the number 3 seam at areas 4 South and 6 South, where future development is proposed. The company did not return to the Quinsam East exploration area in 2013.



Figure 7. Loading a truck at the Quinsam Mine site. Coal is trucked to a barge facility at Middlepoint near Campbell River.



Figure 8. Quinsam Mine uses continuous miners in a room and pillar mining method.

As a private company, Hillsborough does not publish reserve and resource figures, except in its applications to government. Prior to acquisition by Vitol, Hillsborough did publish an estimate of substantial resources at the Quinsam North area, however these are not part of the current mine plan. It appears unlikely that the mine's potential resources will be depleted in the near future, however timely permitting and development of those resources would be important to avoiding gaps in production going forward.

Located only 20 km west of the City of Campbell River, the Quinsam Mine is at once a significant local employer and a subject of close scrutiny. Hillsborough has been testing and researching underground waste and tailings disposal for several years. The mine recently began disposing of coarse rock rejects underground in disused flooded workings. PAG tailings are also disposed of subaqueously. Underground tailings injection infrastructure is in place.

INDUSTRIAL MINERALS

Large quarries on the coast are well placed to serve the Lower Mainland, Vancouver Island and US Pacific Northwest markets by barge. Those with access to

freighter loadout facilities can also supply the eastern Pacific international markets, California, Mexico, and Hawaii. Most of the companies mentioned in this section maintain websites with product specifications to which the reader is referred for more information.

The largest limestone quarry on the coast is **Texada Quarrying** operation near Gillies Bay (MINFILE 092F 395). Texada Quarrying Ltd is a subsidiary of Lafarge North America. Most of its projected 4.0 million tonnes of production in 2013 supplies local cement plants. The quarry also produces aggregate, mainly from dike s, which would otherwise be waste rock. The site also hosts a white carbonate quarry, which is one of only a few sources on the coast (along with Benson Lake). Lafarge carried out a drill program around the existing operations on Texada Island in 2013 to collect limestone quality data. Results are not yet available. The quarry has extensive reserves, and production capability in excess of 100 years at current rates. The quarry has been in operation 61 years and employs 70 people directly.

The Imperial Limestone Co. Ltd. quarry near **Van Anda** (MINFILE 092F 394) on Texada Island produces approximately 250 000 t annually, with similar production forecast for 2013. The product is barged to parent company J.A. Jack & Sons Inc. in Seattle, where it is processed and distributed for a wide variety of potential end uses. Currently much of the product is used in glass making and roofing manufacture. The white products have applications as fillers and extenders. Agriculture uses of limestone include soil sweeteners, animal feed additives, acid neutralization and environmental remediation. Quarrying at the Imperial site dates back to the 1930s, and the current owners have operated it since the early 1950s. They anticipate reserves will last in excess of a further 50 years (Figure 9).

Ashgrove Cement Company's **Blubber Bay** limestone quarry (MINFILE 092F 479) on Texada Island has remained on care and maintenance since 2010, after more than 100 years of operation. It could re-open for sufficiently large contracts. It recently supplied mainly limestone aggregate and lesser amounts of dolomite to Lower Mainland and North Western US markets.

On Northern Vancouver Island, Electra Gold Ltd. continued to mine chalky geyserite at the **PEM 100** or **Apple Bay Quarry** (MINFILE 092L 150) in 2013. Electra Gold expects to almost double its shipments of chalky geyserites from the PEM 100 quarry on Northern Vancouver Island in 2013 over 70 000 t, as compared to just over 40 000 t in 2012. The quarry ships raw silica-alumina product by barge to Ash Grove Cement Company in Seattle for use in cement manufacture.

Also on Northern Vancouver Island, Imasco Minerals Inc. increased sales of its **Benson Lake** (MINFILE 092L 295) white carbonate. Quarry production is expected to be approximately 50 000 t, representing an increase over last year. The operation employs 4 directly, plus two trucking contractors. The product has a high dry brightness (95)



Figure 9. Imperial Limestone Co Ltd has operated this quarry on Texada Island since the 1950s. Prior to going on care and maintenance in 2010, the neighbouring Blubber Bay quarry operated for more than 100 years.

and is used mainly as a white CaCO_3 filler and extender, available in a number of size gradations from Imasco's Surrey location. The carbonate is barged to Surrey from Port Alice.

The **Sumas Shale** quarry on Sumas Mountain (MINFILE 092GSE024, 092GSE004) is owned by Clayburn Industrial Group Ltd, operated by contractor Fraser Pacific Enterprises Inc and delivers its sandstone and shale product to cement plants in Richmond and Seattle through a joint venture with Lafarge North America (Sumas Shale Ltd). Forecasted 2013 production is approximately 420 000 t, which is similar to previous years (approximately 400 000 t in 2012). Since Clayburn's brick and refractory products plant closed in Abbotsford, fireclay is no longer produced separately.

The Ironwood Clay Company Inc.'s increasing exports to Korea and China, together with British and American sales, made it a winner in the 2012 BC Export Awards in the Consumer Products category. Their products are based on glacial marine clay mined on the Central Coast. Recent production has been from **DeCosmos Lagoon** (MINFILE 092M 019) south of Bella Bella. Ironwood produces value-added cosmetic products at its Richmond plant.

The company extracted 500 t at De Cosmos quarry in 2013, and reclamation at that site is ongoing. Ironwood also has a new quarry site at Hvidsten Point, and plans to test another site at the head of Bute Inlet with Glacial Bay Organic Clay Inc. Depending on initial testing and permitting extraction of 400-500 t of material is planned for 2014.

Other individuals and companies supply the growing cosmetic clay market at smaller scales from locations on the Central Coast and Vancouver Island. Generally, no Mines Act permits are required where material is collected by hand, and therefore these small quantities are typically not reported.

Materials marketed as cosmetic clays are generally mixtures. Cosmetic clays have cleansing properties, exfoliating the skin, absorbing oils and other contaminants. Clays from some deposits elsewhere in the world have antibacterial properties which make them suitable for medical applications.

In the Mount Meager area, Garibaldi Pumice Ltd. shipped approximately 5000 cubic metres of pumice from the **Garibaldi Pumice** quarry (MINFILE 092JW 039) in 2013. Reclamation and infrastructure improvements employed two workers. The majority of pumice from the Mt Meager area is used as lightweight fill, but also used in lightweight concrete, landscaping and horticulture (including green roofing). Pumice may have additional applications including fillers, grinding compounds, and cosmetics. Garibaldi's 2012 exploration extended the deposit in measured and indicated categories by 8.2 million cubic metres (coarse pumice) over a 2.35 square km area. There is an additional inferred 6.8 million cubic metres, plus additional finer material.

Neighbouring Great Pacific Pumice Inc (MINFILE 092JW 040) did not produce at their **Mount Meager** quarry in 2013. Local producers face some competition with US suppliers. Transportation is a significant component of the cost.

K2 Stone is a vertically integrated natural stone product supplier with quarries near Port Renfrew on Vancouver Island, (**K2**, MINFILE 092C 159), and in Montana. K2 Stone quarries, processes and distributes their products. Their Ocean Pearl colour comes from the Port Renfrew quarry. In 2013, K2 Stone shipped approximately 15 400 t from Port Renfrew with a 5 person crew. The rock is trucked to Nanaimo for processing into masonry and landscaping products. Other smaller producers of slate are also quarrying rocks of the Leech River Complex. **Van Isle Slate** (MINFILE 092C 154) is one that started from a very small operation over the past few years, and has been offering a line of hand cut products.

Matrix marble and Stone Inc. continues to quarry marble on Vancouver Island and fabricate a line of products including countertops, sinks, tiles and building products. They quarry their Carmanah Black near Port Renfrew (**Gordon River** MINFILE 092C 086) and Tlupana Blue Grey and Vancouver Island White near **Hisnit Inlet** (MINFILE 092E 020). They worked at their Hisnit Inlet location through most of 2013.

Landscaping stone is quarried in the Sea-to-Sky Corridor. The largest operator is Northwest Landscape and Stone Supply, with the **Spumoni Quarry** (MINFILE 092GNW100) and other sites, some of which are to be upgraded to full mining leases.

Haddington Island (MINFILE 092L 146) and **Hardy Island** (MINFILE 092F 425) are two small but regular producers of dimension stone on the coast (Figure 10). The Haddington Island product is a durable, resistant Miocene volcanic rock (70.5% silica) with a dry crushing



Figure 10. Haddington Island Andesite is found on historic buildings and monuments in Vancouver and Victoria. These are details on the Vancouver Art Gallery, constructed as the Provincial Court House in 1906-1912. The quarry on Haddington Island re-opened in 2004 and supplies material for restorations as well as new buildings and monuments.

strength of 18 428 psi, valued for its ability to sustain carving and hold edges. Hardy Island produces from a uniform grey Coast Plutonic Complex granodiorite unit, which is used mainly for residential and commercial construction. The Haddington Island and Hardy Island products are available through Adera Natural Stone Ltd and Bedrock Granite Sales, respectively, along with other local products.

Alpine Natural Stone Ltd is another producer of stone in the Squamish-Whistler corridor extracting at several locations. Elsewhere, several other small quarrying operations continued extracted bulk samples. Mines Act permitting and tenure regulations allow extraction of up to 10 000 t once every 5 years from a claim without upgrading tenures to leases, enabling producers to test marketing and small scale production.

Aggregates are an important part of the mining industry on the south coast, generating more employment in the region than metal and coal mining (Figure 11). The area hosts some of the largest aggregate pits and quarries in Canada. The availability of water transportation is a factor in the million tonne per year and larger operations, making shipment of this low unit value commodity more efficient than by overland means. Most quarries serve local markets, but three have the capability to load Panamax class bulk freighters and export to markets such as California and Hawaii where sand and gravel are in shorter supply.

Several producers do not want yearly sales or production reported publicly, but there are enough respondents to our informal survey to track general trends, which follow construction industry trends.

Peak production on the South Coast was in 2007-08. Volumes dropped dramatically from late 2008 and into



Figure 11. Aggregate is a major part of the mining industry in southwestern BC. The photograph is from Upland Excavating Ltd's pit near Campbell River.

2009. Since then the limited and informally-collected data for this yearly report indicates a recovery, though not to 2008 levels. The reader is referred to Natural Resources Canada and Ministry of Energy and Mines statistics for year-to-year data for the province overall.

The construction materials industry's two largest participants on the coast are also among the world's largest: Lafarge North America and Lehigh Hanson. The third largest on the coast is a local company, Mainland Sand and Gravel Ltd., followed by a number of smaller companies and individual operations. The majority of British Columbia's aggregate production and use occurs on the coast, with some exports from three of the largest mines. In total there are hundreds of producing pits and quarries in the region. Only a few of the largest are profiled here.

One of the largest aggregate-only mines on the coast is the **Sechelt Mine**, operated by Lehigh Hanson. The company no longer makes production figures public, but volumes have been in the 3-5 million tonne range in recent years. A ship loading facility capable of accommodating Panamax class freighters handles most of the shipments.

Lafarge North America's **Earle Creek** (MINFILE 092GNW102) operation will produce 1.3 million tonnes in 2013, and employs 26. There were \$1.5 million in capital upgrades in 2013. Product is shipped by barge.

Pitt River Quarries (MINFILE 092GSE007) will produce 2.0 million tonnes and employs 45. That operation saw 1.0 million in capital upgrades in 2013. Product moves by truck and by barge.

Other large Lafarge aggregate operations in 2013 include:

- Central Aggregates (Bradner Road Abbotsford), which will produce 870 000 t and employs 25

- Ward Road (Sumas Mountain) which will produce 1.05 million t. There were \$600,000 in capital improvements
- Lafarge's Coquitlam (Pipeline Road) operation, which produced 200 000 t before suspending production. It has 8 employees

Also on Pipeline Road are large operations by Jack Cewe Ltd and Allard Contractors Ltd. Together they produce in excess of one million tonnes per year most years.

Polaris Minerals Corporation operates the **Orca Quarry** (MINFILE 092L 220) near Port McNeill, which produces sand and gravel mainly for export in Panamax class freighters. Orca had shipped 2 083 000 t by the end of the third quarter 2013, which represents a 38% increase over the same period in 2012. Shipments in 2012 were 30% higher than in 2011. The increases are largely attributed to an improved Northern California target market. Sales for 2013 are therefore likely to exceed 2 500 000 t.

One of the largest operations in the area is the **Cox Station Quarry**. It is located on the north side of Sumas Mountain, and is operated by Mainland Sand and Gravels Ltd. Over 95% of the product, which is a crushed quartz diorite, goes to the Lower Mainland market via barge on the Fraser River. The quarry also has two CN Rail spur lines which allow shipment by rail. Production and shipments are typically in excess of 2 million tonnes per year. From start of December 2012 to end of November 2013, they shipped 3 074 052 t by barge, approximately 77 000 t by rail and truck. The quarry directly employs 45-50 people.

MINE DEVELOPMENT

There are no major new mining projects in development in the South or West Coast regions. However, as described above, there has been significant exploration and development work at existing mines and quarries.

MINE EVALUATION

There are two major South-West Coast Region mining projects in the pre-application phase of Environmental assessment, a proposed coal mine and a large aggregate operation.

The **Raven Underground Coal Project** (MINFILE 092F 333) is a proposed mine south of Comox on Vancouver Island. As projected in the feasibility study, the main product is to be a semi soft coking coal with a thermal by-product. Forecast production is approximately 830 000 t clean coal per year, over 16 years.

Compliance Energy Corporation is the majority partner in the Comox Joint Venture, and is focused on

getting the project beyond pre-application, and into Environmental Assessment. The project received its terms of reference (Application Information Requirements for the EAO and Environmental Impact Statement Guidelines for the CEAA) in June 2012. (Figure 12). The company then submitted its application for an Environmental Assessment Certificate for the proposed Raven Underground Coal Project in 2013, but the Environmental Assessment Office determined that the application did not contain all required information. Compliance plans to re-submit a revised application in 2014 (Figure 12).

The **BURNCO Aggregate Project** in the McNab Creek Valley is also in the pre-application stage of environmental assessment with both the provincial and federal agencies. That proposed mine would ramp up to a 1 million tonne-per-year operation, initially barging product to BURNCO Rock Products Ltd.'s ready-mix concrete plants in South Burnaby and Port Kells.

BURNCO is in public comment and consultation processes. They submitted Draft Application Information Requirements in September 2013

As of 2013 Canadian Dehua International Mines Group Inc. no longer proposes the imminent re-opening of a small magnetite operation, **Iron Ross**, near Sayward. They have advised Ministry of Energy and Mines staff that the project is returning to exploration stage – now one of several properties Dehua plans to explore for magnetite.

The Iron Ross project includes a cluster of magnetite skarn deposits (MINFILE 092K 043). Iron Ross deposits occur along a contact between Upper Triassic Karmutsen Formation basalts, and overlying Quatsino Formation limestone. The last continuous production was in the 1960s, and a small amount was produced in 2005, when a 4800 tonne bulk sample was used for X-ray shielding concrete. The deposits are among numerous iron skarns on the coast hosted by Vancouver Group volcanics and carbonates.

The **Tasu Aggregate** project of Coastal Construction Aggregates Ltd. is now permitted and the company is seeking contracts. Aggregate products consist of waste from the past producing Tasu magnetite mine



Figure 12. Raven Underground Coal Project Application for Environmental Assessment Certificate.

(MINFILE 103C 003) on Moresby Island (Figure 14). They may also assess the viability of marketing magnetite fines also found in waste dumps at the site. Coastal Construction Aggregates Ltd. plans to ship by barge to markets on the coast. Product should be suitable for applications such as railway ballast, marine fill, armour and rip-rap and may find use in various port expansion projects. The original Tasu iron mine operated between 1967 and 1983, producing tens of millions of tonnes of largely limestone, marble, basalt and diorite waste rock, in addition to more than 23 million tonnes of ore. Waste from past-producing iron skarns has served as aggregate before, with examples on Texada Island and the Brynnor mine near Ucluelet (MINFILE 092F 001).

EXPLORATION PROJECTS

Significant exploration projects are summarized in Table 2.

COAL PROJECTS

The largest coal projects were the proposed Raven Underground Coal mine (in the environmental assessment process) and on-site exploration at Quinsam Mine, as discussed above.

