

# Exploration and Mining in British Columbia, 2019: A summary



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## 1. Introduction

Reflecting its complex geological history, British Columbia is endowed with diverse minerals and deposit types. British Columbia is Canada's largest exporter of coal, leading producer of copper, and only producer of molybdenum. Also produced are significant amounts of gold, silver, lead, and zinc, and more than 30 industrial minerals including gypsum, magnesite, limestone, and dimension stone. Numerous quarries produce sand and gravel or crushed aggregate. In 2019, many mineral exploration projects remained active (Fig. 1).

Flanked by the Pacific Ocean, British Columbia offers easy access to global markets. Mine operations benefit from tax incentives and a well-developed infrastructure, including low-cost electricity, an integrated road and rail network, and large deep-water ports. Exploration benefits from an extensive geoscience database and a web-based mineral tenure system.

This summary uses information from the British Columbia Coal Industry Overview (British Columbia Geological Survey Information Circular 2020-02) and incorporates the Regional Geologist reports in this volume. The Regional Geologists (Fig. 2; Table 1) represent the provincial government on geological matters at a regional level. Within their communities, they provide information on exploration trends, possible investment opportunities, land use processes, First Nation capacity building, and public outreach.

## 2. Mine production

The Ministry of Energy, Mines and Petroleum Resources forecasts the total value of mine production for 2019 at \$8.80 billion (Fig. 3) including coal, copper, gold, industrial minerals, aggregate, molybdenum, and silver. This is \$1.16 billion less than the 2018 preliminary Natural Resources Canada (NRCAN) estimate of \$9.66 billion (Fig. 4) and is mostly due to a decrease in coal prices.

Coal prices were strong early in 2019 but declined in the summer. Having dipped as low as \$130/tonne late in the year, hard coking coal prices averaged \$183/tonne for the year. Third quarter realized prices for pulverized coal injection (PCI) products averaged \$132/tonne; the price slipped below \$100/

tonne on occasion. Thermal coal prices averaged \$99/tonne for the year. (All prices are \$US, west coast port price).

As in previous years, coal was the highest value mine product (58%) followed by copper (21%).

In 2019, ten metal mines operated during at least part of the year (Fig. 1; Table 2). Metallurgical coal was produced at five large open-pit operations in the southeastern part of the province and three open-pit operations in the northeastern part. Teck Coal Limited's **Coal Mountain** mine in the southeast ceased operations in Q2 of 2019. One underground mine on Vancouver Island produced thermal coal, but shutdown part way through the year (Fig. 1; Table 3). About 30 industrial mineral mines and more than 1000 aggregate mines and quarries were in operation.

## 3. Mining highlights

### 3.1. Metal mines

Metal mines accounted for \$2.99 billion (forecast) of all mine production in 2019, representing about 34% of total output (Fig. 3). Ten mines produced in 2019 (Fig. 1; Table 2).

In the Northwest Region producing metal mines included **Brucejack**, **Silvertip** and **Red Chris**. The **Brucejack** mine continued a production ramp up from 2700 tpd to 3800 tpd. For the first three quarters ending September 30<sup>th</sup>, production totalled 258,168 oz Au and 368,989 oz Ag from 970,659 t of ore grading 8.9 g/t Au. Gold recoveries averaged 96.9%. Newcrest Mining Limited acquired 70% interest in the **Red Chris** mine for a final purchase price of \$804 million US, creating a joint venture with Imperial Metals Corp. who hold the remaining 30% interest. Production to the end of the third quarter of 2019 totalled 50.2 Mlbs Cu and 24,316 oz Au, with an average daily mill throughput of 28,829 tpd. The **Silvertip** mine had its first year of full production after being purchased by Coeur Mining Inc. in 2017 from JDS Silvertip Holdings for \$250 million. In the first three quarters of 2019, the mine produced 174,885 t grading 192.65 g/t Ag, 6.96% Zn, and 4.80% Pb (equitable to 883,055 oz of Ag, 13,237,837 lbs of Zn, and 12,534,228 lbs of Pb).

In the North Central Region, the **Mt. Milligan** open-pit

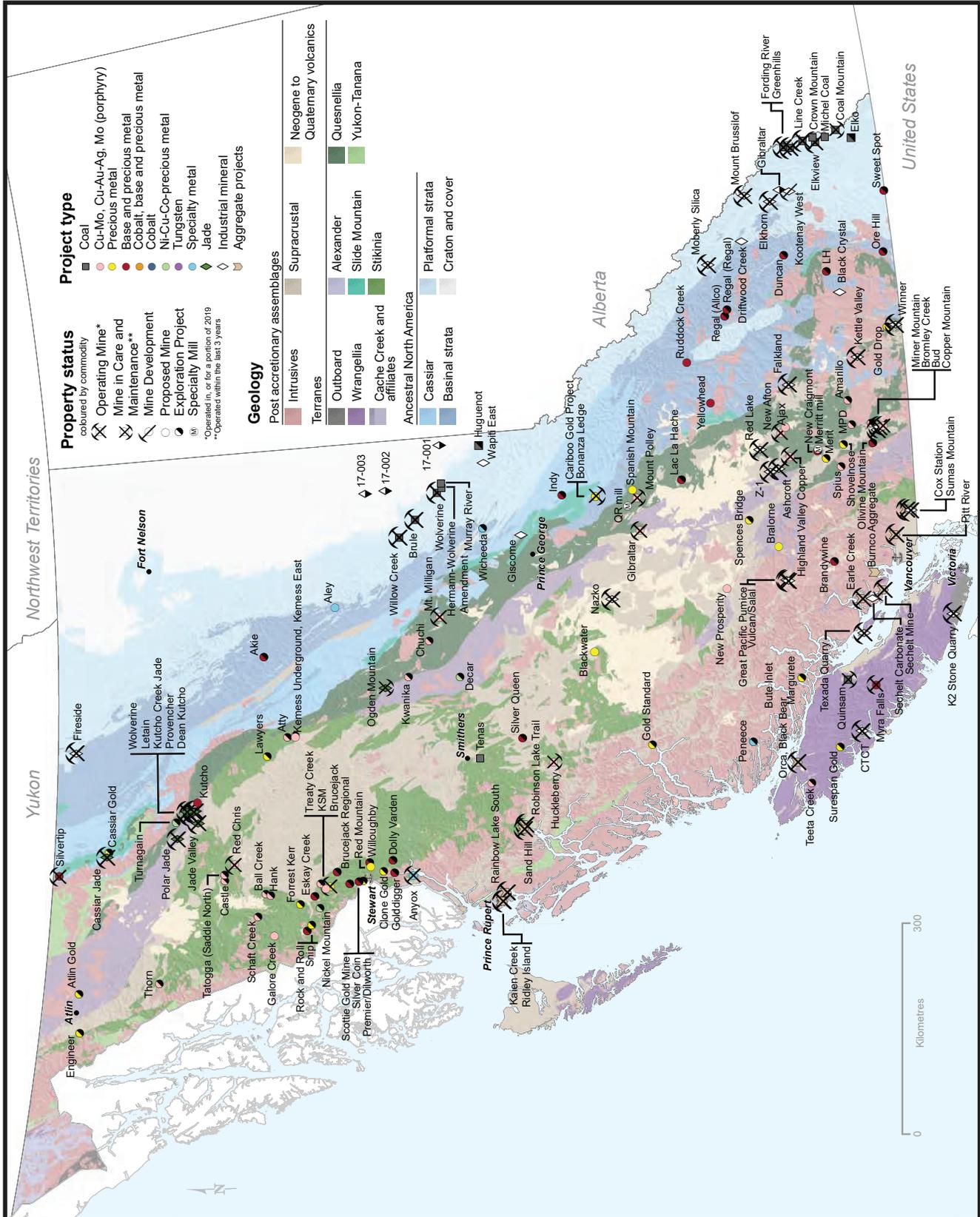


Fig. 1. Mines, mine development, and selected exploration projects in British Columbia, 2019. Based on Clarke et al. (2020), British Columbia Geological Survey Open File 2020-01.



**Fig. 2.** Geographic regions and Regional Geologist offices.

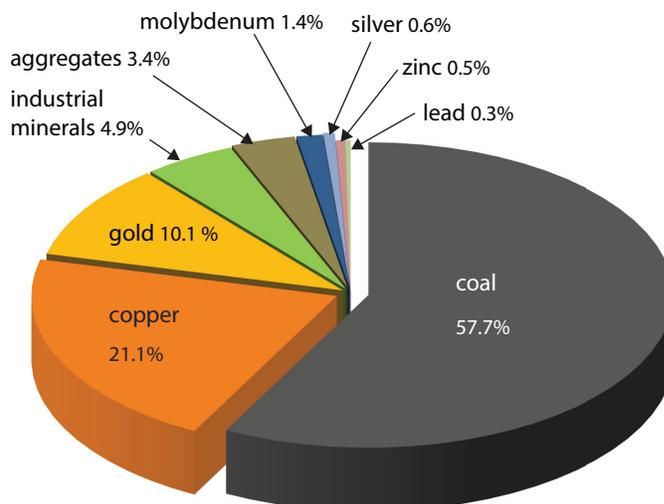
copper-gold mine is in its sixth year. Production to the end of the 3<sup>rd</sup> quarter totalled 53.1 Mlb of Cu and 137,123 Au from 11.92 Mt of ore grading 0.25% Cu and 0.52 g/t Au. Metal recoveries averaged 81.7% for Cu and 67.4% for Au.

In the South Central Region, operating mines included **Copper Mountain**, **Gibraltar**, **Highland Valley**, **Mount Polley** and **New Afton**. Copper Mountain Mining Corporation reported that production at **Copper Mountain** to the end of the 3<sup>rd</sup> quarter totalled 53.4 Mlbs Cu, 20,547 oz Au and 185,212 oz Ag from 8.6 Mt of ore grading 0.28% Cu at 79.3% recovery.

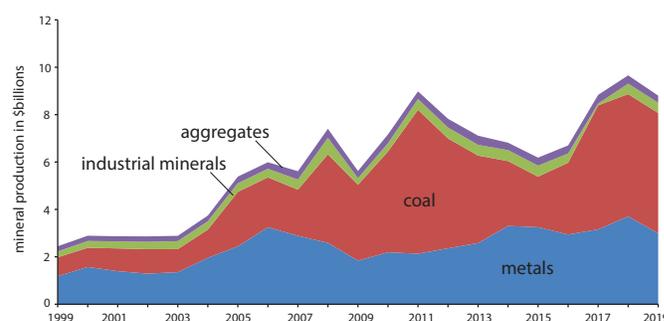
Following 2017-2018 drilling at the New Ingerbelle deposit, in 2019 Copper Mountain Mining Corporation converted resulting resources to reserves. Additional work then further increased reserves at the New Ingerbelle, North Pit, and Main Pit. Expected mine life is now 31 years, based on current reserves and planned production level.

The **Gibraltar** mine reported production to the end of the 3<sup>rd</sup> quarter totalled 92.6 Mlb of Cu and 2.01 Mlb Mo from 22.0 Mt of ore. For the 3<sup>rd</sup> quarter, a copper grade of 0.249% at a recovery of 87.7% was reported. Updated reserves support a projected 19-year mine life. Taseko has a multi-year permit for exploration north and northwest of the mine.

In the first nine months of 2019, Teck Resources Limited's **Highland Valley** mine milled 38.23 Mt at a Cu grade of 0.28% and recovery of 82.7%. For the full 2019 year, the company projects 115 to 120 Mt Cu and 8.8 Mlb Mo in concentrate. Mining began in the Highland Valley camp at the Bethlehem



**Fig. 3.** 2019 forecast value of British Columbia mineral production by commodity; total is \$8.80 billion.



**Fig. 4.** Value of British Columbia mineral production by year 1999-2019; value for 2018 is preliminary estimate, value for 2019 is forecast.

Mine in 1962. Bethlehem was last active in 1982 but Teck proposes to return to the area as an extension project, with pushback and deepening of the Jersey and Iona pits and extracting 137 Mt of ore with average grades of 0.287% Cu and 0.0048% Mo. The HVC Bethlehem Extension now has a Mines Act permit.

In January 2019, Imperial Metals Corporation announced a decision to stop mining and mill low-grade stockpiles before suspending production at the **Mount Polley** mine. They placed the mine on care and maintenance at the end of May. Production to May 26 was 3.83 Mlbs Cu, 10,619 oz Au, and 11,119 oz Ag from 2.23 Mt ore milled.

**Table 1.** Mineral Development Office and Regional Geologist contact information.

Region	Community	Regional Geologist	Phone	email
Northwest	Smithers	Sean Tombe	250-877-2694	Sean.Tombe@gov.bc.ca
Northeast and North Central	Prince George	vacant	-	Gordon.Clarke@gov.bc.ca
South Central	Kamloops	vacant	-	Bruce.Northcote@gov.bc.ca
Southeast	Cranbrook	Fiona Katay	250-919-4724	Fiona.Katay@gov.bc.ca
Southwest	Vancouver	Bruce Northcote	604-660-2713	Bruce.Northcote@gov.bc.ca
Mineral Development Office	Vancouver	Gordon Clarke	604-660-2094	Gordon.Clarke@gov.bc.ca

**Table 2.** Operating metal mines, 2019, forecast mine production, reserves, and resources.

Mine	Region	Operator (partner)	Commodity; deposit type; MINFILE	Forecast 2019 Production (based on Q1-Q3)	Reserves	Resource	Comments
<b>Brucejack</b>	Northwest	<b>Pretium Resources Inc.</b>	Au, Ag; IS-epithermal; 104B 193	344,200 oz Au	P+Pr: 16 Mt grading 12.6 g/t Au and 59.3 g/t Ag	M+I: 18.7 Mt at 14.2 g/t Au and 81.6 g/t Ag Inf: 7.8 Mt at 12.0 g/t Au and 51.3 g/t Ag	May 2019 updated mineral reserves and resources.
<b>Red Chris</b>	Northwest	<b>Newcrest Mining Limited (70%), Imperial Metals Corporation (30%)</b>	Cu, Au, Ag; hybrid calc-alkalic to alkalic porphyry; 104H 005	66.9 Mlbs Cu and 32,400 oz Au	P+Pr: 301.5 Mt at 0.36% Cu, 0.27 g/t Au	2014: M+I: 1.035 Bt at 0.35% Cu, 0.35g/t Au, 1.14 g/t Ag Inf: 787.1 Mt at 0.29% Cu, 0.32 g/t Au, 1.04 g/t Ag	August 2019, Newcrest Mining Limited acquired 70% interest creating a joint venture with Imperial Metals Corporation (remaining 30% interest). First three quarters averaged 28,829 tpd.
<b>Silvertip</b>	Northwest	<b>Coeur Mining Inc.</b>	Ag, Pb, Zn; Manto carbonate-replacement; 104O 038	1,177,300 oz Ag, 17,650,700 lbs Zn, 16,713,300 lbs Pb	P+Pr: 1.61 Mt at 289 g/t Ag, 5.6% Pb, 8.24% Zn	M+I: 1.18 Mt at 222.73 g/t Ag, 4.09% Pb, 8.58% Zn Inf: 0.53 Mt at 271.04 g/t Ag, 5.02% Pb, 9.31% Zn	New mineral resource update February 2019. Regional soil sampling and induced polarization survey.
<b>Mt. Milligan</b>	North Central	<b>Centerra Gold Inc.</b>	Cu, Au, Ag; alkalic porphyry Cu-Au; 093N 194, 191	74 Mlbs Cu 190 Koz Au	P+Pr: 447.56 Mt at 0.186% Cu and 0.3 g/t Au	M+I: 342.23 Mt at 0.136% Cu and 0.2 g/t Au (additional to reserves)	Concentrator design capacity 62,500 tpd. Estimated mine life +20 years. More than 350 employees.
<b>Copper Mountain</b>	South Central	<b>Copper Mountain Mining Corporation 75%, Mitsubishi Materials Corporation 25%</b>	Cu, Au, Ag; porphyry Cu-Au; alkalic; 092HSE001	72-80 Mlb Cu, 29,500-32,500 oz Au, 260,000-290,000 oz Ag (management's guidance)	P+Pr: 476,795,000 t 0.23% Cu, 0.10 g/t Au 0.73 g/t Ag	M+I: 598,850,000 t 0.23% Cu, 0.10 g/t Au, 0.73 g/t Ag	0.10% Cu cut-off. Resources inclusive of reserves. Includes New Ingerbelle.
<b>Gibraltar</b>	South Central	<b>Taseko Mines Limited 75%, Sojitz Corp. 12.5%, Dowa Holdings Co Ltd. 6.25%, Furukawa Co. Ltd. 6.25%</b>	Cu, Mo; porphyry Cu+/-Mo+/-Au; 093B 012	130 Mlb Cu + Mo (+/- 5%) (management's guidance)	P+Pr: 594 Mtons 0.25% Cu, 0.008% Mo	M+I: 1009 Mtons 0.25% Cu, 0.007% Mo Inf: 59 Mtons 0.21% Cu, 0.004% Mo	0.15% Cu cut-off. Resources inclusive of reserves. Does not include Cu oxide.

