

NORTHEAST-CENTRAL REGION

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SUMMARY

Mineral exploration activity in the Northeast-Central region increased marginally in 2001. Exploration expenditures were up by approximately \$0.8 million to an estimated \$7.2 million and the amount of diamond drilling jumped by roughly 13 000 metres to 49 900 metres. The number of major exploration projects increased from 12 to 14. Large drill programs at several porphyry copper-gold prospects generated very encouraging assay results and led to the expansion of mineral resources at the Kemess North deposit and reserves at the Springer zone at the Mount Polley mine. Activity in the Peace River coalfields was up considerably over last year. There was one development project, Willow Creek, and five exploration projects where significant rotary and core drilling took place.

The year 2001 was a turbulent one for mining companies. Depressed metal prices resulted in closure of the Mount Polley copper-gold mine. However, the Kemess gold-copper mine continued to improve its operating efficiency by increasing both throughput and metal recoveries. There was a revival in the coal mining sector province-wide because of the recovery in world coal markets. The Bullmoose metallurgical coal mine benefited from the improved prices and was on pace for record production.

METAL MINES

KEMESS

Northgate Exploration Ltd. owns and operates the large **Kemess** open-pit gold-copper mine located 300 km northwest of Mackenzie. The 50 000 tonne per day operation is in its third full year of production. Total 2001 production is approximately 277 000 ounces gold and 66.3 million pounds copper, both well above levels recorded for the same period in 2000. The average milling rate rose sharply to over 42 000 tonnes per day. Improvements in mill metallurgy, mill availability and throughput have resulted in increased metal recoveries and production. Mining takes place from a single open-pit developed on the Kemess South ore body, a porphyry deposit with proven reserves of 146 million tonnes grading 0.653 g/t Au and 0.235% Cu (as of December 31, 2000). During 2001, Northgate continued its program of operational improvements at the Kemess mine. Capital expenditures of \$4.4 million were made to complete repairs to both of the large ball mills and to install a back-up power transformer.

In 2001, Northgate conducted a 16-hole, 8220-metre drilling campaign on the Kemess North porphyry gold-copper prospect (Photograph 1). The Kemess North deposit, located 6 km north of the Kemess South orebody, is marked by a large gossan that occurs over a 3.5 km east-west strike length. Drilling by previous workers focused on the near-surface potential of the deposit, but deeper drilling by Northgate identified higher grade mineralization over broad intervals. Some of the more impressive drill assay results are: 177.8 metres averaging 1.249 g/t Au and 0.51% Cu in hole KN-01-10, and 248.0 metres averaging 0.91 g/t Au and 0.40% Cu in hole KN-01-11. The drill results led to an expansion of the inferred mineral resource for the zone to 442 million tonnes grading 0.40 g/t Au and 0.23% Cu (using a cut-off grade of 0.6 g/t Au-equivalent). A higher-grade core, estimated to contain 170 million tonnes grading 0.50 g/t Au and 0.29% Cu (using a cut-off grade of 0.80 g/t gold-equivalent), exists within the larger resource.

The Kemess North deposit is characterized by a core zone of intense silicification with well-developed pyrite-chalcopyrite-magnetite stockworks, dilational or 'crackle' breccias and true breccias. The silica-flooded zones carry the highest grades of copper and gold mineralization encountered to date. They mainly occur within one or more sill-like monzodiorite intrusions and enclosing basaltic flows of the Late Triassic Takla Group.



Photo 1. Looking southeast toward the Douglas Pass and East Cirque areas. Six holes were drilled in the East Cirque bowl area during the second phase of exploration. All 2001 drilling was helicopter-supported.

The quartz-rich core zone grades outward to a silica-sericite zone, a hybrid silica-potassic zone, where biotite > potassic-feldspar, and peripheral argillic and propylitic zones. No supergene enrichment has been recognized. The geometry of the deposit is not fully understood, but the ore zone has a gentle northeast dip in the Central Cirque and Douglas Pass areas, and a northwest trending post-mineral fault running up the East Cirque truncates the deposit. The little-tested Kemess East geochemical anomaly is located on the east side of this structure, some 600 metres to the southeast, and may be a faulted offset of the Kemess North deposit. An expanded drill program is planned for 2002.

MOUNT POLLEY

Due to low metal prices, operations at the **Mount Polley** open-pit copper-gold mine, owned by Imperial Metals Corporation, ceased on October 13, 2001. The mine is located 8 km southwest of Likely and is currently on 'care-and-maintenance' status. There are currently about 8 workers on site compared to a workforce of 240 when the mine was in operation. Mount Polley opened in the fall of 1997, and since start-up has produced approximately 370,700 ounces of gold and 133.9 million pounds of copper from milling 27.7 million tonnes of ore.

Reserves in the Cariboo pit (Photograph 2) were exhausted during 2001, but some reserves remain in the Bell pit. The Springer zone, which has not yet been developed, has been stripped in preparation for mining. Proven reserves at the cessation of mining in October 2001, totaled 31.9 million tonnes grading 0.34 g/t Au and 0.357% Cu.

During the year the company conducted a very aggressive exploration program that was successful in outlining a new zone called the Springer North Extension (SNX). The SNX zone is a 230-metre long, north-northwest trending tabular body that may connect to the Springer zone to the south. It is 50 to 80 metres wide and extends at least 100 metres down dip. The SNX zone is comprised of intrusion breccia associated with albitic, potassic and silicic alteration. The breccia contains very fine-grained dissemina-



Photo 2. Reserves at the Cariboo pit, shown here, are exhausted. Development of the Bell pit was well under way when the mine closed.