PRECIOUS METALS

Near Port Alberni Lu'an Canada Capital and Energy Investment Inc purchased the **Mineral Creek** property (MINFILE 092F 079, 331) in 2012. Sona Resources Corporation then optioned the property in 2103. The property has been subject of significant exploration in the 1980s, test mining in the mid 1990s, and more recently, drilling, geophysics and initiation of a bulk sample between 2005 and 2010. The property has a recently approved Notice of Work.

North Bay Resources Inc reported work at its **Mount Washington** (MINFILE 092F 116, 206, 365) and **Zeballos** properties (MINFILE 092L 012 including some rock geochemistry and gold values (Figure 13). Assessment reports are filed but not yet public. Results of Mount Washington area work include a geological and historical compilation, and are published on the company's website. Qualitas Holdings Corp reported geochemical work on their Tahsis property southeast of Zeballos, following up a 2011 program (MINFILE 092E 004, 24, 85). The recent work is unpublished. Mineralization at both Mount Washington and Zeballos areas are related to Eocene to Oligocene magmatism.

After a long period of consultation, the Ministry of Energy and Mines issued a permit for drilling at the **Fandora** gold prospect (MINFILE 092F 040, 41, 205). Imperial Metals Corporation, with a number of active

TABLE 2. SIGNIFICANT EXPLORATION PROJECTS COAST AREA, 2013

Property	Operator	MINFILE (NTS ref.)	Commodity	Deposit Type	Work Program	Metres Drilled
Gillies Bay	Texada Quarrying Ltd.	092F 395	Limestone, Aggregate	Sedimentary	DD; GC	6100
Ladner Gold	New Carolin Gold Corp	092HWN007, 003, 018	Au	Veins	MS	
McNab Valley	BURNCO Rock Products Ltd	(092G.053)	Aggregate	Sand and Gravel	EN; FS	
Myra Falls	NVI Mining Ltd (Nyrstar Mining N.V.)	092F 071,072,073, 330	Zn, Cu, Pb, Au, Ag	VMS	DD; UG	~ 25 000
Quinsam Mine	Hillsborough Resources Ltd	092F 319	Coal (thermal)	Sedimentary	DD; PD; CQ	2211.81
Raven	Comox Joint Venture (Compliance Energy Corporation, Itochu Corporation, LG International Corp)	092F 333	Coal (met +/- thermal)	Sedimentary	EN; FS	

Work Program Abbreviations:
CQ = coal quality testing; DD = diamond drilling; EN = environmental baseline studies / environmental monitoring; FS = feasibility studies;
G = geology, mapping, etc.; GC = geochemical sampling (rock, soil, silt, etc); GP = geophysical (gravity or magnetics); MS = metallurgical
studies; PD = percussion drilling; PF = pre-feasibility studies; R = reclamation; RC = RC drilling; UG = underground development; TR =
trenching



Figure 13. Epithermal textures at Mount Washington overprint porphyry copper mineralization at the former mine site. Nearby is the undeveloped Domineer high sulphidation epithermal gold prospect.

projects around the province, has not announced imminent plans for the property although they reported geochemical sampling for assessment in 2013.

On the Mainland, near Squamish, additional geophysics, geochemistry and prospecting are reported in 2013 on the **Ashlu** property (MINFILE 092GNW045, 47, 55, 62) of Ashlu Mines Inc, a private company, which has assembled a land position around the former Ashlu Mine (MINFILE 092GNW013). A rock, soil and silt sampling program has been ongoing for 4 years, successfully re-locating showings around the former mine. The Ashlu Mine is a past producer which exploited a narrow gold quartz vein (< 1 m to 4.6 m) over a strike length of 90 m and 85 m down dip. In 1981 reserves were just under 90 000 t of 8.57 g/t Au and 12.31 g/t Ag. The property is largely underlain by the Jurassic Cloudburst pluton, with a pendant of Gambier Group rocks in the southwestern portion of the property.

The **Abo**, or **Harrison Lake Gold** project (MINFILE 092HSW092) is located roughly 5 km northeast of the village of Harrison Hotsprings. The property was optioned in late 2011 by Sierra Madre Developments Inc, doing business as Bear Mountain Gold Ltd. Since then they have repaired the core logging/storage facility, rehabilitated the Jenner portal and conducted orientation soil geochemistry surveys. There is a five-year permit in place that allows for drilling.

In the Harrison Lake Gold deposit area, Brokenback Hill Formation sediments and volcanic rocks are intruded by quartz diorite stocks. One of these, the Jenner stock, gives a sericite K-Ar age of Oligocene to early Miocene, as reported in the BC Geological Survey's Geological Fieldwork 1984. Mineralization in the Jenner stock is characterized as disseminated pyrrhotite, minor pyrite, chalcopyrite and traces of molybdenite. The current exploration is based on an intrusion-hosted gold model (Fort Knox type Au). Gold occurrences related to Tertiary

quartz diorite or diorite stocks are also known to the southeast (**Blue Chip**, MINFILE 092HSW017) and northwest (**Doctor's Point**, MINFILE 092HNW071 probably **Providence**, MINFILE 092HNW030 and the **Fire Mountain** cluster of occurrences) proximal to the Harrison Fault. There was some geological work reported at Doctors Point for assessment purposes.

Near the north end of Harrison Lake, Electra Gold Ltd. optioned the **Golden Ridge** project in 2012, formerly the Quet or Hotspring Claims (MINFILE 092GNE027, 33, 38). Check assays on historical drill core were consistent with 1990 and 1997 results. Still at an early stage of exploration, the target is a near-surface low grade gold deposit. The Ministry of Energy and Mines approved a permit for exploration in 2013 (Figure 14).

On the **Dot-Apex** gold property (MINFILE 092ISW055, 79, 90) D.G. Cardinal and J.T. Shearer filed geological assessment work in 2012 and 2013. Electra Gold Ltd had a small drill program at the property in 2010-11.

New Carolin Gold Corp's work at the **Ladner Gold Project** was limited in 2013. Results of 2012 drilling were reported, and historic occurrences were re-visited in the field. There was also dewatering and additional metallurgical sampling of the Carolin Mine tailings (Figure 15). As part of the project, the company is evaluating the economics of re-processing the Carolin Mine tailings. A March 2012 preliminary economic assessment showed high price sensitivity with positive project economics above \$600/oz gold. At \$1100/oz gold the project was estimated to have NPV of \$8 million at a 5% discount rate. The average recovery in the 1982-84 Carolin Mine period of production was slightly better than 50%. At a cut off grade of 1.0 g/t, the indicated resource is approximately 23 700 oz. There is a further inferred resource (5000 oz), and also a portion of the tailings (approximately 40%) which remain untested and are not included in the estimate.

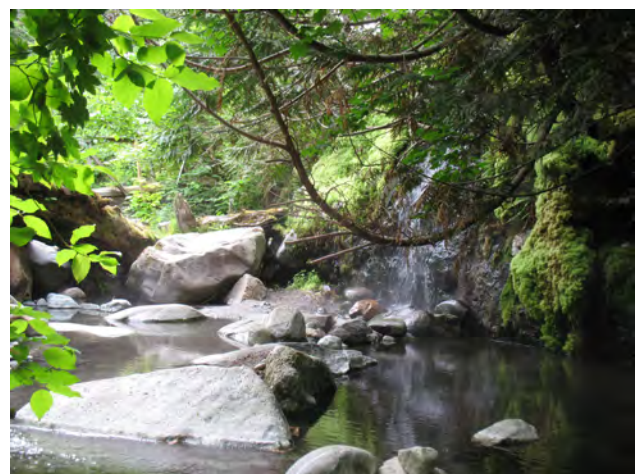


Figure 14. Modern hydrothermal activity in the Harrison Lake area. Much of the gold and Cu-Mo mineralization of current interest in the area appears to be related to Oligocene-Miocene magmatism.



Figure 15. Partially dewatered Carolin Mine tailings were sampled for metallurgical testing.

New Carolin Gold Corp hopes to resolve uncertainty surrounding part of its land position. It had an option agreement with Century Mining Corporation that entered into receivership. New Carolin plans to either acquire the assets relevant to its project, or make arrangements with the ultimate purchaser.

To the northwest, Alexandra Resources Inc. reported a small geochemical and prospecting program on its **Alexandra** property (MINFILE 092HNW031, 092HNW079), a little-explored area northwest of New Carolin Gold's Coquihalla Gold Belt property.

Small amounts of assessment work were filed on **Tasu Global** (MINFILE 103B 076) and **Sandspit Gold** (MINFILE 103G 005 and others) properties on Haida Gwaii in 2013. Although the islands are prospective, with several historical gold producers, early stage and grass roots prospects and one significant defined resource (Taseko Mines' Harmony project), the Islands are generally considered ecologically and culturally sensitive and unwelcoming to mining and exploration. Despite this, recent permitting of the Tasu Aggregate project and a small drill program at Sandspit Gold in 2010 suggests that while an operator will face close scrutiny, Haida Gwaii is not closed to the exploration and mining industries.

BASE METALS AND POLYMETALLIC

The best known Vancouver Island porphyry prospects were inactive, or minimally active in 2013. There are two main ages of porphyry mineralization: Jurassic (Island Copper and neighbouring deposits north of Rupert and Holberg Inlets), and Eocene as seen at Mount Washington and north of Tofino. Recently Miocene porphyry-style Cu-Mo mineralization has been recognized south of Quatsino Sound.

One of the largest projects on the coast in 2012 was the North Island Project of Northisle Copper and Gold Inc. The project was placed on care and maintenance in 2013. The company has a large land package on northern Vancouver Island with several porphyry and epithermal style occurrences along a prospective belt that hosted the

past-producing Island Copper Mine. Between 1971 and 1994, the mine produced 345 million tonnes with average head grades of 0.41% Cu, 0.017% Mo, and 0.19 g/t Au. The company's most advanced target at present is the **Hushamu** deposit (MINFILE 092L 240), which was drilled in 2012. A resource estimate at a 0.3% Cu equivalent cut off yielded:

	Mt	Cu (%)	Au (g/t)	Mo (%)	Re (ppm)
Indicated:	304.0	0.21	0.29	0.010	0.55
Inferred:	205.6	0.18	0.26	0.008	0.38

This resource is comparable in size to the neighbouring **Island Copper** past producer (MINFILE 092F 138), however with lower copper grades and higher gold. There is also an untested IP anomaly to the northwest, and the deposit remains open to the southeast.

Northisle began preliminary engineering studies toward a preliminary economic assessment (PEA) and obtained a notice of work for additional drilling, but chose to put the project on hold pending better market conditions for venture capital.

The Hushamu and Island Copper deposits are broadly similar in that they are related to Middle Jurassic Island Plutonic Suite intrusions of approximately the same age in Jurassic Bonanza Group rocks, and both occur in a prospective belt north of the Holberg Fault. New Rhenium-Osmium molybdenite ages suggest however, that the Hushamu mineralization is slightly older than that of Island Copper. Furthermore, the geology, mineralogy and paragenesis as interpreted to date suggest that the deposits are similar, but not directly comparable. The Hushamu deposit shares some of the advantages of its Island Copper Mine predecessor in its proximity to tidewater, infrastructure and skilled labour.

Catface Copper (MINFILE 092F 120) north of Tofino is another Vancouver Island porphyry copper project at a similar advanced stage of exploration. Imperial Metals Corporation published resource figures in 2009, but has not yet announced its plans for the project. They further defined the main resource area, the Cliff zone, with additional drilling in 2010. No new resource figure has been published. Porphyry mineralization at Catface is related to the Eocene Tofino Intrusive Suite rather than the Jurassic Island Plutonic Suite.

Also inactive in 2013 was Compliance Energy Corporation's **NIC** (MINFILE 092L 266 and others) project on Northern Vancouver Island. Here, disseminated Cu-Mo mineralization is spatially related to Miocene intrusions. Vale Exploration Canada Inc carried out some reconnaissance work on tenures to the northwest, seeking new porphyry targets.

No new exploration is reported at the **Merry Widow** (MINFILE 092L 044 and others), a copper-gold skarn property which was active up until 2008. Former operator Grande Portage Resources Ltd. has forfeited most of their tenures.

Northwest of Gold River, newly-listed Red Hut

Metals Inc. reported some further reconnaissance work on their grass roots **Conuma** property, following a 2011 airborne magnetic survey over part of the property along with mapping, prospecting and soil geochemistry. Targets include VMS style mineralization. The company also acquired an adjacent VMS polymetallic prospect, **Norgate** (MINFILE 092E 083).

On the Preston property, (**Nimkish Copper**, MINFILE 092E 025) Santa Fe Metals Corp conducted a preliminary program of geological mapping and rock sampling, including channel sampling, and packsack drilling.

Northeast of Gold River, another new property with a reconnaissance program in 2011 and 2012 is the **TIB**, recently optioned by Universal Ventures Inc. As is often the case in the densely forested region, new logging roads have revealed mineralization in an area of otherwise poor exposure. Following the discovery, a 585 line km airborne survey was flown in 2011, and further prospecting, mapping, rock geochemistry and a 20-km closely-spaced 3D IP survey was done in 2012. Exploration is in a very early stage, but styles of mineralization so far include possible replacement and vein high grade copper-gold (for example 2.7% Cu over 3.5 m including 0.5 m > 10 g/t Au) and stockwork showings spread over several hundred square metres. The showings occur in Karmutsen volcanics, near an intrusive stock. Intrusives in the area are mapped as Jurassic Island Plutonic Suite. Previous operators believed that known occurrences in the area (MINFILE 092E 050, 092F 401) were porphyry-related. Universal Ventures Inc. has not yet proceeded with the drilling that was proposed on the TIB property to follow up on 2012 geology, geochemistry and geophysics. They have however, optioned properties to the west covering the **Oktwanch** skarn showing (MINFILE 092E 019) and the **Numa** molybdenum showing (MINFILE 092E 062).

North of Alberni Inlet, Equitas Resources Corp optioned the **Nahmint** property from Nahminto Resources Ltd and began a preliminary program that included remote sensing, geochemistry and geological mapping. This follows a 2012 aeromagnetic survey. The company identified four new non-outcropping targets in the Three Jays area based on the results of the 2013 work (Figure 16). They are proposing a follow up program of access construction, mechanized trenching and drilling.

The Nahmint property includes past producers Cascade (MINFILE 092F 157), Monitor (MINFILE 092C 007), and Three Jays (MINFILE 092F 140). All are skarns that produced in the late 19th and early 20th century. Exploration since that time has been preliminary in nature.

To the north of the Nahmit property, Nahminto Resources Ltd holds most of the Macktush property. 2103 inversion and interpretation of existing aeromagnetic data identified targets for further investigation. Drilling has been proposed for the **Rex** area (MINFILE 092F 221), which is an untested porphyry Cu-Mo target in the



Figure 16. Consulting geologist Jacques Houle at the Nahmint property near Port Alberni. Equitas Resources Corp. is the new operator.

approximate centre of the property.

World Organics Inc. has an option on the Macktush North, which includes the **Cous Creek** (MINFILE 092F 360) target area

The **Old Joe**, held by prospector Dan Bruner is a grass roots stage property north of the eastern end of Great Central Lake. It has several MINFILE showings (092F 293, 415, 340, 430) and previously undocumented quartz-calcite copper-gold-silver bearing veins, and other occurrences, including the recently discovered Cadillac Road vein (Figure 17). There has been little exploration beyond prospecting and surface sampling on the property. There was a very limited (170 m) drill program west of Patterson Lake in 1990 and ground geophysics in the 1980s. While individual showings documented to date have appeared to be limited in extent, new roads in the area are uncovering further potential. The area underlying the Old Joe property is mapped as Vancouver Group (Karmutsen Formation), however a magnetic high in the regional magnetic survey crosses the northwestern portion of the property. This anomaly may be related to Island Plutonic suite mapped to the northwest around Thunder Mountain. The property is available for option.

Newly-listed Golden Peak Minerals Inc. filed geochemical and geophysical work for assessment on its **Columbia Shear** property (MINFILE 092F 282, 311, 339, 461 and others) in 2013. Results are not yet published. In the previous year they filed technical reports with results of 2011 and minor 2012 work, including a 261 line km airborne survey (VTEM and magnetometer).