Table 2. Continued.

<b>Highland Valley</b>	South Central	<b>Teck Resources Limited</b>	Cu, Mo; porphyry Cu+/-Mo+/-Au; 092ISW012, 45	115,000-120,000 t Cu, 8.0 Mlb Mo (management's guidance)	P+Pr: 535.5 Mt 0.300% Cu, 0.007% Mo	M: 499.4 Mt 0.30% Cu, 0.008% Mo I: 671.8 Mt 0.24% Cu, 0.009% Mo Inf: 166.0 Mt 0.21% Cu, 0.007% Mo	Resources exclusive of reserves. Evaluating plans for extension of mine life.
<b>Mount Polley</b>	South Central	<b>Imperial Metals Corporation</b>	Cu, Au, Ag; porphyry Cu-Au: Alkalic; 093A 008	3.825 Mlb Cu 10,619 oz Au 11,119 oz Ag (to shut down)	P+Pr: 53.772 Mt 0.337% Cu, 0.299 g/t Au, 0.89 g/t Ag	M+I: 194.32 Mt 0.294% Cu 0.285 g/t Au, 0.727 g/t Ag Inf: 5.619 Mt 0.374% Cu, 0.276 g/t Au, 2.187 g/t Ag	Reserves in 5 zones. Resources inclusive of reserves. Shut down mid year pending improved copper price.
<b>New Afton</b>	South Central	<b>New Gold Inc.</b>	Au, Ag, Cu; porphyry Cu-Au: Alkalic; 092INE023	215-246 koz AuEq (management's guidance)	P+Pr: 52.642 Mt 0.64 g/t Au, 1.9 g/t Ag, 0.78% Cu	M+I: 52.407 Mt 0.63 g/t Au, 2.2 g/t Ag, 0.77% Cu Inf: 13.564 Mt 0.39 g/t Au, 1.4 g/t Ag, 0.45% Cu	Resources exclusive of reserves. Ongoing exploration program.
<b>Myra Falls</b>	Southwest	<b>Nyrstar Myra Falls Ltd.</b>	Zn, Cu, Pb, Au, Ag; Noranda/Kuroko massive sulphide; 092F 330, 71, 72, 73	na	P+Pr: 4.7 Mt 7.11% Zn, 0.78% Pb, 0.92% Cu, 76.55 g/t Ag, 1.78 g/t Au	M+I: 7.64 Mt 6.59% Zn, 0.72% Pb, 0.99% Cu, 72.52 g/t Ag, 1.79 g/t Au	Production suspended for compliance reasons end of 2018. Restarted April 2019. Underground exploration continued with 17,000 m drilling in 198 holes.

P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

Table 3. Operating coal mines, 2019, forecast mine production, reserves, and resources.

Mine	Region	Operator (partner)	Commodity; deposit type; MINFILE	Forecast 2019 Production (based on Q1-Q3)	Reserves	Resource	Comments
<b>Brule</b>	Northeast	<b>Conuma Coal Resources Limited</b>	PCI; bituminous coal; 093P 007	2.62 Mt clean	P+Pr: 12.26 Mt	na	About 230 employees.
<b>Willow Creek</b>	Northeast	<b>Conuma Coal Resources Limited</b>	HCC, PCI; bituminous coal; 093O 008	820,000 t clean	P+Pr: 11.04 Mt	na	About 220 employees, mine and plant.
<b>Wolverine</b>	Northeast	<b>Conuma Coal Resources Limited</b>	HCC; bituminous coal; 093P 025	1.19 Mt	P+Pr: 26.99 Mt	na	About 300 employees, mine and plant.

Table 3. Continued.

<b>Coal Mountain</b>	Southeast	<b>Teck Coal Limited</b>	PCI; bituminous coal; 082GNE001	200,000 t clean	na	PCI M: 56.8 Mt I: 22.9 Mt Inf: 4.8 Mt	Mineable reserves at CMO depleted; reclamation begun; facilities also processed coal trucked from Elkview mine; facilities to be placed on care and maintenance; Coal Mountain Phase II (CMO2, Marten Wheeler) would use facilities from CMO, but project currently remains on hold.
<b>Elkview</b>	Southeast	<b>Teck Coal Limited (95%); Nippon Steel &amp; Sumitomo Metal Corp. (2.5%), POSCO (2.5%)</b>	HCC; bituminous coal; 082GNE017	7.1 Mt clean	HCC P: 6.8 Mt Pr: 258.3 Mt	HCC M: 223.0 Mt I: 156.7 Mt Inf: 205.6 Mt	Baldy Ridge Extension (BRE) approved (2016); exploration drilling in active pits and expansion areas; coal quality testwork; P+Pr reserves expected to support approximately 38 more years at the current production rate.
<b>Fording River</b>	Southeast	<b>Teck Coal Limited</b>	HCC; bituminous coal; 082JSE012	8.15 Mt clean	HCC P: 166.4 Mt Pr: 221.5 Mt	HCC M: 407.6 Mt I: 925.5 Mt Inf: 775.6 Mt	EA approval of Swift expansion (2015); exploration drilling in active pits and expansion areas; coal quality testing; geophysical work and exploration in future expansion areas; pilot water treatment construction; P+Pr reserves are projected to support a further 43 years of mining at current production rate.
<b>Greenhills</b>	Southeast	<b>Teck Coal Limited (80%); POSCAN (20%)</b>	HCC bituminous coal; 082JSE007	6.1 Mt clean	HCC P: 9.7 Mt Pr: 155.3 Mt	HCC M: 162.2 Mt I: 247.2 Mt Inf: 177.1 Mt	Cougar Pit Expansion (CPX) approved (2016); exploration drilling in expansion areas; coal quality testing; P+Pr reserves are projected to support another 28 years of mining at the current planned production rates.

Table 3. Continued.

<b>Line Creek</b>	Southeast	<b>Teck Coal Limited</b>	HCC, TC; bituminous coal; 082GNE020	3.95 Mt clean	HCC P: 2.4 Mt Pr: 57.8 Mt  TC P: 0.4 Mt Pr: 10.1 Mt	HCC M: 312.2 Mt I: 406.5 Mt Inf: 372.8 Mt  TC M: 1.7 Mt I: 1.9 Mt Inf: 1.8 Mt	Burnt Ridge Extension (BRX) approved (2016); pre-stripping on Mount Michael (LCO2); exploration drilling and coal quality test work in expansion areas; Additional of treatment process to West Line Creek water treatment facility, with further design optimization underway; P+Pr reserves at Line Creek are projected to support another 18 years of mining at planned production rates.
<b>Quinsam</b>	Southwest	<b>Quinsam Coal Corporation (ERP Compliant Fuels LLC)</b>	Thermal coal; bituminous coal; 092F 319	na	na	Not reported. Unofficial, noncompliant Resources estimated at 40 Mt in 2013 by mine staff.	Placed on care and maintenance May 2019 and operator filed for bankruptcy in July. Produced about 200,000 t in 2018, the last full year of production.

HCC = hard coking coal; PCI = pulverized coal injection; TC = thermal coal; ULV = ultra low volatile  
P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

New Gold Inc. reported production to the end of the 3<sup>rd</sup> quarter for **New Afton** totalling 61.2 Mlb of Cu, 53,051 oz Au from 4.125 Mt of ore grading 0.81% Cu and 0.49 g/t Au. Metal recoveries averaged 83.3% for Cu and 82.3% for Au.

### 3.2. Coal mines

Nine coal mines (Fig. 1; Table 3) accounted for a forecast production of \$5.08 billion for 2019. This production represents about 58% of all total mineral output in the province. Coal was produced at five large open-pit operations of Teck Coal Limited in southeastern British Columbia, three open-pit operations of Conuma Coal Resources Limited in northeastern British Columbia, and one underground operation of Quinsam Coal Corporation on Vancouver Island. During the year, Teck's **Coal Mountain** mine and Quinsam's **Quinsam** mine suspended operations.

### 3.3. Industrial minerals, aggregates, and jade

About 30 industrial mineral mines and more than 1000 aggregate operations are active in British Columbia (selected operations are listed in Table 4). With forecast production figures for industrial minerals of \$430 million (4.9% of total mineral production) and for aggregates of \$300 million (3.4% of total mineral production), these operations are important to

the economy of the province. British Columbia produces the world's best quality nephrite jade. The Northwest Region was the most active for jade producers.

In the Northeast Region, Fireside Minerals Ltd. mines veins of massive white barite. The barite is crushed and bagged on site and trucked to Fort St. John and Alberta for use in the drilling industry. In the South Central Region, industrial mineral commodities produced include roofing granules (from basalt), limestone, dimension stone, opal, railway ballast, diatomaceous earth, and zeolite. The Southeast Region hosts several industrial mineral mines, the largest of which are in the Rocky Mountain foreland belt. Commodities produced include magnesite, silica, gypsum, graphite, mineral wool, and abrasives. In the Southwest Region a number of operations remained in steady production and continue to be a major employer.

### 4. Mine development projects

As used herein, the term 'mine development projects' refers to those where the decision to produce has been made, necessary permits have been acquired, financing has been secured, and on-site construction has started. In 2019, only CertainTeed Gypsum Canada Inc.'s **Kootenay West** project (Fig. 1; Table 5) was considered under development.

**Table 4.** Selected operating industrial mineral mines and quarries, 2019, forecast mine production, reserves, and resources.

Mine	Region	Operator (partner)	Commodity; deposit type; MINFILE	Forecast 2019 Production (based on Q1-Q3)	Reserves	Resource	Comments
<b>Anyox</b>	Northwest	<b>True-Grit Abrasives</b>	Slag steel	na	na	na	Slag is mined, cleaned, and barged for roofing and sand for sand blasting.
<b>Cassiar Jade</b>	Northwest	<b>Dynasty Jade Ltd.</b>	Nephrite jade; gems and semi- precious stones; 104P 005	na	na	na	Trenching, quarrying, placer production.
<b>Dean Kutcho</b>	Northwest	<b>Cassiar Jade Contracting Inc.</b>	Nephrite jade; gems and semiprecious stones; 104I 078	na	na	na	Mining.
<b>Jade Valley</b>	Northwest	<b>United Oriental Mining Ltd.</b>	Nephrite jade; gems and semi- precious stones	na	na	na	Trenching, quarrying, placer production.
<b>Kaien Creek</b>	Northwest	<b>Terus Construction Ltd.</b>	Industrial rock; crushed rock	na	na	na	Drilling, blasting, crushing, production for CN Railway and LNG projects.
<b>Kutcho Creek Jade</b>	Northwest	<b>Continental Jade Ltd.</b>	Nephrite jade; gems and semi- precious stones; 104I 078	na	na	na	Mining, trenching.
<b>Letain</b>	Northwest	<b>Cassiar Jade Contracting Inc.</b>	Nephrite jade; gems and semi- precious stones; 104I 079	na	na	na	Mining, trenching.
<b>Polar Jade</b>	Northwest	<b>Glenpark Enterprises Ltd.</b>	Nephrite jade; gems and semi- precious stones; 104I 083	na	na	na	Mining, trenching.
<b>Provencher</b>	Northwest	<b>Glenpark Enterprises Ltd.</b>	Nephrite jade; gems and semi- precious stones; 104I 092	na	na	na	Mining, trenching.
<b>Rainbow Lake South</b>	Northwest	<b>Spring Creek Aggregates Ltd.</b>	Industrial rock; crushed rock	na	na	na	Drilling, blasting, crushing, production for CN Railway and LNG projects.
<b>Ridley Island</b>	Northwest	<b>Terus Construction Ltd.</b>	Industrial rock; crushed rock	na	na	na	Drilling, blasting, crushing, production for CN Railway and LNG projects.
<b>Robinson Lake Trail</b>	Northwest	<b>Haisla &amp; Progressive Ventures Construction Ltd.</b>	Industrial rock; crushed rock	na	na	na	Drilling, blasting, crushing, production for CN Railway and LNG projects.

Table 4. Continued.

<b>Sand Hill</b>	Northwest	<b>Terus Construction Ltd.</b>	Industrial rock; crushed rock	na	na	na	Crushing for CN Railway and LNG projects.
<b>Wolverine</b>	Northwest	<b>Cassiar Jade Contracting Inc.</b>	Nephrite jade; gems and semi-precious stones	na	na	na	Mining and trenching.
<b>Fireside</b>	Northeast	<b>Fireside Minerals Ltd.</b>	Barite; vein barite; 094M 003, 019	30,000 t	P+Pr: 475,000 t (non-NI 43-101 compliant)	na	Mined from the Moose Pit. With possible extension to north.
<b>Ashcroft</b>	South Central	<b>IG Machine and Fibers Ltd. (IKO Industries Ltd.)</b>	Basalt (roofing granules); 092INW104	300,000 t	na	Approx. 13.3 Mt in 2002	Typically mines 500,000 t with 60% processed into granule products.
<b>Bromley Creek (Zeotech)</b>	South Central	<b>Canadian Zeolite Corp.</b>	Zeolite; open system zeolites; 092HSE243	na	na	M+I: (as of 2013-06-30): 550,000 t	Operating by Absorbent Products Ltd.
<b>Bud</b>	South Central	<b>Absorbent Products Ltd.</b>	Bentonite; 092HSE162	na	na	na	Operating, but volumes not published.
<b>Falkland</b>	South Central	<b>Lafarge Canada Inc.</b>	Gypsum; 082LNW001	na	na	na	Production affected by shut down of Lafarge's Kamloops Cement Plant.
<b>Kettle Valley Quarries</b>	South Central	<b>Kelowna Sand and Gravel Ltd./Kettle Valley Stone Company</b>	Ashlar, flagstone, thin veneer; 082ENW109, 111, 112	na	na	na	
<b>Nazo</b>	South Central	<b>Can Lava Mining Corporation</b>	Lava rock; cinder cone; 093B 060	na	na	Historical: 45 Mt	1998 resource estimate. Exploration permitted on adjacent property.
<b>Red Lake</b>	South Central	<b>Absorbent Products Ltd.</b>	Diatomaceous earth; lacustrine diatomite; 092INE081	na	na	na	Operating but volumes not published.
<b>Z-1</b>	South Central	<b>ZMM Canada Minerals Corp.</b>	Zeolite; open system zeolites; 092INW095	9000 t	na	Approx. 800,000 t	Historical resource.
<b>Elkhorn</b>	Southeast	<b>CertainTeed Gypsum Canada Inc.</b>	Gypsum; evaporitic bedded gypsum; 082JSW021	Gypsum: 300,000 t; Anhydrite: 120,000 t	na	na	Mine expected to remain open until 2023; the company will replace production by developing the Kootenay West mine (EAO certificate granted in 2018).

Table 4. Continued.