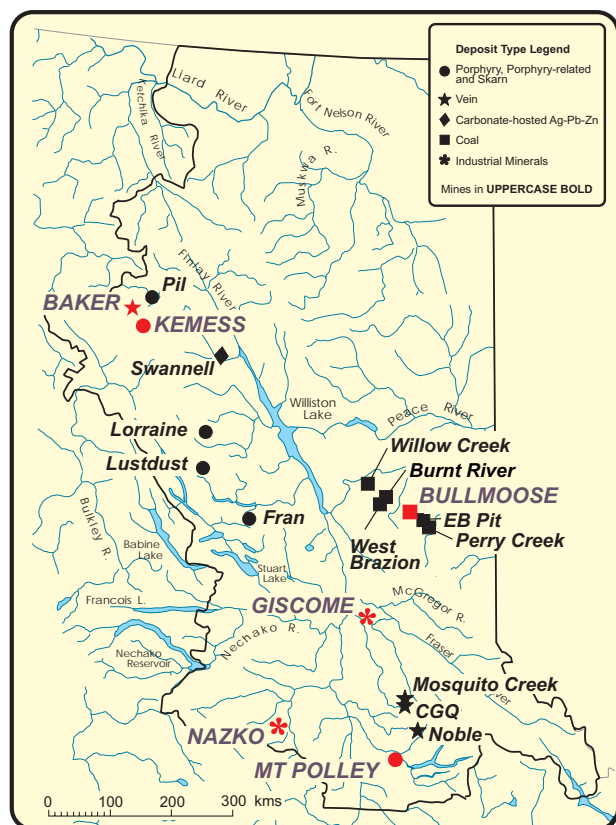


Figure 1. Operating mines and major exploration projects, north-east-central British Columbia - 2001.

tions of chalcopyrite and pyrite. Magnetite and actinolite commonly accompany the sulphides.

The company also undertook exploration drilling on the southern margin of the Cariboo pit, on the Southeast zone (discovered in 2000), in the Bell pit, and in the Springer zone area. An 80 000 tonne bulk sample of oxide material was collected from the Springer zone and evaluated for its metallurgy and milling characteristics.

BAKER

Sable Resources Ltd. mined and milled approximately 1300 tonnes of mineralized material from two zones at its **Baker** gold-silver mine located about 40 km north of the Kemess mine in the Toadogone camp. The ore was mined from surface on the A vein and from an open cut on the B vein. It had an average head grade of less than 44 g/t Au-equivalent. Dore bars were produced from A vein ore and concentrate was generated from the more sulphide-rich B vein ore. Several lines of IP were run over projected extensions of the A and B vein systems and identified several resistivity anomalies. Six diamond drill holes tested the most promising resistivity anomaly, the TD zone, and intersected a massive quartz-calcite-pyrite vein up to 12 metres wide. While assay results were disappointing, only a portion of the vein was evaluated and drilling will continue in 2002.

COAL MINES

BULLMOOSE

The Bullmoose mine, owned by partners Teck-Cominco (61%), Billiton (29%) and Nissho Iwai (10%), was the only major operating coal mine in the region in 2001. It is located near the town of Tumbler Ridge. It produces medium-volatile bituminous coal from the Gates Formation within the South Fork pit. Production in 2001 increased substantially over last year's level to an estimated 2.1 million tonnes of clean metallurgical coal. Most of the coal produced was sent to Japan to fulfill contract obligations, however, improved coal markets led to several lucrative spot sales. The increased level of production will mean a slightly earlier date of closure, likely in the first quarter of 2003.

Several changes in the mine plan, including a reduction in the strip ratio to 14.7 from 17.4 tonnes of waste per tonne of coal, greatly enhanced the economics of the operation. The current workforce of approximately 250 will gradually be reduced as the operation nears its date of closure. Development of the West Fork pit, which contains 10 to 20 million tonnes of metallurgical and thermal coal, is not expected to proceed.

INDUSTRIAL MINERAL MINES

Canada Pumice Corporation produced 19 000 cubic metres of screened and sized lava from its **Nazko** quarry west of Quesnel. Approximately 11 500 cubic metres was shipped from the site to buyers based mainly in the north-west US and western Canada. The company is continuing to broaden its market base by developing new applications for its products, such as 'green-roof' applications, and by strengthening its existing geotechnical, agricultural and horticultural markets.

In the Prince George area, approximately 300 000 tonnes of railroad ballast were produced from Canadian Pacific Railway's (CPR) **Giscome** basalt quarry and about 200 000 tonnes were produced from British Columbia Railway's (BCR) **Ahbau** basalt quarry.

The region's two limestone quarries, at **Giscome** and **Dahl Lake**, were relatively quiet in 2001 producing minor amounts of crushed limestone for use in local pulp mills and irregular blocks for use in landscaping.

On Highway 16, east of Prince George, Dome Creek Structural Slate Co. drilled, blasted and shipped a limited tonnage of attractive green slate from its **Dome Creek** deposit to markets in Alberta and the Lower Mainland. It is being marketed mainly as a flagstone-type of product.

EXPLORATION TRENDS

Approximately \$7.2 million was spent on exploration in the region in 2001 (Figure 2). Figure 3 shows exploration spending (in percent) by deposit type. Exploration drilling increased to 49 900 metres in 2001, up more than 13 000 metres from last year (Figure 4). Approximately 16 100 metres of this total fits into the deposit appraisal category and the remaining 33 800 metres is considered to be exploration drilling (advanced and early-stage). The total number of Notice of Work (NoW) applications received for projects in the region was down slightly from last year (Table 2). This was due primarily to the relatively subdued level of placer activity. There were fourteen major exploration projects (those that involved mechanical disturbance, usually

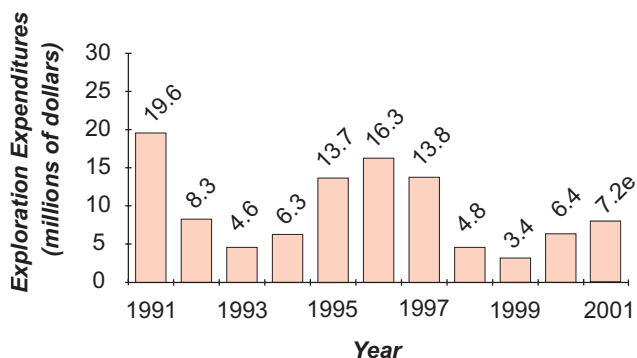


Figure 2. Annual Exploration Expenditures, Northeast-Central Region.

