

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

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SUMMARY AND TRENDS

Activity and output levels for exploration and mining in the Kootenay-Boundary Region of British Columbia continued their upward trend in 2011.

Highlight industry events in 2011 included:

- encouraging gold and copper-gold drill intersections on properties near Greenwood (Golden Dawn Minerals Inc, Grizzly Discoveries Inc, and Open Gold Corp);
- exploration programs in Proterozoic-age Purcell Supergroup rocks for base and precious metals in the southern Purcell Mountains and adjacent areas (Eagle Plains Resources Ltd, Providence Capital Corp, Fjordland Exploration Inc, Active Growth Capital Inc, PJX Resources Inc, Kootenay Gold Inc, Silver Mountain Mines Inc, and Bearclaw Capital Corp);
- strong prices for metallurgical coal;
- increased production at four of the five metallurgical coal mines in the Elk Valley (Teck Coal Limited);
- large exploration rotary drilling programs at three of Teck Coal's five mines;
- approval of the BR-2 Pit expansion at Elkview Operations (Teck Coal Limited);
- submission of an Environmental Assessment Process (EAP) application for the Line Creek Operations Phase 2 Expansion (Teck Coal Limited);
- entry of the Swift Project at Fording River Operations into the EAP;
- increased production at the Mount Brussilof magnesite mine (Baymag Inc);
- positive feasibility study for the Moberly silica mine and processing facility for modifications to support the development of a frac sand operation (HCA Mountain Minerals (Moberly) Ltd).

As in previous years, past-producing, historic mining camps and mines were the sites of important exploration programs, spurred mainly by high gold and silver prices. These included projects in the Beaverdell, Greenwood, Nelson, Salmo, Ainsworth, Slocan and Lardeau areas.

Exploration expenditures in 2011 are projected to total about \$38.5 million, an increase of more than 35% over the previous year (Figure 1). This total was divided between metals (about 58%), coal (39.5%) and industrial minerals (2.5%).

The commodities with the highest exploration expenditures were coal and gold. Exploration expenditures in 2011 can be broken down into stages as shown in Figure 2.

An estimated 126 km of exploration drilling was carried out in the Kootenay-Boundary Region in 2011 (Figure 3). Of this total, approximately 42% represented drilling for metals, compared with 57% for coal.

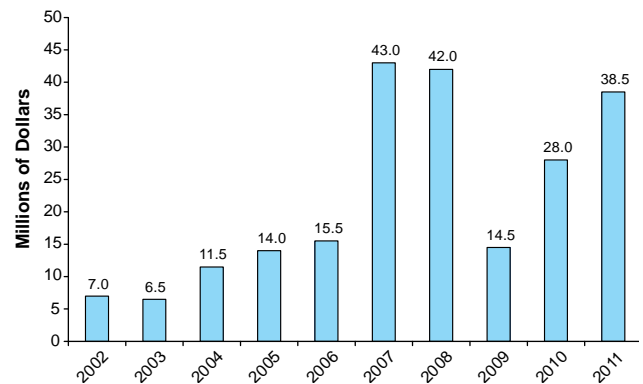


Figure 1. Annual exploration spending in millions of dollars, 2002 to 2011, Kootenay-Boundary Region. The Revelstoke area was added to the region in 2010.

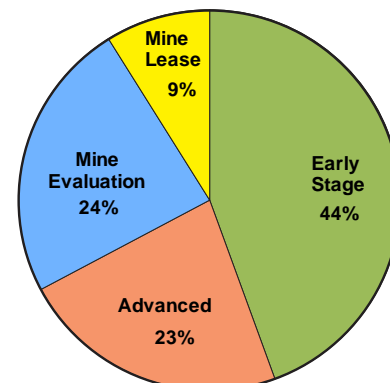


Figure 2. 2011 exploration expenditures by category, Kootenay-Boundary Region.

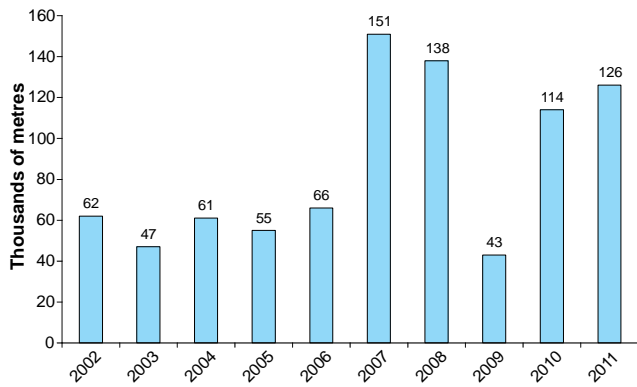


Figure 3. Annual exploration drilling in thousands of metres, 2002 to 2011, Kootenay-Boundary Region. Note that prior to 2004 in-pit drilling at operating coal mines was included in the total.

MINES

The Kootenay-Boundary Region hosts five large coal mines, and smaller operations for various industrial minerals including gypsum, magnesite, silica and dolomite. Operations at the region's only metal mine were suspended for most of the year. Selected current producing mine locations in the Kootenay-Boundary Region are shown on Figure 4 and basic information concerning these operations is listed in Table 1 and outlined below.

COAL

Teck Coal Limited, the world's second-largest exporter of metallurgical coal, operates five large open-pit coal mines in the Elk Valley area. Projected combined total 2011 coal production at the company's **Coal Mountain, Elkview, Line Creek, Greenhills** and **Fording River** operations is approximately 23.2 Mt of clean coal. This compares with an actual production total of 22.64 Mt in 2010. The mines directly employ 3650 people and make a major contribution to the East Kootenay and provincial economies.

Hard coking coal is the predominant output at four of the five Elk valley mines, the exception being Coal Mountain Operations. A range of two or more products is marketed by each of these four operations, based on variations in volatile matter and/or ash contents. In addition to hard coking coal, Teck Coal Limited produces PCI or pulverized coal injection coal, mainly from Coal Mountain and Elkview operations in 2011. Oxidized coal is marketed as thermal coal from most of these sites.

Proven and probable raw coal reserves at the five mines are listed in Table 1. With the exception of Coal Mountain Operations, all of the mines produce from multiple seams. Currently productive coal seams are typically medium-volatile bituminous in rank, and are low in sulphur. Clean metallurgical product coal ash contents

are typically in the 8.6 to 9.5% range. Other attractive quality parameters include high Coke Strength after Reaction (CSR), which is an indicator of the strength of the coke in the blast furnace.

Commercially mineable coals in southeast BC occur in the Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group. They are contained in three structurally separate coalfields, known collectively as the East Kootenay coalfields, in the Front Ranges of the Rocky Mountains. From north to south they are the Elk Valley, Crowsnest and Flathead coalfields. The Elk Valley Coalfield is formed by 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 synclinal structure. 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 in the extreme southeast corner of the region.

A portion of the Crowsnest Coalfield and the entire Flathead Coalfield are now legally off-limits to coal exploration and development based on 2011 provincial legislation that prohibits all mining-related activities in the Flathead River drainage.

Fording River Operations (MINFILE 082FSE009, 010 and 012) is 17 km north of Elkford. Production is projected to be 8.3 Mt of clean coal in 2011. Production occurs mainly at Eagle Mountain 6-Pit and 4-Pit (Figure 5), Turnbull Pit, and Henretta Pit, east of the Fording River. Teck Coal Limited is currently assessing the Swift Project area, west of the Fording River, for future expansion (see Mine Evaluation Projects and Exploration Projects, below).

Greenhills Operations (MINFILE 082JSE007) is 7 km northeast of Elkford. Production is projected to be 5.1 Mt in 2011. There are three active pits, known as Phases 3, 4/5 and 6 (Figure 6).

Line Creek Operations (MINFILE 082GNE020 and 021) is 25 km northeast of Sparwood. Production is projected to be 2.8 Mt in 2011. Production occurs mainly in the Burnt Ridge South, North Line Creek and Horseshoe Ridge pits. Teck Coal Limited continued to evaluate the **Line Creek Operations' Phase 2 Expansion Project** to the north of the currently active mine area, and submitted an application to the Environmental Assessment Office in December (see Mine Evaluation Projects, below).