The property covers a reverse fault bounded body of Sicker Group rocks. Nitinat, McLaughlin Ridge, and Duck Lake Formations have been mapped within the bounds of the property, as well as Island Plutonic Suite granodiorites. Mount Washington Suite intrusive, Vancouver Group, Mount Hall Gabbro and Buttle Lake Group are also exposed in the area. The property covers 10 MINFILE showings, several of which are assigned to BC deposit type I06, Cu+/- Ag quartz veins. Stockworks



Figure 17. Top and bottom - The Cadillac Road Vein is a recent discovery on the Old Joe property. A logging road exposed it for long enough that prospectors were able to record and sample the new copper showing.

and lenses of massive sulphide and semi-massive sulphide of inferred VMS origin are also reported. Of the 10 showings about half are described as volcanogenic, occurring in Sicker Group rocks.

Treasury Metals Inc did not report new activity at its **Lara** polymetallic property (MINFILE 092B 129 and others), although the land package has been re-assembled since portions of it lapsed in 2011. The company is currently focused on a gold project in Ontario and would consider either selling or entering into a joint venture to advance the Lara. Meanwhile they propose a small mapping and sampling program. Assessment work was filed on neighbouring properties along the WNW-ESE trend between the past-producing Mount Sicker area and RCR Mining LLP's property, which includes the **Sognidoro** prospect (MINFILE 092C 144).

The past producing **Sunro** Cu-Au-Ag mine (MINFILE 092C 073) is offered for sale by the Sunro Copper partnership. A U.S. junior company, Golden Global Corporation signed a letter of intent to acquire the property. No new work is reported.

On Texada Island, apart from the work by Lafarge in the north, there was a modest amount of exploration on the central and southern properties held by Northstar

Mining Ltd/D.A. Bombardier. Northstar is a private corporation. Work has proceeded on Texada at a relatively low level over a number of years with results published in Assessment Reports. Best known for limestone and skarn deposits in the north (e.g. **Yellow Kid – Texada Mines** MINFILE 092F 258, **Little Billie** MINFILE 092F 105), the island also has less well-explored vein and porphyry-style showings on the central and southern areas of the island (e.g. MINFILE 092F 276).

North of Powell River, the **Okeover** or **OK** property (MINFILE No 092K 008, 57, 155; 092F 302) is owned 40% by Eastfield Resources Ltd, 60% by Prophecy Coal Corp. Work in 2012 consisted of additional soil geochemistry and rock sampling. The last drill program was in 2007. Since then, soil surveys, IP and ground-based magnetic surveys have identified new drill targets on this Cu-Mo porphyry prospect. Prophecy reported modest exploration activity in 2013 to assess these target areas untested by drilling. A resource in the northern part of the property (North Lake Zone) remains open: the soil geochemistry and IP surveys since 2010 suggest that mineralization may open to the east, west, and south of the inferred resource area at North Lake. The 2006 inferred resource has 86.80 Mt grading 0.31% Cu and 0.014% MoS₂, at a 0.2% Cu cut off.

Miocene Metals Limited reported 2013 work on its **Rogers Creek** (MINFILE 092JSE033) porphyry Cu project. This included interpreting existing data, re-examining over 5000 m of drill core, and collecting physical and geophysical property data from the existing drill core. The information is intended to help constrain a geophysical inversion model and help plan future exploration.

East of Harrison Lake, the **Cogburn Magnesium Project** (MINFILE 092HNE307, 092HSW081, 092HNW041) reverted to the vendor and is available for sale or option. Coast Mountain Geological Ltd filed assessment work on the **Lekcin** (MINFILE 092HSW 082, 143, 168) property, which is owned by John Chapman and Gerald Carlson. Exploration has continued at a modest level with prospecting, geology, geochemistry and geophysics on the Lekcin, and nearby properties to follow up on targets from a multi-property IP survey in 2011. Discoveries of massive and semi-massive sulphide mineralization on this, and nearby properties like the Jason, have raised curiosity, but not sufficient funds to thoroughly test targets. Lekcin is one of several Ni-Cu-PGE/Magnesium properties located near the past-producing Giant Mascot nickel mine. The **Giant Mascot**, or **Pacific Nickel** Mine (MINFILE 092HSW 004, 93, 125) operated in the area between 1958 and 1974, and exploited a number of pipe-like ore bodies. In total more than 4.3 million tonnes of ore were mined, yielding 26.6 million kilograms of nickel, and 13.2 million kilograms of copper, cobalt, silver and gold by-products. The former nickel mine itself is held by Barrick Gold Corporation who acquired it incidentally through a corporate takeover.

They propose a ski resort on the property. Other area properties with Ni-Cu PGE targets include Jason, Cogburn, Krof and Stokke Creek to the northwest.

Natan Resources Ltd reported results of 2012 assessment work on the **Highland South Copper Property**. Reconnaissance geochemistry expanded the previously-identified Central Zone coincident Cu-Mo anomaly, and also identified other areas for follow-up. The property remains at an early stage of exploration, with little reported work beyond soil geochemistry and limited rock sampling (MINFILE 092HNW049). The property is currently held by A.A. Walus as the **Pilsudski** property.

Southeast of Hope, Savoy Ventures Inc deferred a 2013 exploration program on the **Big Range** property (MINFILE 092HSW145) on Sowaqua Creek, to 2014. Savoy completed an airborne (VTEM and magnetic) survey in 2012, and preliminary mapping and sampling since 2010 revealed molybdenum veining and alteration. Historical work in the 1930s and 1980s returned Cu, Mo and Au values.

The Hozameen Fault runs through the property, hosts serpentine, and is setting similar to Carolin Mine to the north. Associated with the fault, a felsic stock with arsenic, molybdenum and copper mineralization in quartz veins has been documented. Other mineralization occurs as orogenic gold, and porphyry Cu-Mo or Mo mineralization. Savoy Ventures Inc began trading on the TSX Venture exchange late in 2013. The company holds an option on the Big Range property.

OTHER INDUSTRIAL METALS

Several Vancouver Island magnetite iron skarn properties have changed hands over the past two years. Canadian Dehua International Mines Group Inc has acquired iron ore prospects on Vancouver Island, including **Iron Ross** (MINFILE 092K 043), **Pearson** (MINFILE 092C 022), **Argonaut** (MINFILE 092F 075) and **Head Bay** (MINFILE 092E 001). They expect the Port Renfrew area (Pearson Project) to be the initial focus. Reconnaissance work began in 2013 and the Ministry of Mines is processing a Notice of Work that includes drilling. The vendor, Pacific Iron Ore Corp published an inferred resource for the Bugaboo Creek area in 2011 consisting of 14.3 million tonnes averaging 60% magnetite at a cut off of 20% magnetite.

As noted above, the **Cogburn Magnesium** project is now offered for sale. This project had a positive 2003 feasibility study by Hatch Associates Ltd. As a silicate Mg resource, the economics would be sensitive to electricity costs as well as magnesium price.

INDUSTRIAL MINERALS

Industrial minerals exploration activity is often either carried out by private companies or very large

construction materials companies for which exploration activity is not considered material and not necessarily disclosed publicly. Texada Quarrying Ltd, a subsidiary of construction materials giant Lafarge, falls into the latter category. They did however report a 6100 m drill program around their **Texada Island Quarry** (or **Gilles Bay**, MINFILE 092F 395). Reserves at the site are sufficient for over 100 years, and therefore the program was largely for quality testing purposes and assessment work, to keep tenures in good standing.

On Vancouver Island, Graymont Western Canada Inc reported geophysical work on its limestone property near **Nimkish Lake** (MINFILE 092L 349). Results are unpublished. This follows a small geochemical and geophysical program in 2012.

PUBLIC GEOSCIENCE

Geoscience BC released results of the Northern Vancouver Island project in May 2013. This was followed by staking and reconnaissance exploration in the survey area. Among several active local explorationists attracted to the area was a newcomer to British Columbia exploration, Vale Exploration Canada Inc. . The 2012 survey was funded by Geoscience BC and the Island Coastal Economic Trust. It included a large airborne magnetometer survey over part of Northern Vancouver Island, extending nearly to Port McNeill in the east and Zeballos in the west. In addition, there was a stream sediment and till sampling and re-analysis program that covered the airborne survey area, plus additional territory. This project complements recent mapping by Graham Nixon and others of the BC Geological Survey.

On the mainland, as part of Natural Resources Canada's Targeted Geoscience Initiative 4, the Geological Survey of Canada, BC Geological Survey and UBC (M.Sc. candidate Matt Manor) are collaborating on a study of the Giant Mascot Ni-Cu deposit, the origin and setting of which remain controversial.

OUTLOOK

Exploration continued at the major mines Myra Falls and Quinsam, as well as the region's largest quarry on Texada Island. Each of these operations could continue for many more years: the Texada quarry already has a vast resource, and both Myra Falls and Quinsam have exploration potential. With infrastructure in place and production ongoing, both mines have the ability to turn targets into resources, and resources into reserves.

With a few exceptions, industrial minerals and aggregate producers have either held steady or improved shipments over last year. Generally this has been the case since the downturn of 2009. These operations are closely tied to the construction industry, which is largely driven by the local and western US economies. Many have made

significant capital investments in their operations, signalling a degree of confidence in the long term outlook.

The exploration targets and proposed mines of the region remain ready to advance, however for most projects, exploration progress is limited by lack of funds. Early stage and grass roots projects will advance slowly until the appetite for risk in venture capital markets changes. On a positive note, prospectors continue to make discoveries and geologists and prospectors continue to compile and review their data when funds are scarce.

Advanced projects and proposed mines are generally not announcing definite timelines as they are also facing uncertainties such as debt financing, permitting/environmental certification and the near term future of commodity prices.

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EXPLORATION AND MINING IN THE KOOTENAY-BOUNDARY REGION, BRITISH COLUMBIA

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SUMMARY AND TRENDS

Despite tighter fiscal budgets for much of the mining sector in 2013, and overall decreased exploration activity in the Kootenay-Boundary region, major projects for coal exploration and development remained strong in the East Kootenay coalfields. Coal production increased in 2013, compared to 2012, despite the continued decline in coal commodity prices since the high in 2011. Mine expansion plans continue at each of the existing mines, and new project areas are also being explored to test the potential for mine development. A recent announcement by the Federal Government regarding an upcoming sale of the mineral rights in the Dominion Coal blocks (Parcels 73 and a portion of 82) in southeastern BC, will also bring further coal exploration activities to the region.

While coal remained strong, tighter capital budgets in 2013 resulted in a decrease in mineral exploration for precious and base metals in the region. Despite this, many smaller early-stage and grassroots programs continued in the area for prospect generation and assessment work. The decreased level of activity may have allowed claim holders to re-evaluate their asset portfolios, and focus efforts towards re-evaluating geological models and exploration for higher quality targets. One trend of note was an increase in exploration and claim staking for graphite projects in the Slocan area. Mining activities for industrial minerals also remained important in the region, in addition to ongoing exploration efforts for Sullivan-style SEDEX targets and gold in the East Kootenays.

Highlights for the year included:

- Conditional Environmental Assessment approval for Teck Coal's Line Creek Phase II mine expansion
- Major coal exploration drilling programs: Teck Coal Ltd, CanAus Coal Ltd, and Jameson Resources Ltd
- Exploration for graphite in the Slocan area: Noram Ventures, Lithium Corporation
- Gold and polymetallic exploration projects in both the east and west Kootenays: Taranis Resources, Silver Mountain Mines, Kootenay Silver, PJX Resources Inc
- Continued exploration for SEDEX mineralization in the Purcell Basin of the

East Kootenays: MMG Ltd, Santa Fe Metals Corp

- Ongoing geosciences initiatives in the East Kootenays:
 - Geological Survey of Canada's TGI-4 project (3D modelling of the Purcell Anticlinorium)
 - GeoscienceBC's SEEK project (Stimulating Exploration in the East Kootenays)

Total exploration expenditures in 2013 were approximately \$35.5 M (Fig. 1), and an estimated 71 000 metres of exploration drilling (Fig. 3) occurred in the Kootenay-Boundary region. As noted above, the majority of the exploration spending was on coal projects, with exploration expenditures down only moderately from previous years, while the bulk of the decrease for the expenditures in the region was reflected mainly in 'advanced projects' related to metallic mineral exploration (Fig. 2). In-pit drilling for geological characterization and development planning at active mines (mainly coal) accounted for an additional 39 000 drilling metres. The locations of selected major projects for the area in 2013 are highlighted on Figure 4.

MINES AND QUARRIES

The region hosts five large coal mines in the Elk Valley, in addition to several smaller operations for industrial minerals, including magnesite, gypsum, silica sand, mineral wool, limestone, and dolomite (highlighted on Figure 4, and in Table 2). In addition to exploratory drilling, operators conducted in-pit drilling for geological characterization and development planning.

COAL

Teck Coal Ltd, the world's second-largest exporter of metallurgical coal, operates five large open-pit coal mines in the Elk Valley area. The mines at **Fording River, Greenhills, Line Creek, Elkview, and Coal Mountain** produce approximately 70% of Canada's total annual coal exports, and directly employs over 4500 people full-time, in addition to contractors, service companies, suppliers, and support businesses. The mines in the Elk Valley

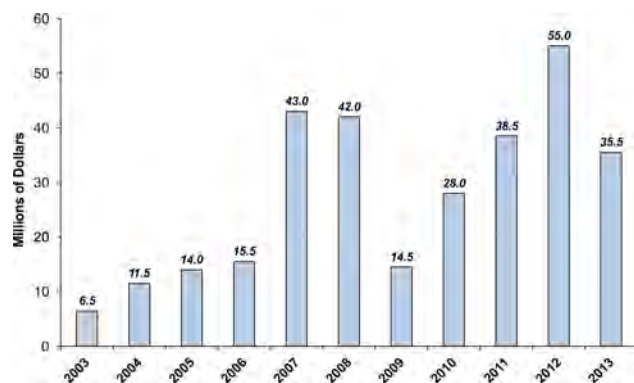


Figure 1. Annual exploration spending in millions of dollars, 2003 to 2013, Kootenay-Boundary Region. The Revelstoke area was added to the region in 2010.

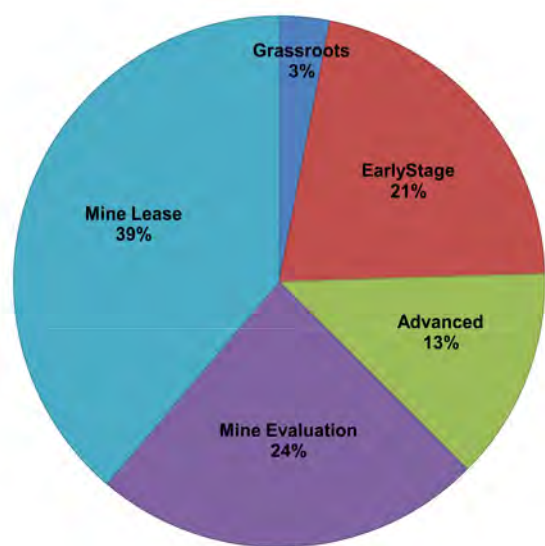


Figure 2. 2013 exploration expenditures by category, Kootenay-Boundary Region.

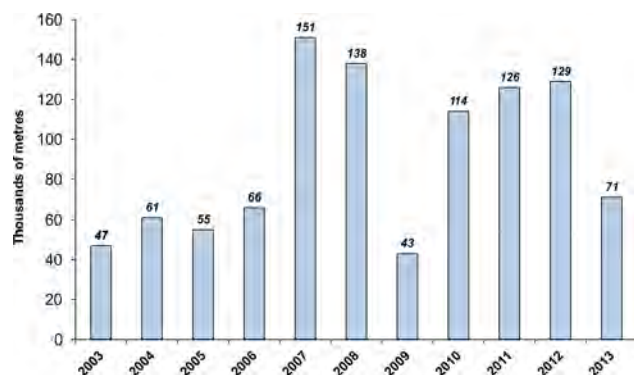


Figure 3. Annual exploration drilling in thousands of metres, 2003 to 2013, Kootenay-Boundary Region.

contribute largely to both the local and provincial economies.