<b>Moberly Silica</b>	Southeast	<b>HCA Mountain Minerals Limited</b> (Northern Silica Corporation)	Silica; industrial use silica, frac sand; 082N 001	na	20 to 140 mesh frac sand (dry) P: 8.9 Mt of 64% frac sand + Pr: 4.6 Mt of 64% frac sand (2014)	M+I: 30 to 140 mesh frac sand (dry): 37.5 Mt at 70% frac sand + 11.3 Mt silica as frac sand residues (2016)	Drilling (7 DDH, 1900 m); mapping, sampling, thin section work; design modifications to processing plant.
<b>Mount Brussilof</b>	Southeast	<b>Baymag Inc.</b>	Magnesite; hydrothermal sparry magnesite; 082JNW001	230,000 t	P: 50 Mt	na	MgO, and MgOH; sediment-hosted sparry magnesite.
<b>Winner</b>	Southeast	<b>Rockwool Inc.</b>	Gabbro/basalt; crushed rock for mineral wool; 082ESE265	Quarrying feed stock for mineral wool plant	na	na	Crushing, screening, stockpiling; environmental monitoring.
<b>Cox Station</b>	Southwest	<b>Mainland Construction Materials</b>	Aggregate; R15: crushed rock; 092GSE103	Typically, 2-3 Mtpy	na	na	
<b>CTCT</b>	Southwest	<b>Vancouver Island Marble Quarries Ltd.</b>	Marble; R09:limestone; 092E 020	Typically about 400 t annually	na	na	Supplies Matrix Marble and Stone Inc.
<b>Earle Creek</b>	Southwest	<b>Lafarge Canada Inc.</b>	B12: sand and gravel	Typically >1 Mtpy	na	na	
<b>Vulcan/Salal</b>	Southwest	<b>Garibaldi Pumice Ltd.</b>	Pumice; volcanic ash; 092JW 039	Approx. 20,000 m <sup>3</sup> annually	na	11,396,000 m <sup>3</sup> pumice 4,990,000 m <sup>3</sup> pumicite (fines)	2014 resource. Additional exploration 2015, 2018.
<b>K2</b>	Southwest	<b>K2 Stone Quarries Inc.</b>	Dimension stone, flagstone; 092C 159	15,000-20,000 t annually	na	na	Number represents material extracted.
<b>Orca</b>	Southwest	<b>Polaris Minerals Corporation</b>	B12: sand and gravel	Up to 6 Mtpy	P+Pr: 121.6 Mt (2005)	M+I: 134.1 Mt (2005)	Subsidiary of U.S. Concrete Inc. Exports to USA.
<b>Pitt River</b>	Southwest	<b>Lafarge Canada Inc.</b>	Aggregate; R15: crushed rock; 092GSE007	Typically > 1 Mtpy	na	na	
<b>Sechelt</b>	Southwest	<b>Lehigh Hanson Materials Limited</b>	B12: sand and gravel	Typically > 1 Mtpy	na	Several decades	
<b>Sumas Shale</b>	Southwest	<b>Sumas Shale Ltd.</b> (Lafarge Canada Inc., Clayburn Industrial Group)	Shale, clay, sandstone; B05; residual kaolin; 092GSE024	About 500,000 t annually	na	50+ years	Approximately 55% shale, 45% sandstone for cement production.

**Table 4.** Continued.

<b>Texada Quarry</b>	Southwest	<b>Texada Quarrying Ltd.</b> (Lafarge Canada Inc.)	Limestone, aggregate; limestone; 092F 395	na	na	100+ years	Mostly produces limestone for cement manufacture. High brightness carbonate and aggregates also produced.
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P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

**Table 5.** Mine development projects.

Mine	Region	Operator (partner)	Commodity; deposit type; MINFILE	Reserves	Resource	Comments
<b>Kootenay West</b>	Southeast	<b>CertainTeed Gypsum Canada Inc.</b>	Gypsum; evaporitic bedded gypsum; 82JSW005, 20	na	North and South quarries: Total 16.9 Mt (at average quality of 83-85%)	Granted a conditional EA certificate in January, 2018; environmental baseline work, permitting, and modifications to mine design; construction began in 2019; 400,000 tpy; 43-year mine life; blended product to market specifications.

#### 4.1. Kootenay West (CertainTeed Gypsum Canada Inc.)

CertainTeed Gypsum's **Kootenay West** project is a new gypsum mine under construction in the Southeast Region. The operation plans to produce 400,000 tpy over a 43-year mine life.

#### 5. Selected proposed mine or quarry projects

Projects at the proposed mine or quarry (or mine evaluation) stage have a resource defined or largely defined and are at least preparing to submit a project description to initiate the environmental assessment process or are waiting on permit amendments. Projects that have permits in place but have yet to obtain financing to begin site construction are also considered to be at the proposed stage. Selected projects (Fig. 1; Table 6) discussed below are grouped by region and commodity types.

##### 5.1. Northwest Region

Proposed metal mines include Galore Creek Mining Corporation's **Galore Creek** project, Seabridge Gold Inc.'s **KSM** project, Kutcho Copper Corp.'s **Kutcho** project and Ascot Resources Ltd.'s **Red Mountain** project. Telkwa Coal Ltd., a subsidiary of Allegiance Coal Ltd., is proposing to develop the **Tenas** coal mine project.

##### 5.1.1. Proposed metal mines

The **Galore Creek** gold-copper project is operated by the Galore Creek Mining Corporation (GCMC). Ownership of GCMC is equally split between Teck Resources Limited and Newmont Corporation. Newmont purchased 50% interest from Novagold Resources Inc. in July 2018. Newmont and Teck announced that they will complete prefeasibility studies

over three to four years with an annual budget of \$10 to \$15 million (50% basis). The project consists of 13 known zones of gold-copper mineralization with Proven plus Probable reserves reported as 528 Mt at 0.59% Cu, 0.32 g/t Au, and 6.02 g/t Ag.

Kucho Copper Corp.'s **Kutcho** project entered the environmental assessment and permitting process in September 2019. The deposit has Probable reserves of 10.4 Mt grading 2.01% Cu, 3.19% Zn, 0.37 g/t Au and 34.61 g/t Ag, with a Measured plus Indicated resource of 17.26 Mt at 1.85% Cu, 2.72% Zn, 0.49 g/t Au, and 33.9 g/t Ag. The average annual production is expected to be 33 Mlbs of Cu and 42 Mlbs of Zn.

Seabridge Gold Inc. continued work on their **KSM** porphyry copper-gold project. The project consists of four porphyry Cu-Au deposits: Kerr, Sulphurets, Mitchell, and Iron Cap. The deposits represent what may be the largest undeveloped copper-gold camp in the world (by reserves). Proven plus Probable reserves are reported as 2.198 Bt grading 0.55 g/t Au, 0.21% Cu, 2.6 g/t Ag, and 42.6 g/t Mo. Measured plus Indicted resource estimate totals 2.902 Bt grading 0.54 g/t Au, 0.21% Cu, 2.7 g/t Ag, and 44 ppm Mo. Seabridge received federal and provincial approval of its environmental assessment in 2014 and is seeking partnership to enter construction. The focus of exploration work in 2019 was to evaluate potential for additional porphyry Au-Cu systems below the Sulphurets thrust fault, follow up high-grade epithermal Au mineralization in the Sulphurets deposit, and expand on the Sulphurets resource estimate.

The **Red Mountain** project is a proposed high-grade underground gold mine. In March of this year, Ascot Resources completed the acquisition of the Red Mountain project from IDM Mining, who received its Environmental

Table 6. Selected proposed mine projects.

Project	Region	Operator (partner)	Commodity; deposit type; MINFILE	Reserves	Resource	Comments
<b>Galore Creek</b>	Northwest	<b>Galore Creek Mining Corporation (Teck Resources Limited (50%)), Newmont Corporation (50%)</b>	Cu, Au, Ag; alkaline porphyry; 104G 090	P+Pr: 528 Mt at 0.59% Cu, 0.32 g/t Au, 6.02 g/t Ag	M: 256.8 Mt at 0.72% Cu, 0.36 g/t Au I: 846.7 Mt at 0.39% Cu, 0.23 g/t Au Inf: 198.1 Mt at 0.27% Cu, 0.21 g/t Au	25,000 m of drilling. Metallurgical, geotechnical, resource, and brownfield exploration. Geological mapping, lidar, and stream-sediment sampling.
<b>KSM</b>	Northwest	<b>Seabridge Gold Inc.</b>	Au, Cu, Ag, Mo; calc-alkaline porphyry; 104B 191	P+Pr: 2.198 Bt at 0.55 g/t Au, 0.21% Cu, 2.6 g/t Ag, 42.6 g/t Mo	M+I: 2.902 Bt at 0.54 g/t Au, 0.21% Cu, 2.7 g/t Ag, 44 g/t Mo Inf: 2.719 Bt at 0.35 g/t Au, 0.32% Cu, 2.0 g/t Ag, 29 g/t Mo (Total for KSM deposits)	Exploration work to evaluate potential for additional Au-Cu porphyry systems below the Sulphurets thrust fault, follow up high-grade epithermal gold mineralization in the Sulphurets deposit, and expand the Sulphurets resource estimate.
<b>Kutcho</b>	Northwest	<b>Kutcho Copper Corp.</b>	Cu, Pb, Zn; Noranda/Kuroko VMS; 104I 060	Pr: 10.4 Mt at 2.01% Cu, 3.19% Zn, 0.37 g/t Au, 34.6 g/t Ag	M+I: 17.26 Mt at 1.85% Cu, 2.72% Zn, 0.49 g/t Au, 33.9 g/t Ag	Mineralogical study to determine the variability and abundance of copper sulphide minerals.
<b>Red Mountain</b>	Northwest	<b>Ascot Resources Ltd.</b>	Au, Ag; subvolcanic and precious metal veins; 103P 086	P+Pr: 1.95 Mt at 7.53 g/t Au, 21.9 g/t Ag	M+I: 3.19 Mt at 7.63 g/t Au, 21.02 g/t Ag Inf: 0.41 Mt at 5.32 g/t Au, 7.33 g/t Ag	March 2019: Ascot purchased the project from IDM Mining for \$45 million.
<b>Tenas</b>	Northwest	<b>Allegiance Coal Ltd. (95%), Itochu Corp. (5%)</b>	Coal; metallurgical coal; 093L 156	P+Pr: 62.9 Mt coal	na	Entered provincial Environmental Assessment process in November of 2018 estimated to produce approximately 775,000-825,000 t of steelmaking-coal annually with a mine-life of ~25 years.
<b>Murray River</b>	Northeast	<b>HD Mining International Ltd.</b>	Coal; bituminous; 093I 035	P: 261.6 Mt mineable coal	M+I: 314.2 Mt in situ; Inf: 373.9 Mt coal in situ	Provincial and Federal EA certificates in place. Mine plan and reclamation program approved April 2018. Would produce 6 Mtpy from two longwall faces over 25-year mine life with 764 direct jobs.
<b>Sukunka</b>	Northeast	<b>Glencore Canada Corporation</b>	Coal; Bituminous 093P 014	na	145.0 Mt coal in situ	20+ year mine life at 1.5-2.5 Mt saleable coal per year, 250 permanent jobs once operational. Permitting in progress.

Table 6. Continued.

<b>Wapiti East</b>	Northeast	<b>Fertoz International Inc.</b>	P <sub>2</sub> O <sub>5</sub> ; Sedimentary phosphate deposits; 093I 008, 22, 15	na	I+Inf: 1.54 Mt 21.6% P <sub>2</sub> O <sub>5</sub>	Permitting in progress. Proposed seasonal shallow open pit mine with annual production of less than 75,000 t over a +20year mine life.
<b>Wolverine-Herman Amendment</b>	Northeast	<b>Conuma Coal Resources Limited</b>	Coal; bituminous; 093I 031	P: 10.7 Mt Pr: 3.6 Mt	M: 15.0 Mt I: 15.6 Mt Inf: 9.6 Mt	Drilling (6 DD, 1937 m, 6 RC, 721 m, Sonic, 26, 780 m).
<b>Aley</b>	North Central	<b>Taseko Mines Ltd.</b>	Nb; Carbonatite-hosted; 094B 027	P+Pr: 83.8 Mt at 0.50% Nb <sub>2</sub> O <sub>5</sub> (at 0.30% Nb <sub>2</sub> O <sub>5</sub> cut-off)	M+I: 285.8 Mt at 0.37% Nb <sub>2</sub> O <sub>5</sub> (at 0.20% Nb <sub>2</sub> O <sub>5</sub> cut-off)	Proposed open-pit mine with 10,000 tpd ore processing rate and average annual production of 9000 t Nb over a 24-year mine life. In 2019, environmental monitoring, pilot plant to provide product samples.
<b>Blackwater</b>	North Central	<b>New Gold Inc.</b>	Au, Ag; Epithermal Au-Ag-Cu (intermediate sulphidation); 093F 037	P+Pr: 334.4 Mt at 0.74 g/t Au, 5.5 g/t Ag, containing 8.17 Moz Au, 60.8 Moz Ag (combined direct processing and low grade)	M+I: 61.32 Mt at 0.71 g/t Au, 4.4 g/t Ag, containing 1.40 Moz Au, 8.73 Moz Ag (combined direct processing and low grade, exclusive of reserves)	Received Federal and Provincial Environmental Assessment certificates. Drilling (3 DDH, 342 m, 12 sonic/air rotary, 750 m). Proposed open-pit mine with 60,000 tpd ore processing rate and life-of-mine average annual production of 413 Koz Au and 1.74 Moz Ag over a 17-year mine life.
<b>Giscome</b>	North Central	<b>Graymont Western Canada Inc.</b>	CaCO <sub>3</sub> ; limestone; 093J 041, 25	na	I: >100 Mt of limestone (>95% calcium carbonate, <5% magnesium carbonate) in situ	Environmental Assessment under review. Proposed 600,000 tpy limestone quarry to feed a vertical lime kiln producing 198,000 t of lime annually over a 50+ year mine life.
<b>Kemess Underground (KUG)</b>	North Central	<b>Centerra Gold Inc.</b>	Cu, Au, Ag; porphyry Cu±Mo±Au; 094E 021	Pr: 107.38 Mt at 0.27% Cu, 0.54 g/t Au, 1.99 g/t Ag; containing 629.6 Mlbs Cu, 1.87 Moz Au, 6.88 Moz Ag	I: 246.4 Mt at 0.22% Cu, 0.42 g/t Au, 1.75 g/t Ag; containing 1195 Mlbs Cu, 3.33 Moz Au, 13.87 Moz Ag (inclusive of reserves)	Permitted, proposed underground panel cave mine with 24,600 tpd ore processing rate and life-of-mine average annual production of 106,000 oz Au and 47 Mlbs Cu over a 12-year mine life.
<b>Ajax</b>	South Central	<b>KGHM Ajax Mining Inc. (KGHM Polska Miedz SA 80%, Abacus Mining and Exploration Corporation 20%)</b>	Cu, Au; alkalic porphyry; 092INE012, 13	(P+Pr: NSR cut-off US\$7.10/t): 426 Mt grading 0.29% Cu, 0.19 g/t Au, 0.39 g/t Ag	(M+I: NSR cut-off US\$7.10/t): 568 Mt grading 0.26% Cu, 0.18 g/t Au, 0.35 g/t Ag	Environmental certification denied by provincial (2017) and federal ministers (2018).

Table 6. Continued.