TABLE 1
2001 MINE PRODUCTION AND RESERVES, NORTHEAST-CENTRAL REGION

Mine (Operator)	Employment	Production (approx.)	Reserves (Jan. 1, 2001)
Kemess (Northgate Exploration Ltd.)	440	8615 kg (275 000 oz) Au, 30 000 tonnes (66.3 million lbs) Cu	146 million tonnes grading 0.653 g/t Au and 0.235% Cu
Mount Polley (Imperial Metals Corp.)	240	2070 kg (66 600 oz) Au, 13 600 tonnes (30 million lbs) Cu	32 million tonnes grading 0.357% Cu and 0.34 g/t Au (when the mine closed Oct 13/01)
Baker (Sable Resources Ltd.)	10	1270 tonnes mined with head grade of approx. 44 g/t Au-equivalent	N/A
Bullmoose (Teck-Cominco)	240	2.1 million tonnes of metallurgical coal	Production to continue at 1.7 million tonnes/ year until early 2003
Nazko (Canada Pumice Corp.)	4	19 000 m ³ tephra	44 million tonnes

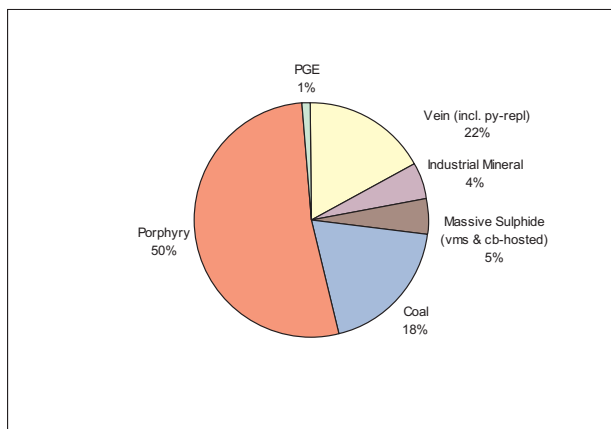


Figure 3. Exploration targets expressed as a percentage of total 2001 expenditures (estimated to be \$7.2 million) in the Northeast-Central Region.

diamond drilling and/or trenching, and expenditures in excess of \$100 000, two more than in 2000 (Table 3). However, depressed copper and gold prices resulted in several projects being deferred or cancelled (examples are: Gibraltar, Sustut Copper and Pine). Overall, 2001 activity resulted in several excellent exploration successes.

Porphyry copper systems, and in particular those with potential for significant gold enrichment, continue to be the most sought after targets in the region, accounting for more than half of the total exploration spending. Five of the fourteen major projects, including Kemess North, Lorraine, Lustdust, Fran and Mount Polley, focused on gold-enriched porphyry systems and/or related skarn mineralization. Each project generated encouraging drill assay results. They are reviewed in the Exploration Summary section.

There was a 10-fold increase in exploration spending, to about \$1.25 million, on metallurgical and thermal coal projects in the Peace River coalfields in 2001 compared to 2000. This increase stemmed from a sudden turn-around in world coal markets and coincided with a re-assessment of the coalbed methane potential of the northeast. The five major coal projects were Burnt River, West Brazion, EB, Perry Creek and Willow Creek. The latter project also included extraction of a bulk sample, or trial cargo, that was sent abroad for test marketing.

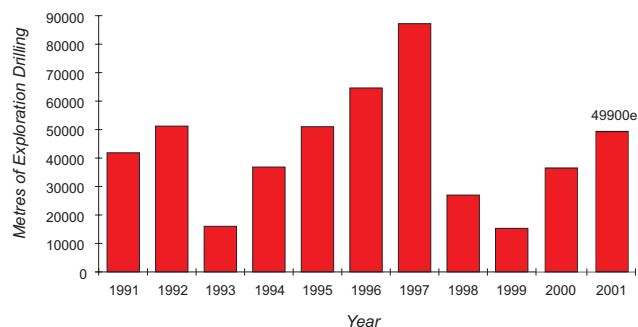


Figure 4. Annual Exploration Drilling, Northeast-Central Region.

EXPLORATION SUMMARY

GATAGA / KECHIKA TROUGH

The Sedex lead-zinc-silver belt was not active during 2001.

TOODOGGONE CAMP

With the exception of the major drill program at Kemess North, exploration activity in the Toodoggone region was limited in 2001. However, there were a number of small programs targeting either epithermal gold-silver vein systems or porphyry copper-gold prospects.

Finlay Minerals Ltd. conducted a multi-disciplinary reconnaissance-style program, consisting of line-cutting, Induced Polarization (IP) and magnetometer surveys, soil geochemistry and prospecting, on their **Pil** porphyry copper-gold property. The property is centered approximately 35 km north of the Kemess mine and is host to numerous copper and/or gold geochemical anomalies and showings, many of which coincide with IP chargeability and magnetic highs. The 2001 program focused on the Pil North area of the property, where intermediate volcanic rocks of the Lower Jurassic Toodoggone formation are in contact with conspicuous, rusty-weathering quartz monzonitic to syenitic phases of the Early Jurassic Black Lake intrusive suite. Limited infill geochemical sampling was also con-

TABLE 2
NOTICE OF WORK (NOW) SUBMITTALS FOR PROJECTS IN THE
NORTHEAST-CENTRAL REGION

Type of NoW	Year						
	1995	1996	1997	1998	1999	2000	2001
Mineral	221	184	164	115	86	112	109
Placer	498	440	415	403	393	422	397
Coal	3	4	5	5	2	1	9
Other	67	58	57	56	42	33	34
Total NoW	789	686	641	579	523	568	549