Annual combined production of metallurgical and thermal coal from the East Kootenay coalfields at the five major mines has been increasing over the past few years, driven by strong demand on the world market, and active exploration and mine expansion projects in the area. Total clean coal production at Teck Coal Ltd's operation in the East Kootenays is projected to be 25.27 Mt for 2013. This is up from the actual 2012 production reported of 24.13 Mt, and 22.55 Mt in 2011. Production volumes, and Proven and Probable reserves are reported in Table 1.

The main coal deposits in the southern interior of BC extend along a 175 km northwest-southeast trend of the Front Ranges of the Rocky Mountains, where structural thickening and exposure of the seams allows for open-pit mining. The commercially mineable coals are found within Mist Mountain Formation of the Jurassic - Cretaceous Kootenay Group. The original thickness of deposition of the Mist Mountain averages 500 to 550 m, with several seams of sufficient quality and potentially mineable thickness.

Economic occurrences of the Mist Mountain Formation are found within three structurally separated coalfields, known collectively as the East Kootenay coalfields, and include from north to south: the Elk Valley, the Crowsnest, and the Flathead coalfields. The Elk Valley Coalfield is in the Alexander Creek and Greenhills synclines, and includes the **Fording River**, **Greenhills** and **Line Creek** operations. The Crowsnest Coalfield coincides with the Fernie Basin, a broad north-trending synclinorium. It has hosted coal mining since before the turn of the twentieth century and includes the current **Elkview** and **Coal Mountain** operations. The Flathead Coalfield consists of four relatively small, isolated exposures of Kootenay Group rocks in the extreme southeast corner of the region. Resulting from provincial legislation that prohibits subsurface resource exploration and development in the Flathead Valley, the Flathead Coalfield and part of the Crowsnest Coalfield, are excluded from coal mining activity in BC.

The Kootenay coalfields produce from multiple seams within the Mist Mountain Formation. Coal seams are typically medium-volatile bituminous in rank, with some high volatile-A bituminous coals, stratigraphically near the top of the section. Locally, low-volatile bituminous coals also occur in basal portions of the section.

Hard coking coal (HCC) is the predominant product at four of the five Elk Valley mines (Fig. 4), the exception being the Coal Mountain mine. Two or more coal products are marketed by each of these operations, generally based on variations in volatile matter and/or ash contents. Products are typically medium-volatile bituminous in rank, and contain 8.6-9.5% ash. Sulphur is generally about 0.5%. Other attractive quality parameters include high Coke Strength after Reaction (CSR) test

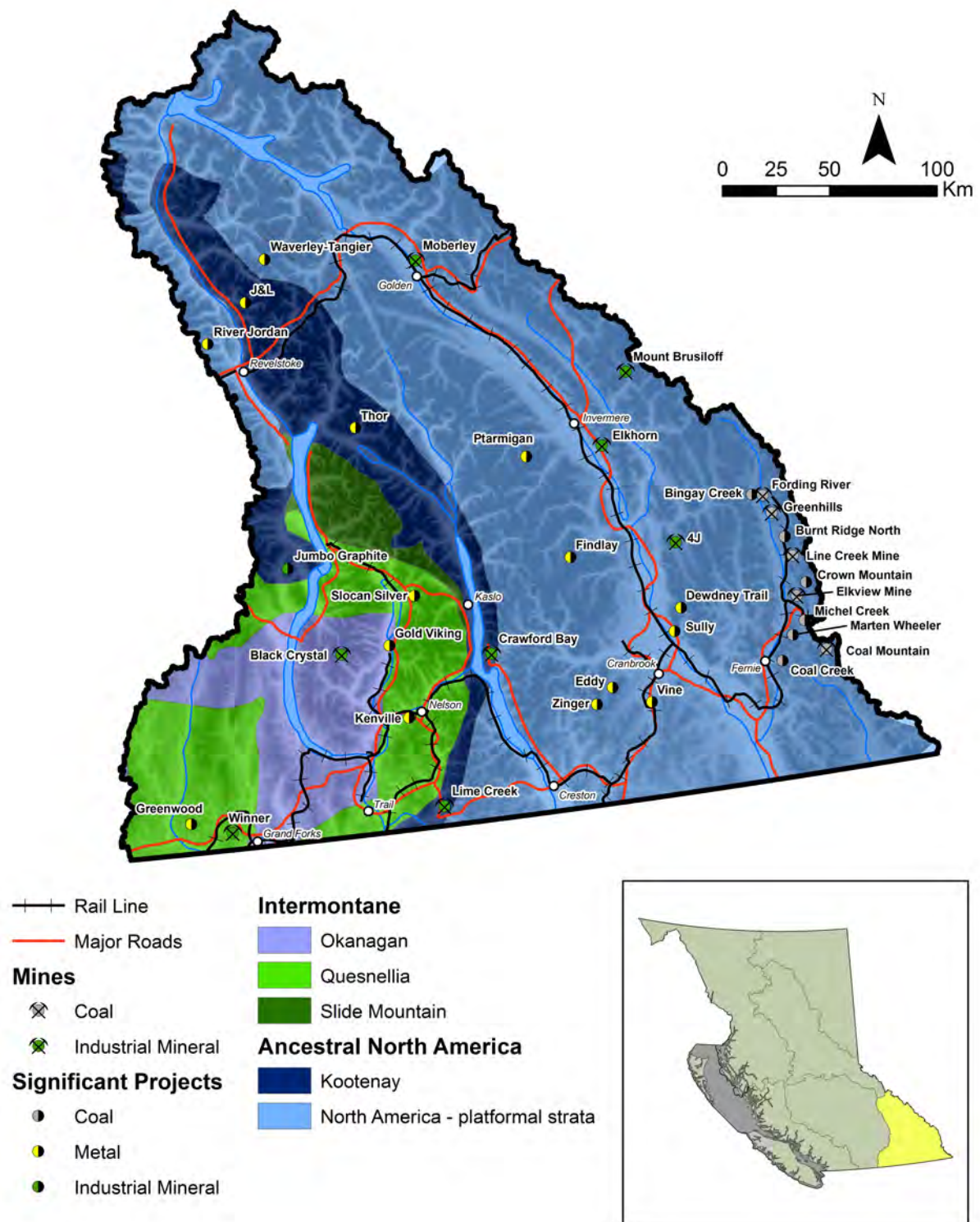


Figure 4. Locations of selected operating mines and exploration projects, Kootenay-Boundary Region, 2013.

TABLE 1. SELECTED PRODUCING MINES AND QUARRIES, KOOTENAY-BOUNDARY REGION, 2013

Mine	Operator	Commodity	Employment	Actual 2012 Production	Projected 2013 Production	Proven and Probable Reserves as of December 31, 2012 or as indicated
Coal						
(Reserves from Teck Coal, 2012 Annual Information Form)						
Coal Mountain	Teck Coal Limited	PCI and Thermal coal	338	2.68 Mt	2.50 Mt	13.3 Mt
Elkview	Teck Coal Limited	Metallurgical coal	1080	4.65 Mt	5.35 Mt	211.1 Mt
Fording River	Teck Coal Limited	Metallurgical and Thermal coal	1200	8.80 Mt	8.92 Mt	614.5 Mt
Greenhills	Teck Coal Limited	Metallurgical, PCI and Thermal coal	580	4.60 Mt	5.10 Mt	70.1 Mt
Line Creek	Teck Coal Limited	Metallurgical, PCI and Thermal coal	520	3.40 Mt	3.40 Mt	64.5 Mt
Line Creek Phase II	Teck Coal Limited	Metallurgical, PCI and Thermal coal				59 Mt (Dec 31, 2013)
Industrial Minerals (selected)						
4J	Georgia-Pacific Canada Inc	Gypsum				
Crawford Bay	Imasco Minerals Inc	Dolomite				
Elkhorn	CertainTeed Gypsum Canada	Gypsum	17	423 kt	429 kt	
Lime Creek	Imasco Minerals Inc	Limestone				
Moberly Silica	Heemskirk Canada Limited	Silica sand				43.2 Mt total industrial silica; including 13.5 Mt @ 64% 140-mesh frac sand (June 30, 2012)
Mount Brussilof	Baymag Inc	Magnesite	42	180 kt	180 kt	
Winner	Roxul Inc	Gabbro (mineral wool)			150 kt	

results. In addition to hard coking coal, Teck Coal Ltd produces pulverized coal injection (PCI) coal, mainly from Coal Mountain. Oxidized coal is also marketed as thermal coal in some cases (Fig. 5).

Fording River Operations (MINFILE 082FSE009, 010 and 012), 29 km northeast of Elkford, produces metallurgical coal primarily, with a small amount of thermal coal from their Eagle Mountain, Turnbull, and Henretta Pits. Projected 2013 production is 8.9 Mt, up slightly from 8.8 Mt produced in 2012. Proven and probable reserves are projected to support a 74-year mine life at the current production rate, and mine expansion plans are currently underway at both their **Henretta** and **Swift** areas (see Mine Evaluation and Exploration Projects, below).

Greenhills Operations (MINFILE 082JSE007) is 8 km northeast of Elkford, and operated under a joint

venture between Teck (80%) and POSCAN (20%). Proven and probable reserves are projected to support another 15 years of mining at the current rate, but mine expansion plans are underway to extend operations northward into the **Cougar North** area (see Mine Evaluation and Exploration Projects, below). Production in 2013 is projected to be 5.1 Mt of metallurgical coal, with minor amounts of thermal and PCI coal, an increase of 0.5 Mt from 2012.

The Greenhills Cougar North extension (Fig. 6) is directly to the south of the Fording Swift area, and current plans are underway to merge the mining grids and datasets for both mines. The Cougar North and Swift areas will be collectively known as the **“Swift”** expansion.

Line Creek Operations (MINFILE 082GNE020 and 021), 25 km northeast of Sparwood (Fig. 7),



Figure 5. Truck and shovel operations in the Elk Valley (Teck Coal Ltd, Line Creek Operations). Photo by Dave Grieve.



Figure 6. View looking north at Cougar pit highwall and Cougar Ridge North, at Greenhills Operations (Teck Coal Ltd). Cougar Ridge North will link Teck's Fording River and Greenhills expansion areas and collectively be known as the "Swift". Photo by Dave Grieve.

produces metallurgical and thermal coal from the Burnt Ridge South, North Line Creek, and Horseshoe Pits, and has an estimated reserve life of approximately 20 years. Production in 2013 is expected to remain flat at 3.4 Mt, however active mine expansion plans are well underway with the **Line Creek Phase II**, which received conditional Environmental Assessment approval in October. This expansion will extend the operations at Line Creek northward, and encompass the **Mount**



Figure 7. Coal seams at Burnt Ridge South pit highwall, Line Creek Operations (Teck Coal Ltd). Photo by Dave Grieve.

Michael and Burnt Ridge North areas (see Mine Evaluation and Exploration Projects, below).

Elkview Operations (MINFILE 082GNE013 to 017 and 023), 5 km east of Sparwood, is operated by a partnership between Teck Coal (95%), Nippon Steel & Sumimoto Metal Corporation (2.5%), and POSCO (2.5%). The mine produces mainly high-quality mid-volatile hard coking coal, and has a remaining reserve life of approximately 34 years at the current production rate. Forecasted 2013 production is 5.4 Mt, a 0.7 Mt increase in production from 2012. Production is mainly from their Baldy Ridge BR1 (Fig. 8) and Natal PH1 Pit (Fig. 9). The mine received approval for their sub-EAP expansion at Baldy Ridge (Baldy Ridge BR2 and BR6 Pits, and Natal Ridge PH2 Pit) in 2012, which is within their current mining area. Environmental baseline and other studies are in the process of being submitted to satisfy permit conditions.

Coal Mountain Operations (MINFILE 082GNE001), 32 km southeast of Sparwood, produces mainly PCI and thermal coal, with proven and probable reserves expected to support another 7 years of production at current rates. Projected production was down slightly in 2013 at 2.5 Mt from 2.7 Mt in 2012. Coal is mainly produced from seams at **37-Pit** and **6-Pit**, with 2013 exploration drill programs to expand **6-Pit** to the south (see Exploration Projects).

INDUSTRIAL MINERALS

The Kootenay-Boundary Region continues to be an important source of industrial minerals and related products, including gypsum, magnesite, silica sand, mineral wool, dolomite, limestone, graphite, tufa, flagstone, railroad ballast, rip rap, smelter slag and aggregate, but only selected larger operations are described here (Table 1, Fig. 4).

Baymag Inc produces high-quality magnesite from its open-pit mine (Figs. 4 and 10) at **Mount Brussilof** (MINFILE 082JNW001), which is in the Rocky



Figure 8. View of Baldy Ridge pit at Elkview Operations (Teck Coal Ltd). Photo by Dave Grieve.



Figure 9. View looking southeast at Natal Ridge at Elkview Operations (Teck Coal Ltd). Natal 2 pit, now mined out, is in the foreground. Photo by Paul Jago.

Mountains northeast of Radium, and has been in production since 1982. The Mount Brussilof deposit represents a large magnesium alteration zone in Cambrian carbonates of the Cathedral Formation. Ore is transported by truck to the company's processing facilities in Exshaw, Alberta for production of magnesium oxide (magnesia or MgO) and magnesium hydroxide (MgOH). Production in 2013 is expected to remain flat at approximately 180 kt. The processed products have a variety of environmental, industrial and agricultural uses, including use as a pH



Figure 10. View of the Mount Brussilof mining operations (Baymag Inc). Magnesite is mined from magnesite-rich sparry carbonates of the Cambrian Cathedral Formation. Photo by Dave Grieve.

modifier and precipitant. It is also used as a component in cements which are typically used in the production of fireproofing materials and coatings, as well as in the production of fibreglass, magnesium metal alloys, and steel and nickel refining.

Silica sand is produced by Heemskirk Canada Ltd at the **Moberly Silica** operation (MINFILE 082N001), in the Rocky Mountains 8 km north of Golden (Figs. 4 and 11). The nearby plant and load-out facility is adjacent to Highway 1 in the Rocky Mountain Trench. The deposit lies within a regionally-extensive quartzite unit in the Ordovician Mount Wilson Formation (Fig. 12). At Moberley, the unit is near-vertical, about 200 m thick, and extends along a 1000 m strike length. Variation in friability is related to shearing and/or alteration of the zone.

Measured plus indicated resources at the Moberly Silica mine site are estimated at 43.2 Mt of silica suitable for glass making, silica flour and other uses. Silica flour, used in cements, was shipped to several markets in 2013.

In 2011, the company completed a positive feasibility study that outlined the operation's capacity to produce high-quality frac sand for the western Canadian oil and gas industry. An estimated project cost of \$26 million would include costs for redevelopment of the current operation at the Moberly Mine, upgrading the haul road, and construction of a new processing plant. In 2012,



Figure 11. Silica sand at the Moberley mine (Heemskirk Canada Ltd). The mine currently produces a variety of silica products, and is currently evaluating facility expansion plans to supply frac sand to the oil and gas industry. Frac sand is used as a proppant for wellbore stimulation. Photo by Dave Grieve.



Figure 12. Ordovician-aged Mount Wilson formation quartzites at the Moberley silica mine (Heemskirk Canada Ltd). Photo by Dave Grieve.

detailed engineering studies were undertaken, and a 35-year mine plan was completed. A separate resource estimation specific to production of 64% frac sand (and 36% residuals suitable for other applications) yielded 32.4 Mt in the Measured plus Indicated category. Ore reserves (proven and probable) of silica suitable for 20-mesh to 140-mesh frac sand are 13.5 Mt @ 64% sand. The company is currently looking at financing for their expansion project to implement the frac sand operation.

Two gypsum mines operate in the Kootenay-Boundary region, both of which produce from an evaporite unit in the Devonian Burnais Formation, in the Rocky Mountains. CertainTeed Gypsum Canada operates the **Elkhorn** Mine (MINFILE 082JSW021) east of Windermere (Fig. 4). Production is currently from the EQWE pit, and is expected to continue for another 7 to 12 years, depending on recovery rates and market conditions. In 2013, the company submitted an application to the Environmental Assessment Office for the **Kootenay West**

Mine (see Mine Evaluation Projects). Georgia-Pacific Canada Inc operates the **4J** gypsum mine (MINFILE 082JSW009) and rail load-out facility southeast of Canal Flats. There was no mining activity in 2012, and 2013 activities involved re-establishing benching at the mine for possible re-start.