<b>Bralorne</b>	South Central	<b>Avino Silver and Gold Mines Ltd.</b>	Au; Au quartz veins; 092JNE001	na	M+I: 577,559 t grading 9.6 g/t Au	Past producer 1900-1971. Operated on a trial basis 2010-2014. New 100 tpd permit in 2017. Exploration in 2018 included drilling, airborne and ground geophysics, mapping, and geochemical sampling.
<b>Cariboo Gold</b>	South Central	<b>Barkerville Gold Mines Ltd. (acquired by Osisko Gold Royalties Ltd.)</b>	Au; Au-quartz veins; 093H 140, 139, 19, 6	na	M+I (cut-off 3.0 g/t Au): 13.495 Mt 5.6 g/t Au Inf: (3.0 g/t cut-off): 11.936 Mt 5.0 g/t Au	PEA has u/g mine with 11-year mine life, average 185,000 oz/y Au. In EA pre-application stage. Exploration continued with 91,000 m drilling.
<b>New Prosperity</b>	South Central	<b>Taseko Mines Limited</b>	Cu, Au; porphyry; 092O 041	P+Pr: NSR cut-off \$5.50/t: 831 Mt grading 0.23% Cu and 0.41 g/t Au; containing (recoverable) 3.6 Blb Cu; 7.7 Moz Au	M+I (cut-off 0.14% Cu): 1010 Mt grading 0.24% Cu; 0.41 g/t Au	Project at post-decision stage. Granted provincial environmental certificate but denied federal approval. Exploration and site evaluation proposed in 2019 but deferred pending a new legal challenge.
<b>Ruddock Creek</b>	South Central	<b>Ruddock Creek Mining Corporation (Imperial Metals 45.3%, Mitsui Mining and Smelting Co. 30%, ITOCHU Corp. 20%, JOGMEC 4.7%)</b>	Pb, Zn, Ag; Broken Hill-type; 082M 082	na	M+I (cut-off 4.0% Pb+Zn): 6.2 Mt grading 6.50% Zn, 1.33% Pb	Project at environmental assessment pre-application stage. Exploration drilling continued in 2019. Highlight 40.9 m 16.83% Zn, 3.46% Pb, 4.74 g/t Ag. Japan Oil, Gas and Metals National Corporation earning an interest.
<b>Spanish Mountain</b>	South Central	<b>Spanish Mountain Gold Ltd.</b>	Au, Ag; Au-quartz veins; 093A 043	na	M+I (cut-off 0.15 g/t Au): 273.2 Mt grading 0.47 g/t Au, 0.71 g/t Ag Inf: 52.4 Mt 0.37 g/t Au, 0.67 g/t Ag	Project at environmental assessment pre-application stage. Preliminary economic assessment updated in 2019.
<b>Yellowhead</b>	South Central	<b>Taseko Mines Limited</b>	Cu, Au, Ag; Noranda/ Kuroko; 082M 008, 9	P+Pr (cut-off 0.14% Cu): 716 Mt grading 0.26% Cu, 0.029 g/t Au, 1.18 g/t Ag	M+I (cut-off 0.2% Cu): 815 Mt 0.28% Cu, 0.030 g/t Au, 1.3 g/t Ag	BC Environmental Assessment Office terminated EA process 2018. Taseko Mines Limited acquired the project and plans to advance it.

Table 6. Continued.

<b>Black Crystal</b>	Southeast	<b>Eagle Graphite Corp.</b>	Graphite; metamorphic hosted flake graphite; 082FNW260, 283	na	Regolith+calc-silicate; M+I: 19.23 Mt at 1.35% fixed carbon Inf: 23.92 Mt at 1.3% fixed carbon (2018)	Research and development; possible application for Li-ion batteries.
<b>Crown Mountain</b>	Southeast	<b>NWP Coal Canada Ltd. 80% (Bathurst Resources Ltd. 20%)</b>	Coal (HCC and PCI); open-pit; 082GNE018	HCC: P: 42.60 Mt Pr: 4.91 Mt  PCI: P: 7.13 Mt Pr: 1.19 Mt (2014)	HCC+PCI: M: 68.9 Mt I: 6.0 Mt (2014)	Option agreement with Bathurst Resources Limited, with ability to earn 50% with investment of \$121.5 M; Pre-application of EA (2014); Application Information requirements (AIR) received in April (2018); coal quality test work; water quality and treatment studies involving passive biological treatment; engineering studies and mine design; bankable feasibility study; 16-year mine life; 1.7 Mtpy.
<b>Driftwood Creek</b>	Southeast	<b>MGX Minerals Inc.</b>	Magnesite; hydrothermal sparry magnesite; quarry; 082KNE068	na	M+I: 7.847 Mt grading 43.27% MgO Inf: 55.8 Mt (2016; using cut-off grade of 42.5% MgO)	Preliminary Economic Assessment: 169,700 t of MgO, average grade of 43.27% MgO, 19-year mine life, 2.4:1 strip ratio; scoping study underway; environmental baseline studies; 100 t bulk sample; preliminary test work indicates recovery rates of 93.4% reverse flotation and removal of up to 70% silica and 30% calcium oxides; bulk of resource is within 100 m of surface; 2016 drilling extended the zone; 20 year mine lease acquired.
<b>Michel Coal</b>	Southeast	<b>North Coal Limited</b>	Coal (HCC and PCI); open-pit and underground; 082GSE050	na	HCC: M: 44.6 Mt I: 42.5 Mt; open-pit and underground (2015)	Entered pre-application of EA in 2015, re-submission of their project description in September (2018) to include all 3 mining areas; geotechnical studies and updates to mine design; coal quality testing indicates coal has similar characteristics to Elk Valley hard coking coal; drilling identified 20 coal seams with cumulative thickness of 70 m (14% of a 504 m section in the Mist Mountain Formation).

Table 6. Continued.

<b>Black Bear</b>	Southwest	<b>Polaris Materials Corporation</b> (Parent company US Concrete, Inc.)	Aggregate; R15; na	na	na	Orca environmental certificate amendment Application Information Requirements approved for proposed 250,000 tpy near the Orca quarry.
<b>BURNCO Aggregate</b>	Southwest	<b>BURNCO Rock Products Ltd.</b>	Aggregate; B12: sand and gravel; na	na	Approx. 20 Mt	Has environmental certification.
<b>Sechelt Carbonate</b>	Southwest	<b>Ballinteer Management Inc.</b>	Limestone, dolostone, aggregate; R09: limestone; R10: dolomite; R15: crushed rock; 093GNW031	na	Carbonate Rock: 76.1 Mt Gabbro: >700 Mt	Proponent requests project remain in environmental assessment pre-application stage.

HCC = hard coking coal; PCI = pulverized coal injection; TC = thermal coal; P = Proven; Pr = Probable; M = Measured; I = Indicated; Inf = Inferred

Assessment Certificate in October of 2018. Ascot purchased the Red Mountain project for \$45 million and the project has an estimated capital development cost of approximately \$145 million. In 2019, Ascot Resources published a mineral resource estimate that built on the estimate IDM published in 2016. Forty drill holes completed late in 2018 increased the gold resource by 200,000 oz and the Measured plus Indicated resources are now reported at 3.19 Mt grading 7.63 g/t Au and 21.02 g/t Ag, with an additional Inferred resource of 0.41 Mt grading 5.32 g/t Au and 7.33 g/t Ag. In 2017, a Proven plus Probable reserve of 1.95 Mt at 7.53 g/t Au, 21.9 g/t Ag was reported.

### 5.1.2 Proposed coal mines

Telkwa Coal Ltd., a subsidiary of Allegiance Coal Ltd., is proposing to develop the **Tenas** project, which is 25 km south of Smithers and 7 km southwest of the community of Telkwa. Itochu Corp. has a 5% interest. The Telkwa coalfield produced 433,000 t of thermal coal from rocks of the Skeena Group (Early Cretaceous) between 1918 and 1970. Currently there are four separate pits on approximately 1050 ha, where the current focus is the Tenas pit. The project has entered the provincial Environmental Assessment process. It is estimated that the project would produce approximately 775,000-825,000 t of steelmaking coal annually with a mine-life of about 25 years. In 2017, the company released a reserve estimate of Proven plus Probable reserves of 62.9 Mt of coal. In 2019, 47 drill holes were completed to obtain additional coal quality and geotechnical information, and 600 m of sonic drilling was completed for geotechnical design and proposed waste-rock locations. Additional groundwater monitoring wells were installed throughout the property.

### 5.2. Northeast Region

Proposed mines in the Northeast Region include HD Mining International Ltd.'s **Murray River**, Glencore Canada Corporation's **Sukunka** and Conuma Resources Limited's **Wolverine-Herman Amendment** coal projects. Ferto International Inc. proposes the **Wapiti East** industrial mineral mine (phosphate).

#### 5.2.1. Proposed coal mines

**Murray River** is a proposed underground mine that would extract metallurgical coal from the Gates Formation. In 2015, HD Mining International Ltd. completed bulk sampling for testing coal quality, processing, and marketability. In April 2018, the company received its Mines Act permit. An adit, driven to collect the bulk sample in 2015 but also to be used for the mining conveyor, descends 1.3 km down a decline. Two vertical shafts are to be completed, one for moving staff and equipment, and the other for ventilation. HD Mining plans to construct its own wash plant and use existing rail facilities. The project is expected to provide about 764 jobs in direct employment during a 25-year mine life. Chinese miners experienced in longwall methods would start production but would be replaced within 10 years once Canadian miners are trained. Murray River awaits a final investment decision by HD Mining's parent company, China Huiyong Holdings.

Glencore Canada Corporation and JX Nippon Oil and Energy Corporation's **Sukunka** project has been planned as both an open-pit and underground operation. The project is listed on The British Columbia Environmental Assessment Office website as 'in progress'.

In July 2019, Conuma applied to the Environmental Assessment Office to open pit mine coal at the **Wolverine-**

**Herman Amendment** project, as a satellite to the Wolverine mine. If approved the Hermann pit would produce 1.5 to 3 Mt of coal per year and add up to 7 years to the life of the wash plant at the Wolverine mine.

### 5.3. North Central Region

There are four proposed mines in the North Central Region. Three are proposed metal mines and include, Taseko Mines Ltd.'s **Aley** Niobium project; New Gold Inc.'s **Blackwater** Au-Ag project and Centerra Gold Inc.'s Cu-Au-Ag **Kemess Underground** project. Graymont Western Canada Inc.'s **Giscome** project is a proposed industrial mineral mine (limestone).

#### 5.3.1. Proposed metal mines

Taseko Mines Ltd.'s **Aley** project is a niobium-bearing carbonatite. Reserves stand at 84 Mt grading 0.5% Nb<sub>2</sub>O<sub>5</sub>. An open-pit mine is proposed, processing 10,000 tpd and producing ferroniobium. The projected mine life is 24 years with an output of about 9 Mkg of niobium annually, making it among the largest niobium deposits in the world. Environmental assessment is underway. In 2019, Taseko continued environmental monitoring and began product development and marketing initiatives. A pilot plant program was initiated to build on bench-scale niobium flotation and converter processes and to provide product samples for marketing.

New Gold Inc.'s **Blackwater** project has combined direct processing and low-grade Proven and Probable reserves of 344.4 Mt grading 0.74 g/t Au and 5.5 g/t Ag. As proposed, Blackwater would be a 60,000 tpd operation with a 17-year mine life. Once completed, the operation would consist of an open pit, an ore processing facility, a waste rock dump, a tailings pond, water management facilities, offices, employee accommodations, warehouses, and a truck shop. In 2019, New Gold received both provincial and federal Environmental Assessment Certificates but has not yet decided when to initiate the final mine permitting process as they re-evaluate project sizing and processing options.

Centerra Gold Inc.'s **Kemess Underground (KUG)** project is estimated to contain an Indicated resource of 246.4 Mt grading 0.22% Cu, 0.42 g/t Au, and 1.75 g/t Ag. Within this resource are Probable reserves of 107.4 Mt grading 0.27% Cu, 0.54 g/t Au, and 1.99 g/t Ag. The former Kemess South mine closed in 2011. However, infrastructure remains in place, and both the camp and ore processing plant will be used to service KUG, which is about 6.5 km north of the former processing plant. KUG is considered a stand-alone operation, to be mined by panel caving with crushed ore conveyed underground to the processing plant. Processing rate would be 24,600 tpd with a life of mine average production of 106,000 oz Au and 47 Mlbs Cu over a 12-year mine life. The KUG project has approval for development but Centerra is currently concentrating resources elsewhere.

#### 5.3.2. Proposed industrial mineral mines or quarries

At their **Giscome** limestone project, Graymont Western Canada Inc. plans to exploit a high-purity Paleozoic limestone deposit. Crushed stone would be transported about 5 km by conveyor to lime kilns at a former stone quarry, owned and operated by CN Rail, in the community of Giscome. An existing CN Rail line would be used for transporting the product. The British Columbia Environmental Certificate for the project is in place, and the Mines Act Permit process is underway. The company anticipates starting construction in about 2020, with up to 600 Kt of limestone quarried annually.

### 5.4. South Central Region

Proposed mine projects in the South Central Region include KGHM Ajax Mining Inc.'s **Ajax**, Avino Silver and Gold Mines Ltd.'s **Bralorne**, Barkerville Gold Mines Ltd.'s **Cariboo Gold**, Taseko Mines Limited's **New Prosperity**, Ruddock Creek Mining Corporation's **Ruddock Creek**, Spanish Mountain Gold Ltd.'s **Spanish Mountain** and Taseko Mines Limited's **Yellowhead** projects. All are metal mine projects.

#### 5.4.1. Proposed metal mines

The **Ajax** porphyry copper-gold project, owned by KGHM Ajax Mining Inc., is an 80:20 joint venture between KGHM Polska Miedz S.A. and Abacus Mining and Exploration Corporation. A revised feasibility study released in 2016 modelled Ajax as a 65,000 tpd open-pit mine with a projected 18-year life. In December 2017, the project was denied certification by the British Columbia Ministries of Environment and Climate Change Strategy and Energy, Mines and Petroleum Resources. In June 2018, the Ministers of Natural Resources and Fisheries, Oceans and the Canadian Coast Guard denied federal certification. Although KGHM Ajax has not announced plans for the site, Abacus issued an update stating that the project remains a priority and that they have begun re-engaging those potentially affected by it.

In December, Talisker Resources Ltd. closed its acquisition of Bralorne Mines Ltd., a subsidiary of Avino Silver & Gold Mines Ltd. The cash and shares deal includes a payment of \$8.7 million. Avino acquired the **Bralorne** gold mine in 2014 and suspended mining shortly thereafter because the tailings storage facility reached capacity. Since then, Avino has carried out upgrades and plan to meet permitting requirements. In 2017, they received an updated permit for a 100 tpd throughput mining operation. Avino anticipates operating the mine at more than 100 tpd. However, they report that much of their existing infrastructure is inadequate for higher throughput and they are proceeding with re-development. The dam for tailings storage was raised in 2015 and the impoundment buttressed in 2016. A new water treatment plant was built in 2016, electrical systems upgraded, and retired equipment and buildings removed or demolished. Exploration on the property includes 28,000 m of drilling, which began in 2018 and extended through 2019.

The two-phase program included an underexplored area called the NorthEast block. Reporting gold-bearing veins in 27 of 35 holes, the company considers that the area has greater potential than previously recognized.

Barkerville Gold Mines Ltd. submitted a project description for the **Cariboo Gold** project to the British Columbia Environmental Assessment Office, which then issued a section 10 order requiring the project to obtain an Environmental Assessment Certificate to proceed. A 2019 preliminary economic assessment studied a 4000 tpd underground mine beneath Cow Mountain, Island Mountain, and the Valley zone in between. Reserves of 14.7 Mt at 4.5 g/t Au average diluted gold grade would give an expected 11-year mine life. Assuming a base-case gold price of US \$1325/oz and \$1.00=US\$0.77, the study estimated an internal rate of return of 28.1% and net present value of C\$402.2 million at a discount rate of 5%.

A concentrator on site would serve as a pre-concentrator to reduce transportation costs to the QR mill 111 km away. Tailings generated at the mine site would be disposed of as paste backfill. Tailings at the mill site would be dry stacked. The QR mill currently has a capacity of 850 tpd and would require modification to process the higher feed grades of the pre-concentrated material. A large exploration project is ongoing with about 91,000 m drilling in 2019 at Cow Mountain (including newly discovered Lowhee zone), Island Mountain (Mosquito and Shaft zones), and Barkerville Mountain. In November of 2019, Osisko Gold Royalties Ltd. acquired all shares in Barkerville Gold Mines Ltd. they did not already own. The deal valued Barkerville at about \$338 million.

