



**Ministry of Energy, Mines
and Petroleum Resources
Mining and Minerals Division**

EXPLORATION AND MINING in British Columbia 2009

Ministry of Energy, Mines and Petroleum Resources
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Front Cover:

Rotary fill-in drilling at Teck Coal Limited's Mount Michael property, 3 km north of the Line Creek mine and roughly 9 km southeast of Elkford in the Elk Valley coalfield. The Mount Michael property is included in the Line Creek Operations' Phase II Expansion Project. The coal-bearing Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group occurs on the east limb of the Alexander Creek syncline and in the hanging-wall of the Ewin Pass thrust fault. The 500 m thick section contains about 10 major coal seams, representing 10% of the section. (Photo credit: Dave Grieve)

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FOREWORD

INTRODUCTION

Exploration and Mining in British Columbia 2009 is the latest annual documentary record of the province's exploration and mining industry. The record goes back to 1874 when the *Annual Report of the British Columbia Minister of Mines* first went to print and has evolved through various formats over the years.

This publication is closely linked to its companion document, *British Columbia Mines and Mineral Exploration Overview 2009*. Compared to the provincial *Overview 2009*, *Exploration and Mining in British Columbia 2009* provides a region-by-region perspective and a more in-depth look at significant projects. Readers who wish to acquire a first-pass or general picture of the mining and exploration industry in British Columbia may find the *Overview* to be a more useful publication.

The province's exploration sector for coal, metals and industrial minerals is large and by necessity the reviews and summaries contained in this volume tend to be focused on the larger and/or more advanced projects. To learn more about a particular region, readers are encouraged to contact the appropriate regional geologist. Contact information is given below.

Readers are also encouraged to use this publication in concert with the online geological databases accessible through the BC Ministry of Energy, Mines and Petroleum Resources' MapPlace Internet site (<http://www.empr.gov.bc.ca/Mining/Geoscience/MapPlace/Pages/default.aspx>). For example, MINFILE references given in this publication can be geographically located and queried, and additional information such as bedrock geology, geochemistry, mineral tenures and assessment reports can be displayed concurrently.

Information in *Exploration and Mining in British Columbia 2009* has been compiled and written by the province's regional geologists and the director of the Mineral Development Office in Vancouver, based on their personal knowledge supplemented by industry information. A staffing vacancy in Prince George has necessitated that the chapters concerning the North Central and Northeast regions are, for this year only, relatively brief and general.

B.C.'s Regional Geologists and the Mineral Development Office

The regional geologists are located in Vancouver (Bruce Northcote), Smithers (Paul Wojdak), Kamloops (Bruce Madu), Prince George (vacant) and Cranbrook (Dave Grieve). They support the Mineral Development Office in Vancouver (Jay Fredericks, director) in providing front-line stimulation and promotion of mineral exploration and development in the province. As regional experts they also support various functions of the Ministry of Energy, Mines and Petroleum Resources and particularly of their respective offices.

Regional geologists' key roles and responsibilities include:

- fostering sustainable exploration, development and use of the province's mineral and coal resources;
- providing clients with up-to-date technical information and professional advice about known and potential mineral and coal deposits;
- providing geological and mineral resource information to project review or land-use decision-making processes;

- monitoring the status of the mining industry and the development of infrastructure required for mineral resource development;
- working on field projects and surveys, compilations, promotional brochures and deposit models; and
- contributing information to maintain and update geosciences databases (e.g. MINFILE).



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Methodology

Compilation of *Exploration and Mining in British Columbia* presents certain challenges. Deadlines demand manuscript submission before all information from programs carried out later in the year is available, and before some programs are even complete. It is also difficult to garner information on all

programs that have occurred. In particular, critical grassroots exploration that leads to many new discoveries may be difficult to track because it typically occurs below Mines Act permit thresholds.

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

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

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

MINING

British Columbia is a significant producer of coal, copper, molybdenum, gold, silver, zinc, industrial minerals and construction aggregate, with a total forecast value of \$5.7 Billion for 2009.