The **Winner** quarry (MINFILE 082ESE265) is located 7.3km southeast of Greenwood, and west of Grand Forks (Fig. 4). Gabbro is quarried from an open-cut and trucked to Roxul Incorporated's manufacturing plant in Grand Forks, where it is blended with other mineral material to make mineral wool. Mineral wool is used in fireproof and sound insulation, as well as fire retardant clothing.

At its Creston Operations Plant at **Sirdar**, Imasco Minerals Inc produces a variety of crushed and ground rock products from limestone, dolomite, granite and quartzite. Raw sources for these products include an underground dolomite mine at **Crawford Bay** (MINFILE 082FNE113), a limestone quarry at **Lime Creek** (MINFILE 082FSW307) southeast of Salmo, and a granite quarry at **Sirdar** (MINFILE 082FSE072) (Fig. 4). The carbonate units are Cambrian in age, whereas the granite is part of the Cretaceous Bayonne batholith.

Eagle Graphite Corp operates the **Black Crystal** flake graphite operation. Graphite ore is produced from the quarry on Hoder Creek (MINFILE 082FNW260), 22 km west of Slocan City (Fig. 4), and processed at the pilot plant near the confluence of Koch Creek and the Little Slocan River, 10 km west of the Slocan Valley village of Passmore. Host rocks are amphibolite-grade calc-silicates of the Valhalla gneiss complex. Disseminated fine to coarse flake graphite occurs along, and parallel to foliation planes and metamorphic compositional bands over an area roughly 500 square metres. The graphitic horizon is 80 to 100 m thick, with carbon grades up to 6.95%. It occurs in two zones: a "hard rock" zone, and an overlying regolith zone. Most of the deposit, especially the regolith zone, is friable and blasting is not required. Acid rock drainage is not an issue due to the calcareous nature of the host rock.

MINE DEVELOPMENT AND EVALUATION

MINE DEVELOPMENT

Approximately \$50 million was spent on mine development in 2013, predominantly in the Elk Valley, at Teck Coal Ltd's five mine operations. Development activities included: pre-stripping in permitted mining areas; in-pit drilling (over 39 000 m) for refinement of reserve definitions, coal quality analysis, geotechnical analysis, and structural interpretation; and access and infrastructure construction. Teck Coal is developing an area-based Management Plan in the Elk Valley to address

water quality issues and mitigate potential impacts of projects in the area. As part of the plan, Teck actively monitors water quality, and is in the construction phases of selenium treatment facilities and additional active fresh water diversion efforts around their mining operations.

MINE EVALUATION

Mine evaluation refers to the exploration stage in which environmental, social, financial and engineering assessments and studies are undertaken, and applications are prepared and submitted for the Environmental Assessment Process (EAP) and/or the various permits required for statutory approval of a mining project. It includes technical assessment of the project, identification of potential impacts, and design of mitigation measures, and requires studies that examine wildlife, surface water, groundwater, geotechnical and other issues. More detailed descriptions of some of the projects mentioned in this section are found with the corresponding mine and/or exploration property descriptions.

In 2013, one East Kootenay coal mine expansion project was granted conditional approval from the Environmental Assessment Office. Two other coal projects, and one gypsum operation are at various stages of the Environmental Assessment Process, as outlined below:

- **Line Creek Phase II Expansion** project (Teck Coal Ltd, Line Creek Operations). In October 2013, the project was granted Conditional Environmental Assessment approval from government agencies. The project will extend the operations at Line Creek northward, and encompass the **Mount Michael** and **Burnt Ridge North** areas. The \$62 Million dollar project will extend the mine life by 18 years, and produce an estimated 3.5 Mt of clean metallurgical coal per year, adding 59 Mt of reserves to the mine. Open-pit mining methods are proposed.
- **Swift** project (Teck Coal Ltd, Fording River Operations). This project, entered the EAP in 2011 and is in the pre-application stage. It is located west of the Fording River, and partially encompasses previous Fording River Mine pits on the Greenhills Range. Open-pit mining methods are proposed.
- **Kootenay West Mine** project (CertainTeed Gypsum Canada Inc). The proposed project entered EAP in 2013, and will be located 12 km northeast of Canal Flats. A single quarry, divided into North and South segments, would target gypsum from a structurally contorted, hydrated layer (5 – 40 m in thickness), within the sedimentary Middle Devonian Burnais Formation. The mine would have an average production rate of 400 000 tonnes per year, over

a 38-year mine life, with a total mineral reserve of 15 Mt and average quality of 83 - 85% gypsum. Capital investment is expected to be between \$7.5 and \$10 Million.

- **Bingay Main** (Centermount Coal Ltd), located on the **Bingay Creek** property. This proposal for an open-pit and underground coal mine entered the EAP in early 2013, but the project was suspended on account of recent lower coal prices. The proposed operation is 21 km north of Elkford in the Elk Valley (Fig. 4). Construction had been planned to begin in 2014, dependent on permitting approval. The mine would produce 2 Mt of coal annually, and have a mine life of approximately 20 years, with a total resource of approximately 39 Mt of clean coal. The company will continue to raise capital for final Feasibility Studies in anticipation of a market recovery and improvement in coal price.

Mine evaluation studies were completed on other projects in the region in 2013. Teck Coal Ltd completed a study for **Marten-Wheeler**. Crows Nest Pass Coal Mining provided updated resource and coal quality studies, and pre-feasibility studies for underground mining at **Coal Creek**. Jameson Resources Ltd provided a resource estimate and a Preliminary Economic Assessment for **Crown Mountain**. The project will be entering the pre-feasibility stage. Huakan International completed pre-feasibility level metallurgical testwork for **J&L** (Fig. 13). West High Yield Resources Ltd worked on pre-feasibility and feasibility studies for **Record Ridge**. Stanfield Mining Group of Canada is in the preliminary stages of a re-start proposal for the **Gallowai Bul River**, underground mine.



Figure 13. Aerial view of surface facilities and an adit portal at the J&L. Photo courtesy of Huakan International Mining Inc.

EXPLORATION HIGHLIGHTS

Selected 2013 mineral and coal exploration projects in the Kootenay-Boundary Region are listed in Table 2, and their locations are shown on Figure 4. The number of

TABLE 2. SELECTED EXPLORATION PROJECTS, KOOTENAY-BOUNDARY REGION, 2013

Property	Operator	MINFILE	Commodities	Target Type	Work program	Drilling metres (approx. in some cases)
Coal Creek	Crowsnest Pass Coal Mining Ltd	082GSE035	coal	sedimentary	G, RC, CQ, EN	
Coal Mountain	Teck Coal Ltd	082GNE001	coal	sedimentary	RC, CQ	3,600
Crown Mountain	Jameson Resources Ltd	082GNE018	coal	sedimentary	G, RC, CQ, FS, EN	1,649
Dewdney Trail	PJX Resources Inc		Au	sedimentary replacement	G, GC	
Eddy	PJX Resources Inc	082FNE059, 082FSE118, 095	Au	vein	G, GC	
Elkview Operations (Baldy Ridge)	Teck Coal Ltd	082GNE017	coal	sedimentary	RC, CQ, EN	9,031
Findlay	MMG Ltd	082KSE041, 063, 060, 075	Pb, Zn, Ag	sedex, vein	G, GP, GC	
Fording River Operations (Henretta/Swift)	Teck Coal Ltd	082JSE010	coal	sedimentary	G, RC, CQ, EN	18,451
Gold Viking	Rainbow Resources Inc	082FNW193	Ag, Pb, Zn, Au	vein	G, GC	
Greenhills Operations (Cougar North)	Teck Coal Ltd	082JSE007	coal	sedimentary	G, RC, CQ, EN	4,398
J&L	Huakan International Mining Inc	082M 003	Au, Pb, Zn, Ag	sedex, vein	PF, MS, EN	
Jumbo Flake Graphite	Noram Ventures Inc	082LSE076	C (graphite)	sedimentary replacement	DD, G, GP, GC, MS	1,295
Line Creek (Phase 2)	Teck Coal Ltd	082JSE001, 082GNE022	coal	sedimentary	DD, RC, CQ, EN	6,900
Marten-Wheeler	Teck Coal Ltd	082GNE006	coal	sedimentary	G, RC, CQ	8,142
Michel Creek	CanAus Coal Ltd	082GSE050	coal	sedimentary	G, RC, CQ, R	15,000
Ptarmigan	Silver Mountain Mines Inc	082KSE030, 036	Ag, Au, Cu, Zn	vein, manto	G, DD, GP, GC	900
River Jordan	Silver Phoenix Resources Inc	082M 001	Ag, Pb, Zn	sedex, vein	G, GP, GC	
Slocan Silver	Klondike Silver	082FNW050	Ag, Pb, Zn	vein	G, UG, GC	
Sully	Santa Fe Metals Corp		Pb, Zn, Ag	sedex	DD, GP	1,500
Thor	Taranis Resources Inc	082KNW030, 031, 060, 061	Au, Ag, Pb, Zn	sedex, vein	G, TR, GC	
Vine	PJX Resources Inc	082GSW050	Pb, Zn, Ag, Au	sedex, vein	G, DD, GP	900
Waverley-Tangier	Silver Phoenix Resources Inc	082N 014, 015	Ag, Pb, Zn, Au	vein, manto	G, GP, GC	
Zinger	PJX Resources Inc	082FSE012, 120, 122	Au	vein	G, GC	

Work Program Abbreviations:

CQ = coal quality testing; DD = diamond drilling; EN = environmental baseline studies / environmental monitoring; G = geology, mapping, etc.; GC = geochemical sampling (rock, soil, silt, etc); GP = geophysical (gravity or magnetics); MS = metallurgical studies; PF = feasibility and pre-feasibility studies; R = reclamation; RC = RC drilling; UG = underground development; TR = trenching

exploration programs in the area that included drilling or trenching (or other mechanized ground disturbance) was down in 2013 as a result of difficulties in raising capital dollars. Despite this, a number of operators continued to be active in the region, and assessment work in the area continued, with a shift of focus towards geological evaluation and further target definition. The information in this section was derived mainly from company reports, presentations, press releases, websites, and discussions with exploration project staff, and was supplemented in some cases with MINFILE descriptions and Assessment Reports.

EAST KOOTENAY COALFIELDS PROJECTS

Teck Coal Ltd undertook several programs to outline new coal resources and reserves, as either expansions or replacements of its current operations. All are in areas with potential for open-pit mining, and all represent potential sources of hard coking coal. Three other companies were also exploring for reserves of hard coking coal in the East Kootenay coalfields in 2013: CanAus Coal Ltd, Jameson Resources Ltd, and CrowsNest Pass Coal Mining Ltd.

Elk Valley Coalfield

Exploration drilling at Fording River Operations was carried out at the **Henretta Phase 4** and **Swift Project** areas. The Henretta Phase 4 area is east of the current Henretta Pit footwall, on the east limb of the Alexander Creek Syncline. Exploration drilling is intended to demonstrate mineable coal reserves down section from the current footwall limit in an area anticipated to contain coals with standard Fording River quality characteristics.

The **Swift Project** is located in the northern part of the Greenhills Range (MINFILE 082JSE010), west of the Fording River and adjacent to current workings and mine facilities (Fig. 4). It comprises both previously mined and unmined zones in the Greenhills portion of the Fording River property, and represents the next major potential expansion area for Fording River Operations, as a replacement for the Eagle Mountain pits. The Swift Project expansion will be based on mining multiple coal seams on both limbs of the Greenhills Syncline. Mine development will progress to the west and upward from previous open pits. The objectives of the 2013 drill program were to intersect ultimate pit limits in geologically complex areas, verify the viability of proposed designs, and improve resource confidence levels in areas with lower drill densities. Large-diameter reverse flood (LDRF) drill techniques were also used to collect bulk samples for coal quality testing. The project is in the Pre-Application stage of the EA process.

Along strike to the south at Teck's Greenhills Operations, rotary drilling was carried out in the **Cougar North** area (MINFILE 082JSE007), immediately north of the existing operations and Cougar Pit (Fig. 6). As with

the Greenhills Mine as a whole, the Cougar North Extension is part of the Greenhills Range and is underlain by the Greenhills Syncline. Coal seams 1, 7, 10, 16, and 20 are the main seams and most continuous throughout the area. Coal seams generally grade in rank from medium volatile bituminous in the lower portions of the section, to high-volatile-A bituminous in stratigraphically higher intervals. Coal seams above 7-seam are current targets for the expansion, with 7-seam and 10-seam most likely representing the greatest potential sources of coal reserves. The **Cougar North** Extension is the proposed expansion area for Greenhills Operations, and at full development its pits will merge with the Fording River Operations expansion.

Exploration at **Cougar North** was planned in conjunction with the ongoing Fording River Operations **Swift Project** exploration program (above), located along strike to the north. Teck Coal's Cougar North Extension and the Swift expansion areas will be merged and collectively become the **Swift**.

Teck Coal Ltd's Line Creek Operations continued drilling in 2013 on the **Burnt Ridge North** (MINFILE 082JSE001) and **Mount Michael** (MINFILE 082GNE022) areas, which are 2 to 6 km north of currently active pits in the Elk Valley Coalfield. Mist Mountain Formation rocks comprise the Burnt Ridge North and Mount Michael areas, along the west and east limbs of the Alexander Creek Syncline. Some variability in coal quality exists between the coal seams on the east and west limbs of the syncline, however coal seams are predominantly medium-volatile bituminous in rank, with some high volatile-A bituminous coals near the top of the section. They are similar to seams currently being mined at Line Creek Operations in terms of their quality characteristics. The objective of the 19-hole drill program in 2013 was to delineate mineable reserves and gather lithological and geotechnical information.

Together, the Mount Michael and Burnt Ridge areas make up the **Line Creek Phase II Expansion Project**, which received conditional Environmental Assessment approval in 2013 (see Mine Evaluation). Both areas are intended to provide new reserves to replace those in Line Creek Operations' current pits, and are projected to extend the mine life to 2032.

Jameson Resources Ltd continued drilling in 2013 on the **Crown Mountain** property (MINFILE 082GNE018) (Figs. 4 and 14). Further to a resource estimate, a Preliminary Economic Assessment (PEA), environmental baseline studies, and additional coal quality work were also completed. Located 15 km northeast of Sparwood, the property is 8 km east of Teck Coal Ltd.'s Elkview Operations, and 12 km to the south, and on strike with Line Creek Operations. The project area is considered to be an erosional outlier at the extreme south end of the Elk Valley Coalfield. It is separated by complex geology and thrust faulting into three distinct structural domains, known as the North Block, the South Block, and the Southern Extension. Seven major seams occur on the



Figure 14. Art Palm (Jameson Resources Ltd) and Jacob Entz (Foraco Canada Ltd) with large diameter core from the Crown Mountain exploration drill program. Photo courtesy of Jameson Resources Ltd.

property, with a combined average thickness of 35 m in the North Block, and 15 m in the South and Southern Extension blocks. The seams are interpreted as equivalents of the Line Creek Coal Mine seams 8, 9, and 10.

The 2013 drilling was a follow up to Jameson's extensive 2012 drill program on the property, which was the first drilling since Shell Canada Resources explored on the property in 1979 - 1981. Jameson estimates a total open-pit coal resource of 90 Mt at the Crown Mountain project, with a combined Measured and Indicated Resource of 66 Mt. Coal quality test work is ongoing, with initial results indicating coal quality characteristics that are similar to the Elk Valley coking coals.

Activities at Centermount Coal Ltd's **Bingay Creek** property (MINFILE 082JSE011) were on hold in 2013 as a result of commodity pricing, but the company has applied for further permits to expand activities on the property in the near future. The focus in 2012 was on drilling for geotechnical and hydrological data, geological interpretation, and coal quality. The project entered the Environmental Assessment Process in early 2013 for a proposed open-pit and underground coal mine referred to as **Bingay Main**.

At Bingay Creek (Fig. 4), the coal-bearing Mist Mountain Formation is preserved in a tight, asymmetric syncline in the immediate footwall of the west-dipping Bourgeau thrust fault. The west limb of the Bingay Creek syncline is steeply east-dipping, to overturned. Strata at Bingay Creek are contiguous with those on the west side of the Greenhills Range, and are separated from the Greenhills syncline by the Fording Mountain anticline. In comparison to coal-bearing sections in other parts of the Elk Valley coalfield, the section at Bingay Creek appears to be relatively rich in coal, both in terms of the number of potentially mineable seams and average seam thickness. For example, four seams are consistently greater than 15 m thick. Coals at Bingay Creek are known to be medium-volatile and high volatile-A bituminous in rank, based on previous exploration results.