The **New Prosperity** project of Taseko Mines Limited, is a porphyry gold-copper deposit with Proven and Probable reserves of 830 Mt grading 0.42 g/t Au and 0.23% Cu. Taseko continues to seek a judicial review of the February 2014 federal decision to deny the project. British Columbia granted Taseko a project certificate in 2010 and extended its expiry date by five years to 2020. In 2017, the British Columbia Ministry of Energy, Mines and Petroleum Resources issued a permit for a detailed site investigation of proposed mine infrastructure. Most of the activity concerning this project has been in the courts. The Tsilhqot'in Nation challenged the 2017 permit, arguing the province breached its duty to consult and accommodate. In 2019, the case reached the Supreme Court of Canada, which ruled that Taseko could proceed with the investigative work. However, before the work could begin, the Tsilhqot'in Nation filed a complaint on different grounds, infringement of aboriginal rights, and a new injunction halted the work.

The **Ruddock Creek** project remains in the pre-application phase of environmental assessment. A mineral resource estimate, released in March 2012, reported 4.65 Mt grading 6.77% Zn and 1.38% Pb (Indicated) and 5.38 Mt grading 6.69% Zn and 1.31% Pb (Inferred), using a 4.0% combined Pb+Zn cut-off. Ruddock Creek Mining Corporation is the operator and manager of the joint venture (Imperial Metals Corporation 45.3%; Mitsui Mining and Smelting Co. Ltd. 30%;

Itochu Corporation 20%; Japan Oil, Gas and Metals National Corporation 4.7%). JOGMEC funded the 2019 program. The joint venture operators followed up on positive 2018 results by drilling a total of 8800 m in 17 holes on the Q and V zones at the western edge of the massive sulphide prospect. A highlight from the deep V zone was 40.9 m grading 16.83% Zn, 3.46% Pb and 4.74 g/t Ag.

The **Spanish Mountain** project has Measured and Indicated resources of 273.2 Mt grading 0.47 g/t Au, 0.71 g/t Ag. Spanish Mountain Gold Ltd. proposes a phase one scenario whereby 39 Mt at an average diluted grade of 1.00 g/t Au and 0.74 g/t Ag would feed an 11-year, 10,000 tpd operation with average life of mine production of 104,000 oz/y Au. The project has been in the pre-application phase of environmental assessment since 2011. Current efforts are directed more toward optimization studies than environmental certification.

The British Columbia Environmental Assessment Office terminated Yellowhead Mining Inc.'s Harper Creek copper project assessment in 2018. However, in early 2019, Taseko Mines Limited acquired Yellowhead Mining, renamed the project **Yellowhead** and is evaluating advancing it. A 2014 feasibility study considered a 70,000 tpd open-pit mine with a 28-year life, based on Proven and Probable reserves are 716.2 Mt at 0.26% Cu, 0.029 g/t Au and 1.18 g/t Ag.

## 5.5. Southeast Region

Proposed mine projects in the Southeast Region include NWP Coal Canada Ltd.'s **Crown Mountain** and North Coal Ltd.'s **Michel** coal projects. As well, there are two proposed industrial mineral mine projects: Eagle Graphite Corp.'s **Black Crystal** and MGX Minerals Inc.'s **Driftwood Creek** project.

### 5.5.1. Proposed coal mines

The **Crown Mountain** project is owned by NWP Coal Canada Ltd., 80% (a wholly owned subsidiary of Jameson Resources Ltd.) and Bathurst Resources Limited, 20%. Bathurst could become a 50/50 joint venture partner after exercising all tranches in the terms of an option agreement, with an investment totalling \$121.5M. The project contains seven major Mist Mountain Formation coal seams, with combined average thicknesses of 15 to 35 m. In 2014, the company completed a resource estimate of 74.9 Mt (Measured + Indicated).

In October 2014, the project advanced to the pre-application stage of environmental assessment and received application information requirements from the Environmental Assessment Office in April 2018. Results released in 2019 from coal quality test work indicate a premium hard coking coal in the north pit, and a low-volatile hard coking coal in the south pit. Coal quality test work indicates that approximately 84% of the coal is hard coking coal, the remainder PCI coal. Environmental baseline work and geotechnical drilling continued, as did engineering work on spoil pile design and water treatment, including the use of biological reduction of nitrate and selenium by naturally occurring microbes in waste piles. A feasibility study for the

project is in progress and includes an open-pit mine with an estimated production capacity of 1.7 Mt per year of clean coal and a 16-year mine life.

In 2015, North Coal Ltd., a wholly owned subsidiary of CoalMont Pty Ltd., entered the pre-application phase of environmental assessment for their **Michel Coal** project. With subsequent expanded resource delineation and coal quality test work, the company amended their project proposal to include not only Loop Ridge, but also their Loop South, Tent Mountain, and Michel Head areas and, in September 2018, submitted a revised project description. The expanded plan will give them more flexibility in blending product from different areas to specification for clients. The project is expected to produce between 2.3 and 4 Mt annually, with a 30-year mine life. In 2019, work continued on their environmental baseline, permitting, and mine design. The project will use diversion, and active and passive techniques for managing waste rock and treating water to ensure that targets identified in the Elk Valley Water Quality Plan can be met. Drilling has identified 20 coal seams, between 5 and 20 m thick, and confirmed that coal is representative of typical Elk Valley hard coking coals (HCC). Structure and spacing of the seams give the project a low (ca. 6:1) strip ratio. In 2018, the company released an updated resource estimate with 44.6 Mt Measured and 42.5 Mt Indicated (open pit and underground) and is working towards an updated pre-feasibility engineering and design report.

### 5.5.2. Proposed industrial mineral mines or quarries

Eagle Graphite Corp. operates the **Black Crystal** flake graphite project. Graphite is in two identified zones: a 'hard rock' zone, and an overlying 'regolith' zone. The regolith zone is the near-surface weathered zone 2-4 m thick and has grades of up to 6.95% carbon. Most of the deposit is friable, and blasting is not required. Sand and aggregate would be by-products during the mining and refining process. In 2019, the company continued research into processing techniques and received a \$290,000 grant from CleanBC towards advancing lithium-ion graphite.

The **Driftwood Creek** project is owned by MGX Minerals Inc. The deposit is 100 to 300 m wide to a depth of approximately 110 m, and has been traced along strike for 2000 m. In 2018, the company released a preliminary economic assessment for a 1200 tpd quarry operation. The mine would produce 169,700 t of MgO at an average grade of 43.27% MgO, with a 19-year mine life, and 2.4:1 strip ratio. In 2019, the company continued environmental baseline studies and obtained permits for additional infill drilling.

## 5.6. Southwest Region

Proposed quarries in the Southwest Region include Polaris Materials Corporation's **Black Bear**, BURNCO Aggregate's **BURNCO Aggregate** and Ballinteer Management Inc.'s **Sechelt Carbonate** projects.

### 5.6.1. Proposed quarries

Polaris Materials Corporation is including the **Black Bear** project near its Orca sand and gravel quarry in an environmental certificate amendment for Orca. If the project proceeds, it will be a source of up to 250,000 tpy of crushed basalt.

The **BURNCO Aggregate** project now has environmental certification and may proceed with British Columbia Mines Act and other permitting. The proposed sand and gravel mine would ramp up to a 1.6 Mtpy operation, initially barging product to BURNCO Rock Products Ltd.'s ready-mix concrete plants in South Burnaby and Port Kells. BURNCO submitted revisions to the project in 2014, changing production rate, relocating some facilities, and specifying a mine life of 16 years.

Ballinteer Management Inc. now holds the property comprising the **Sechelt Carbonate** project. They filed engineering, archeological, and baseline environmental studies for assessment in 2016; activity was not reported for 2017-2019. The property contains resources of calcite- and dolomite-bearing carbonate rock and gabbroic rock for potential use as aggregate.

## 6. Exploration expenditures

In 2019, exploration expenditures, drilling estimates, and other metrics for British Columbia were captured in the British Columbia Mineral and Coal Exploration Survey. The survey is a joint initiative between the Province of British Columbia Ministry of Energy, Mines and Petroleum Resources, the Association for Mineral Exploration, and EY LLP. A full report will be available in March. The new survey does not capture exploration expenditures for aggregates, which had previously been done for the Southwest region only.

Total metal, industrial mineral and coal exploration expenditures are estimated at 329.5 million for 2019, down \$1.9 million from the 2018 survey total of \$331.4 million. Of this, \$40.8 million was from coal projects and \$288.7 million was from metal and industrial mineral projects (Fig. 5). Exploration expenditures by region (Fig. 6) can be further divided into five categories: grassroots, early stage, advanced stage, mine evaluation, and mine lease (Figs. 7, 8). The provincial combined total for grassroots and early-stage exploration in the 2019 survey is 39.8%, down from the 2018 total of 44.4%.

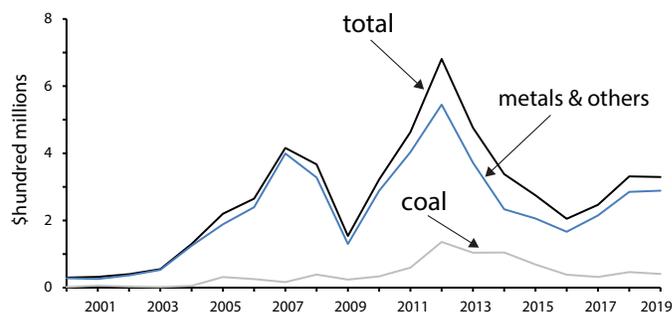


Fig. 5. Exploration expenditures per year, by type.

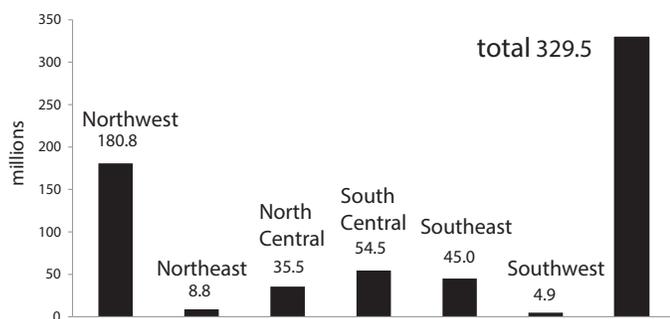


Fig. 6. 2019 exploration expenditures by region.

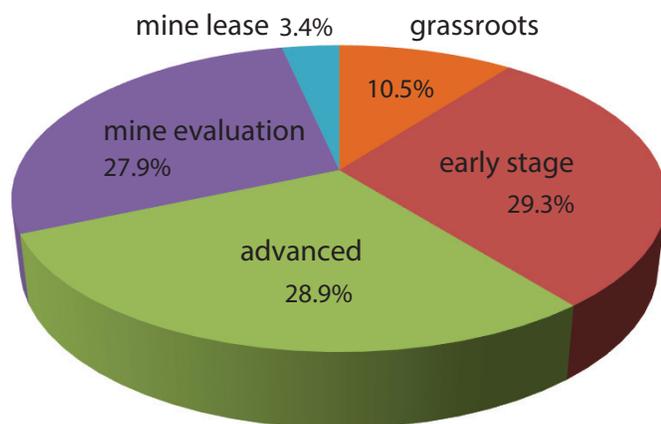


Fig. 7. 2019 exploration expenditures by category.

The total reported metres drilled for the province was 709,734, down from the 2018 total of 730,500 (see Fig. 9 for regional breakdown).

## 7. Exploration land tenure

Acquisition of new mineral claims in 2019 was down slightly compared to 2018 (Fig. 10). The total for 2019 was 1,913,583 hectares vs. 1,961,719 hectares for the previous year. New coal licences issued in 2019 totalled 9045 hectares, up slightly from the 2018 total of 8852 hectares (Fig. 11).

## 8. Summary of assessment work, 2018

Results of mineral exploration programs are submitted by industry in assessment reports to the government in compliance with the Mineral Tenure Act. After a one-year confidentiality period, the reports become an open resource for mineral exploration, investment, research, land use, and resource management. The British Columbia Geological Survey maintains these reports in the Assessment Report Indexing System (ARIS) database. This database provides information about the location, mineral occurrences, commodities, claims, work types, and expenditures as presented in the assessment reports. ARIS contains more than 37,600 reports dating from 1947, and describes work valued at more than \$2.8 billion. All reports are available online as PDF documents through the British Columbia Geological Survey website.

The present summary includes assessment work registered with a Statement of Work affidavit date to the end of 2018 and

does not include work that may have been conducted in 2018 but registered in 2019. The expenditures recorded in assessment reports are registered to maintain claims beyond their expiry date and thus reported costs represent only a portion of the total amount spent.

The number of approved assessment reports with an affidavit date of 2018 totalled 714 (Fig. 12), with declared costs of \$112,528,518.38 (Fig. 13), a 22% increase in expenditures from 2017 (Table 7). The Northwest Region accounted for 52% of the province-wide exploration costs in 2018 (Fig. 14). The region registered \$59 million in exploration expenditure in 2018, a 25% increase from 2017 (\$47.2 million) and more than double 2015 levels (\$25.6 million). Drilling accounted for 66% of the expenditures, geochemical sampling 15%, geophysical surveys 11%, geological mapping 6%, prospecting 1%, and physical work 1% (Fig. 15). Average exploration costs by work type (Table 8) are from report statements for labour, consulting, food, accommodation, transport, camp equipment rentals and supplies, laboratory analyses, report preparation, direct administration, and project management.

In addition to data about exploration work and expenditures, the ARIS database contains information about commodities. The commodities that showed the most growth between 2016 and 2018 were silica (as frac sand or industrial use silica), platinum, palladium, cobalt, and vanadium (Table 9).

Traditionally, data in assessment reports have been embedded in paper or non-digital electronic files, such as .PDF, making then difficult to extract and use. To resolve this problem, the British Columbia Geological Survey has embarked on a program to encourage submission of digital data files such as spreadsheets, databases, maps, and grids, which can be easily retrieved, integrated, recalculated, and recast for specific needs. These files can be uploaded through the ARIS Data Submission page (<http://ardata.bcgeologicalsurvey.ca>), submitted by CD/DVD/USB when an assessment report is filed, or e-mailed to [ARIS.digital@gov.bc.ca](mailto:ARIS.digital@gov.bc.ca).

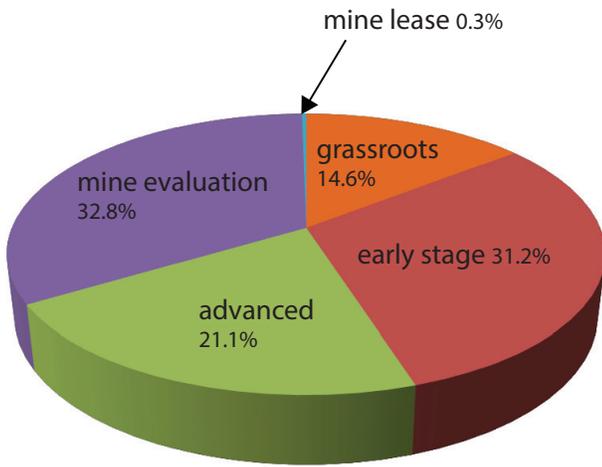
## 9. Selected exploration project highlights

After two years of recorded increases in exploration expenditures, there was a decrease of \$1.9 million in 2019. Explorationists however, continued to discover, define, and expand porphyry and porphyry-related copper-gold and copper-molybdenum deposits, gold deposits of various types, and stratiform base-metal, specialty metals, industrial minerals, and coal deposits. Data from the British Columbia Mineral and Coal Exploration Survey show a slight decrease in grassroots and early-stage projects (combined). Below, selected exploration projects (Fig. 1; Table 10) are grouped by project type and region; the individual regional sections of this volume provide further details.