The global economic recession that began in 2008 impacted British Columbia's mining industry. No major metal or coal mines closed in 2009, but production levels were down across the board and revenues were hurt by the generally lower commodity prices. No new mines were opened and construction at some sites was stalled.

Producing metal mines in 2009 included Endako (molybdenum), Gibraltar (copper-molybdenum), Highland Valley Copper (copper-molybdenum), Huckleberry (copper-molybdenum), Kemess South (gold-copper), MAX (molybdenum), Mount Polley (copper-gold-silver) and Myra Falls (zinc-copper-gold-silver). There are three coal mines in northeast British Columbia (Brule, Trend and Wolverine), five in the southeast (Coal Mountain, Elkview, Fording River, Greenhills and Line Creek) and one on Vancouver Island (Quinsam). There are a range of industrial minerals produced from well over 30 sites in British Columbia, including limestone (including Benson Lake, Gillies Bay, Harper Ranch, Pavilion and Van Anda), gypsum (Elkhorn, 4J and Falkland), magnesite (Mount Brussilof) and decorative rock (including Kettle Valley Stone).

MINE DEVELOPMENT

The proposed Mount Milligan copper-gold mine received approval from both provincial and federal Environmental Assessment agencies in 2009. Three projects entered the British Columbia Environmental Assessment Process: the Line Creek Phase II Expansion project in the Elk valley (coal), the Raven Coal project on Vancouver Island, and the Chu project near Vanderhoof (molybdenum). There are numerous

other planned and proposed mines at various stages in British Columbia at present. They are described in this volume, and include Galore Creek (copper-gold), Red Chris (copper-gold), KSM (gold-copper), Kitsault (molybdenum), New Afton (copper-gold), Copper Mountain (copper gold) and Goodrich Central South (coal). Expansions are underway at some of the major producing mines, including Endako, Gibraltar and Highland Valley Copper.

MINERAL EXPLORATION

The year began with relatively low prices for most mineral commodities (gold being the notable exception). Consequently the ability of mineral exploration companies to raise funds was impacted and the estimated total expenditure for work carried out in 2009, \$154 million, was only a fraction of that in either of the previous two years. However, metal prices generally increased as the year went on. For example, copper gained back most of its losses by the end of the year, and gold reached record levels. As a result, there were definite signs of improvement in the health of the exploration sector toward the end of 2009. This resulted in a number of late-season programs, and ambitious plans being made for exploration in 2010. Another positive indicator was the number of new option agreements on exploration properties that were entered into late in the year.

With a variety of geological settings, British Columbia is host to a wide range of mineral deposit types. The porphyry environment, including copper, copper-molybdenum and especially copper-gold mineralization, continued to be the most attractive in 2009. Significant porphyry projects included Snowfield, Mount Dunn, Cassiar Moly, Pine, Pinchi, Kwanika, Ajax, Prosperity, Newton Mountain, Lac La Hache, Yalakom, Catface and Roger's Creek. The emphasis with respect to vein-style mineralization was on precious metals, especially gold and/or silver. Vein targets in 2009 included Golden Eagle, Atlin Gold, Treaty Creek, Premier Gold, Homestake Ridge, Terrace, Deer Horn, Blackwater-Davidson, Capoose-Silver Trend, Spanish Mountain, Lustdust, Bralorne, Windpass, Elk, Mineral Creek, Ladner Gold, Slocan Silver, Kenville Gold Mine, Greenwood Gold and Yankee-Dundee. Massive sulphide projects in 2009 included Rock & Roll, Bodine, Ruddock Creek, Harper Creek and Moore. Sediment-hosted gold mineralization was investigated at the Spanish Creek property. Active projects with skarn mineralization included Iron Mist (magnetite), Panorama Ridge (gold), Pearson (magnetite) and Jersey-Emerald (tungsten). Intrusion-related precious metal-enriched mineralization was targeted at the Nox Fort and Crowsnest projects. Rare metals associated with carbonatites were assessed at the Blue River, Wicheeda and Rock Canyon properties.

Coal exploration in 2009 included the Raven Coal project on Vancouver Island, Belcourt West, Wolverine and Gething in northeast British Columbia, and Mount Michael and Baldy Ridge in the southeast.

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