TABLE 3
MAJOR EXPLORATION PROJECTS, NORTHEAST-CENTRAL REGION

Property (Owner)	MINFILE	NTS	Commodity	Deposit Type	Work Done
Bonanza Ledge (International Wayside Gold Mines Ltd.)	093H 019	93H/4E	Au	replacement(?), mesothermal vein	22ddh, 5156 m; IP, SP, prosp
Burnt River (Western Canadian Coal Corp.)	093P 007-008	93P/5W	coal	sedimentary	14 rdh, 900 m; spot coring
Fran (Navasota Resources Ltd.)	-	93N/1W	Au, Cu	porphyry	5 ddh, 993 m; geol, geochem
Ingenika/Swannell (Cross Lake Minerals Ltd.)	094C 002	94C/11E	Ag, Pb, Zn	manto, carbonate-hosted	3 ddh, 401m; geochem
Kemess North (Northgate Exploration Ltd.)	094E 021	94E/2	Au, Cu	porphyry	16 ddh, 8220 m;
Lorraine (Eastfield Resouces Ltd.)	093N 002	93N/14W	Au, Cu, PGE	magmatic-porphyry	13 ddh, 2508 m;
Lustdust (Alpha Gold Corp.)	093N 009	93N/11W	Au, Ag, Zn, Cu, Pb	skarn, manto, porphyry	18 ddh, 5609 m; geol
Mosquito Creek Gold (Island Mountain Gold Mines Ltd.)	093H 010	93H/4E	Au	pyrite replacement	7 ddh, 1224 m; prosp; geochem; IP
Mount Polley (Imperial Metals Corporation)	093A 008	93A/12E	Au, Cu	porphyry	41 ddh, 6696 m; 170 pdh, 9421m; geol
Noble (Noble Metal Group Inc.)	-	93A/13E	Au	placer, lode	12 pdh, geol
EB (Western Canadian Coal Corp.)	093P 015	93P/3W	coal	sedimentary	20 rdh, 1800 m; spot coring
Perry Creek (Western Canadian Coal Corp.)	093P 015	93P/3W	coal	sedimentary	16 rdh, 2000 m; spot coring
West Brazion (Western Canadian Coal Corp.)	093P 006	93P/5W	coal	sedimentary	8 rdh, 700 m; spot coring
Willow Creek (Pine Valley Coal Ltd.)	093O 008	93O/9E	coal	sedimentary	26 rdh, 1950 m; spot coring; 40,000 tonne trial cargo

ducted in the Pil South area. The Lorne showing at Pil South consists of silicified and fracture-controlled pyrite-chalcopyrite in chloritic augite-phyric volcanics. A one-metre chip sample from the showing assayed 0.928% Cu. The zone is several tens of metres across, sits on the edge of a significant IP anomaly, and is part of a north-west-trending structure whose dimensions are unknown.

Canasil Resources Inc. conducted a modest program of prospecting and geochemistry on its **Brenda** porphyry copper gold property immediately west of the Pil property. The White Pass zone area is marked by intense alunite alteration. Past trenching and drilling have produced impressive gold-copper assays.

A limited program of sampling and geological mapping was conducted by Guardsmen Resources Ltd. on a geophysical anomaly that lies between the Cliff Creek zone, part of the former **Lawyers** mine, and the **Silver Pond** prospect. Guardsmen confirmed the presence of 'bonanza-grade' epithermal gold mineralization and will re-visit the property in 2002.

OMINECA MOUNTAINS

The **Lorraine** copper-gold property of Eastfield Resources Ltd., is located in the Swannell Ranges of the Omineca Mountains about 190 km northwest of Fort St. James. The property is under option from Lysander Resources Ltd. and covers 240 square km that is underlain mostly by alkalic rocks of the Early Jurassic Hogem batholith. Sulphide mineralization at Lorraine consists of both net-textured magmatic and disseminated to stockwork porphyry zones. A series of northwest-trending mineralized panels, including the Bishop, Upper Main (Photograph 3) and Lower Main zones, were drilled during the company's 13-hole, 2500-metre diamond drilling program. The most encouraging assays came from holes drilled on the Bishop and Lower Main zones. Hole 2001-58 intersected two mineralized intervals in the Bishop zone, the lower one averaged 0.59% Cu and 0.11 g/t Au over 69.8 metres. Hole 2001-60, drilled just south of the Lower Main zone, intersected 113.2 metres grading 0.76% Cu and 0.49 g/t Au. Both zones are still open to the south; they may connect along strike and could coalesce at depth. The present geo-

logical resource estimate for the property is 32 million tonnes grading 0.66% Cu, 0.17 g/t Au and 4.7 g/t Ag. Drilling is expected to continue at Lorraine in 2002.

The **Fran** property, located 70 km northeast of Fort St. James, was drilled by Navasota Resources Ltd. The property hosts several gold-bearing sulphide vein/shear showings that were discovered by Richard Haslinger in 1997. He optioned the claims to Cassidy Gold Corp. early in 2001. Navasota is earning a majority interest in the property from Cassidy through its work program. The 5-hole, 992-metre diamond drilling program was designed to test for gold-bearing porphyry mineralization related to shear/vein zones. Underlying rocks are fine-grained volcanic sediments and cherty argillites of the Upper Triassic Takla Group (Inzana Lake succession) and granodiorite of the Lower Jurassic Kalder pluton. Drilling is taking place in the area between the 'Upper' and 'Lower' showings within a 1500 metre long northwest-trending gold geochemical anomaly. Grab samples from the Lower showing graded more than 40 g/t Au. Mineralization occurs in both the intrusive and hornfelsed sedimentary rocks and consists of polymetallic quartz veins and sulphide stockwork zones. The most encouraging result was a 16-metre intersection from hole FR-002 that averaged 2.01 g/t Au (with traces of copper). The company is planning to return to the property early in 2002 for follow-up drilling.