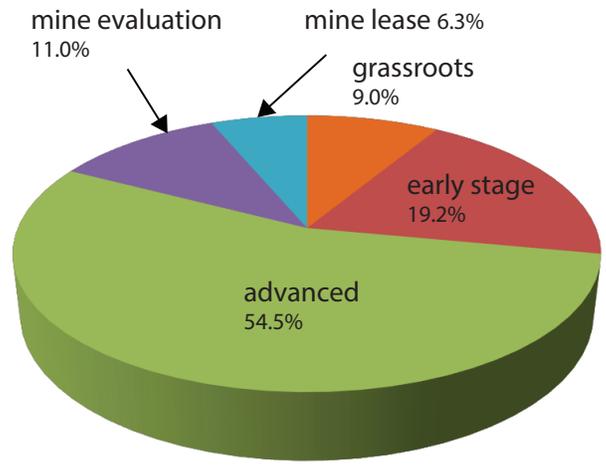
### 9.1. Selected precious metal projects

#### 9.1.1. Northwest Region

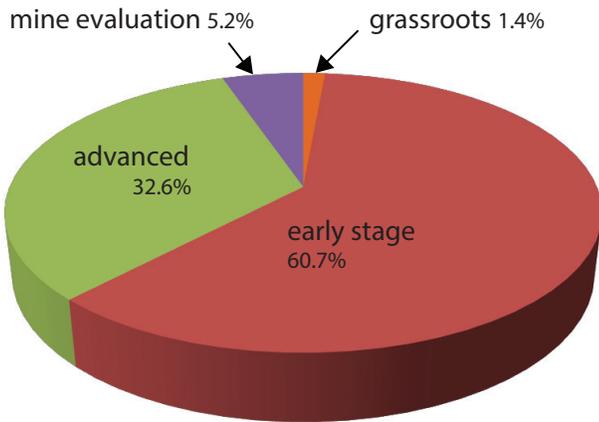
Brixton Metals Corp.'s **Atlin Gold** project includes a 933 km<sup>2</sup> area near Atlin. Mesothermal-style mineralization



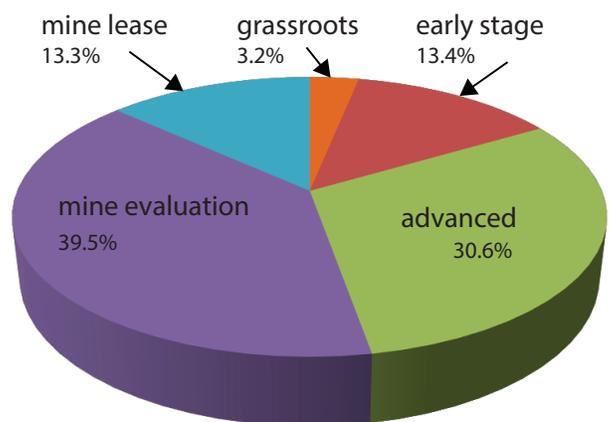
Northwest



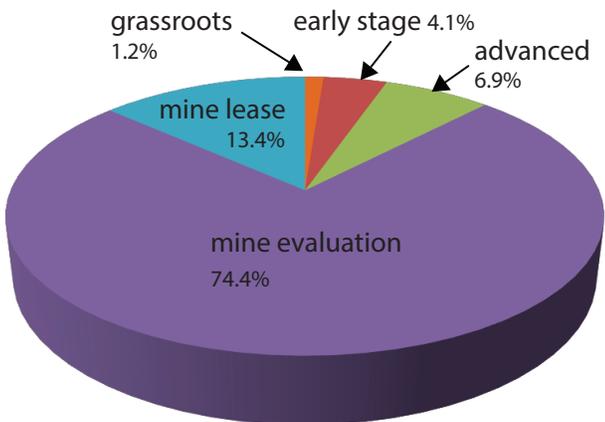
South Central



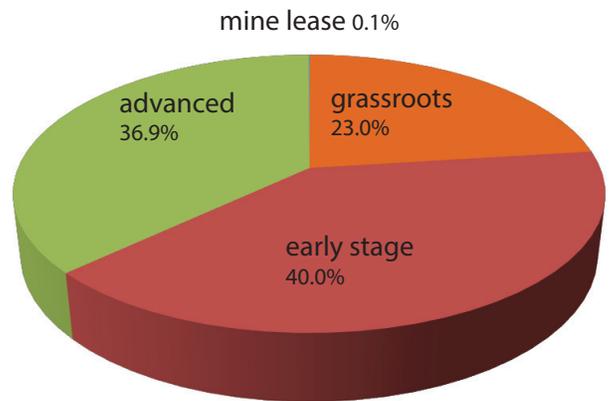
North Central



Southeast



Northeast



Southwest

Fig. 8. 2019 exploration expenditures by category in each region.

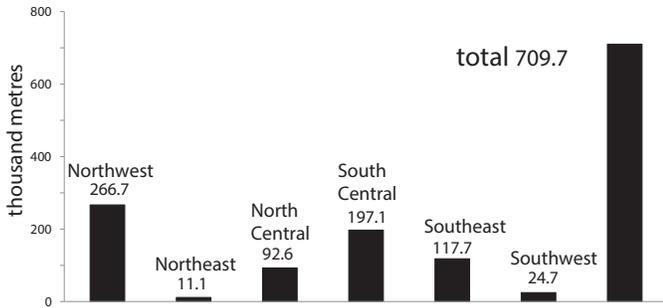


Fig. 9. 2019 exploration drilling by region.

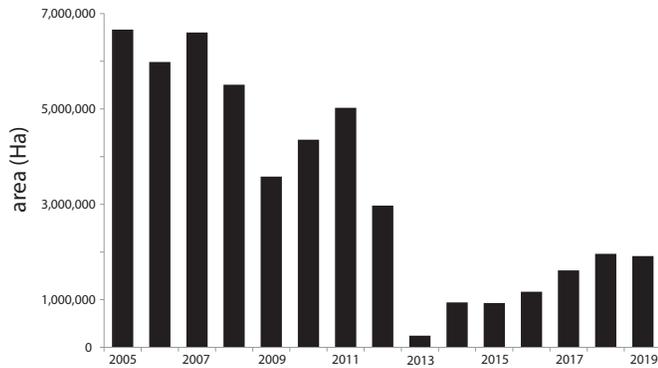


Fig. 10. New mineral claims by year.

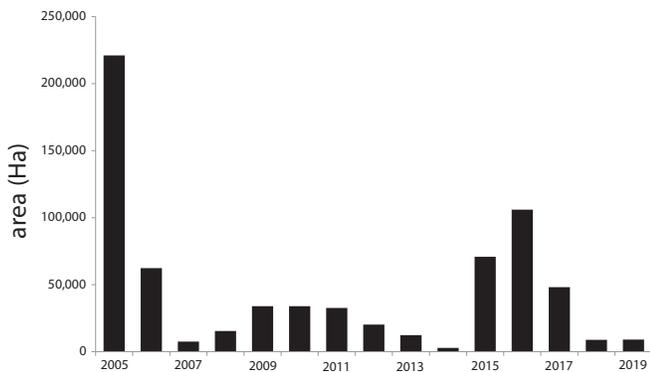


Fig. 11. New coal licence issuances by year.

is structurally controlled, and new geophysical data from vertical-gradient magnetic surveys highlight several structures that could potentially control gold mineralization. Exploration work in 2019 included 1618 m of drilling in 22 holes at the Pictou and LD showings, a 1965 line-km magnetic geophysical survey, and soil and rock sampling. Results from drilling included gold mineralization in 13 of 22 holes, where highlights were 8.53 g/t Au across 2 m. A rock grab sample from Union Mountain returned 45 g/t Au.

Margaux Resources Ltd. and Wildsky Resources Inc. entered into an agreement for Margaux Resources to acquire 100% interest in the **Cassiar Gold** project early in 2019. Historic gold production on the property was approximately 350,000 oz at an average grade of 11.9 g/t Au, and about 275,000 m of

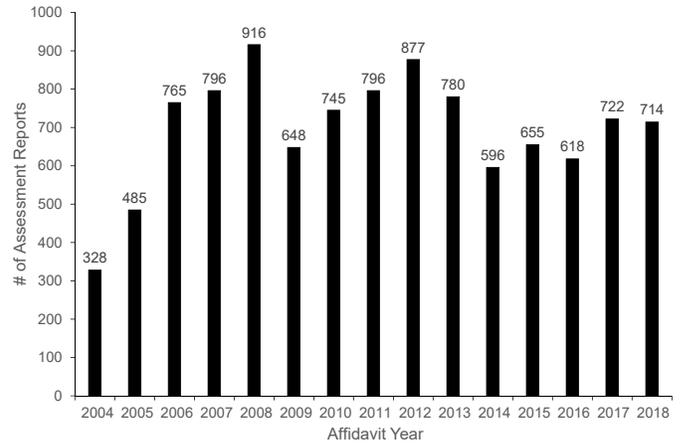


Fig. 12. Assessment reports approved between 2004 and 2018 by work affidavit date.

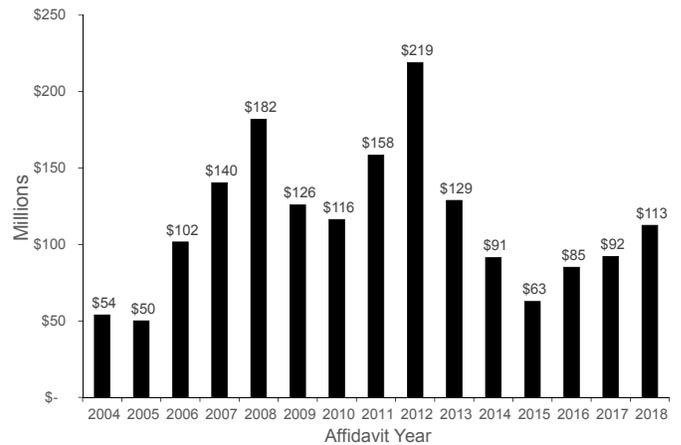


Fig. 13. Expenditures approved for assessment credit between 2004 and 2018 by work affidavit year.

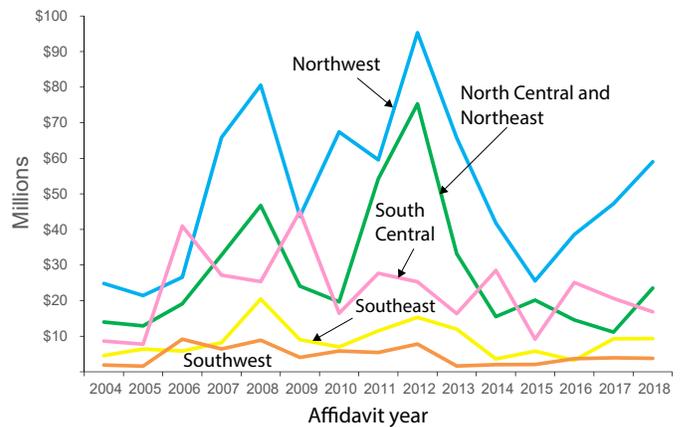
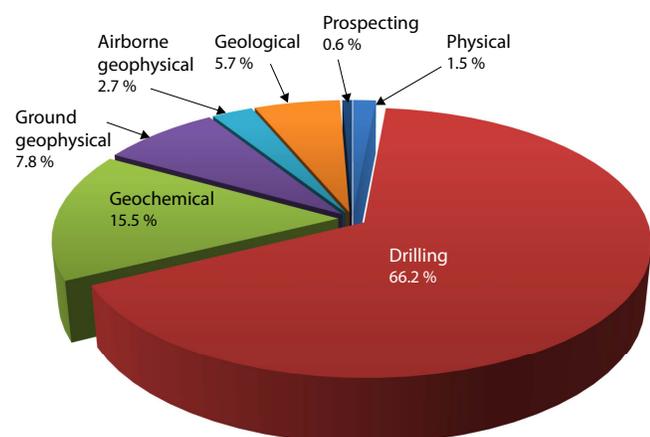


Fig. 14. Expenditures approved for assessment credit between 2004 and 2018 by work affidavit year and region.

**Table 7.** Summary of assessment work, 2018.

		Reports	Value	Core drilling		Non-core drilling		Stream sediment	Rock	Soil
				\$	Holes	m	Holes	m	Samples	Samples
Northwest	2018	193	\$59,027,865	450	128,179	27	1717	19,377	1072	11,566
North Central and Northeast	2018	97	\$23,517,701	95	43,727	8	602	6623	84	1655
South Central	2018	222	\$16,858,908	145	45,792	65	1,041	14,882	495	3095
Southeast	2018	120	\$9,348,942	154	25,071	-	-	4936	172	2087
Southwest	2018	82	\$3,775,102	25	3715	12	306	3918	170	1359
Provincial total	2015	655	\$62,719,690	682	158,006	95	520	26,782	1827	10,770
Provincial total	2016	618	\$85,141,604	465	165,212	14	250	34,715	777	9698
Provincial total	2017	722	\$92,215,514	1199	205,434	173	3458	30,188	1450	14,648
Provincial total	2018	714	\$112,528,518	869	246,484	112	3665	49,736	1993	19,762

**Fig. 15.** Proportion of value of exploration by work type in the work affidavit year 2018.

historical drilling was conducted on the property. Orogenic-style mineralization is found predominantly in basalt-hosted low-sulphide gold-bearing shear veins intimately related to regional faults. Shear veins are generally steeply dipping and <2 m wide, but widths range from a few cm to about 10 m. In September 2019, after a review of historical data, Margaux announced an updated Inferred resource estimate for the Taurus deposit at 21.83 Mt grading 1.43 g/t Au with a 0.7 g/t Au cut-off. The company is compiling and analyzing data and furthering its economic assessment with more field work.

In November, Sky Gold Corp. dropped the option for the **Clone Gold** project, and Teuton Resources Corp. now owns 75% interest, with Silver Grail Resources Ltd. owning the remaining 25%. The property is 20 km southeast of Stewart and contains gold and gold-copper mineralization in a series

**Table 8.** Average exploration project costs, 2018.

	Cost	2015	2016	2017	2018
Core drilling	\$ per m	219	310	252	297
Non-core drilling	\$ per m	631	611	284	361
Stream sediments	\$ per sample	200	332	355	348
Soil samples	\$ per sample	148	139	152	152
Rock samples	\$ per sample	260	269	371	371
Trenching	\$ per m	91	92	163	78
Ground EM	\$ per km	1306	1419	3700	2187
Ground magnetics	\$ per km	739	1182	906	807
Induced polarization	\$ per km	5339	7882	4879	8362
Airborne magnetics	\$ per km	59	48	40	91
Airborne EM	\$ per km	293	177	126	83
Geological mapping	\$ per ha	41	70	59	16
Prospecting	\$ per ha	19	51	19	9

**Table 9.** Most commonly explored for commodities.

	Reports filed 2016	Reports filed 2017	% change 2016-17	Reports filed 2018	% change 2017-18
Gold	1113	1375	24%	1109	-19%
Copper	833	1055	27%	851	-19%
Silver	692	847	22%	817	-4%
Zinc	358	537	50%	439	-18%
Lead	311	424	36%	356	-16%
Molybdenum	239	277	16%	218	-21%
Cobalt	15	45	200%	86	91%
Nickel	30	60	100%	63	5%
Silica/frac sand	3	8	167%	39	388%
Platinum	20	28	40%	36	29%
Palladium	19	21	11%	31	48%
Iron	25	19	-24%	22	16%
Limestone	27	11	-59%	20	82%
Tungsten	37	49	32%	20	-59%
Vanadium	0	0	-	19	-

**Table 10.** Selected exploration projects.

Project	Region	Operator (partner)	Commodity; Deposit type MINFILE	Resource (NI 43-101 compliant unless indicated otherwise)	Comments
<b>Atlin Gold</b>	Northwest	<b>Brixton Metals Corporation</b>	Au; Hydrothermal precious metal veins; 104N 043	na	1695 line-km magnetic survey; 1618 m of drilling with highlights of 8.53 g/t Au across 2 m and a grab sample returned 45 g/t Au.
<b>Ball Creek</b>	Northwest	<b>Golden Ridge Resources Ltd. (80%), Evrim Resources Corp. (20%)</b>	Cu, Au; Porphyry; 104G 072	na	Soil sampling, geological mapping, and prospecting identified new mineralized targets. 1095 m of deep diamond drilling to test the southwest extension of Main zone; drilling at Goat zone. Highlights at Main zone: 291.5 m at 0.14% Cu, 0.48 g/t Au, and 0.95 g/t Ag.
<b>Brucejack Regional</b>	Northwest	<b>Pretium Resources Inc.</b>	Au, Cu, Pb, Zn; Epithermal vein and VMS	na	15,000 m of drilling at regional Brucejack prospects. Regional grassroots sampling, mapping, prospecting, geophysics, and hyperspectral mapping. Drill highlights from the A6 zone included 1.5 m grading 2890 g/t Ag and 1.81% Cu.
<b>Cassiar Gold</b>	Northwest	<b>Margaux Resources Ltd.</b>	Au; Precious metal veins; 104P 012	Inf: 21.83 Mt at 1.43 g/t Au (0.7 g/t Au cut-off)	Compilation and data analysis.
<b>Castle</b>	Northwest	<b>Colorado Resources Ltd.</b>	Cu, Au, Ag; Porphyry and precious metal veins	na	Coincident gold and copper anomalies from sampling chargeability anomalies over East Castle zone; 1555 m drilling as follow up.