Crowsnest Coalfield

Teck coal Ltd drilled at their **Elkview** mine, located immediately east of Sparwood, on their mine expansion area at **Baldy Ridge** (MINFILE 082GNE016), in Baldy Ridge BR2 and BR6 pits, as well as Natal Ridge PH2 (Figs. 8 and 9). The purpose of the program was for geological characterization of the Mist Mountain coal seams and to better define reserves for the next phase of mining and expansion at Baldy Ridge, which is located on the west flank of the east limb of the north-trending Sparwood syncline.

Teck Coal Ltd continued to assess the potential of the **Marten-Wheeler** property (MINFILE 082GNE006 and 007), 19 km northeast of Fernie (Fig. 4), and immediately south of Parcel 73 of the Dominion Coal Block (082GNE008). This site represents a possible expansion area for Coal Mountain Operations. It encompasses Marten and Wheeler ridges in the western part of the Crowsnest Coalfield. Both large diameter rotary drilling and RC drilling was carried out in 2013 for geotechnical (mine design) and coal sampling purposes. A bulk sample is planned for the area.

Teck Coal Ltd continued exploration drilling at their **Coal Mountain** property (MINFILE 082GNE001) (Fig. 4) within the permitted area south of **6-Pit** to delineate a possible pit extension on 6-seam (Fig. 15). Pulverized Coal Injection (PCI) coal is the main product shipped from Coal Mountain.

Crows Nest Pass Coal Mining Ltd carried out geological modelling, resource, and pre-feasibility work at their **Coal Creek** property (MINFILE 082GSE035), 8 km east of Fernie, and immediately south of Teck's Marten Wheeler project (Fig. 4). Multiple seams within a series of thick coal zones dip gently to the east over a large area of the property. Coal seams at Coal Creek are on the west limb of the Fernie Basin in the Crowsnest Coalfield. Individual seams are easterly, down-dip extensions of coal seams that were accessed from their surface outcrops at the underground Coal Creek and Elk



Figure 15. Fall exploration drilling at Coal Mountain (Teck Coal Ltd). The Reverse Circulation drill program targeted the south extension of 6-seam, which is mined in 6-pit.

River collieries, the latter of which closed in the late 1950s. The project is underlain by 11 coal zones that vary from 2 m to over 20 m in thickness, and the company is evaluating three seams in the uppermost part of the Mist Mountain Formation (B, 10 and 9) for underground room-and-pillar mining potential. Drilling from 2012 indicates high quality hard coking and PCI coal are present in the upper seams. Environmental baseline studies, including water quality data gathering and analysis are ongoing over the project area.

CanAus Coal Ltd, a wholly owned subsidiary of CoalMont Pty Ltd, drilled on their three licences at the **Michel Creek** (MINFILE 082GSE050) area, 15 km southeast of Sparwood between Teck's Elkview and Coal Mountain operations. The three drill programs were at the **Loop Ridge**, **Tent Mountain**, and **Michel Head** areas (Figs. 4 and 16), all on the west side of the regionally extensive Erickson normal fault. Drilling has identified twenty coal seams with an average cumulative thickness of 70 m, within a 504 m stratigraphic section of Mist Mountain Formation. Geological modelling and correlation of drill data and coal quality data is currently underway to better define the stratigraphic and structural relationships, and define a NI 43-101 Resource. Initial raw coal tonnage estimates from historic and current data indicate potential resources between 120 - 140 Mt of high quality, mineable coking coal. Plans are to commence a pre-feasibility study in 2014.



Figure 16. Location map the Michel Creek Coking coal project area (CanAus Coal Ltd). 2013 drilling was carried out by Loop Ridge, Tent Mountain, and Michel Head, targeting mid-volatile bituminous coking coal similar to the coal that is mined in the Elk Valley mines. Figure courtesy of CoalMont Pty Ltd.

GOLD PROJECTS

Boundary District

Exploration for gold in the Greenwood area has been active and ongoing for a number of years. Deposit-type signatures identified in the area include: structurally controlled Au-Ag ± Cu; Zn-Pb bearing mesothermal quartz veins; low sulfidation Au-Ag epithermal veins; Jurassic to Cretaceous alkali porphyry-related Cu-Au-Ag; Cu-Au-Ag and base metal skarns; and precious, and base metal massive sulphides associated with late Paleozoic rocks and volcanism. Additionally, just to the south of the Canada/USA border in Northern Washington, is Kinross' underground Buckhorn mine and concentrator (Kettle River Operations). Structurally, the Buckhorn area comprises the Republic and Toroda grabens, and has produced over 6.5 million ounces of gold from numerous historic mines. This proximity to the gold skarn orebody at the Buckhorn, combined with high gold prices, has made the Greenwood area prospective for gold exploration.

With exploration drilling on the **Greenwood Gold** property (Fig. 4) slowing after 2012, Grizzly Discoveries Ltd took the opportunity in 2013 for further geological interpretation and analysis of their extensive drilling between 2008 and 2012. An updated NI 43-101 technical report was released in 2013. A number of advanced exploration and reconnaissance targets have been identified for future exploration on the **Dayton** (MINFILE 082ESW022), **Rock Creek (Ket 28)** (MINFILE 082ESW210), **Motherlode** (MINFILE 082ESE034), and **Mount Attwood** (MINFILE 082ESE221) claim groups. The company's holds over 90 000 hectares in eight different claim groups that extend from east of Greenwood to west of Anarchist Summit. The project area is underlain by rocks of the Paleozoic Knob Hill and Anarchist Groups, Triassic Brooklyn Formation, and Eocene Penticton Group. Intrusions of Jurassic, Cretaceous, and Eocene age occur throughout the area.

In 2013, Ximen Mining Corporation conducted a small exploration program on the North Star workings at the **Gold Drop** property (MINFILE 082ESE153), located north of Greenwood. The property hosts numerous gold-bearing quartz veins that are exposed at surface and in underground mine workings. A total of 6178 tonnes with an average grade of 3.84 g/t Au and 76.93 g/t Ag has been historically mined, as recently as the 1980's. Ximen's summer work focused on the **Winze vein**, and plans are in place to obtain permits and funding for trenching, drilling, and bulk sampling in 2014.

West Kootenays

Mineralization in the area near the historic Silver King mine (MINFILE 082ENW018, 082FSW176) continues to be the focus of ongoing exploration in the West Kootenays. Associated with volcanic rocks of the

Jurassic Elise Formation (Rossland Group) and the co-magmatic Silver King porphyry intrusions, a belt of mineralization trends northwest-southeast, sub-parallel to, and east of the Silver King Shear Zone. Gold mineralization occurs in both bulk tonnage (low-grade) and bonanza (high-grade) associations, while gold-copper mineralization occurs in bulk tonnage associations. Gold mineralization has four distinct settings: a high-grade corridor, associated with volcanics and intrusives; volcanic-intrusive contact areas; bonanza shoots; and, bulk tonnage haloes around shoots.

Sultan Minerals Inc conducted a small mapping and sampling program on the **Daylight** property (MINFILE 082FEW175) this year. The property is located 500 metres north of the historic Silver King mine, and hosts the historic **Starlight**, **Victoria**, and **Daylight** mines, which operated intermittently from 1937 to 1949. Mineralization on the property occurs as vein, stockwork, and porphyry-style gold and gold-copper.

Altair Gold Inc released the results of their 2012 drilling on the **Kena** property, 8 km south of Nelson, and also to the northeast of the historic Silver King mine. The property includes the Gold Mountain (MINFILE 082FSW379), Kena Gold (082FSW237), Kena Copper King (082FSW332), and South Gold zones. The two-phase drilling program consisted of 7527 m in 41 holes, and was designed to test geophysical anomalies, extend known mineralized areas down dip and along strike, and to fill in gaps between the current resource blocks at the Kena Gold, and Gold Mountain zones. Results demonstrated strong continuity of gold mineralization within the two zones. Assay results can be found on the company's website. An updated resource estimate prepared in 2012 included 10.85 Mt of Measured plus Indicated resource, grading 0.71 g/t Au in the Gold Mountain Zone, and 14.68 Mt grading 0.64 g/t Au in the Kena Gold Zone. This represents a combined Measured plus Indicated gold resource of 549 000 ounces in the two zones. The high-grade corridor has been demonstrated to extend over 5.65 km along strike. Altair is currently working on an updated geological model using the 2012 drill results, and plans to further test areas on the property.

Anglo Swiss shareholders have approved a sale of the **Kenville Gold** property (MINFILE 082FSW086) to Eagle Creek Gold Corp, with a December 30, 2013 closing date. Located 6 km west of Nelson (Fig. 4), the past-producing Kenville Mine was the first underground lode gold mine in BC. Also known as the Granite-Poorman, the mine operated intermittently between 1890 and 1954, with the bulk of the production prior to 1912. More than 180 000 tons of ore was mined, yielding over 2 tons Au and 861 kg Ag, along with significant amounts of copper, lead and zinc. Production averaged more than 17 g/t Au, from a series of northeast-dipping quartz veins. Host rocks are the Jurassic Eagle Creek plutonic complex, which is intruded into, and may be the intrusive equivalent of, volcanic rocks of the Jurassic Elise Formation - (Rossland Group). Late Jurassic Nelson granodiorites, and Tertiary

intrusive rocks are also common in the immediate area. The property lies near the Silver King Shear Zone and hosts Au-Ag-Cu mineralization in a northwest trending system of quartz veins, and Pb-Zn-Ag sulphide veins. An alkalic porphyry copper-gold signature may be associated with the intrusives. Faults and dikes cross and offset the sub-parallel main vein systems, resulting in a complex structural network.

Potential exists for the extension of known ore-grade material and discovery of additional mineralization in the vicinity of Kenville Mine. Vein intersections at depth to the south and southwest of the underground workings, and geophysical anomalies warrant further work. Results from the 2012 drilling included one intersection of 3.08 m grading 14.14 g/t Au (drillhole KE12-01). The same drillhole intersected ten separate gold-bearing veins over a core length of 400 m. Extensions of high-grade gold and silver veins, characteristic of the Kenville, have now been intersected as far as the optioned Ron property, a distance of approximately 800 m to the south.

Rainbow Resources Inc continued exploration work in 2013 on their **Big Strike** project, which comprises several properties with varying styles of mineralization in different parts of the West Kootenays, including the **Gold Viking** (MINFILE 082FNW193), **Whitewater** (MINFILE 082FSW222), and **Referendum** (MINFILE 082FSW177) properties. The focus in 2013 was on the extent of gold-bearing quartz vein systems.

Located 2 km northeast of Slocan City is the **Gold Viking** past producer (MINFILE 082FNW193) (Fig. 4). Shipments between 1932 and 1936 totalled 15 tonnes, yielding 4790 g Ag, 373 g Au, and 14 kg Pb. Hosted by granitic rocks near the western margin of the Jurassic Nelson batholith, galena, sphalerite, pyrite, and chalcopryite mineralization is associated with quartz veins in north and northeasterly-trending shear zones. Gold is believed to be associated with pyrite. A pyrite-rich stockwork vein system and breccia zones within altered quartz monzonite were observed in Rainbow Resources' 2012 drill core. Drilling results from 2012 of 12 diamond drillholes included: 45 g/t Ag and 0.6 g/t Au over 4.6 m (drillhole GV-12-02); 2.4 g/t Au and 34.1 g/t Ag over 2.7 m (drillhole GV-12-03); 17.3 g/t Au and 65.6 g/t Ag over 1.9 m (drillhole GV-12-04). At **Whitewater**, northeast striking vein systems display chalcopryite, pyrite, pyrrhotite, and molybdenum mineralization. Banded veins are 0.5 to 2 metres thick. At **Referendum**, visible gold is present in shear-hosted banded quartz veins that are up to 2 m in width and 400 m in length.

East Kootenays

In the East Kootenays, The Kimberley Gold Trend is a roughly east-west trend of gold mineralization that runs through the historic gold rush town of Fort Steele, and is highlighted by mineral exploration projects and showings, and current and historic placer mining activities. It reflects dilation and focused fluid flow along structures

that developed above a deep basement structure, known as the Vulcan tectonic zone. This basement structure controlled Proterozoic and Paleozoic basin geometry, and most likely influenced the configuration of later Jurassic and Cretaceous thrust faulting and folding, which acted as conduits for multi-episodic mineralization events.

In 2012, PJX Resources Inc followed up on their 2011 airborne geophysical surveys with drilling at the **Zinger** property, 24 km west of Cranbrook (Fig. 4). They targeted zones which included a 4 km-long magnetic trend with gold mineralization and potentially related silicification. Drillhole ZG12-02 tested a fold structure and explored the down dip extension of mineralization intersected in a hole drilled by Chapleau Resources in 2003. The 2012 hole intersected near surface mineralization grading 2.92 g/t Au over 2 m, within a broader interval of 0.50 g/t Au over 22.38 m. The gold mineralization appears to be associated with quartz veining and/or flooding in folded and sheared siltstones and argillites. The sediments are variably silicified display sericite-chlorite-iron-carbonate alteration. PJX's 2013 mapping and sampling program identified additional geological structures along the 8 km trend which may contain additional mineralization. Historic and recent data are being compiled to define additional targets along strike, and at depth.

The property is part of the Kimberley Gold Trend, and includes a belt of gold anomalies over an 8 x 2 km area. Host rocks are the Proterozoic Purcell Supergroup, predominantly metasedimentary quartzites, argillites, and siltstones of the Creston Formation, argillites of the Kitchener Formation, and gabbro sills and dikes. The property is adjacent to the Perry Creek fault, and at the headwaters of Perry Creek. Known mineralization on the Zinger (MINFILE 082FSE012, 120 and 122), is predominantly vein style. Multiple linear mineralized structures and veins occur *en echelon*, in association with zones of shearing. Veining occurs as bedding-parallel quartz stockworks or quartz veins and stringers with iron carbonate, sericite, and minor sulphides, including mainly pyrite (weathered to limonite near the surface), galena and chalcopyrite. Gold mineralization appears to be structure-related, and predominantly occurs in areas with open to tight folding.

Elsewhere in the Kimberly Gold Trend, PJX Resources Inc conducted mapping and sampling work at the **Eddy** property (MINFILE 082FSE029, 095, 116, and 118), 14 km southwest of Cranbrook (Fig. 4), to follow up on anomalies from the 2010 airborne geophysical electromagnetic and magnetic test surveys. Drilling in 2012 had targeted areas identified through the airborne geophysics, and focused on an area where anomalies overlap historical surface showings of Au, Cu, Pb, Zn and Ag. The property is predominantly underlain by the Aldridge and Creston Formations, and Moyie sills within the Proterozoic Purcell Supergroup. The alteration assemblage on the property is quartz-sericite-pyrite-iron-carbonate. The Eddy property encompasses a 9.5 km-long

northeast-trending shear zone within the fold hinge of a regional anticline. Several offsets in the fault zone may create shoot-like dilation zones that host gold mineralization. At the surface, the silicified shear zones contain narrow quartz veins, which are locally vuggy, and contain pyrite, partly oxidized to limonite, with rare free gold and galena.

PJX Resources Inc also focused mapping and sampling efforts on the **Lewis** and **Spirit** showings at the **Dewdney Trail** property, 29 km to the northeast of Cranbrook, in the Hughes Range in the Wildhorse valley (Fig. 4). Stratabound between less permeable argillaceous units, a 75 to 100 m thick succession of immature quartz-wacke sandstone (Spirit quartzite) in the Upper Aldridge Formation is pervasively altered, veined, and fractured. Veins are typically filled with hematite/limonite, quartz, pyrite, \pm copper oxides and magnetite, and are multi-episodic. The zone contains anomalous gold values throughout, including some visible gold. The fracture density and alteration of this unit suggest that it possibly acted as a conduit for mineralizing fluids during thrust displacement and/or fluid circulation driven by the Late Cretaceous magmatic events. The Spirit quartzite at the **Spirit** showing is 100 m thick along a strike length of 6 km, while at the **Lewis** showing, the unit is of similar thickness, over a 3 km length. At both showings, the unit is anomalous in gold and has potential for large-tonnage gold prospects.