Elkview Operations (MINFILE 082GNE013 to 017 and 023) is 5 km east of Sparwood. Production is projected to be 4.2 Mt in 2011, a decrease from 2010. Production occurs mainly in the BR-1 (Figure 7), and Natal 1 and Natal 2 pits, on Baldy and Natal ridges, respectively. In addition, thermal and PCI coal are produced from the Cedar North Pit on the west side of Harmer Ridge. Teck Coal Limited applied for and

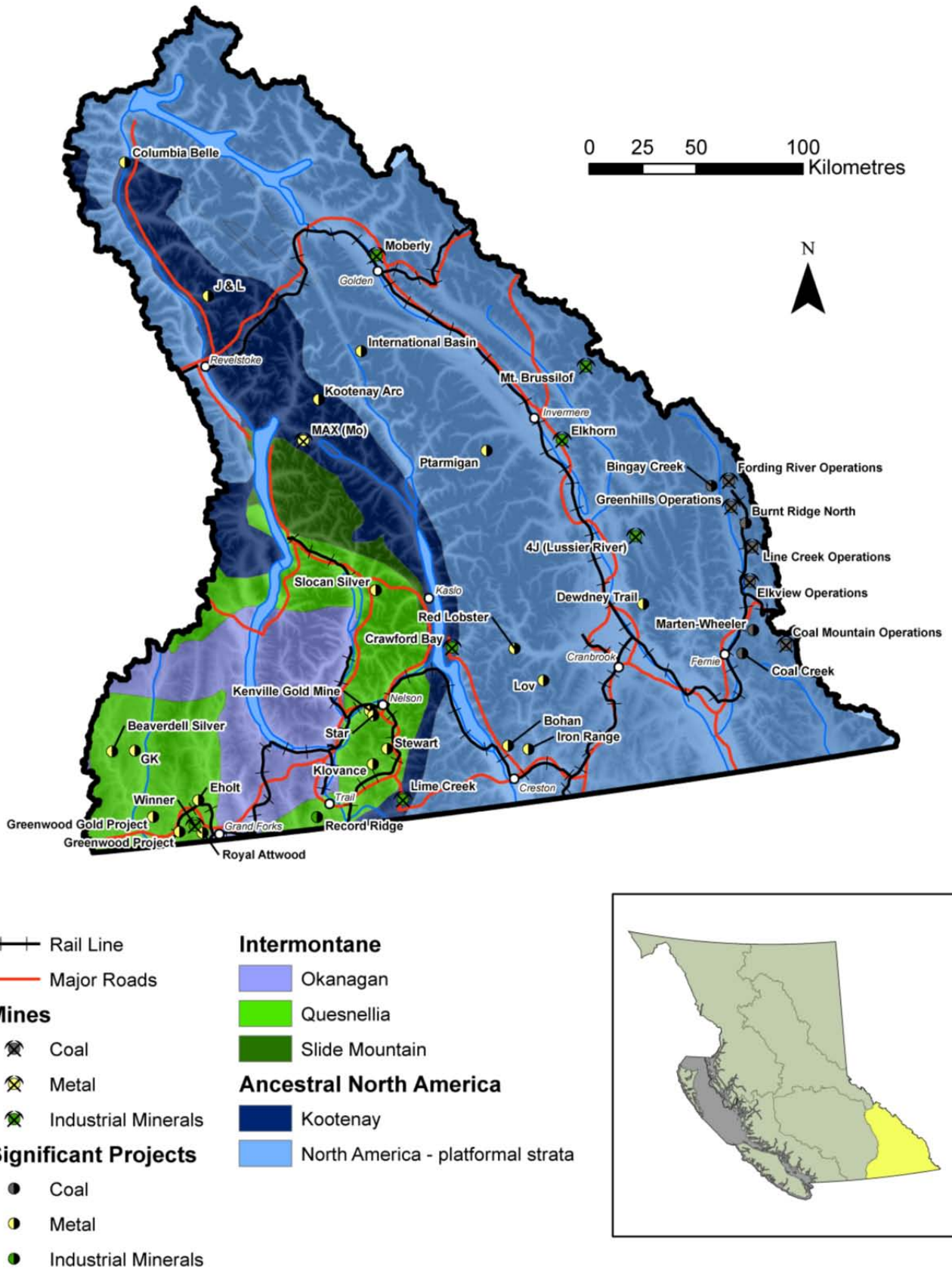


Figure 4. Locations of selected operating mines and exploration projects, Kootenay-Boundary Region, 2011. On-lease exploration drilling programs at three operating mines (Fording River, Greenhills and Elkview) are not indicated separately.

TABLE 1. SELECTED PRODUCING MINES, KOOTENAY-BOUNDARY REGION, 2011

Mine	Operator	Commodity	Employment	Actual 2010 Production	Projected 2011 Production	Proven and Probable Reserves as of December 31, 2010 or as indicated
Coal						
Coal Mountain	Teck Coal Limited	PCI and thermal coal	314	2.19 Mt	2.78 Mt	19.5 million tonnes
Elkview	Teck Coal Limited	Metallurgical coal	984	5.41 Mt	4.19 Mt	220.6 million tonnes
Fording River	Teck Coal Limited	Metallurgical and thermal coal	1238	7.93 Mt	8.34 Mt	263.8 million tonnes
Greenhills	Teck Coal Limited	Metallurgical, PCI and thermal coal	613	4.51 Mt	5.10 Mt	80.6 million tonnes
Line Creek	Teck Coal Limited	Metallurgical, PCI and thermal coal	502	2.60 Mt	2.76 Mt	38.6 million tonnes
Metals						
MAX	Roca Mines Inc	Mo				Measured and indicated resource of 1.7 million tonnes at 0.73% Mo (December 2009)
Industrial Minerals (selected)						
4J	Georgia-Pacific Canada Inc	Gypsum				
Crawford Bay	Imasco Minerals Inc	Dolomite				
Elkhorn	CertainTeed Gypsum Canada	Gypsum	17	445 000 t	430 000 t	
Lime Creek	Imasco Minerals Inc	Limestone				
Moberly	HCA Mountain Minerals (Moberly) Ltd	Silica sand				
Mount Brussilof	Baymag Inc	Magnesite	40	159 000 t	180 000 t	
Winner	Roxul Inc	Gabbro (mineral wool)	.			



Figure 5. View looking east at Fording River Operations (Teck Coal Limited). Pits on Eagle Mountain and associated rock dumps are in the middle distance. The coal preparation, clean coal storage, rail load out and tailings facilities are also visible.

received approval for the **BR-2 Pit** expansion on Baldy Ridge within the current active mine area (see Mine Evaluation Projects and Exploration Projects, below).



Figure 6. View looking north at Greenhills Operations (Teck Coal Limited) along the Greenhills Range. North of the visible highwall are the Cougar North Extension and Swift Project exploration areas (Greenhills and Fording River operations, respectively).



Figure 7. Elkview Operations of Teck Coal Limited. The BR-1 Pit high-wall at the south end of Baldy Ridge is visible in the distance. The new BR2 expansion area, approved in late 2011, will be north of BR1.

Coal Mountain Operations (MINFILE 082GNE001) is 32 km southeast of Sparwood. Production is projected to be 2.8 Mt in 2011. Production occurs mainly in 6-Pit, 34-Pit and 37-Pit (Figure 8). Unlike the other four Teck Coal mines in the Elk valley, the predominant product at Coal Mountain is PCI coal, not hard coking coal.

METAL

Roca Mines Inc's **MAX** underground molybdenum mine at Trout Lake was the only producing metal mine in the region, but only operated for a few months in 2011.

The MAX Mine began shipping concentrate in November 2007 and achieved full commercial production in April 2008 at a rate of 72 000 t/y. In April 2010 Roca received approval to expand its production rate to 1000 t/d. This Phase 2 expansion has been partially implemented, but full production rates have not been achieved.