The 40-unit **Duncan** property covers a series of high-grade copper veins and shears hosted by Early Jurassic alkalic intrusive rocks of the Hogem batholith. It is located immediately south of the Lorraine property and south of the Omineca River. The showings were discovered and staked in 2001 by prospector Richard Haslinger.

The **Lustdust** polymetallic prospect of Alpha Gold Corp., located 210 km north-northwest of Prince George, was the target of another aggressive diamond drilling campaign in 2001. The property lies immediately west of the Pinchi fault. It is underlain by deformed sedimentary rocks of the Permian Cache Creek Group that have been intruded and altered by a monzonitic stock and a series of feldspar megacrystic dikes and sills. Age dating has shown that the stock is Eocene (Ray *et al*, 2002), like the productive Babine porphyry suite to the west. Auriferous, polymetallic



Photo 3. Project geologist Jay Page standing on the Upper Main zone, Lorraine property.

vein, manto, skarn and porphyry-style mineralization occur over a strike length of 2.5 km.

The company drilled 18 holes for an aggregate length of approximately 5600 metres. Many of the drill-holes tested magnetic anomalies on the north side of Canyon Creek, where porphyry-style alteration and mineralization had been previously identified. The company intersected fracture-controlled molybdenite with pyrite and traces of chalcopyrite within monzonite with weak potassic alteration, but grades were generally low. Other holes targeted auriferous skarn mineralization and produced some very encouraging results, including a 59-metre intersection in hole DDH-44 that averaged 0.67 g/t Au and 0.8% Cu. Drilling in 2002 is expected to focus on the gold-bearing skarn mineralization in the vicinity of Canyon Creek.

Cross Lake Minerals Ltd. completed 3 drill holes totaling 401 metres on its **Swannell** lead-zinc-silver property, located 100 km north-northwest of Germansen Landing. The holes intersected narrow (1.0 to 4.5-metre) intervals of sphalerite-galena-pyrite mineralization within silicified Cambrian dolostone. Assays ranged from 4.5% to 10.8% combined Pb-Zn with up to 28.2 g/t Ag. The company also completed a soil survey over part of the Swannell property and the adjoining Pb-Zn-Ag **Ingenika** property, which lies immediately to the north. Several multi-element anomalies were identified and additional follow-up work is being considered for next field season.

Cross Lake Minerals also drilled 2 holes totaling 146 metres on their **End Lake** carbonate-hosted lead-zinc-silver property, located 48 km north-northwest of Germansen Landing. Drilling took place near two old adits that were driven to evaluate sphalerite-galena-pyrite mineralization in altered Cambrian limestone. Low assay results will result in a thorough review of the property before any further work is conducted.

ROCKY MOUNTAIN FOOTHILLS/ PEACE RIVER COALFIELDS

The exploration boom in the Peace River coalfields during the 1970's and 1980's led to discovery of a number of large coal deposits. Most of the deposits were not developed due to a combination of weak markets and lack of necessary infrastructure (*e.g.* roads, rail and power). Many deposits in the Peace River Coalfields host high quality coking coal that wash well to a low ash content (6-8%), have low sulphur and moderate/low phosphorous contents, and have fluidity characteristics similar to coals from the Quintette and Bullmoose deposits. Other deposits contain coal suitable for Pulverized Coal Injection (PCI), a partial replacement for coke in the steel making process.

There are eleven deposits in the Peace River coalfields with development potential. They are: Saxon, Belcourt, Monkman, EB North, Perry Creek, Sukunka, Burnt River, West Brazion, Lossan, Willow Creek and Carbon Creek. Many of these deposits received an advanced level of exploration decades ago, including extensive drilling, underground development and bulk sampling; in some cases resources were defined. In 2001, the Wolverine Group (EB

North and Perry Creek), the Brazion Group (Burnt River and West Brazion) and Willow Creek deposits were explored and/or developed.

The **Willow Creek** property, which is 45 kilometres west of Chetwynd, has a mine permit. The project is owned by Globaltex Industries (67%) and Mitsui Matsushima of Japan (33%). The operator, Pine Valley Coal Ltd., began to develop the deposit late in 2000 and in 2001 mined and shipped 36 000 tonnes from the '7 seam' in the Peninsula Pit area (Photograph 4). The company also conducted diamond drilling outside of the pit area to guide future development of the property.

The coal measures are within the Cretaceous Gething Formation and occur on the east limb of the Peace River anticline. The coals are low-volatile bituminous in rank and are suitable for PCI and thermal markets. The project is permitted for annual production of 900 000 tonnes per year using a conventional wash plant. However, the company recently produced a revised mining proposal that envisages mining and shipping 200 000 tonnes/year of raw coal from the Peninsula Pit area. The bulk of the coal would come from the low strip-ratio '7 Seam' that is brought close to surface by a series of minor folds. Approximately 830 000 tonnes (run-of-mine) are found in this area. The raw product would have an ash content of 9%, an average of 15.7% volatile matter, an average sulphur content of less than 0.6%, and be suitable for direct shipping. Plans for 2002 include expansion of the Peninsula pit to produce a second trial cargo of approximately 60 000 tonnes. Current established mineable reserves for the property total 15.6 million tonnes.

Western Coal Corp., a 100%-owned subsidiary of Western Canadian Coal Corp., explored four of its properties in the Peace River coalfields in 2001. Most of the work consisted of air-rotary drilling with spot coring of coal seams on the Perry Creek and **EB** deposits. This work is expected to confirm or enhance resources and more accurately characterize the coal quality of the two deposits. These deposits, referred to as the Wolverine Group, lie between the Bullmoose and Quintette mines, some 25 to 30 km west of Tumbler Ridge. The coal measures of particular interest occur in the Lower Cretaceous Gates Formation.



Photo 4. Loading coal in the Peninsula pit, Willow Creek coal project.

The coal is regarded as medium-volatile bituminous of metallurgical quality.