The Dewdney Trail property is underlain by Mesoproterozoic Fort Steele, Aldridge, Creston and Kitchener Formations. The upper Aldridge on the property is dominantly argillaceous and siliceous, and is pervasively altered (sericite-quartz-pyrite-iron oxide-iron carbonate). The property contains several mineral showings, including: 1) large-tonnage sediment-hosted vein type gold prospects at the **Spirit**, **Tac**, and **Lewis** showings, 2) vein-type prospects at the **Jack Leg**, and 3) skarn and stockwork Cu-Au prospects at the **Dew Drop** showing. Airborne geophysics has been conducted on the property, along with trenching and initial diamond drilling to follow up on some of the anomalies. Rock samples have yielded up to 18 g/t Au, and thrust repeats of the favorable altered quartzite on the Dewdney property have gold showings over a 12 km length. Over 20 targets have been identified on airborne geophysics.

Eagle Plains Resources Ltd. and Turnberry Resources Ltd. released the results of their 2012 drill program on the **Wildhorse** property (MINFILE 082GNW020), located approximately 40 km northeast of Cranbrook. Four holes were drilled from two pads at the Dardenelles quartz vein, to test the southern and western extension of the system, and possible structural repeats. The vein varies from 4 cm to 1 m in width and carries galena, chalcopyrite, pyrite, and visible free gold. The only hole that returned values of economic significance was WH12013, with grades of 2.29 g/t Au and 3.2 g/t Ag over 0.87 m.

POLYMETALLIC PROJECTS

West Kootenays

In 2013, Taranis Resources Inc released a NI 43-101 resource estimate for the **Thor** property, located north of Trout Lake (Fig. 4), based on the 152 drillholes on the property that were drilled between 2007 and 2008. The estimate highlights both open-pittable (62% of the property) and underground mining projects. Together, the total resource in the Indicated category is 640 000 tonnes grading 0.88 g/t Au, 187 g/t Ag, 0.14% Cu, 2.51% Pb, and 3.51% Zn, and total Inferred resource of 424 000 tonnes grading 0.98% Au, 176 g/t Ag, 0.14% Cu, 2.26% Pb, and 3.2% Zn.

The main focus of the 2013 exploration program was the **SIF** zone, where nuggety, visible gold is hosted in quartz-ankerite veining located to the west of the Scab zone (Fig. 17). Chip and panel sampling in this 20 x 8 m zone returned 21.25 g/t Au over 11.45 m in one sample. Line cutting and soil sampling was also conducted on two grids as a follow up soil work conducted in 2012. A number of targets have been identified on the property, including the **Scab**, **SIF**, **Gold Pit**, **Mega Gossan**, **West Limb**, and the **Ridge Target**. These zones appear as VLF conductors, and also as gossan features. Several gold occurrences are found within the footwall of the existing sulphide deposit, where visible gold is found in quartz-bearing veins. The **Mega Gossan** zone displays intense iron-staining at surface over a 500 x 200 m area (Fig. 18). It is believed to be the product of groundwater leaching of a metal-enriched sulphide deposit located somewhere at depth, “up water” along the path of hydrological flow. Mapping from 2012 suggests that its source may be similar in characteristics to an area of Ag-Pb-Zn-Cu-Au mineralization that is located 1 kilometre to the south.

The Thor property is located at the north end of the Kootenay Arc, and is underlain by a thick succession of complexly folded and faulted sedimentary and volcanic rocks of the Badshot Formation and Lardeau Group. The



Figure 17. Visible gold in quartz-siderite zone at the SIF zone on the Thor property. Angular vugs are the result of weathering of carbonate crystals. Photo courtesy of Taranis Resources Inc.



Figure 18. Iron-staining at the Mega-Gossan zone on the Thor property. A 200 x 500 metre zone at surface where ferrous minerals have precipitated, it may be the product of groundwater leaching of a metal-enriched deposit located at depth, and “up-water” along the path of hydrological flow. Its source is still unknown. Photo courtesy of Taranis Resources Inc.

property has potential for exhalative-type base metal sulphides (Ag-Pb-Zn-Au-Cu) within the Lardeau Group (Fig. 19). Primary stratiform sulphide mineralization predates structural folding and faulting on the property. Mineralization is concentrated in the west limb of the Thor aniform, where numerous parallel horizons containing galena, chalcopyrite, pyrite and sphalerite, extend along a 2 km strike length in a northwesterly direction. High-grade gold occurrences also occur in late-stage vein structures that flank the sulphide deposit. Historic production on the property was from the Silvercup, Triune, Nettie L. and True Fissure mines. Early shipments from the Silvercup and Triune mines are reported to have contained more than 150 oz/t of silver, with over 30% lead.

At the **J&L** gold-silver-zinc-lead property, 35 km north of Revelstoke (Figs. 4 and 13), Huakan International Mining Inc continued pre-feasibility level metallurgical test work (flotation, bio-oxidation, and pressure oxidation tests). An NI 43-101 resource estimate released in 2011 includes 3.953 Mt Measured-plus-Indicated resources grading 5.68 g/t Au, 56.5 g/t Ag, 1.94% Pb and 3.56% Zn in the Main Zone. This represents 722 000 ounces of gold in the measured and indicated categories. The Yellowjacket Zone, which was included in a resource estimate for the first time, contains 1.003 Mt at 64.1 g/t Ag, 2.77% Pb, 9.08% Zn and 0.21 g/t Au in the Indicated category.

The property lies in the Selkirk allochthon, and mineralization is hosted by the late Proterozoic to early Cambrian Hamill Group metasedimentary rocks. The polymetallic mineral zones at the J&L (MINFILE 082M 003), known as the Main Zone and the overlying Yellowjacket Zone, are stratabound, massive sulphide-bearing units interpreted as shear-hosted replacements. The Main Zone averages 2.5 m in thickness and has been exposed over 850 m along strike in underground drifting.



Figure 19. Ag-Pb-Zn-Au-Cu mineralization at the Thor property (Taranis Resources Inc). Photo taken by Dave Grieve.

Previous underground drilling defined the zone over a 1.2 km strike length, while on surface it has been traced for 1.6 km. It has been traced down-dip for 800 m.

In 2013, Silver Phoenix Resources Inc conducted a small ground-based exploration program at their **Waverley-Tangier** project (MINFILE 082N 015 and 082N 014), located north of Revelstoke (Fig. 4). At both the Waverley and Tangier historic workings, vein-like ore shoots and manto-style mineralization occur in Lower Cambrian strata. Replacement mineralization is composed of calcite-quartz, and may include pyrite, jamesonite, malachite, azurite, galena, sphalerite, and minor amounts of tetrahedrite. In 1928, 15 tons of sulphide ore was shipped from the Tangier workings, containing 1.5 oz/t Au, 130 oz/t Ag, and 25% Pb. Historic assays on the Waverley workings report grades of 10% Pb, 1% Zn, and 0.5 oz/t Ag.

In November 2013, Agave Silver conducted mapping and sampling on their **Kaslo Silver** (Cork-Province) property (MINFILE 082FNW094), regionally on the western margin of the Kootenay Arc. The company has been re-evaluating the geological and deposit-models. The property is underlain by deformed and metamorphosed, schists, argillites, quartzites, and limestones of the Upper Triassic Slokan group, and Middle Jurassic Nelson intrusions, including feldspar porphyritic granites, granodiorites, and hornblende diorites. Shear-hosted sphalerite, galena, pyrite, and chalcopryite mineralization occurs in fractures, veins, and

as replacement mineralization within limestone beds. Historic production occurred on the Cork-Province property from various adits and shafts between 1900 and 1966, and yielded about 16 tons of Ag, 5846 tons Pb, 9033 tons Zn, 69 tons Cd, and 1896 g Au, from 191 410 tons mined.

Discovery Ventures Inc updated the historic resource at the **Willa** past producer (MINFILE 082FNW071), located 8 km south of Silverton. The resource now includes 758,000 tonnes grading 6.67 g/t Au, 0.85% Au, and 12.54 g/t Ag, in the Measured and Indicated category using a cut-off grade of 3.5 g/t Au. The property is underlain by Lower Jurassic Rossland Group volcanic, and Middle Jurassic Nelson intrusions, and is characterized by complex geology with multi-phase deformation and mineralization events. Mineralization (Pb-Zn-Ag-Au \pm Mo) with a potential alkalic porphyry Cu-Au signature occurs within structurally controlled breccias, pipes and stockwork veins, massive sulphide, and skarns. Historic production records for the Willa indicate that 300 tonnes was mined, with no recorded recovery in 1899. In 1988, 7883 g Ag, 2873 g Au, 4418 kg Cu, 63 kg Pb, and 4154 kg Zn were recovered from 495 tonnes of custom ore.

In 2013, Discovery Ventures Inc also entered into an agreement to acquire interest in the **MAX** Mine (Fig. 20) and mill (MINFILE 082KNW087), located 135km west of the Willa property, near Trout Lake. The company intends to use the milling facilities to process ore from Willa. Details of the deal are still pending.

For their **LH** property, International Bethlehem released the results of a 2012 drillhole (LH-12-25), which returned 1.28 g/t Au over 5 m. Mineralization follows a zone of fracturing, faulting, and silicification within a roof pendant of Lower Jurassic Rossland Group metavolcanics. Quartz lenses and veins 30 to 60 cm thick host disseminated gold, with arsenopyrite, pyrite, and pyrrhotite and minor chalcopryite.

Emgold Mining Corporation released results from their 15-hole, 2012 diamond drilling program on the **Rozan** property, located 11 km south of Nelson. Drilling tested exploration targets identified through geophysics, geological mapping, and geochemical sampling. Highlights included 11.13 g/t Au over 1.45 m in drillhole 12ROZ-08 at the Sheeted Vein zone, and 1.65 g/t Au over 1.00 m in drillhole 12ROZ-01 in the Main Vein zone (also known as the Golden Eagle, MINFILE 082FSW179), 700 m to the west. Target mineralization may be similar to intrusion-hosted quartz vein systems.

The Rozan claims straddle a northwest-southeast trending package of sheared rocks parallel and in close proximity to the Silver King Shear Zone. Host rocks belong to the Jurassic Elise and Archibald Formations (Rossland Group), and Jurassic Nelson intrusions. Known mineralization on the property is generally polymetallic (Au, Ag, Cu, Pb, and Zn), but the current exploration focus is on gold: both high-grade veins, and bulk-



Figure 20. Entrance to 960-level portal at the MAX mine. Production at the molybdenum mine was suspended in 2010 after sill pillar stability issues. Operation resumed in 2011, but was later suspended again due to commodity prices. In 2013, Discovery Ventures Inc was granted conditional approval to acquire all issued and outstanding shares of FortyTwo Metals Inc, a subsidiary of Roca Mines. FortyTwo holds assets, including the MAX Mine and associated crushing, milling and concentrating facilities, tailings storage facilities, mineral claims, mining leases, and other licences and holdings. Photo taken by Dave Grieve.

mineable, disseminated zones. Other styles of mineralization on the property include polymetallic stockwork veins and skarns, and porphyry and/or shear-hosted systems (see Assessment Report 32592). The Main Vein was mined between 1928 and 1972.

Emgold Mining Corp also released the results of their 2012 drilling on their **Stewart** property (MINFILE 082FSW229), located 7 km north of Salmo. The company completed 1445 m of drilling in 11 diamond-drill holes, focusing on three exploration targets: the Stewart Creek Gold zone, the Free Silver zone, and the Stewart moly zone. Drilling resulted in several intersections grading over 1.0 g/t Au in several holes at the Stewart Creek Gold zone, and a new exploration target on the southern portion of the property. At the Free Silver zone, drilling encountered low-grade lead and zinc mineralization with minor amounts of gold and silver in every hole, indicating potential for low-grade bulk tonnage base metals at this zone. At the Stewart moly zone, drilling was successful in extending the halo of low-grade molybdenite mineralization (0.1% MoS₂) to a depth of approximately

200 m, with interceptions of higher-grade breccia pipes. The property is underlain by Lower Jurassic Elise and Hall formations of the Rossland Group, with intrusives of the Middle to Late Jurassic Nelson quartz monzonite porphyries, and Middle Eocene biotite augite monzonite Coryell Intrusions and related dikes. Mineralization consists of pyrite-pyrrhotite veins with Pb-Zn-Ag; tungsten-bearing skarns; Au-quartz veins peripheral to the intrusive complex; and disseminated and selvage molybdenite in fractures, and quartz-stockwork zones and breccias.

East Kootenays

Silver Mountain Mines Inc conducted a gravity survey and additional sampling on the **Ptarmigan** polymetallic property, 27 km west of Invermere in the Purcell Mountains (Fig. 4). Gravity data was acquired on the **Ptarmigan/Iron Cap, Horsethief and Gopher Creek**, and **Nip and Tuck** grids. The gravity survey results are being used alongside anomalous surface geochemical and subsurface drill results to generate targets. The survey identified the newly discovered **Dunwalk** anomaly, which was also targeted by a late 3-hole drill program in December, 2013. The company also released a NI 43-101 report on the property in 2013. Drilling and metallurgical testing in 2012 was focused on the Ptarmigan Mine and the Upper Ptarmigan and East Ptarmigan zones (Fig. 21), and designed to define known mineralized zones. It identified new silver-bearing veins and pyritic semi-massive to massive manto-style mineralization. Drilling results from 2012 include 6.8 m grading 0.52 g/t Au and 452 g/t Ag (drillhole PT12-64). Preliminary evaluation of the mineralization at the Level 1 workings of the historic Ptarmigan Mine suggests a potential tonnage of 2184 Mt grading 330 g/t Ag (see project report on the company website).

The property includes the past-producing Ptarmigan (MINFILE 082KSE030) and Iron Cap (082KSE036) occurrences. Mineralization occurs in polymetallic veins or in massive sulphide replacements in carbonates (mantos), and generally consists of pyrite, galena, sphalerite, and tetrahedrite (Fig. 22). The Ptarmigan Mine itself consisted of a series of adits driven along the fault contact between lower Windermere Supergroup strata to the east and the Late Proterozoic upper Belt-Purcell Supergroup strata to the west. Mineralization is stratigraphically below the Windermere unconformity, in strata of the Purcell Supergroup. The workings appear to be spatially associated with a series of north-trending, steeply dipping normal faults, which may have acted as hydrothermal conduits for metal-bearing fluids. Late Cretaceous intrusions may have provided a heat source for hydrothermal fluid enrichment, and contributed to metal zonation. Selective mining of the Ptarmigan yielded grades of over 4000 g/t Ag, 5.4 g/t Au, 0.6% Cu and 0.5% Zn.

PJX Resources Inc continued work in 2013 at the



Figure 21. View of the access road to the Upper/East Ptarmigan, at the Ptarmigan property. Photo courtesy of Silver Mountain Mines Inc.



Figure 22. Sample from the Ptarmigan Mine (Silver Mountain Mines Inc), with malachite, tetrahedrite, and pyrite. The sample was taken from Pyrite #1, a zone where 32.2 tonnes was mined in 1959 along a strike length of 60 m. Based on smelter returns, the zone yielded 2638 g/t Ag and 1.7 g/t Au. Photo courtesy of Silver Mountain Mines Inc.

Vine property (MINFILE 082GSW050) (Fig. 4), with one diamond-drill hole, and geophysical gravity work. The target was a zone of bedded massive sulphide mineralization (Pb-Zn-Ag) in Proterozoic-age Aldridge Formation sedimentary rocks that was intersected at 700 m depth in two historic drillholes. The gravity survey identified a 2 x 4 km anomaly just to the east of the two historic holes. More detailed gravity work is planned to help define targets and determine their depth within the anomaly for testing. The Vine Pb-Zn-Ag vein occurrence was discovered in the late 1970s by Cominco, and is a shear-related vein system within the Middle Aldridge formation argillites and quartzites. Historic trenching and drilling has revealed massive and disseminated sulphides (pyrite, sphalerite, and galena) along a strike length of over 1000 metres, and depth of over 700 metres. Recent drilling, sampling and modelling have also identified anomalous gold values within the vein.