The MAX operation was shut down from the beginning of the year until late July in order to address sill pillar stability problems. The work included: constructing a by-pass on the main access ramp; drilling of a new stope; and geotechnical investigations, modeling and monitoring. The mine restarted at the end of July at a rate of 500 t/d. Unfortunately, due to economic factors, production was suspended again in the first week of October. The mine remained shut down for the rest of the year.

The MAX deposit (MINFILE 082KNW087) contains measured plus indicated resources of 42.9 Mt grading 0.20% MoS₂ using a 0.10% MoS₂ cut-off. The Phase 1 mine has been producing from the HG zone, with an initial resource of 280 000 tonnes (measured and indicated) grading 1.95% MoS₂ at a 1.00% cut-off. The



Figure 8. Coal preparation facilities at Coal Mountain (Teck Coal Limited).

Phase 2 expansion is based on a measured plus indicated resource of 1.7 Mt at 0.73% Mo.

MAX property geology comprises metasediments of the Paleozoic Lardeau Group that are intruded by the Cretaceous Trout Lake stock. The deposit is a pipe-like quartz-vein stockwork that extends from surface to a depth of at least 1000 m, in which molybdenite occurs mainly along margins of veins. The vein stockwork is best developed in close proximity to the margins of the intrusive body and its associated offshoots. Potential exists for additional high-grade zones, as well as a deeper large porphyry system.

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, tufa, flagstone, railroad ballast, rip rap, smelter slag and aggregate. Selected larger operations are described below and listed in Table 1, and their locations are shown on Figure 4.

Baymag Inc produces high-quality magnesite from its open pit mine near **Mount Brussilof** (MINFILE 082JNW001), in the Rocky Mountains northeast of Radium. The Mount Brussilof deposit represents a large magnesium alteration zone in Cambrian carbonates. The operation has been in production since 1982. 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 2011 is projected to be approximately 180 000 tonnes, a 13 per cent increase over 2010. The processed products have a variety of environmental, industrial and agricultural uses. A recent and growing market for an environmental application has been the Alberta oil sands mining operations, where magnesia in suspension is used to promote precipitation of silica from waste waters.

There are two gypsum mines in the Rocky Mountains portion of the Kootenay-Boundary region, both producing from an evaporite unit in the Devonian Burnais Formation. CertainTeed Gypsum Canada operates the **Elkhorn** Mine (MINFILE 082JSW021) east of Windermere, where production is mainly from the Elkhorn West Extension Pit (Figure 9). Production is projected to be approximately 430 000 tonnes in 2011, a slight decrease compared with 2010. Georgia-Pacific Canada Inc operates the **4J** gypsum mine and rail load out facility (082JSW009) southeast of Canal Flats.

Silica sand is produced from friable quartzite of the Ordovician Mt Wilson Formation by HCA Mountain Minerals (Moberly) Ltd at the **Moberly Mine** (MINFILE 082N001) and plant, in the Rocky Mountains 8 km north of Golden. Stockpiled material was shipped to several markets in 2010.

In late 2011 the company reported the outcomes of a feasibility study looking into the potential of producing frac sand for the western Canadian oil and gas industry. The study concluded that a commercial frac sand operation at the Moberly Mine and plant site is economically viable with a relatively small capital investment (estimated at \$20 million). The investment is based on redevelopment of the current operation, including upgrading of the haul road and construction of a new processing plant.

Measured plus indicated resources at the Moberly Mine site are estimated at 43 Mt of silica suitable for glass making, silica flour and related uses. Within this overall resource is an estimated measured and indicated resource of 32.4 Mt of 64% frac sand (estimates consistent with the Australasian Joint Ore Reserves Committee [JORC] Code). The Mt Wilson Formation extends along strike to the southeast and northwest beyond the current resource boundary.

Imasco Minerals Inc produces a variety of crushed and ground rock products at its Creston Operations Plant at **Sirdar** from limestone, dolomite, granite and quartzite rock types. 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). The carbonate units are Cambrian in age, while the granite is part of the Cretaceous Bayonne batholiths.

The **Winner** gabbro quarry (MINFILE 082ESE265) west of Grand Forks supplies feed for the Roxul Inc mineral wool insulation manufacturing plant in Grand Forks.

MINE EVALUATION PROJECTS

Mine evaluation refers to the stage when environmental, social, financial and engineering assessments and studies are undertaken, and applications



Figure 9. Elkhorn gypsum mine (CertainTeed Gypsum Canada).

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.

Elk Valley coal mine evaluation projects in the region during 2011 included Line Creek Operations Phase 2, Baldy Ridge BR-2 Pit, and the Swift Project, all of which are potential expansion projects at existing coal operations. More detailed descriptions of the projects are found with the corresponding mine and/or exploration property descriptions.

- **Line Creek Phase 2 Expansion** (Line Creek Operations) – An application for the Phase 2 Expansion was submitted to the Environmental Assessment Office, and permit applications were submitted to government agencies, in December 2011. This expansion, which encompasses Mount Michael (MINFILE 082GNE022) on the east limb of the Alexander Creek Syncline and Burnt Ridge North (082JSE001) on the west limb, will extend Line Creek’s production activities to the north of currently active pits.
- **Baldy Ridge BR-2** (Elkview Operations) – An application for the BR-2 Pit was submitted in the summer of 2011, and approvals were granted in December 2011. This project did not trigger the EAP. BR-2 is on Baldy Ridge (MINFILE 082GNE016), and is immediately north of the BR-1 Pit highwall (Figure 7) within the current mine area.
- **Swift Project** (Fording River Operations) – This project, which entered the EAP in 2011 and is in the pre-application stage, is located west of the Fording River and partially encompasses previous mine areas on the Greenhills Range.

EXPLORATION HIGHLIGHTS

Selected 2011 mineral and coal exploration projects in the Kootenay-Boundary Region are listed in Table 2, and their locations are shown on Figure 4. Generally the selected exploration programs involved expenditures in excess of about \$250 000 in 2011 on work that included drilling or trenching or other mechanized ground disturbance. The following text also includes updates on some other important projects in the region that did not undertake major physical exploration programs in 2011. The information in this section was derived mainly from company reports, presentations, press releases and websites, as well as discussions with exploration project staff.

Gold Projects

BOUNDARY DISTRICT

Grizzly Discoveries Ltd’s extensive **Greenwood Gold** Project was active again this year. The company’s holdings extend from east of Greenwood to west of Anarchist Summit, and cover an area roughly 70 km by 25 to 30 km. The project area is underlain by a range of rock units, including the Paleozoic Knob Hill and Anarchist groups, Triassic Brooklyn Formation, and Eocene Penticton Group. Intrusions of Jurassic, Cretaceous and Eocene rocks occur throughout the area.

The project area includes many known mineral occurrences and deposit types, among them gold-quartz veins, polymetallic veins, skarns, and intrusion-related precious metals. A common theme for Grizzly Discoveries’ targets is the proximity of intrusive rocks, notably Eocene syenites. The emphasis has generally been on gold, with or without copper. High gold prices and the proximity to Kinross’ Buckhorn Mine and concentrator in northern Washington are factors favouring the region with respect to gold exploration. A focus in 2011 was on the identification of drill targets similar to Buckhorn gold skarn and Midway Golden Eagle epithermal gold deposits. Recently the company has begun to focus on the silver potential of some of its holdings, particularly at sites where there was past silver production.

Activities in 2011 included diamond drilling, ground geophysics, soil geochemistry, geological mapping, prospecting, and rock sampling at the Dayton, Motherlode, Ket 28, Overlander and Copper Mountain areas. These properties, with the exception of Copper Mountain, were also slated for drilling in 2011.