The **Perry Creek** deposit occurs in a broad syncline with gently dipping limbs. Sixteen drill holes were completed in 2001 and targeted the J seam, which is split into the J1, J2 and J3 divisions, that has a cumulative thickness of more than 5 metres. Data from these holes should enable the company to revise the resource for the area; target tonnage is 35 million tonnes.

The **EB** deposit is about 5 km due west of Perry Creek. Twenty holes were completed for a cumulative length of about 2000 metres. Coal measures occur in multiple seams that are relatively uncomplicated by structure. Seams A to D (same nomenclature as at Bullmoose) have a combined thickness of 12 metres over a 60-metre interval. The **EB** deposit has an in-place resource of more than 19 million tonnes.

In December, Western Canadian Coal submitted a Stage 1 project report to the B.C. Environmental Assessment office for review. The proposal outlines a combined open-pit / underground operation that would produce between 1.5 and 2.0 million tonnes of coal annually. Coal from the Perry Creek underground and **EB** open pit would supply a centrally located washplant. Proximity to the existing BC Rail line and to other strategic infrastructure greatly reduce development costs. The company plans a late-2003 or early-2004 startup.

Western Canadian Coal also owns coal licenses over the **Brazion**, Burnt River and **West Brazion** deposits, located along the same trend, but further to the northwest.

At the **West Brazion** property six to eight holes tested Upper Gething Formation coal seams that are exposed on the flanks of a plateau immediately south of Brazion Creek. Strata are gently inclined to the south and the coal measures are relatively close to surface. The main target is the 'Discovery' seam that has a cumulative coal thickness of 3.8 metres within a 5.5 m total thickness (including partings). Total coal thickness is 8 to 9 metres within a 70-metre interval. Relatively little exploration has taken place at West Brazion, but limited early work suggests that the coal is coking quality, amenable to low cost mining and worthy of re-evaluation.

The **Burnt River** property is about 10 km east of the West Brazion property. Drilling in 2001 targeted Gething Formation coal seams of the Dillon structure, a narrow northwest-trending syncline that has a gentle southeasterly plunge. This coal-bearing structure occurs immediately northeast of another shallow, broader syncline that was the focus of past exploration by Teck Corporation. Teck conducted a substantial evaluation of the deposit that included drilling of more than 230 drill holes, development of 3 adits and excavation of two small pits from which a 43 000 tonne bulk sample was extracted. This work identified 23 million tonnes of coal at low strip ratios. There are two seams of interest in the Dillon structure, an upper one that is about 3 metres thick and a lower one that is about 6 metres thick. In 2001, fourteen holes totaling 900 metres were drilled. Burnt River coal is classified as low volatile bituminous/semi-anthracite and is suitable for PCI markets.

A number of causes are responsible for recovery of the coal mining sector in British Columbia. They include: the recent and ongoing restructuring and consolidation of the coal mining sector; recovery of the metallurgical and thermal coal markets; increased energy demands (i.e. electric power generation/provision for local and US markets); expanding and/or developing 'niche' markets (i.e. PCI); and coalbed methane potential. Data collected from other coal exploration also benefits the coalbed methane sector.

There is a limited history of **coalbed methane** (CBM) exploration in northeast British Columbia. However, recent increases in the price of natural gas have led to renewed interest in the potential of this untapped resource. The Peace River coalfield contains an estimated 60 to 200 Trillion cubic feet (Tcf) or 1700 – 5700 billion cubic metres of methane. The rights to specifically explore twelve parcels of land in northeast British Columbia for CBM were sold in August 2000, and August 2001, for a total of approximately \$13 million. Companies involved are AEC, BP/Northstar and Koch. Seven CBM well locations have been licensed and four of the approved sites were drilled in 2001. Exploration expenditures over 2000-2001 are estimated to have been \$10 million.

NECHAKO PLATEAU

The Nechako Plateau area saw little activity in 2001, but several small programs did proceed. Castle Metals conducted limited prospecting on the **Laidman Lake** and **Holy Cross** gold properties located south of Vanderhoof and on the **Clisbako** property located west of Quesnel. The Holy Cross and Clisbako properties host epithermal gold mineralization within altered intermediate to felsic volcanics. Both prospects have potential for bonanza grades. The Laidman Lake property hosts several zones of auriferous quartz vein stockwork within quartz monzonite and is more of a bulk tonnage target.

Prospecting Assistance Program grantee Robin Day outlined a 100-metre wide by 4-kilometre long east-trending zone of hematitic breccia north of Finger Lake, called **Iron Knoll**. Underlying rocks are andesitic volcanics of Jurassic or Triassic age that may be coeval with the Brooks diorite complex. The zone is coincident with an aeromagnetic high, however the breccias exposed at surface are not magnetic, although they are weakly anomalous in copper. The hematite may be the surface expression (oxidized) of a buried magnetite-rich, copper-gold system (i.e. Iron Oxide Gold-Copper model).

CARIBOO

Mineral exploration activity in the Wells-Barkerville area, known for its placer gold mining history and three lode gold mines, slowed somewhat in 2001. Overall, there were fewer programs and a lower level of expenditures. The belt is underlain by isoclinaly folded phyllitic argillites, psammites and limestones of the Paleozoic Snowshoe Group

The largest exploration program in the Cariboo region was conducted by International Wayside Gold Mines Ltd.

on its **Cariboo Gold Quartz** property located immediately south of Jack of Clubs Lake. The company drilled 25 NQ holes focusing on the high-grade gold **Bonanza Ledge** zone, discovered in 2000, and its potential extensions along trend to the northwest (Wells Trend) and southeast. Encouraging assay results from numerous holes extended the strike length of the 'replacement-style' mineralization and alteration to over 1000 metres. The system has been traced beyond several late brittle structures and has been confirmed in the hanging wall of the BC vein. The best intersections are 6.7 metres in hole BC01-11 that averaged 7.68 g/t Au, and 13.2 metres in hole BC01-15 that averaged 5.97 g/t Au. Three of the holes were drilled on the Wells Trend gold geochemical anomaly, centered approximately four km northwest of Bonanza Ledge. They intersected "Bonanza Ledge-style" alteration and a discrete auriferous quartz vein.