In the St. Mary's valley, 35 km northwest of Kimberley, Bluefire Mining Corporation conducted exploration at the **K9** property which is on strike with, and surrounding the **Great Dane** crown grants (MINFILE 082FNE051). Exploration is for stratabound massive sulphides and possible gold within the Creston Formation. Mineralization occurs as sulphide lenses commonly concentrated in the hinges of steeply plunging minor

folds. An AeroTEMII high resolution EM airborne survey was conducted on a portion of the **K9** property in 2006, and a more extensive EM survey was completed in 2011. Geophysical anomalies are along strike of the known stratabound mineralization. Structures on the property may also represent an extension of the regional Iron Range fault zone.

The property is underlain by steeply-dipping pyllitic quartzites and dolomitic limestones of the Proterozoic Middle to Upper Aldridge, Creston, and Kitchener formations, as well as a number of thick gabbroic sills. Mineralization at the Great Dane consists of pods and stringers of chalcopryite, pyrite, galena, sphalerite, and siderite, with Ag-Pb-Zn \pm Au mineralization within brecciated phyllitic quartzites of the Creston formation. In the early 1900's a shaft was driven into 15 - 20 feet of mineralization at the Great Dane, to exploit a 1.8 m wide stratabound lens of Ag-Pb-Zn-Cu sulphides. Channel sampling of the lens in the 1980's returned values of returned grades of 20.29 oz/t Ag, 2% Cu, and 61.50% Pb over 0.6 metres; 18.2 oz/t Ag and 45.40% Pb over 0.6 metres; and 10.12 oz/t Ag and 32.60% Pb over 0.5 metres.

Klondike Gold Corp continued ground-based exploration work at the **Lewis-McNeal** property (MINFILE 082FSE109) at the Brook zone, 25 km southwest of Cranbrook in the Purcell Mountains. The focus of the 2013 work was gold-bearing vein systems on the property, and included a ground VLF-EM and magnetic survey. The program followed up on work conducted in 2012, which identified a north-trending gold-bearing vein-shear system, in a zone 15 – 20 m in width, along a strike length of 300 m. The property is underlain by rocks of the Middle Proterozoic Purcell Supergroup, and has historically been explored for SEDEX Sullivan-type mineralization within the Aldridge formation. The property also hosts vein-controlled copper mineralization related to gabbros, and gold mineralization in veins and faults, possibly related to the McNeil fault.

Klondike Gold Corp was also active again at their **Hughes Range** property, located 20 km northeast of Cranbrook. Exploration work in 2012 had outlined a southwest trending structural corridor, characterized by disseminated copper and base metal mineralization, gold-bearing quartz veins, and Cretaceous intrusions. In 2013, the company conducted geophysical a VLF-EM survey over the zone to constrain zones of increased conductivity, and constrain controlling structures and lithologies. The past producing Kootenay King Mine (MINFILE 082GNW009) is on the property, and exploration has historically been for stratiform Pb-Zn base metals within the Purcell Supergroup.

Bethpage Capital Corp conducted a small sampling exploration program on the **Hall Lake** property (MINFILE 082FNE170), 34 km southwest of Kimberley. Underlain by rocks of the Purcell Supergroup, the property hosts the mid-Cretaceous granitoid Hall Lake stock, and possible intrusion related gold-silver mineralization. Sulphide mineralization, (pyrite,

arsenopyrite, and galena) is associated with a felsic intrusive dike that crosscuts the main stock on the property. Airborne geophysical surveying in 2011 identified 5 conductive anomalies on the property.

BASE METALS PROJECTS

West Kootenays

Exploration activities in 2013 at Klondike Silver Corp's **Slocan Silver** Project, east of New Denver (Fig. 4), were mainly underground on the 4625 and 4755 levels of the **Silvana** past-producing mine (MINFILE 082FNW050), and **Hinckley** past producer (MINFILE 082FNW013). Surface exploration also continued in other areas of the Slocan Silver project, with a focus on gaining access to the area's historically productive sites, evaluating other areas, and developing the company's portfolio. The company's Silvana mill at Sandon, a 100 t/day concentrator, operates at an average rate of 40 t/day, but was shut down in the latter half of 2013 as the company re-evaluated geological modelling of the zone. The company has an arrangement for a smelter to accept concentrates, and the overall goal is to locate sufficient ore to operate the mill at maximum capacity. The project is in a rich historic silver-lead-zinc mining area (Fig. 23). Klondike's extensive holdings are divided into various areas, each of which encompasses past producers of vein-style mineralization. These include the Sandon, Hewitt, Silverton Creek, Cody Creek, Payne, and Jackson Basin camps. Mineral occurrences in the Slocan are hosted by sheared and brecciated argillites and slates of the Triassic Slocan Group intruded by granodiorite and quartz monzonite dikes.

Silver Phoenix Resources Inc conducted a TDEM geophysical survey in 2013 on their **River Jordan** project (MINFILE 082M 001), 20 km northwest of Revelstoke (Fig. 4), which hosts the **King Fissure Deposit**. The survey was correlated with previous drilling results on the property. Several anomalies were identified, and the company has plans for follow-up work. The property is



Figure 23. Plaque highlighting the silver-lead mining history in the Slocan. Photo taken by Dave Grieve.

underlain by a gneissic domal structure in the Shuswap Metamorphic Complex. Core granite gneiss rocks are overlain by a Proterozoic (or lower Paleozoic-aged) paragneiss assemblage of calc-silicate gneiss, pelitic gneiss, quartzites and marbles. The paragneiss assemblage hosts stratabound massive sulphides, including sphalerite, pyrrhotite, pyrite, and galena. Structurally, the King Fissure deposit lies within the southerly trending Copeland synform, with sulphide mineralization exposed on both limbs. Massive sulphides range from 1.5 to 3 m thick.

East Kootenays

Active and ongoing exploration for SEDEX and related base metal targets continues to be of importance in the East Kootenay area. The Aldridge Formation of the Purcell Supergroup was deposited during the Proterozoic in the Purcell Basin. During deposition, the basin underwent various phases of extension and graben formation. Contemporaneous to extension, was the exhalation of metal rich brines along syn-sedimentary faults which interacted with seafloor boron and aluminous sediments to form stratabound massive sulphides in the basin. Exhalative-style mineralization and alteration include tourmalinite (boron) horizons, sections of fragmental sediments, anomalous Pb-Zn-Ag-Sn-Cu, and indicator element geochemistry.

The contact between the lower and middle Aldridge members (LMC) is the Sullivan time horizon that hosts the Sullivan Mine (MINFILE 082FNE052), and sedimentary exhalative (SEDEX) Pb-Zn-Ag ore body that was mined at Kimberley. The mine operated from 1909 to 2001, and produced over 17.5 Mt of zinc, 18.5 Mt of lead, and 297 million ounces of silver. The LMC most likely represents a widespread basin-extensional event and is currently the focus of targeted exploration efforts in southeastern BC. Moreover, typical indicators of Sullivan-style SEDEX mineralization occur throughout the lower to upper Aldridge, indicating potential for Sullivan-style mineralization at multiple stratigraphic levels.

The Geological Survey of Canada (GSC) is currently conducting a multi-year project in the area, the Targeted Geoscience Initiative (**TGI-4**). The main focus of the project is to generate a regional 3D geoscience model of the Purcell Anticlinorium, including Belt-Purcell stratigraphy and structures. Geological, geophysical, and geochemical data throughout the Purcell Basin are being compiled in order to generate new perspectives and understanding on ore controls for SEDEX targeting. Regional structures highlighted by the model, also provide control on various mineralization events. The project is still underway, in a combined effort between the GSC and industry.

GeoscienceBC's **SEEK** project (Stimulating Exploration in the East Kootenays) also continues to be active in the region, with a focus to stimulate economic

activity in the region by acquiring, compiling, and adding value to public and private sector mineral exploration information. With a focus on the Belt-Purcell basin, ground geophysical data has been compiled for the region into a single database. In 2013, new ground gravity survey data was added in the St. Mary Valley area, surrounding Kimberley and the historic Sullivan Mine. Data releases can be found on the GeoscienceBC website.

As these geoscience projects are ongoing within the region, industry also continues to be active. In 2013, MMG Ltd continued work on the **Findlay** property (MINFILE 082KSE041, 053, 060, 075), 30 km southwest of Canal Flats and 40 km northwest of Kimberley (Fig. 4). Focused mapping, sampling and ground geophysics (AMT survey) were completed on the far west **Middle Fork Creek** and the north eastern **Phoenix** areas of the claim block. The Middle Fork Creek area hosts a thick fragmental package with disseminated syngenetic pyrrhotite, banded tourmaline, massive pyrrhotite, and sphalerite mineralization. Tourmaline-rich quartz veins cross-cut Moyie sills and adjacent Middle Aldridge sediments. The Lower-Middle Aldridge Formation contact can be mapped over the property, and has been the target of previous drill programs.

The property is underlain by the Proterozoic Purcell Supergroup, including the Aldridge Formation, and Cretaceous intrusions. Targets include the Sullivan horizon in the Aldridge Formation, which corresponds with the contact between the lower and middle members of the formation (LMC). The stratigraphy displays exhalative-style mineralization and alteration, and includes tourmaline (boron) horizons, sedimentary fragmentals, anomalous Pb-Zn-Ag-Sn-Cu, and base metal occurrences. Both stratabound and vein-style massive sulphides are found on the property. This evidence is consistent with the interpretation that this part of the Purcell Basin may be the northern extension of the Sullivan-North Star structural corridor, a north oriented fault-bound graben, developed through rift extension (Price, 1981) that also hosts the Sullivan ore body. The property also exhibits polymetallic veining, and hosts the historic Silver Key Mine (MINFILE 082KSE053), which produced 31 tons of ore averaging 3,431 g/t Ag from structurally controlled narrow polymetallic (Ag-Pb-Zn +/- Au) quartz veins within the Lower Aldridge.

Santa Fe Metals Corp drilled one diamond-drill hole on the **Sully** property, located on the east side of the Rocky Mountain trench at the base of the Hughes Range, 22 km northeast of Cranbrook (Figs. 4 and 24). The target on the property is a 4 x 3 km subsurface geophysical gravity anomaly that has been identified using surface gravity stations and a downhole TDEM gravity survey that was conducted last year. Interpretation on the anomaly is consistent with SEDEX mass models of contrasting specific gravities, of metal sulphide mineralization relative to the country rocks. When considered in conjunction with other geophysical and geological evidence, the model suggests the potential for



Figure 24. Geologist Paul Ransom, during drilling at the Sully property.

a sulphide-bearing mineral occurrence at the same stratigraphic horizon in the Aldridge Formation (Proterozoic Purcell Supergroup) that hosts the Sullivan ore body that was mined at Kimberley. Recent interpretations suggest the anomaly represents both an east and west target, or thrust repeat, of sedimentary exhalative Pb-Zn-Ag mineralization, upturned and rotated by a complex interplay of folding and faulting. The company employed enhanced drill stabilization techniques during drilling, however significant drill deviation caused the hole to miss the target. Geological interpretation is still underway on the property, and the company intends to continue exploration in 2014.

INDUSTRIAL MINERALS PROJECTS

West Kootenays

Graphite is a naturally occurring form of carbon, and is a commodity that has recently become of interest due to an increased demand for technical applications, including: batteries, hydrogen fuel cells, electrodes, components in electric motors, as an additive in polymer compounds, dry lubricants, catalysts, synthetic diamonds, and a variety of other uses such as in steel production. With both metallic and non-metallic properties, it is an excellent conductor of heat and electricity. Both flake size and purity are important factors in graphite pricing, with higher prices in the commodity markets for large-flake, ultra-pure graphite. The **Black Crystal** graphite quarry (see Mines),

located 40 km northwest of Nelson (Fig. 4), is one of only two active producers of graphite in North America over the past 20 years. Similar meta-sedimentary host rocks in the West Kootenays have recently been the target of further exploration and staking in the region.

In 2013, Noram Ventures Inc drilled eight diamond-drill holes on their **Jumbo** flake graphite property (MINFILE 082LSE076, 077, 078), 15 km southeast of Nakusp, on the west side of Upper Arrow Lake (Fig. 4). Three primary targets were identified on SkyTEM airborne surveys at the **Black Fly**, **South Limb**, and **Big Flake** areas, and analytical results from rock sampling on the property indicated grades ranging from 0.5 - 7.3% graphite. In 2013, geological mapping, sampling, and drilling were conducted on a sinuous conductor with a cumulative strike length of 35 km and width up to 2 km, which is interpreted to represent a tightly folded sedimentary host. Preliminary metallurgical testing on a 10 kg sample from the **Big Flake** area indicates grades of 3.81% high purity flake graphite, with 45.5% of the sample in the large flake category, and 96% C(LOI) representing the mass of moisture and volatile material present in a sample. The property is underlain by Proterozoic to Paleozoic Monashee Complex paragneiss, and quartz-rich metasediments that have undergone polyphase deformation and upper amphibolite facies medium to high grade metamorphism.

Early in 2013, Noram Ventures Inc released results on their 2012 drill program at the **Kokanee** flake graphite property, located 50 km northeast of Nelson, near Crawford Bay on the east side of Kootenay Lake. The 2012 drilling consisted of 6 diamond-drill holes in a portion of the main zone, and established a down-dip extent of graphitic mineralization of 100 to 150 m, along a strike length of 1200 m. Exploration results indicate a potential resource of 15 - 22.5 Mt @ 1.65 - 1.80% graphite, and are encouraging for further exploration on the property. Recent sampling of an EM anomaly confirmed the presence of large-flake graphite, which is a strong conductor, and the 2012 drill program represented the first assessment for graphite potential. The graphite is hosted by strongly foliated, schistose, calc-silicates of the Cambrian Hamill Group and Devonian Index Formation (Lardeau Group). Chip samples of quartz-mica schist/gneiss outcrops with abundant disseminated large flake graphite ranged from 0.70 to 6% graphite. The property is also underlain by older Cambrian meta-epiclastic sedimentary sequences, inter-bedded mafic tuffs, and Cretaceous granitic intrusions. The property has also been historically explored for base metals since the early 1900s, after the discovery of large massive sulphide-bearing boulders (MINFILE 082FNE129), and includes the historic Pb-Zn-Ag Bluebell Mine.

In 2013, Lithium Corporation focused mainly on the **BC Sugar** property, located 35 km northeast of Nakusp, 100 km northwest of Eagle Graphite's **Black Crystal** operation, and 50 km northwest of Noram Ventures' **Jumbo Graphite** prospect. Prospecting and sampling

revealed favorable geology with 3 - 5% flake graphite. Petrographic and graphite characterization work is ongoing, and the company is planning drilling in 2014. The property is underlain predominately by quartz-biotite gneisses +/- graphite, graphitic calc-silicate gneiss, and graphitic marbles of the Shushwap Metamorphic Complex in the central and northern extremities, and Eocene felsic intrusives predominately to the south.

Other properties with recent exploration for graphite in the West Kootenays include the **Blu Starr** property (MINFILE 082FNW259), operated by Anglo Swiss Resources Inc. Several large electromagnetic conductors were identified through an airborne EM survey conducted in late 2012. A 3 km conductor associated with the Tedesco flake graphite showing has been identified on the property, in addition to 4 new anomalies. Recent rock samples at the Tedesco showing returned values of up to 4.43% graphite (carbon), where large flakes of graphite are hosted within interlayered gneisses, marbles, and calc-silicates. The property is located within the meta-sedimentary gneisses of the Valhalla Metamorphic Complex, adjacent to the **Black Crystal** property.

OUTLOOK FOR 2014

Despite lower levels of exploration activity in 2013, the number of single-year and multi-year area based permits (MYAB) that have been submitted to the Regional office for permitting approval indicates that exploration interest in the area remains high. Exploration plans for minerals (both metallic minerals and industrial minerals), in addition to coal projects show promise in 2014, dependant on market conditions of the mineral industry. Major mine development, expansion plans, and projects in the East Kootenay coalfields will also continue to drive activities in the area. Furthermore, though the details of the announcement have not yet been fully disclosed, the recent announcement by the Federal Government for the upcoming sale of Parcel 73, and a portion of Parcel 82 in the Dominion Coal Blocks may fuel further interest and activity in the area.

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