Drilling at the **Dayton** (MINFILE 082ESW022), 6 km north of Bridesville near the Mt McKinney gold camp, was intended to follow up on the recent discovery of widespread copper-gold mineralization and investigate the potential for large tonnage, porphyry-style copper-

TABLE 2. SELECTED EXPLORATION PROJECTS, KOOTENAY-BOUNDARY REGION, 2011

Property	Operator	MINFILE (or TRIM sheet)	Commodities	Target Type	Work program	Metres of drilling where available (approximate in some cases)
Beaverdell Silver	Molycor Gold Corp	082ESW032, 067, 072	Ag, Pb, Zn, Cu, Au	polymetallic veins	DD	2457
Bingay Creek	Centremount Coal Ltd	082JSE011	coal	sedimentary	DD, RC	909
Bohan	Active Growth Capital Inc	(82F.028)	Pb, Zn	SEDEX, manto	DD	380
Coal Creek	Crowsnest Pass Coal Mining Ltd	(82G.046)	coal	sedimentary	RC, DD	1447
Columbia Belle	Goldstar Minerals Inc	082M 190	Zn, Pb, Cu, Ag, Au	SEDEX	DD	750
Dewdney Trail	PJX Resources Inc	(82G.073)	Au	sediment- hosted vein	DD, TR, G	750
Eholt	Open Gold Corp	082ESE187	Au, Cu	skarn, epithermal, massive sulphide	DD	1919
Elkview Operations (includes Baldy Ridge BR-2 Pit)	Teck Coal Limited	082GNE017	coal	sedimentary	RC	18 164
Fording River Operations (includes Swift Project)	Teck Coal Limited	082JSE010	coal	sedimentary	A, RC	40 417
GK	Bitterroot Resources Ltd	082ESE175	Au, Cu, Ag	intrusion-related veins	A, DD	2051
Greenhills Operations (Cougar North Extension)	Teck Coal Limited	082JSE007	coal	sedimentary	A, RC, DD	5248
Greenwood Project (includes Wild Rose and Boundary Falls)	Golden Dawn Minerals Inc	082ESE045, 116, 130, 171	Au, Cu, Ag	vein, porphyry	DD, GC	
Greenwood Gold (includes Motherlode, Ket 28, Dayton, Overlander, Copper Mountain)	Grizzly Discoveries Inc	082ESE034, 147, 174, 255, 082ESW022, 210, 231	Au, Cu, Ag, Mo, Zn, Pt	vein, skarn, intrusion- related, porphyry	DD, GC, GP, G	
International Basin	Kingsman Resources Inc	082KNW094	Au, Ag, Pb, Cu, Zn	polymetallic veins	DD	1087

TABLE 2. CONTINUED

Property	Operator	MINFILE (or TRIM sheet)	Commodities	Target Type	Work program	Metres of drilling where available (approximate in some cases)
Iron Range	Providence Resources Corp	082FSE014 to 028	Au, Zn, Pb, Fe, Cu	SEDEX, IOCG	DD, GC, G, IP, AB-EM, AB- gravity	6300
J & L	Merit Mining Corp	082M 003	Au, Ag, Pb, Zn	SEDEX, replacement vein	UG, UG- DD DD	2800
Kenville Gold Mine (Nelson Mining Camp project)	Anglo Swiss Resources Inc	082FSW086	Au, Cu			4400
Klovance (Castlegar project)	Swift Resources Inc	(82F.023)	Ag, Cu, Pb, Zn, Au	polymetallic veins	DD, TR, G	2057
Kootenay Arc	Mineral Mountain Resources Ltd	082KNW095, 110, 112	Au, Ag, Pb, Cu, Zn	polymetallic veins, Carlin?	DD, GC	2940
Lov	Bearclaw Capital Corp	082FSE124	Mo, W, Au, Pb, Cu	skarn?, porphyry?	GC, DD	653
Marten- Wheeler	Teck Coal Limited	082GNE006	coal	sedimentary	A, RC	5134
Ptarmigan	Silver Mountain Mines Inc	082KSE030, 036	Ag, Au, Cu, Zn	polymetallic veins, manto?	DD	3712
Record Ridge (Rosland project)	West High Yield (WHY) Resources Ltd	082FSW119, 116, 117	Mg, Au, Ni, Co	ultramafic; vein	DD	4001
Red Lobster (Kimberley Gold Trend Project)	Fjordland Exploration Inc	(82F.068)	Pb, Zn	SEDEX	DD	1400
Royal Attwood	Golden Dawn Minerals Inc/Hi Ho Silver Resources Inc	082ESE206	Cu, Au	skarn	DD, GP, GC, G	
Slocan Silver	Klondike Silver Corp	082FNW050	Ag, Pb, Zn	vein	TR, UG (25m)	N/A
Star	Valterra Resource Corporation	082FSW083, 084, 294	Au, Ag, Cu	vein, porphyry	P, DD	1362
Stewart	Emgold Mining Corporation	082FSW229	Mo, W, Au, Ag, Cu, Pb, Zn	vein, skarn	DD	2526

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;

-gold. Recent work at the Dayton has identified a new bulk tonnage, low-grade copper-gold zone, coincident with gold-in-soil and induced polarization anomalies. Early 2011 results include 0.43 g/t Au and 0.15% Cu over 51 m (drill hole 11DA09). Gold mineralization at the Dayton is also known to occur in quartz veins, and associated with copper-gold skarns. Alkalic intrusions appear to be spatially related to mineralization.

Ket 28 (MINFILE 082ESW210) is a gold prospect 8 km west of Rock Creek. Mineralization is associated with zones of brecciation, quartz veins and hornfels alteration in proximity to a southeast-northwest trending shear zone. Recently the company has discovered widespread copper and low-grade gold associated with skarn-type alteration.

The **Motherlode** (MINFILE 082ESE034) is a copper-gold skarn past producer 3 km west of Greenwood. Production occurred at various time intervals up until 1962.

At the **Overlander** (MINFILE 082ESE174), 9 km southeast of Greenwood, strong geophysical anomalies spatially associated with gold-in-soil anomalies adjacent to old workings have never been drilled. The property is known for gold-quartz veins and skarns; sulphides are reported to include chalcopyrite, pyrrhotite and bornite, with lesser sphalerite, galena and molybdenite.

The **Copper Mountain** area is 13 km west of Greenwood. It is a gold-silver vein-related target (with or without copper and zinc) in siliceous biotite hornfelsed rock in proximity to intrusive contacts. Gold at Copper Mountain is associated with a wide zone of pyrite and arsenopyrite; sulphides are most concentrated adjacent to syenite dykes. A strong gold intersection (1 g/t over 30m) at the **Prince of Wales** target (MINFILE 082ESE255) was reported in 2010.

Golden Dawn Minerals undertook a diamond drilling program on the **Wild Rose** property, which includes the adjacent **Tam O-Shanter**, 3.5 km southwest of Greenwood. The Wild Rose is part of Golden Dawn's **Greenwood** Project (also see the Boundary Falls polymetallic project, below).

The Paleozoic Knob Hill Group, comprising chert, chert breccias, argillite and greenstone, underlies the property. Gold-silver-copper mineralization on the Wild Rose (MINFILE 082ESE116) and Tam O-Shanter (082ESE130) occurrences is hosted by the Wild Rose quartz vein system, which has been explored through underground workings and previous drilling campaigns. Wild Rose veins trend north northwest, and occur both within the Wild Rose fault zone and its hangingwall.

A recent focus at the Wild Rose has been a system of lower-grade, bulk tonnage gold-copper targets (porphyry-style) in zones to the east and west of the old workings. The Deadwood gold zone, an example of one of these targets, trends northwest-southeast and coincides with a magnetic anomaly. The zone has been drilled over a strike length of 1000 m and is believed to extend 1500 m

in length, 300 m in width and to a depth of 300 m. An inferred resource estimate of 19.4 Mt grading 0.45 g/t Au was released in 2011 (cut-off grade of 0.3 g/t). A new zone of silver-bearing mineralization about 300 m north of the main Deadwood zone was discovered by drilling in 2011. Results included 166.5 g/t Ag over 12 m (drill hole 11WR19).

Golden Dawn Minerals Inc and Hi Ho Silver Resources Inc carried out a diamond drilling program on the **Royal Attwood** property (MINFILE 082ESE206), 9 km west of Grand Forks. The program was intended to target some of the numerous geochemical gold and copper anomalies that are coincident with airborne geophysical anomalies. The Royal Attwood property is underlain by the Devonian to Permian Knob Hill Group and Triassic Brooklyn Formation rocks that are intruded by diorite and granodiorite of the Jurassic to Cretaceous Nelson Intrusions and syenitic rocks of the Eocene Coryell Plutonic Suite. Previous exploration on the property has identified potential for skarn Cu-Au, as well as vein, breccia and intrusion-related mineralization.