The **Grouse Creek** project of sister company Golden Cariboo Resources Ltd. consisted of a program of prospecting and geochemical sampling of several claim groups that are along strike southeast of the Bonanza Ledge discovery. The program identified 'magnetite porphyroblastic' chlorite phyllite, which forms the hangingwall unit at Bonanza Ledge, but no assays from the program have been released.

At **Mosquito Creek Gold**, Island Mountain Gold Mines Ltd. drilled seven holes focusing mainly on the Kutney zone, an area formerly explored by Newmont Exploration of Canada Ltd. Drilling evaluated the down plunge potential of some high-grade pyrite replacement mineralization in impure limestones in which a 3-metre channel sample assayed 15.8 g/t Au.

Eureka Resources Inc. conducted limited geochemical and geophysical surveys on its **Lottie Lake** volcanogenic massive sulphide property north of Wells. The property is underlain mainly by cherty argillite and basalt of the Mississippian-Permian Antler Formation (Slide Mountain Terrane). Five lines of IP were added to last years survey and delineated two strong east-trending conductive zones. The zones are 300 metres and 400 metres in length, and occur south of the main high-grade float area. Eureka completed two short diamond drill holes to test these targets in late September. Details and assay results have not yet been released.

West of Wells, partners Mel Zeiler and Gary Toop trenched a polymetallic mesothermal vein system on their **GM** property. A series of discrete quartz veins and stockworks carrying galena and pyrite, with lesser sphalerite and chalcopyrite, cut schists and quartzites of the Snowshoe Group. A grab sample from one of the veins assayed 786 ppb Au, 134.6 ppm Ag and >10000 ppm Pb.

LIKELY AND HORSEFLY AREAS

Fjordland Minerals Ltd. outlined two large chargeability anomalies on its **Woodjam** gold-copper property near Horsefly. The property includes the Megabuck prospect, where silicified and propylitized intermediate flows and breccias of Eocene age contain stringers

of chalcopyrite and magnetite. The company intends to conduct a diamond drilling program early in 2002.

A three-hole diamond drill program by partners Herb Wahl and Jack Brown-John tested several sulphide-bearing shear zones on their **Rodeo-Luky Jack** porphyry-related prospect south of Horsefly Lake. However, results did not match expectations.

PLACER MINING AND EXPLORATION HIGHLIGHTS

By Ken MacDonald, P.Geo.

INTRODUCTION

The placer sector in the northeast-central region remained at a relatively low level of activity that mirrors the overall general decline encountered over the past several years. Accurate estimates of expenditures on exploration and testing are unavailable but are roughly estimated at between \$1.49 and \$2.24 million, thought to be down from year 2000. There was only one significant production mine recorded in the region (where volume of washed paydirt exceeded 2000 m³) and fewer mid-sized projects active this year. Many operators were inclined to continue modest testing programs for assessment purposes.

Overall, the amount of new ground explored and material processed decreased. High fuel costs and low commodity prices contributed significantly to the decline. A total of 86 965 hectares of ground was held under placer tenure (excluding crown grants), which is virtually the same coverage from the previous year.

TRENDS

The continued downward turn in placer mining activity is reflected by the relatively low number of Notice of Work (NoW) applications submitted to the Prince George Mines Branch office. A total of 397 placer NoWs were filed, compared to 422 in 2001. Of the total, 213 NoWs were for mechanical testing and 184 comprised handwork. This corresponds to a general shift over time from mechanical testing when commodity prices and fuel costs were more favorable, to the situation today when relatively few operators are inclined to run expensive testing equipment or engage in large-scale production.

Of the programs conducted, all but one program consisted of exploration testing and most tended to be less than the applicant had originally planned. A total of 80 programs were conducted, and ranged from 1 m³ to 4600 m³ of paydirt washed. The total volume of production planned was about 121 000 m³, while actual recorded production amounted to about 30 000 m³, a decline of 75%.

In terms of significant placer production, only one program exceeded 2000 m³ of paydirt compared to year 2000 in which six programs exceeded 2000 m³. No information is available on the quantity of gold recovered or the grade of material washed.

Many operators who failed to conduct their planned program either completed hand testing or paid cash in lieu of assessment work to maintain tenure. Operators have given a variety of reasons for cancelled programs, ranging from under-valued gold prices; lack of capital for equipment, parts, or fuel; inability to raise reclamation security; health issues; or employment in other sectors during the seasonal months.

SIGNIFICANT PROGRAMS

GERMANSEN-MANSON (OMINECA CAMP)

The largest program, and only property from which production was recorded, occurred in the Omineca region. J.M. Thomas of Angel Jade Mining completed bulk testing from ten pits on Manson Creek for a total of about 4600 m³ of paydirt washed (Photograph 5). Some infill testing is planned for the coming season to continue determination of grade and volume.

On nearby Slate Creek, Robert Gauthier completed a modest program of testing and small-scale mining from three main pits and recorded about 1000 m³ of paydirt processed. Gauthier also tested ground on Killdare Creek (Manson Creek) where he developed three main mine pits and tested gravels from ten satellite pits.

One noteworthy program on a property located peripheral to the main GERMansen-Manson camp was conducted by V. Pogorevc (Photo 6). Mr. Pogorevc tested about 1000 m³ of gravel on McConnell Creek over a period of sixteen weeks. Using creative welding, fabrication from old sluice parts, and a well-honed and superior knowledge of recovery, Pogorevc has built a unique washplant that incorporates several basic designs to improve recovery rates of fine-grained gold.

WELLS-BARKERVILLE (CARIBOO CAMP)

F. Nestle continued testing his extensive holdings on Summit Creek near Barkerville. Work in the past several years has focused on small, buried, bedrock channels.



Photo 5. Excavating material from paystreak on Manson Creek, Angel Jade Mining.



Photo 6. View of washplant and clean-up jig on McConnell Creek, V. Pogovec.