Table 10. Continued.

<b>Clone Gold</b>	Northwest	<b>Teuton Resources Corp. (75%), Silver Grail Resources Ltd. (25%)</b>	Ag, Zn, Pb; Polymetallic; 104A 176	na	In November, Sky Gold Corp. dropped the option for Clone Gold; Teuton Resources Inc. now owns 75% interest and Silver Grail Resources owns 25%. Drilling of 811 m to confirm historical results and test new areas. Highlights of 124.6 g/t Au across 4.1 m in the Main “H” zone.
<b>Dolly Varden</b>	Northwest	<b>Dolly Varden Silver Corporation</b>	Cu, Pb, Zn, Ag, Au; Kuroko VMS with polymetallic veins; 103P 188	I: 3.42 Mt at 299.8 g/t Ag Inf: 1.29 Mt at 277.0 g/t Ag	Preliminary metallurgical testing, 11,000 m of drilling, geochemical sampling, prospecting and geological mapping. Highlights at Chance target of 15.20 m grading 488.3 g/t Ag, 0.55% Pb, and 0.05% Zn in a previously unknown offset of the Chance vein.
<b>Engineer</b>	Northwest	<b>Engineer Gold Mines Ltd.</b>	Au, Ag; LS-epithermal; 104M 014	Inf: 41,000 t at 19.0 g/t Au	3000 m of surface and underground drilling. Historic channel sample highlights from the Double Decker vein returned 38.03 g/t Au across 24.7 m.
<b>Eskay Creek</b>	Northwest	<b>Skeena Resources Limited</b>	Au, Ag, Cu, Pb, Zn; VMS and precious metal veins; 104B 008	I: 12.65 Mt at 4.3 g/t Au, 110 g/t Ag (pit constrained) Inf: 14.42 Mt at 2.3 g/t Au, 47 g/t Ag (pit constrained) I: 819,000 t at 6.4 g/t Au, 139 g/t Ag (underground) Inf: 295,000 t at 7.1 g/t Au, 82 g/t Ag (underground)	Drilling in 2019 focussed on upgrading areas of Inferred resources into Indicated category; highlights include 312.81 g/t Au and 95 g/t Ag across 2.21 m, and separately 6.75 g/t Au and 285 g/t Ag across 27.50 m.
<b>Forest Kerr</b>	Northwest	<b>Aben Resources Ltd.</b>	Au, Ag, Cu; Precious metal veins	na	9600 m drilled in 25 holes; highlights include a 16 m interval grading 2.22 g/t Au, 2.39 Ag, and 0.31% Cu.
<b>Golddigger</b>	Northwest	<b>Goliath Resources Limited</b>	Au, Cu, Pb, Zn; Polymetallic veins	na	Field reconnaissance to followup targets generated via lidar and geochemical sampling. Most chip samples (30) from Sure Bet zone returned assays >1.4 g/t Au. A single channel sample was assayed at 8.4 m of 7.37 g/t Au, including 3.4 m of 17.68 g/t Au.
<b>Hank</b>	Northwest	<b>Golden Ridge Resources Ltd.</b>	Cu, Au; Calc-alkaline porphyry	na	2952 m of drilling with highlights at the Williams zone including 278 m grading 0.35% Cu, 0.28 g/t Au, and 1.71 g/t Ag.

Table 10. Continued.

<b>Nickel Mountain</b>	Northwest	<b>Garibaldi Resources Corp.</b>	Ni, Cu, Co, Pt, Pd, Au; Tholeiitic intrusion hosted; 104B 006	na	25,000 m of drilling; highlights include 18.2 m grading 7.04% Ni and 3.81% Cu in a broader zone of mineralization of 86.5 m grading 1.88% Ni and 1.32% Cu.
<b>Premier/Dilworth</b>	Northwest	<b>Ascot Resources Ltd.</b>	Au, Ag, Cu; LS-epithermal, polymetallic veins; 104B 054	I: 2.78 Mt at 7.46 g/t Au and 26.2 g/t Ag (Premier, Northern Lights, Big Missouri, Silver Coin, and Martha Ellen deposits)	>50,000 m of drilling; highlights included 24.45 g/t Au across 8.43 m.
<b>Rock and Roll</b>	Northwest	<b>Etruscus Resources Corp.</b>	Cu, Zn, Pb, Au; Besshi VMS and intrusion-related precious metal veins; 104B 377	Inf: 2.02 Mt at 0.71 g/t Au, 87.1 g/t Ag, 0.23% Cu, 0.23% Pb, 0.98% Zn	Biogeochemical orientation survey for Au, Ag, Ba, Cu, Fe, Hg, Pb, Se, Zn in tree bark samples; 2500 m of diamond drilling.
<b>Schaft Creek</b>	Northwest	<b>Teck Resources Limited (75%), (Copper Fox Metals Inc. (25%))</b>	Cu, Mo, Au, Ag; Porphyry; 104G 015	M+I: 1.23 Bt at 0.26% Cu, 0.017% Mo, 0.19 g/t Au, 1.69 g/t Ag Inf: 597.2 Mt at 0.22% Cu, 0.016% Mo, 0.17 g/t Au, 1.65 g/t Ag	Continued environmental studies and infrastructure work.
<b>Scottie Gold Mine</b>	Northwest	<b>Scottie Resources Corp.</b>	Au, Ag, Cu; Intrusion-related and polymetallic veins; 104B 034	na	Geochemical surface sampling and 2050 m of drilling on Bow property. Drilling in areas recently exposed from glacier retreat. A grab sample at the Domino zone produced 536 g/t Au and 735 g/t Ag.
<b>Silver Coin</b>	Northwest	<b>Ascot Resources Ltd.</b>	Au, Ag, Cu, Zn, Pb; LS-epithermal and polymetallic veins; 104B 095	I: 0.70 Mt at 4.46 g/t Au and 17.9 g/t Ag Inf: 0.97 Mt at 4.39 g/t Au and 19.0 g/t Ag	10,500 m of drilling; highlights include 52.67 g/t Au across 3.59 m.
<b>Silver Queen</b>	Northwest	<b>Equity Metals Corporation</b>	Ag, Pb, Zn, Au; Transitional porphyry-epithermal; 093L 002	I: 0.815 Mt at 6.35% Zn, 3.24 g/t Au, 201.4 g/t Ag, 0.26% Cu, 0.96% Pb Inf: 0.801 Mt at 5.21% Zn, 2.49 g/t Au, 184.3 g/t Ag, 0.31% Cu, 0.88% Pb (resources at NSR cut-off of C\$100/t)	New Nadina Explorations changed its name to Equity Metals Corp. In August, a mineral resource estimate was released.
<b>Snip</b>	Northwest	<b>Skeena Resources Limited</b>	Au, Ag; Intrusion-related, mesothermal; 104B 250	na	Surface drilling in 10 holes totalling 1934 m; highlight of 1131.91 g/t Au across 1.5 m.

Table 10. Continued.

<b>Tatogga</b> (Saddle North)	Northwest	<b>GT Gold Corp.</b>	Cu, Au, Ag; Porphyry; 104G 432	na	Continued to expand mineralization to depth and along trend. Recent drilling has also identified high-grade precious metal veins peripheral to the main body of porphyry mineralization including highlights of 4.11 m of 25.42 g/t Au and 15.70 m of 6.21 g/t Au. Newmont Corporation invested \$25.9M. Resource estimate and economic evaluation expected first quarter, 2020.
<b>Thorn</b>	Northwest	<b>Brixton Metals Corporation</b>	Ag, Au, Cu, Zn, Pb; Subvolcanic; 104K 031	I: 7.4 Mt at 35.54 g/t Ag, 0.51 g/t Au, 0.13% Cu, 0.32% Pb, 0.59% Zn	Geological mapping and soil-rock geochemistry at the Chivas zone. An induced polarization-magnetotelluric survey showing a chargeability high over Oban zone. Drill highlights at Oban zone returned 554 m of 0.57 g/t Au, 0.24% Cu, 43 g/t Ag, 0.55% Zn, and 0.28% Pb.
<b>Treaty Creek</b>	Northwest	<b>Tudor Gold Corp. (80%),</b> (Teuton Resources Corp. (20%), American Creek Resources Ltd. (20%))	Cu, Au; Porphyry; 104A 004	na	Drilling at the Goldstorm zone, totalling 9780 m in 14 diamond drill holes, returned highlights of 2.006 g/t Au across 87 m, in an interval of 336 m averaging 1.004 g/t Au.
<b>Turnagain</b>	Northwest	<b>Giga Metals Corp.</b>	Ni, Co, Pt, Cu, Mo; Alaskan-type, magmatic; 104I 014	M+I: 1.073 Bt at 0.220% Ni and 0.013% Co Inf: 1.142 Bt at 0.217% Ni and 0.013% Co	Updated resource in September 2019 based on 36 infill holes totalling 8940 m drilled in 2018. A preliminary economic assessment (PEA) is expected in 2020.
<b>Willoughby</b>	Northwest	<b>Strikepoint Gold Inc.</b>	Au, Ag, Zn, Pb; Precious and polymetallic veins; 103P 006	na	Hand-trenching and channel sampling; 2000 m of diamond drilling. North zone highlights of 26.28 g/t Au and 95.00 g/t Ag across 4.0 m; surface sampling near the Wilkie zone returned a grab sample of 67.3 g/t Au and 164.0 g/t Ag.
<b>Akie</b>	North Central	<b>ZincX Resources Corp.</b>	Zn, Pb, Ag; Sedimentary exhalative Zn-Pb-Ag; 094F 031	I: 22.7 Mt at 8.32% Zn, 1.81% Pb, 14.1 g/t Ag Inf: 7.5 Mt at 7.04% Zn, 1.24% Pb, 12.0 g/t Ag (at 5% Zn cut-off)	PEA proposed 18-year mine life, mine production rate 4000 tpd, 25.8 Mt total mined, initial capital cost \$302.3 million. In 2019, four DDH holes, 2347 m. Results included 10.94 m (true width) of 10.85% Zn, 2.23% Pb and 17.0 g/t Ag and 14.65 m (true width) of 16.20% Zn, 3.39% Pb and 27 g/t Ag.
<b>Atty</b>	North Central	<b>Serengeti Resources Inc.</b>	Cu, Mo, Au; Porphyry Cu±Mo±Au	na	Geophysics, 29.8 line-km IP. Drilling six DDH, 2318 m. Results included 87.7 m of 0.04% Cu, 0.14 g/t Au and 0.4 g/t Ag.

Table 10. Continued.

<b>Chuchi</b>	North Central	<b>Centerra Gold Inc.</b>	Cu, Au; Alkalic porphyry Cu-Au; 093N 159	I: historic non-NI 43-101 compliant: 50 Mt at 0.21-4.0% Cu, 0.21-0.44 g/t Au (Digger Resources Inc., 1991)	Geophysics, 731 line-km low altitude aeromagnetic survey. Drilling four DDH, 1755 m.
<b>Decar</b>	North Central	<b>FPX Nickel Corp.</b>	Ni; Ultramafic-hosted 093K 039, 72, 89	I: 1843 Mt at 0.143 DTR (Davis tube recoverable) Ni Inf: 391 Mt at 0.115% DTR Ni, at 0.06% cut-off	Bench-scale metallurgical testing produced clean nickel concentrates grading 63 to 65% Ni with improvements in recovery relative to previous testing. By-product iron ore concentrates graded 60 to 65% cent Fe.
<b>Indy</b>	North Central	<b>InZinc Mining Ltd.</b>	Zn, Pb, Ag; Sedimentary exhalative Pb-Zn-Ag 093N 240	na	Soil surveys (1194 samples), mapping and prospecting.
<b>Kemess East</b>	North Central	<b>Centerra Gold Inc.</b>	Cu, Mo, Au; Porphyry Cu±Mo±Au; 094E 315	I: 113.12 Mt at 0.38% Cu, 0.46 g/t Au, 1.94 g/t Ag, containing 954 Mlb Cu, 1680 Koz Au, 7066 Koz Ag	Potential to be integrated into the Kemess Underground project.
<b>Kwanika</b>	North Central	<b>Kwanika Copper Corp. (65% Serengeti Resources Inc., 35% Posco International Corporation)</b>	Cu, Au, Ag; Porphyry Cu±Mo±Au; 093N 073	I: Central zone pit: 11.8 Mt at 0.37% Cu, 0.39 g/t Au, 1.07 g/t Ag. Central zone underground: 41.4 Mt at 0.46% Cu, 0.52 g/t Au, 1.36 g/t Ag	Working on an interim study report.
<b>Lawyers</b>	North Central	<b>Benchmark Metals Inc.</b>	Au, Ag, Cu, Zn; Epithermal Au-Ag-Cu, low sulphidation; 094E 066	Inf: Cliff Creek N zone, 550 Kt at 4.51 g/t Au, 209.15 g/t Ag  Duke's Ridge Zone, 58 Kt at 4.30 g/t Au, 139.13 g/t Ag	Drilling, 47 DDH, 11,000 m. Results included 4.4 m grading 11.73 g/t Au and 476 g/t Ag at the Cliff Creek zone, 25.0 m grading 2.79 g/t Au and 177 g/t Ag, and 2.95 m grading 30.2 g/t Au and 1361 g/t Ag at the AGB zone, 2.87 m grading 46.9 g/t Au and 3056 g/t Ag at the Phoenix zone and 3.34 m grading 7.85 g/t Au and 830 g/t Ag at the Duke's Ridge zone.
<b>Mt. Milligan on-lease (brownfield) and off-lease (greenfield)</b>	North Central	<b>Centerra Gold Inc.</b>	Cu, Au, Ag; Alkalic porphyry Cu-Au; 094N 194, 093N 091	na	Geophysics, 640 line-km low altitude aeromagnetic survey, planned 32 line-km IP. Drilling near pit (planned) 25,000 m. Drilling outside ultimate pit, 23 holes, 9900 m.

Table 10. Continued.