Open Gold Corp's **Eholt** copper-gold property (MINFILE 082ESE187) is roughly 15 km north of Grand Forks. Numerous mineralized zones are known on the property, representing various styles of mineralization, including skarn, mineralized shear zones, possible volcanogenic massive sulphide mineralization, and epithermal style mineralization (Assessment Report 29702). Open Gold drilled the Dead Honda skarn and Senator massive sulphide showings in 2011, two of six priority targets. Host rocks for skarn mineralization on the property include calcareous and other sediments of the Triassic Brooklyn Formation. Triassic, Jurassic and Eocene intrusive rocks are widespread.

Bitterroot Resources Ltd carried out a diamond drilling program at the **GK** gold property (MINFILE 082ESE175, 217, 252 and 256). The GK is immediately east of Beaverdell and 65 km southeast of Kelowna. Gold mineralization is related to a high-level magmatic-hydrothermal system (see Assessment Report 28179). Host rocks belong to the Upper Paleozoic Anarchist Group, and consist predominantly of an assemblage of tuffaceous volcanic and sedimentary rocks cut by diorite intrusions and dykes of alkaline to calc-alkaline affinity. Anomalous gold values on the property occur within brecciated and silicified intervals associated with intrusive contact zones. Mineralization consists of sulphide-enriched vein-breccias and stockworks containing pyrite, arsenopyrite, quartz and carbonate. Previous work focused on gold-bearing quartz veins. Drilling in 2011 was intended to test for bulk-mineable, stockwork-hosted gold-copper mineralization.

Recent activities at the **Jumping Josephine** or **JJ** property undertaken by joint-venture partners Astral Mining Corporation and Kootenay Gold Inc, have been centred on a 2003 discovery of high-grade gold mineralization known as the JJ Main zone. The JJ Main zone (MINFILE 082ESE275) is 22 km west of Castlegar

and just north of Highway 3. Mineralization in this zone is hosted by monzonitic rocks of the Jurassic Nelson Plutonic Suite, and may be related to a later-phase Jurassic intrusion that does not reach surface. Occurrences of Eocene Coryell syenite are also widespread locally. Mineralization (chiefly pyrite and arsenopyrite) occurs with quartz in stockworks, vein-breccias, ladder veins and sheeted veins, and is associated with a prominent northeast-trending shear zone. The mineralized structure in the vicinity of the JJ Main zone has been intersected in trenching and drilling over a strike length of greater than 900 m and at up to 240 m vertical depth in drill holes.

Although there was no physical work carried out at the Jumping Josephine property this year, an initial resource estimation for the JJ Main zone was released. The estimate includes an indicated resource of 363 000 t grading 2.95 g/t Au at a cut-off grade of 0.05 g/t.

WEST KOOTENAYS

Valterra Resource Corporation's gold-silver-copper **Star** Project is 7 km southwest of Nelson, and includes both the Star and the Toughnut properties. The project area contains five known gold zones in proximity to the prospective Silver King shear zone, including the Star and Eureka past producers, the Alma N zone (immediately to the south of the Star), the Toughnut occurrence, and the Gold Eagle zone further to the southeast.

Production from the Eureka Mine (MINFILE 082FSW084) between 1905 and 1954 totalled about 9000 t of ore averaging over 2 g/t Au, 125 g/t Ag and 1.77% Cu. Gold-silver-copper mineralization at the Star Project is hosted by both the Jurassic Elise Formation volcanic rocks (Rossland Group) and Jurassic Eagle Creek pluton, and has both alkali porphyry (disseminated) and shear-hosted (higher-grade) affinities. Mineralization consists mainly of pyrite, with or without chalcopyrite, within sericite and K-feldspar alteration zones.

A mineralized trend has now been defined by drilling, geochemistry and geophysics over a potential strike length of 3.5 km. Mineralization is consistent with a zoned porphyry model, subjected to shortening and shearing and related hydrothermal activity that generated zones of higher grade. Drilling in 2011 targeted the Gold Eagle, Alma N and Eureka zones. Results included 1.23 g/t Au, 2.17 g/t Ag and 0.24% Cu over 15.52 m (drill hole VST11-014, Eureka zone).

Anglo Swiss Resources Inc was active again on its **Kenville Gold Mine** property, roughly 6 km west of Nelson. The past-producing Kenville Mine, also known as the Granite-Poorman, operated intermittently between 1890 and 1954, with the bulk of production prior to 1912. More than 180 000 t of ore was mined, yielding over 2 t 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 (Figure 10).



Figure 10. Recent drill-core from the Kenville Gold Mine Project (Anglo Swiss Resources Inc). High-grade gold in the core is associated with pyrite and chalcopyrite in a quartz vein. "Pseudodiorite" of the Eagle Creek pluton is also visible.

Host rocks at the Kenville (MINFILE 082FSW086) are within the Jurassic Eagle Creek plutonic complex which is intruded into, and may be the intrusive equivalent of, basalts of the Jurassic Elise Formation of the Rossland Group. Jurassic (Nelson Suite) and Tertiary intrusive rocks are also common in the immediate area. The property lies on the Silver King shear zone.

The company's most recent objective has been to explore for extensions of known ore-grade material and new mineralization. The current focus is to follow up on recent vein intersections at depth and to the south and southwest of the underground workings, and the late 2010-2011 and 2011 drill programs were specifically focused on the Kenville Mine area, testing possible southerly extensions of veins. Strike and dip extensions of economic high-grade gold and silver veins, characteristic of the Kenville, have been intersected up to approximately 500 m to the south. Results include 1.46 m grading 49.91 g/t Au (drill hole KE11-22).

The Kenville Gold Mine property is part of a larger Anglo Swiss project area, referred to as the Nelson Mining Camp. This area contains numerous examples of gold, silver and base metal mineralization, including other past producers. One of the objectives of the overall Nelson Mining Camp program has been to identify potential deep source areas and/or disseminated mineralization. Efforts devoted to the overall Nelson Mining Camp were reduced in 2011, in favour of focus on the Kenville Mine.

Sultan Minerals Inc's **Kena** property is 8 km south of Nelson and includes the Gold Mountain, Kena Gold, Kena Copper King and South Gold zones. Porphyry-style gold and gold-copper mineralization is associated with both the Jurassic Elise Formation volcanic rocks (Rossland Group) and the co-magmatic Jurassic Silver King Porphyry intrusions. The belt comprising these zones trends northwest-southeast and is sub-parallel to

and east of the Silver King shear zone. Gold mineralization tends to occur in four settings: a high-grade corridor, associated with volcanics and intrusives; volcanic-intrusive contact areas; bonanza shoots; and, bulk tonnage haloes around shoots. Gold-copper mineralization in the belt referred to above occurs in bulk tonnage (low-grade) settings, particularly in the Kena Copper King zone, while gold mineralization occurs in both bulk tonnage and bonanza (high-grade) settings. All these styles of mineralization have been a target of recent exploration efforts.

While there was no physical exploration activity at the Kena in 2011, an updated 43-101 report recommends major follow-up drilling on the Gold Mountain zone (gold) and the Kena Copper King zone (copper-gold).

EAST KOOTENAYS

PJX Resources Inc carried out trenching and initial diamond drilling on the **Dewdney Trail** gold property (Figure 11), in the Hughes Range approximately 33 km northeast of Cranbrook. Target areas on this extensive property have been identified by prospecting, geological mapping and airborne geophysics. Known gold occurrences to date are associated with quartz veins in quartzites of the middle Aldridge Formation of the Proterozoic Purcell Supergroup. The quartz veins are thin and closely-spaced, and typically form a box-work texture. The favourable stratigraphic horizon, which consists of interbedded quartzite and argillite over 200 m in true thickness, extends over 12 km in strike length in two thrust sheets. Mineralization is associated with sericite, quartz-pyrite, iron-carbonate and iron-oxide alteration, and is being likened to the sediment-hosted vein (SHV) model. The Dewdney Trail property is part of the so-called Kimberley Gold Trend.