However, groundwater and depth of pay continues to frustrate efforts to fully expose the source of auriferous gravels.

R. McMudroch excavated a couple of test pits on his property near Stanley, on an unnamed southern tributary to Lightning Creek. Many of the historic underground placer workings in the Stanley area targeted bedrock benches and timbered remnants of drifts have been exposed from recent exploration work.

G. Jennex was active on his Burns Creek ground and continued limited testing of about 1500 m³ of paydirt from an area made famous by the discovery of the Hatton Nugget.

S. Koscis operated immediately west of the Thistle Pit in an attempt to uncover the buried remnant of shallow pay gravels that may have survived glacial erosion. The Thistle pit historically produced 20,000 ounces of gold in the early 1900s. Koscis was also busy testing paleochannel gravels at nearby Eight Mile Lake, where auriferous gravels have previously been documented sandwiched between two till units (Levson and Giles, 1993).

M. Young completed testing in and around the rim of an old hydraulic pit on upper Summit Creek, but recovery is believed to have been hampered by small throughput and undersized equipment.

Further west toward Quesnel, K. Thompson and his partner worked a low terrace on the Cottonwood River, downstream from Cottonwood Canyon. Total throughput was about 1300 m³ of paydirt from one main mine area. Recovery was hampered by the presence of clay partings.

Upstream of Thompson, R. Krekowski continued testing a dry and abandoned oxbow channel on the south shore of the Cottonwood River. Gold is reported to be very fine and difficult to recover with his conventional washplant. He washed about 1100 m³ of paydirt over a four-week period.

LIKELY-KEITHLEY CREEK (CARIBOO CAMP)

Noble Metals was unable to complete plans for a major stripping program on its Keithley Creek lease and settled for limited production of about 1400 m³ of paydirt from their main mine pit. The most recent mining removed thick

overburden down to the bedrock surface, with the mine expanding upslope as funds are made available for stripping. Workers were also busy with ongoing reclamation, including the remediation of an old pond and berm road located near the confluence of Keithley and Snowshoe Creek.

K. Green continued limited testing using a very unique aerial slusher to excavate shallow (<1m deep) gravel lenses located in the sub-alpine above Snowshoe Creek. The operator has designed a small bucket conveyance suspended from a spar pole, similar to an underground tigger winch. Using creative welding and ingenuity, Green can single-handedly tug and dump to a conventional trommel using winch controls and hydraulics.

HIXON CREEK AREA

D. Romanow began testing ground adjacent to the old Quesnelle Gold Quartz mine on Hixon Creek. Results were disappointing and no further work is planned. B. Tomm completed several programs of exploration on adjacent leases on Hixon Creek. One program consisted of excavation and processing of 500 m³ of paydirt from one mine pit. I. Broadfoot and partner B. Prothero continued testing on a large lease located on Terry Creek. About 2000 m³ of paydirt was processed from three mine pits.

RECLAMATION

Daniel Romanow was awarded the 2001 Placer Citation for meritorious placer reclamation by the Technical and Research Committee for Reclamation in BC. Mr. Romanow received the award in recognition of the outstanding reclamation completed on the Grace lease located near Barry Creek in the Tregillus Lake area.

CONCLUSION

Placer activity during 2001 decreased slightly from the level witnessed in the previous year. Following a trend that has continued over the past several seasons the average size of an operation and the total exploration expenditures have continued to decrease, mainly in response to depressed gold prices and rising fuel costs. Other reasons for the decline range from seasonal employment in other sectors, lack of capital and health issues.

It is expected that development and testing in 2002 will remain at about the same levels that the region has experienced during the past several years unless unforeseen events decrease fuel costs and increase gold prices. The major focus will continue to be the traditional streams and creeks in the Wells-Barkerville, Likely, Hixon and Germansen River-Manson Creek placer gold camps.

OTHER INFORMATION

The Prospectors Assistance program awarded grants totalling \$79 129 to support nine grassroots exploration projects in the region. The projects targeted a range of commodities including industrial minerals, copper, gold and platinum group elements.

During the 2001 field season, staff of the British Columbia Geological Survey Branch conducted several programs in the region. Fil Ferri and Brian O'Brien examined the stratigraphic and structural setting of massive sulphide mineralization hosted by Late Proterozoic to Paleozoic Snowshoe Group rocks in the Cariboo Lake area of the Wells-Barkerville belt. In the Omineca Mountains, Gerry Ray and Ian Webster completed a detailed examination of styles of mineralization at the Lustdust polymetallic property. In the Peace River coalfields, Barry Ryan evaluated the characteristics of Gething formation coal from the Willow Creek deposit and Andrew Legun reviewed coalbed methane geology of northeast British Columbia. Vic Levson investigated the platinum group element content of placer deposits throughout the province with the intent of identifying unrecognised lode sources. Results from these programs are published in the annual Geological Survey Branch 'Fieldwork' volume (Geological Fieldwork 2001, Paper 2002-1) and/or as 'Open File' maps or reports.

OUTLOOK FOR 2002

The level of exploration is expected to increase sharply in 2002. The main metal targets will be gold-enriched por-

phyry copper deposits, epithermal and mesothermal gold vein systems, and volcanogenic massive sulphide deposits. Activity in the Peace River coalfields will emphasize advanced exploration and development.

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REFERENCES

- Levson, V.M. and Giles, T.R. (1993): Geology of Tertiary and Quaternary Gold-bearing Placers in the Cariboo Region, British Columbia (93A, B, G, H); *B.C. Ministry of Energy and Mines*, Bulletin 89, 202 pp.
- Ray, G., Webster, I., Megaw, P., McGlasson, J. and Glover, K. (2002): The Lustdust Property in Central British Columbia: A Polymetallic Zoned Porphyry-Skarn-Manto-Vein System; in Geological Fieldwork 2001, *B.C. Ministry of Energy and Mines*, Paper 2002-1, pages 257-280.

