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EXPLORATION AND MINING IN BRITISH COLUMBIA 2013



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EXPLORATION AND MINING
in British Columbia 2013

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

By **Fiona Katay, P.Geo.**
Regional Geologist, Cranbrook

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

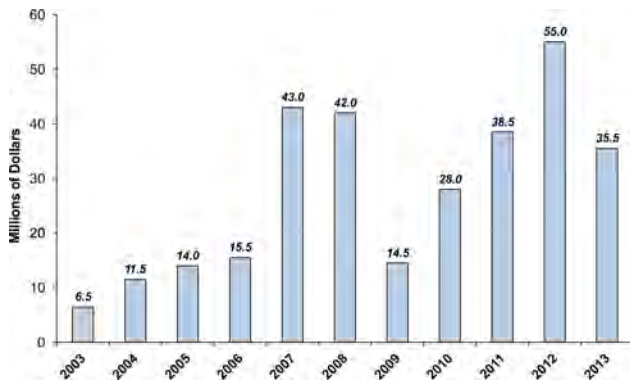


Figure 1. Annual exploration spending in millions of dollars, 2003 to 2013, Kootenay-Boundary Region. The Revelstoke area was added to the region in 2010.

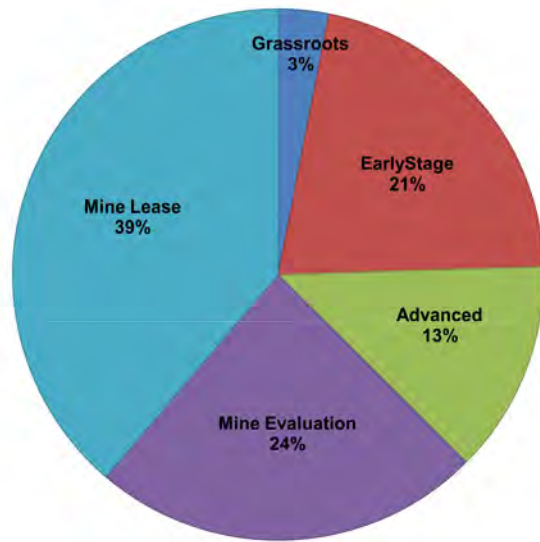


Figure 2. 2013 exploration expenditures by category, Kootenay-Boundary Region.

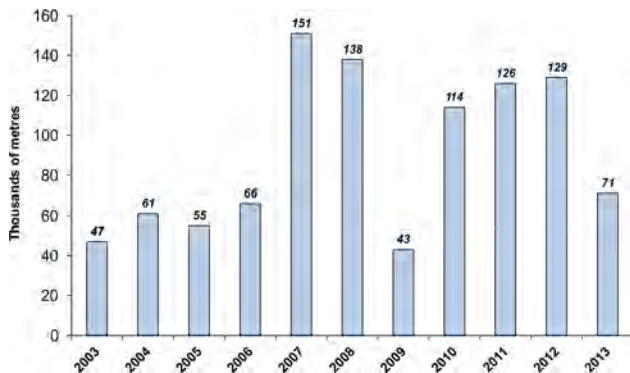


Figure 3. Annual exploration drilling in thousands of metres, 2003 to 2013, Kootenay-Boundary Region.