Figure 11. Diamond drilling on the Dewdney Trail Project. PJX Resources Inc President John Keating examines drill core with PJX Chief Financial Officer Linda Brennan (left), and BC Ministry of Forests, Lands and Natural Resources Operations Regional Director of Authorizations, Jeremy Zandbergen (back to camera).

Base Metals Projects

WEST KOOTENAYS

Emgold Mining Corporation's **Stewart** property is in the Ymir area about 9 km north of Salmo. The property has potential for tungsten, copper, molybdenum, gold and silver. It has two distinct components, the Stewart molybdenum zone (MINFILE 082FSW229) in the east and the Craigtown gold zone further to the west. Most of the work to date, including the 2011 drilling campaign, has focused on the Stewart molybdenum zone (SMZ).

The project area is underlain by the Elise and Hall formations of the Lower Jurassic Rosslund Group, intruded by the middle to late Jurassic Nelson Suite and Tertiary plugs and dykes. Molybdenum is associated with quartz-stockwork and breccia zones, while tungsten-bearing skarns and lead-zinc-silver veins are also known. The SMZ has an historic molybdenum resource within a podiform breccia. Overall the SMZ is about 200 m by 80 m in extent, and has been drilled previously to a depth of 150m. The objective in 2011 was to fill in previous drilling in the breccia zone, and to look for easterly extensions of the mineralization.

The **Columbia Belle** lead-zinc-silver-copper property (MINFILE 082M 190) is located 100 km north of Revelstoke. In 2011 Goldstar Minerals Inc carried out a diamond drilling program. Mineralization at the Columbia Belle consists predominantly of stratiform (possibly SEDEX) massive galena and sphalerite. Host meta-sedimentary rocks belong to the Cambrian Index Formation; they are intruded by quartz monzonitic sills and dykes.

There were no physical exploration activities at the Sultan Minerals Inc **Jersey-Emerald** property, 10 km south of Salmo, in 2011. The property, which is situated near the south end of the Kootenay Arc, is host to a variety of different types and styles of mineralization. Replacement-style, stratabound lead-zinc mineralization is associated with Paleozoic carbonates. Tungsten is associated with the contact between Paleozoic sedimentary rocks and Cretaceous intrusions. It is hosted by both skarn and massive pyrrhotite bodies. Gold is also associated with skarn. Molybdenum-bearing, granitic intrusion-hosted quartz stockworks lie beneath some of the old tungsten mine workings and in some cases molybdenum is also associated with tungsten.

The underground Jersey lead-zinc and Emerald tungsten mines (MINFILE 082FSW009, 010, 011 and 218) closed in 1973. The Jersey Mine was historically British Columbia's second largest lead-zinc producer, and the Emerald was Canada's second largest tungsten producer. The HB-Garnet Mine (MINFILE 082FSW004 and 082FSW249), which closed in 1978 and is also part of the Jersey-Emerald property, was the province's third largest lead-zinc producer.

The property includes an estimated tungsten resource of 2.72 Mt averaging 0.358% WO₃ (measured plus indicated) using a 0.15% cut-off. Further, there is a lead-zinc indicated resource estimated at 1.9 Mt averaging 1.96% Pb and 4.10% Zn, using a cut-off grade of 3.5% combined lead-zinc. These resources are located in the areas of the old Jersey and Emerald Mine workings.

Late in the year Sultan Minerals signed a Letter of Intent with Tunxsten Resources Ltd, granting Tunxsten the exclusive option to acquire up to 65 per cent interest in the property, with the overall objective of moving the Jersey-Emerald property toward production.

Klondike Silver Corp's **Slocan Silver Project**, east of New Denver, is in a rich historic silver-lead-zinc mining area. Klondike's 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. The company's Silvana mill at Sandon, a 100 t/day concentrator, is operational, and the company has an arrangement for a smelter to accept concentrates from the mill.

Mineral occurrences in the Slocan are hosted by sheared and brecciated argillite and slate of the Triassic Slocan Group intruded by granodiorite and quartz monzonite dikes.

The overall goal of the company is to locate sufficient ore to operate the mill at its maximum capacity. This includes the search for remnant and new ore in the Silvana Mine (MINFILE 082FNW050). Underground drifting and other activities in 2011 were focused on remnant Silvana ore. There was some surface exploration on the Slocan Silver Project in 2011, including work at Sandon Creek and Cody Creek.

EAST KOOTENAYS

Providence Capital Corp continued a diamond-drilling program begun in the fall of 2010 on the **Iron Range** property, roughly 15 km northeast of Creston. Providence Capital holds the option to earn a 60 per cent interest in the property from Eagle Plains Resources Ltd. There are two settings for mineralization at the Iron Range. One is gold mineralization associated with iron oxide breccias along the Iron Range fault. These known occurrences (MINFILE 082FSE014 to 028) have possible affinities with iron oxide-copper-gold (IOCG) mineralization. The second style is sedimentary exhalative (SEDEX) mineralization associated with the contact between the lower and middle members of the Aldridge Formation (known as the Sullivan horizon) in the Proterozoic Purcell Supergroup. This latter style is directly analogous to the Sullivan Mine ore body at Kimberley.

Most recent exploration, including the 2010-2011 drilling campaign and associated airborne geophysical surveys and geological mapping, has been focused on a

potential SEDEX target at the Sullivan horizon near the south end of the Iron Range, in an area of pervasive albite alteration. Results have been encouraging and suggest the presence of a hydrothermal vent system at Sullivan time, and also indicate that there are significant levels of gold in association with the typical SEDEX minerals. This new discovery is termed the Talon zone. For example, drillhole IR10-010, drilled late in 2010, intersected two intervals of gold-bearing massive sulphide mineralization, the lower of which is believed to be at or near the lower-middle Aldridge contact. Results from the upper zone included grades of 5.1 g/t Au, 1.86% Pb, 2.1% Zn and 75.3 g/t Ag over 14 m. This and other drill holes in the vicinity display a distinctive brecciated "net" texture with albite alteration (Figure 12).

The **Bohan** property, 20 km north of Creston, is prospective for Pb-Zn SEDEX and Manto-style replacement mineralization. Active Growth Capital Inc, under an option from Eagle Plains Resources Ltd, carried out a helicopter-supported diamond drilling program in 2011. The target was an untested lead and zinc coincident soil anomaly. Host rocks on the property are part of the upper Purcell Supergroup (Proterozoic).

Fjordland Exploration Inc carried out a diamond drilling program on the **Red Lobster** property, 30 km west of Kimberley. It is one of several properties held under option from Kootenay Gold Inc collectively called the Kimberley Gold Trend Project. The Red Lobster is probably on trend to the north with the Iron Range Fault, and the target on the property is SEDEX lead-zinc and gold mineralization associated with silicified sediments. The property hosts three known zones of mineralization in the Aldridge Formation with corresponding soil geochemical anomalies. The drill holes targeted the Cominco and Shado zones, and all intersected sulphide minerals. Based on initial observations, mineralization may have been remobilized from deeper zones.

Bearclaw Capital Corp undertook a helicopter-supported drill program on the **Lov** property 37 km west of Cranbrook. Drilling followed up on geochemical sampling completed earlier in the year, and previous airborne geophysical surveys. The Lov property appears



Figure 12. Recent drill-core from the Talon zone on the Iron Range property (Providence Resources Corp). Albite alteration and breccia textures suggest the possible existence of a hydrothermal vent at Sullivan time in the Aldridge Formation.

to have potential for molybdenum, tungsten, gold, lead, copper and other mineralization, related to Cretaceous granitic intrusions (perhaps porphyry and/or skarn systems). Cambrian sedimentary rocks of the Eager Formation, which include argillites and limy argillites, are intruded by coarse crystalline granite to granodiorite. Where it crops out, the intrusive is cut by networked quartz veins which contain galena, pyrite, molybdenite and chalcopyrite (see Assessment Report 26971).

Polymetallic Projects

BOUNDARY DISTRICT

Golden Dawn Minerals Inc continued to assess its **Boundary Falls** gold-silver-lead-zinc property (MINFILE 082ESE171 and 045), 4.5 km southwest of Greenwood. Along with the Wild Rose property (see Gold projects, above), which is adjacent to the north, Boundary Falls is part of Golden Dawn's **Greenwood** Project. The Boundary Falls property includes the Skomac Mine past producer (also known as the May Mac Mine) and is host to a 120 t/day mill referred to as the "Roberts Mill".

On the Boundary Falls property a quartz vein system trends northwest, subparallel to the fault contact between Permo-Carboniferous Attwood Group argillite and shale and metamorphosed Triassic diorite. Veins average about 0.9 m in width, but swell to 1.8 m locally. They are hosted within a thinly-bedded, carbonaceous, sheared argillaceous zone. The shear zone varies between 3 and 4 m in width. Mineralization consists of pyrite, galena, sphalerite, chalcopyrite, accessory tetrahedrite and some native silver. The favourable belt appears to extend over one kilometre in length and has a width of 200 m. Intermittent production from this property took place between 1903 and 1983 on the upper and lower Skomac veins. Average grades were 5.19 g/t Au, 238 g/t Ag, 1.64% Pb and 1.00% Zn.

A letter of intent with Lichtfield del Peru SAC was signed in September 2011, whereby Lichtfield may earn a 50 per cent interest in the Boundary Falls property. This arrangement will facilitate underground exploration, including a potential bulk sample, and development.

Molycor Gold Corp drilled its **Beaverdell Silver** polymetallic property, 4 km south of Beaverdell. The property is roughly 1.5 km southwest of the past-producing Beaverdell Mine (MINFILE 082ESW030), and includes several small past producers including the Wellington (082ESW072), Duncan (082ESW032) and Tiger (082ESW067). Production from the Wellington averaged 6456 g/t Ag, 9.0% Zn and 6.0% Pb.

Vein-type mineralization of the Beaverdell Camp in general is characterized by a high silver content. Mineralization is composed of galena, sphalerite and pyrite with lesser amounts of arsenopyrite, tetrahedrite, pyrrargyrite, chalcopyrite, polybasite, acanthite, native

silver and pyrrhotite. Five separate quartz vein systems are arranged roughly *en echelon* in the belt. Westkettle granodiorite (middle Jurassic) and Beaverdell quartz monzonite (Eocene) are the dominant hostrocks.

Molycor drilled both the Duncan-Bounty and North Kokomo-Tiger zones in 2011. The objective was to intersect extensions of known silver-lead-zinc-copper-gold mineralization to a depth of 200 m. Sulphide-bearing quartz veins in the Duncan-Bounty and Kokomo-Tiger zones on the property range from 0.1 to 3.0 m in thickness. There appear to be at least three separate vein systems in the Kokomo-Tiger zone. The overall length of the Duncan Bounty veins has been demonstrated to exceed 1000 m.

WEST KOOTENAYS

Huakan International Mining Inc carried out underground drilling at the **J&L** gold-silver-zinc-lead property, 35 km north of Revelstoke. The polymetallic mineral zones at the J&L (MINFILE 082M 003) are stratabound, massive sulphide-bearing units. Mineralization of the Main zone is believed to represent shear-hosted replacement overprinting a SEDEX deposit. Stratabound zinc-lead-silver mineralization observed in the overlying Yellowjacket zone may be a remnant of original SEDEX deposition.

The property lies near the north end of the Kootenay Arc. Mineralization is hosted by the late Proterozoic to early Cambrian Hamill Group metasedimentary rocks, and occurs in two significant zones, one of which, the Main zone, is described as a stratiform, structurally-controlled precious metal and polymetallic-base metal massive sulphide deposit. The Main zone averages 2.5 m in thickness and has been exposed over 850 m along strike in underground drifting. Previous underground drilling has defined the zone over a 1.2 km strike length, while on surface it has been traced for a total of 1.6 km. It has been traced down-dip for 800 m. The subparallel Yellowjacket zone is a siliceous zinc-lead-silver stratabound zone in the immediate hangingwall of the Main zone.

A major underground drilling campaign over the winter of 2010/2011 (Phase 1) totalled 7900 m. Results included 8.47 g/t Au, 48.17 g/t Ag, 1.65% Pb and 5.76% Zn over 2.49 m (2.16 m estimated true thickness, drill hole MM11-51). It was focused on the Main zone, for which a new NI 43-101 resource estimate was derived in 2011. This includes 2.368 Mt measured plus indicated resource grading 6.81 g/t Au, 67.8 g/t Ag, 2.16% Pb and 2.99% Zn. Late in the year work had begun to extend the underground drift by 450 m, in preparation for another campaign of underground drilling over the winter months (Phase 2).

Mineral Mountain Resources Ltd continued to evaluate a series of gold-bearing polymetallic properties in the Selkirk Mountains approximately 65 km southeast of Revelstoke known collectively as the **Kootenay Arc**

Project. The properties are in general underlain by metasedimentary and volcanic rocks of the Paleozoic Lardeau Group. This area is known for polymetallic vein occurrences, but potential for sediment-hosted types of mineralization is also being investigated.

Based on a large geochemical sampling program in 2010, the properties with the four highest priority gold and silver anomalies were the focus in 2011 of follow-up airborne geophysics, geochemical sampling, and geological mapping. These were the Black Warrior (MINFILE 082KNW110), Butte Bonanza (082KNW095 and 112), Pulley Creek and Spine Mountain properties. In addition, diamond drilling was carried out on the Black Warrior and Butte Bonanza properties.

The **Black Warrior** is 18 km northeast of the community of Trout Lake. The property contains a series of polymetallic showings which are proximal to the vertically dipping Black Warrior limestone, and are part of an 8 km-long trend over which sulphide-bearing veins occur at the contact between the limestone and a graphitic argillite unit. At the main Black Warrior occurrence there are intersecting vertical and horizontal veins containing massive galena and some chalcopyrite and sphalerite, with variable amounts of gold and silver. The occurrence is centered on a near-vertical mineralized quartz vein that ranges from 0.6 to 2.4 m in thickness. Drilling results included 1.0 g/t Au, 47.0 g/t Ag and 1.33% Zn over 1 m (drill hole BW 11001).

At the **Butte Bonanza** property, 20 km southeast of Trout Lake, vertically dipping phyllites and argillites are crosscut by stacked faults which are host to gold and silver-bearing quartz-carbonate vein sets. The property is being investigated for its Carlin-style mineralization potential. A 950 m-long gold-silver-arsenic geochemical anomaly is attracting further attention, including the 2011 drilling program. Results included 0.9 g/t Au and 14.1 g/t Ag over 3.44 m (drill hole BB11011).

At the **Klovance** polymetallic property (Figure 13), 11 km northwest of Salmo, Swift Resources undertook an initial drilling program. The property is part of the company's **Castlegar** Project, which includes the Amazing Grace (also drilled in 2011) and Skarn properties.

The Klovance property encompasses the contact zone of the Bonnington pluton (mid Jurassic Nelson suite) and Jurassic Rossland Group volcanic and sedimentary rocks; Cretaceous intrusives also occur in the general area.

Trenching has now exposed a zone of shear-hosted polymetallic mineralization intermittently over a strike length of 400m. The zone ranges from less than a metre to more than 4 m, and it contains narrow veins and veinlets of massive to semi-massive sulphide mineralization.



Figure 13. Old workings on the Klovance property (Swift Resources Inc).

EAST KOOTENAYS

Silver Mountain Mines Inc drilled the **Ptarmigan** polymetallic property, 27 km west of Invermere in the Purcell Mountains, in 2011. The property includes the past-producing Ptarmigan (MINFILE 082KSE030) and Iron Cap (082KSE036) occurrences. Mineralization occurs in veins or in massive sulphide replacements in carbonates, and generally consists of pyrite, galena, sphalerite and tetrahedrite.