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

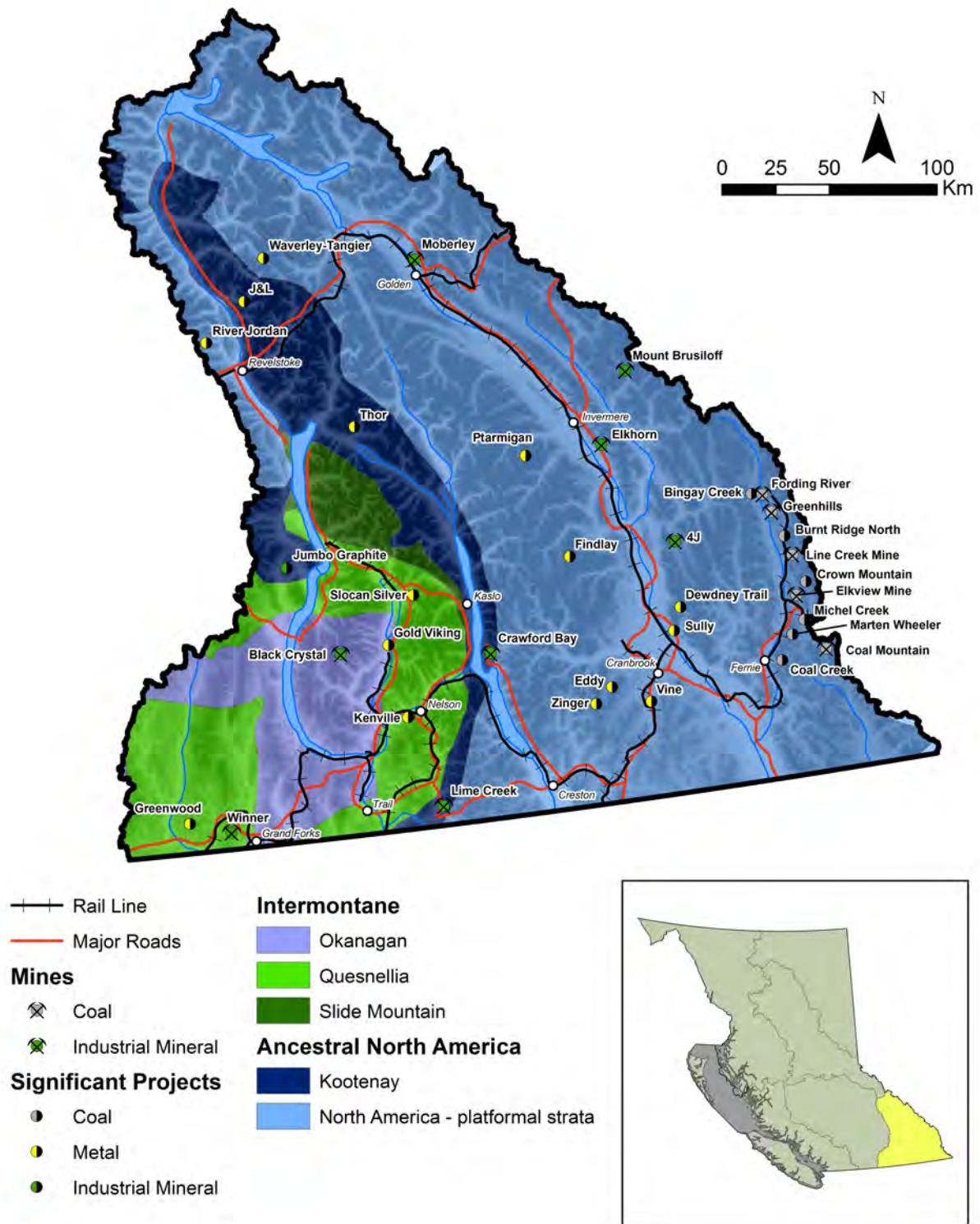


Figure 4. Locations of selected operating mines and exploration projects, Kootenay-Boundary Region, 2013.

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 Moberly, 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 at 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 Pentiction 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 (Rosslund 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 - (Rosslund 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 chalcopryrite 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 chalcopryrite, 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, ± 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

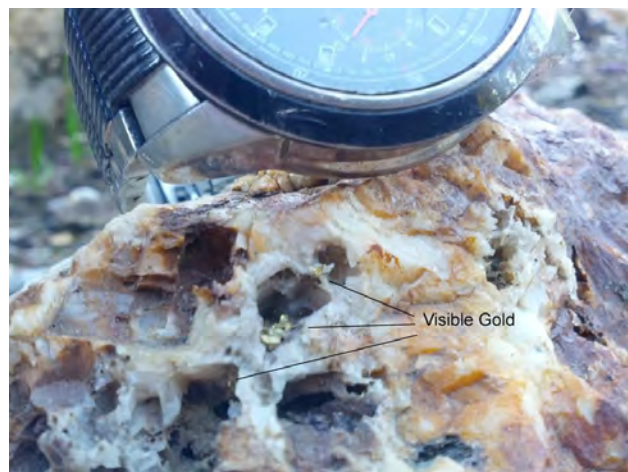


Figure 17. Visible gold in quartz-siderite zone at the SIF zone on the Thor property. Angular vugs are the result of weathering of carbonate crystals. Photo courtesy of Taranis Resources Inc.



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 chalcocite 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 chalcocopyrite.

Engold 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

faults. 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 chalcopyrite, pyrite, galena, sphalerite, and siderite, with Ag-Pb-Zn ± 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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