The Ptarmigan Mine itself consisted of a series of adits driven along the fault contact between Windermere Supergroup strata to the east and the upper Purcell Supergroup strata to the west. Mineralization is situated stratigraphically below the Windermere unconformity, in other words within strata of the Purcell Supergroup. Selective mining of the Ptarmigan yielded over 4000 g/t Ag, 5.4 g/t Au, 0.6% Cu and 0.5% Zn.

The goal of the 2011 drilling campaign was to determine the size and potential of the Ptarmigan-Iron Cap Basin, and to continue to explore and carry out work on new discoveries. The program targets included the Upper Ptarmigan massive sulphide trend and the Iron Cap lead-silver trend. The Upper Ptarmigan is located about 300 m from the original Ptarmigan Mine. Observed textures reflect extensive massive sulphide comparable to manto-style carbonate replacement deposits. Drilling

results in 2011 included 6.4 m grading 0.36 g/t Au, 95.5 g/t Ag and 3.70% Pb (hole PT11-37).

Kingsman Resources Inc's **International Basin** polymetallic property (MINFILE 082KNW094) is located about 35 km southwest of Golden in the Purcell Mountains at the headwaters of Bobbie Burns Creek. Mineralized quartz veins, with or without Fe-carbonate, occur within a northwest-trending structural corridor which extends at least 3.5 km (Figure 14). This corridor is marked by variable and locally intense alteration (quartz, sericite, Fe-carbonate and pyrite) and coincides with the axis of an anticlinal fold system. Mineralization consists mainly of galena and pyrite, with minor tetrahedrite, chalcopyrite and sphalerite. Gold is associated with pyrite. A sheeted vein model has also been proposed for the property.

The area is underlain by northwest trending metasediments of the Upper Proterozoic Horsethief Creek Group (Windermere Supergroup). Rock types include greenish grey chloritic schists, dark slaty schists, quartzites, slates and conglomerates.

The objective of the 2011 helicopter-supported drill program was to test lateral and downdip continuity of some of the mineralized veins and vein systems. Results included 8.71 g/t Au over 0.5 m (BB11-01) and 265 g/t Ag over 1.25 m (drill hole BB11-03).

East Kootenay Coalfields Projects

As indicated previously, the Elk Valley coal mines of Teck Coal Limited are involved in programs to outline new coal resources and reserves, as either expansions or replacements of current operations. All are in areas with potential for open-pit mining, and represent potential sources of metallurgical coal. Swift Project and Cougar North Extension are in the Elk Valley Coalfield, while Marten-Wheeler is in the Crowsnest Coalfield.

The Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group averages 500 to 550 m in thickness in the Elk Valley and Crowsnest coalfields, and at almost any location includes several coal seams of potentially mineable thicknesses. The coals are typically medium-volatile bituminous in rank, with some high volatile-A bituminous coals near the top of the section. At a few locations, low-volatile bituminous coals occur near the base of the section.

Exploration drilling at Fording River Operations was carried out at the **Swift Project, Swift RX2 and Henretta Phase 4** areas. The Swift Project is west of the Fording River and adjacent to current workings and mine facilities (Figure 15). Swift represents the next major potential future expansion area for Fording River Operations, as a replacement for the Eagle Mountain pits. The objective of the large drilling 2011 program (21 741 m) in the Swift



Figure 14. Mineralized quartz vein on the International Basin property (Kingsman Resources Inc).



Figure 15. Rotary drilling on the Swift Project, Fording River Operations (Teck Coal Limited).

phases 1 and 2 areas was to improve resource and reserve confidence levels.

The Swift Project is in the North Greenhills Range (MINFILE 082JSE010), and represents both previously mined and unmined zones in the Greenhills portion of the Fording River property. It is along strike to the north from Teck's Greenhills Operations. 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 Swift Project entered the Environmental Assessment Process in 2011 and is currently in the pre-application stage.

At Greenhills Operations rotary and diamond drilling was carried out in the **Cougar North Extension area** (Figure 16), north of the existing operations and immediately adjacent to the Swift Project exploration area of Fording River Operations described above. This site is a proposed expansion area for the Greenhills Operations. As with the Greenhills Mine as a whole, the exploration project area is part of the Greenhills Range and is underlain by the Greenhills Syncline. 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.

Teck Coal continued to assess sites within the general Elkview Operations area immediately east of Sparwood. These included the Baldy Ridge (proposed BR-2 Pit), Natal Ridge (Natal Phase 2) and Adit Ridge areas. Coal seams from the lower half of the stratigraphic section, especially the 10-seam or Balmer seam, are the targets at B-2 and Adit Ridge, while Natal Phase 2 encompasses coal seams from throughout the section.

The BR-2 Pit Project received its approval and permits in December.

Teck Coal also continued to assess the potential of the **Marten-Wheeler** property (MINFILE 082GNE006 & 7), roughly 19 km northeast of Fernie and immediately south of Parcel 73 of the Dominion Coal Block (082GNE008). This site represents a possible future expansion area for Coal Mountain Operations, although it is approximately 18 km distant and is not contiguous geographically or geologically. It encompasses Marten, Wheeler and Hosmer ridges in the western part of the the Crowsnest Coalfield. Although potentially hard coking

coal products, coals in the Marten-Wheeler area tend to be of somewhat higher volatile-matter content (lower rank) than current typical products from most of from Teck's mines. A major rotary drilling program was carried out in 2011 (Figure 17).

Crows Nest Pass Coal Mining Ltd carried out a rotary and partial core drilling program on its **Coal Creek** property, 8 km east of Fernie (Figures 18 and 19). The Mist Mountain Formation on the property is overlain by younger Kootenay Group and Blairmore Group strata, and occurs mainly at depth. Coal seams at Coal Creek are on the west limb of the Fernie Basin in the Crowsnest Coalfield. Individual seams are down-dip extensions of coal seams which were accessed from their surface outcrops at the underground Coal Creek Colliery, which closed in 1958. The company is targeting three seams in the uppermost part of the Mist Mountain Formation (B, 10 and 9), and is evaluating underground room-and-pillar mining potential.

Centremount Coal Ltd followed up on its large 2010 diamond and rotary-drilling program on the **Bingay Creek** property with a smaller drilling program in 2011. Bingay Creek (MINFILE 082JSE011) is 20 km north of Elkford on the floor of the Elk Valley, within the Elk Valley Coalfield. The Mist Mountain Formation at Bingay Creek is preserved in the Bingay Creek Syncline, a tight, overturned syncline in the immediate footwall of the west-dipping Bourgeau thrust fault.

Industrial Minerals Projects

West High Yield (WHY) Resources Ltd carried out diamond drilling on its **Record Ridge Magnesium Project** (MINFILE 082FSW214) 3.5 km west of Rosland. Host rocks at the site are variably serpentinized and locally carbonatized ultramafic cumulates, most likely belonging to the Slide Mountain Terrane. This



Figure 16. Rotary drilling on Cougar North Extension, Greenhills Operations (Teck Coal Limited). Photo courtesy of Chris Lane.



Figure 17. Rotary drilling on the Marten-Wheeler Project (Teck Coal Limited).



Figure 18. Rotary drilling on the Coal Creek Project (Crowsnest Pass Coal Mining Ltd).



Figure 19. Geologist Gordon Shewchuk examining drill core on the Coal Creek Project (Crowsnest Pass Coal Mining Ltd).

close-spaced drilling program was designed to upgrade the resource estimate, as well as to provide geotechnical information for a preliminary economic assessment. A measured-plus-indicated resource of 39.8 Mt grading 23.1% Mg at a 12% cut-off was estimated previously. There is also a second, larger ultramafic body in the area. The company is also interested in the Ni, Cr and Co potential of the ultramafics.

Record Ridge is within the company's overall **Rossland** Project area, which includes the the **Midnight, OK** and **IXL** properties (MINFILE 082FSW119, 116 and 117), all gold past producers. Gold mineralization is associated with ultramafic contacts and a regional tectonic boundary, and consists of gold-bearing quartz-carbonate veins, in contrast to the more typical Rossland-style sulphide-rich veins.

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