<b>Stardust</b>	North Central	<b>Sun Metals Corp.</b>	Ag, Pb, Zn; Skarn Ag-Pb-Zn; P93N 009	na	Drilling, estimated 27 holes, 15,000 m. Results included 24.85 m of 3.13% Cu, 4.8 g/t Au, and 93.45 g/t Ag, and 58.01 m of 2.49% Cu, 2.61 g/t Au, and 44.3 g/t Ag.
<b>Wicheeda</b>	North Central	<b>Defense Metals Corp.</b>	Carbonatite-hosted deposits; Nb, REE; 093J 014	Inf: 11.37 Mt 1.14% Ce, 0.53% La, 0.23% Nd, 0.04% Nb, 0.01% Sm and 1.96% LREE (at a 1% LREE cut-off)	Collected 30 t bulk sample. Drilling, 13 holes, 2005 m. Results included 83 m of 4.43% light rare earth oxides (LREO) and 58 m of 4.01% LREO.
<b>17-001, 002, 003</b>	Northeast	<b>Sil Industrial Minerals Ltd.</b>	Sand and gravel (as frac sand)	na	Drill sampling, 90 holes, 600 m.
<b>Huguenot</b>	Northeast	<b>Colonial Coal International Corp.</b>	Coal; Bituminous	M+I: 132.0 Mt (in situ surface mineable)	Released a Preliminary Economic Assessment.
<b>Amarillo</b>	South Central	<b>Troubadour Resources Inc.</b>	Cu; L04: Porphyry Cu±Mo±Au; 082ENW108	na	Mapping, sampling, drilling 1075 m in 4 holes
<b>Lac La Hache</b>	South Central	<b>Engold Mines Ltd.</b>	Cu, Au, Ag, Fe; L03: Alkalic porphyry Cu-Au, K01: Cu skarn; 092P 120, 108, 2	I: 7.60 Mt 0.28% Cu, 0.05 g/t, 1.26 g/t Ag, 11.4% magnetite Inf: 15.8 Mt 0.21% Cu, 0.04 g/t Au, 0.93 g/t Ag, 8.32% magnetite Inf: 1.073 Mt 2.48 g/t Au, 0.64% Cu, 5.98 g/t Ag (Aurizon)	Diamond drilling (1276 m, 9 holes), soil sampling. Highlight 6.18 g/t Au, 0.80% Cu and 2.63 g/t Ag across 4.55 m.
<b>Merit</b>	South Central	<b>Independence Gold Corp.</b>	Au, Ag; H05: Epithermal Au-Ag; 092ISW106	na	Prospecting, rock sampling, ground magnetic survey, metallurgy. Sample highlight 9.5 g/t Au and 341 g/t Ag.
<b>Miner Mountain</b>	South Central	<b>Sego Resources Inc.</b>	Cu, Au; L03: Alkalic porphyry Cu-Au; 092HSE203, 78	na	Trenching results reported early in the year included 18 m grading 0.96% Cu and 0.31 g/t Au. New drill targets identified.
<b>Mont</b>	South Central	<b>Leo Lindinger</b>	Bentonite; E06: Bentonite	na	3 drill holes-all intersected bentonite clay.
<b>MPD</b>	South Central	<b>Dunnedin Ventures Inc.</b>	Cu, Au; L03: Alkalic porphyry Cu-Au; 092HNE243, 55, 191, 244	na	1766 m diamond drilling in 3 holes. Surface trench sample 0.89% Cu across 46 m.
<b>New Craigmont</b>	South Central	<b>Nicola Mining Inc.</b>	Cu, Au; Cu skarns; 092ISE035	na	Results of 2018 drilling released, additional drilling 2019. Highlights 84 m 0.34% Cu, 44 m 0.45% Cu, 13 m 0.65% Cu with magnetite. Soil geochemistry, mapping.

Table 10. Continued.

<b>Olivine Mountain</b>	South Central	<b>GSP Resources Corp.</b>	Cu, Au, Pd; M05: Alaskan type; 092HNE201, 092HSE095, 141, 39	na	Approx. 1200 m in 7 holes.
<b>Shovelnose</b>	South Central	<b>Westhaven Ventures Inc.</b>	Au; H05: Epithermal Au-Ag-Cu low sulphidation; 092HNE309, 308	na	Approx. 20,000 m in 50 holes. Third vein zone intersected in South zone. New targets identified in regional prospecting, ground magnetic, soil, and resistivity surveys.
<b>Spences Bridge</b>	South Central	<b>Talisker Resources Ltd.</b>	Au, Ag; H05: Epithermal Au-Ag-Cu low sulphidation; 092O 054, 60, 143, 092INW092, 110, 092ISW118, 124, 84	na	Regional stream-sediment survey, prospecting.
<b>Spius</b>	South Central	<b>Pacific Ridge Exploration Ltd.</b>	Cu, Mo; L04: Porphyry Cu±Mo±Au; 092HNW027	na	Diamond drilling 1087 m in 4 holes.
<b>Duncan</b>	Southeast	<b>Rokmaster Resources Ltd.</b>	Zn-Pb-Ag; Carbonate-hosted; 082KSE023, 22	na	Mapping; sampling; soil geochemistry; historic drill core results include 7.5 m grading 6.2% Zn + 6.3% Pb, 4.8 m grading 11.4% Zn + 0.8% Pb, and 6.9 m grading 7.1% Zn + 4.6% Pb.
<b>Elko</b>	Southeast	<b>Pacific American Coal Limited</b>	Coal (HCC, PCI); 082GSE029	M: 117.6 Mt I: 93.2 Mt Inf: 92.3 Mt (JORC 2019)	Drilling (8 RC, 1 large-diameter core; 3451 m); environmental baseline studies and permitting; mapping of five coal seams; 3 seams have hard coking coal quality, 2 seams have PCI coal.
<b>Gibraltar</b>	Southeast	<b>MGX Minerals Inc.</b>	Si; Silica sandstone; 082JSW001	na	Drilling (5 DD holes, 200 m); metallurgical test work results indicated suitability for medium quality feedstock for metallurgical-grade silicon; sampled 97.8 to 99.9% SiO <sub>2</sub> .
<b>Gold Drop</b>	Southeast	<b>GGX Gold Corp.</b>	Au; Alkaline intrusion associated Au; 082ESE055, 150, 152, 153, 285, 286, 287	na	Drilling (48 DD holes, 2284 m on C.O.D. vein; 10 DD holes, 685 m on North C.O.D. vein); rock sampling; trenching; channel sampling; airborne audio magnetotelluric survey.
<b>LH</b>	Southeast	<b>Magnum Goldcorp Inc.</b>	Cu-Ag-Au; Subvolcanic, skarn, Au-veins; 082FNW212	na	Drilling (4 DD holes, 250 m); results included 5.58 m grading 4.068 g/t Au, including 0.27 m grading 22.8 g/t Au.
<b>Ore Hill</b>	Southeast	<b>Apex Resources Inc.</b>	Au+/-Ag, Pb, Zn; Au-quartz veins, polymetallic veins; 082FSW040, 48, 50, 51, 52, 53, 082FSE030, 31, 34, 25	na	Data compilation, mapping, rock sampling; 2 magnetic anomalies coincident with soil geochemical anomalies and historic production; drilling (600 m DD program) late in the year; visible gold in drill core.

Table 10. Continued.

<b>Regal</b>	Southeast	<b>Affinity Metals Corp.</b>	Ag-Pb-Zn+/-Au; Polymetallic veins, SEDEX; 082N 004, 3, 16	<b>Regal:</b> 590,703 t grading 71.6 g/t Ag, 2.66% Pb, 1.26% Zn, 1.1% Cu, 0.13% Sn, 0.015% W (1982; non-compliant)	Drilling (1846 m; <b>Regal:</b> 10 DD holes, <b>Allco:</b> 11 DD holes); data compilation; 2011 ZTEM airborne geophysical survey; grab sampling (22 samples at <b>Allco</b> ) with results up to 4420 g/t Ag, 2.27% Cu, 26.4% Zn, >20% Pb, and 5.68 g/t Au.
<b>Sweet Spot</b>	Southeast	<b>Teck Resources Ltd.</b>	Pb-Zn-Ag+/-Au; Polymetallic vein, SEDEX; 082GSW077	na	Drilling (2 DD holes, 1371 m); mapping; sampling; re-logging historic core; petrophysics; short wave near infrared spectral analysis; initial stages of exploration identified fragmental units, alteration assemblages, and indicators of SEDEX mineralization.
<b>Brandywine</b>	Southwest	<b>Bayhorse Silver Inc.</b>	Ag, Au, Pb, Zn; I05: Polymetallic veins; 092JW 001, 21, 22	na	Core reanalysis. Metallic screen assays up to 20.2 g/t Au across 1.5 m.
<b>Gold Standard</b>	Southwest	<b>DSM Syndicate Holdings Ltd.</b>	Au, Ag; I01: Au quartz veins, reported VMS target	na	Mapping, rock sampling. Highlight 5.81 g/t Au across 12 m.
<b>Margurete</b>	Southwest	<b>Academy Metals Inc.</b>	Au, Ag; I01: Au quartz veins; 092K 025, 151, 187, 30, 20	na	Rock sampling, backpack drilling. Highlight 8.62 g/t Au over 0.38 m, 6.18 g/t Au across 2 m.
<b>Penece</b>	Southwest	<b>Delrey Metals Corp.</b>	Magnetite, Ti, V; M05: Alaskan type; 092M 010, 1	na	Airborne magnetic survey. Deposit type is speculative.
<b>Surespan Gold</b>	Southwest	<b>Privateer Gold Ltd.</b>	Au, Ag; Au-quartz veins; 092L 008, 311, 155	Historical: 122,470 t at 9.26 g/t Au and 324,772 t at 15.09 g/t Au	Drilling 4400 m in 18 holes.
<b>Teeta Creek</b>	Southwest	<b>ArcWest Exploration Inc.</b>	Cu, Mo, Au; L04: Porphyry	na	Mapping, prospecting, rock sampling. Highlight 21.1 g/t Au. Teck Resources Limited has entered into an agreement to explore the property to earn an initial 60%.

M = Measured; I = Indicated; Inf = Inferred

of sub-parallel shears along a 500 m strike length. In 2019, before dropping the option, Sky Gold drilled 811 m, which was designed to confirm historical results and test new areas. Drill highlights included 124.6 g/t Au across 4.1 m in the Main “H” zone, which has known mineralization extending along a 300 m strike length.

Centred on the historic Engineer Gold mine the 14,020 ha **Engineer** project is 32 km southwest of Atlin. Dewatering of existing underground workings was completed in 2019, which will provide exploration access to Shear zone A, Jersey Lilly, Double Decker, and Engineer veins on one of the mine levels.

Dewatering will also allow for test mining and bulk sampling. A 3000 m surface and underground drill program was conducted, targeting near-mine veins and bulk-tonnage shear and intrusive-hosted gold targets. Historic channel sample highlights from the Double Decker vein returned 38.03 g/t Au across 24.7 m.

Since 2016, the Boundary zone has been the focus of Aben Resources at the **Forrest Kerr** project. Earlier this year an airborne magnetic survey was completed over the entire Boundary zone to delineate the subsurface geology and put into context high-grade gold mineralization discovered previously (2018 drill highlights of 62.4 g/t Au across 6.0 m).

In 2019, 9600 m of core drilled in 25 drill holes focussed on testing the North Boundary zone and encountered precious and polymetallic mineralization in shear zones cutting Hazelton Group volcanic and subvolcanic rocks and spatially coincident with magnetic anomalies. Drill highlights included a 16 m interval grading 2.22 g/t Au, 2.39 Ag, and 0.31% Cu.

Approximately 20 km north-northeast of Stewart, the **Premier** project is Ascot Resource's flagship operation. About 628,000 m of previous drilling primarily targeted the Premier mine, the Big Missouri mine, Martha Ellen, and the Dilworth zones. Drilling in 2019 was designed to test exploration targets delineated from geophysical work in 2018 and to upgrade and expand resources in known zones of mineralization. By the end of the year more than 52,000 m of drilling was completed; a highlight included 24.45 g/t Au across 8.43 m. Precious metal mineralization in the area is thought to have been magmatically derived and is spatially associated with the Texas Creek plutonic suite. Mineralized quartz-calcite veins, vein stockwork, and hydrothermal breccia systems cut volcanic and sedimentary rocks of the Hazelton Group. The Premier, Northern Lights, Big Missouri, Silver Coin, and Martha Ellen deposits contain an Indicated resource of 2.78 Mt grading 7.46 g/t Au and 26.2 g/t Ag.

The **Snip** mine produced approximately 1 Moz of gold from 1991 to 1999. Skeena Resources Limited acquired 100% interest in the project from Barrick Gold in 2017. Late in 2018, Skeena optioned the property and received an investment from Hochschild Mining Holdings Ltd, where nearly \$7 million was generated giving Hochschild 8.3% of Skeena's total issued and outstanding shares. In addition, Hochschild may earn 60% interest in the Snip project by spending twice the amount Skeena has spent since its original option from Barrick. Since the original acquisition from Barrick, Skeena Resources has reviewed and modelled more than 280,000 m of historical drill data. Surface drilling in 2019 in 10 holes totalled 1934 m and intersected a drill highlight of 1131.91 g/t Au across 1.5 m.

### 9.1.2. North Central Region

The **Lawyers** project is a regional-scale prospect that follows northwest-trending linear magnetic and radiometric anomalies with multiple gold-silver showings for more than 20 km. Showings include the Cliff Creek, Dukes Ridge, Phoenix, Marmot and AGB (Fig. 3) zones. Except for Marmot, all zones are considered part of the same system.

In 2019, Benchmark Metals Inc. drilled 47 diamond drill holes totalling 11,000 m. Highlight assays included 4.4 m grading 11.73 g/t Au and 476 g/t Ag at the Cliff Creek zone, 25.0 m grading 2.79 g/t Au and 177 g/t Ag and 2.95 m grading 30.2 g/t Au and 1361 g/t Ag at the AGB zone, 2.87 m grading 46.9 g/t Au and 3056 g/t Ag at the Phoenix zone and 3.34 m grading 7.85 g/t Au and 830 g/t Ag at the Duke's ridge zone. Lower grade envelopes around high-grade vein sets may indicate potential for a bulk tonnage resource. Surface sampling identified a new zone, Marmot East, across an area of 500 by 250 m, where rock grab samples graded up to 24.2 g/t Au and

1425 g/t Ag.

### 9.1.3. South Central Region

Independence Gold Corp. identified seven gold targets at the **Merit** property in the Spences Bridge belt, based on surface rock samples. A sample from Sullivan Ridge graded 9.5 g/t Au and 341 g/t Ag. They also commissioned a ground magnetic survey over the property. Early-stage metallurgical testing yielded gold recoveries of 99.5% and 96.6% using gravity, flotation, and cyanide leach.

Westhaven Ventures Inc. focussed on drilling the **Shovelnose** low-sulphidation epithermal prospect again in 2019 with a planned 20,000 m program. They were on track to reach that target by the end of the year. They have now identified three northwest-trending gold-bearing vein zones at the South Zone. Vein zone 1 has been extended along strike for about 1000 m with a vertical extent of 300 m. Zone 2 has a 460 m strike length and zone 3 has a 170 m strike length. The company also reported seven new epithermal targets, including drill targets outside the South Zone, resulting from prospecting, ground magnetic (327 line-km), soil (more than 6000 samples) and resistivity surveys (18 km).

Talisker Resources Ltd.'s **Spences Bridge** project was prompted by early signs of a significant epithermal gold discovery at Westhaven's Shovelnose project. Talisker Resources now holds claims covering most of the Spences Bridge belt, which consists of Lower Cretaceous calc-alkaline volcanic rocks extending for 220 km along a northwest trend. Talisker is prospecting for epithermal mineralization and conducting regional stream-sediment sampling to identify targets. They have also been working on a nearby property covering a target area they call the Remington Belt north of the Bridge River camp in Bridge River complex and Taylor Creek Group rocks.

### 9.1.4. Southeast Region

GGX Gold Corp. continued drilling and trenching at their **Gold Drop** project. The property hosts numerous north-trending, easterly dipping gold-bearing veins that are 10 cm to 2 m thick distributed along steeply dipping strike-slip and normal faults. GGX Gold Corp. has been drilling at the Gold Drop, Everest and C.O.D veins since 2017. Mapping, sampling, and trenching has also identified several other veins, with values of 81.8 g/t Au and 630 g/t Ag in grab sample at the Everest vein, and up to 6.98 g/t Au and 38.6 g/t Ag at the Silent Friend and Ken veins. In 2019, the company continued to drill both the C.O.D. (48 DD holes, 2248 m) and C.O.D. North veins (10 DD holes, 685 m). The company also completed an airborne magnetotelluric survey and identified additional deeper drill targets for late 2019.

### 9.1.5. Southwest Region

DSM Syndicate returned to its gold vein discovery at their **Gold Standard** project. Channel samples graded 5.86 g/t Au and 14.18 g/t Ag across 12 m, including 5 m of 12.66 g/t Au and

30.20 g/t Ag. They describe mineralization as orogenic quartz vein and shear hosted. Juggernaut Exploration Ltd., a partner in the DSM Syndicate, has agreed on an option deal to earn 100% interest in the property.

At their **Margurete Gold** project, Academy Metals Inc. (formerly Unity Metals Corp.) explored several contiguous properties adjacent to the Phillips Arm gold camp, including Margurete and Hewitt Point. Packsack drill and outcrop samples produced several results of greater than 10 g/t Au. Packsack drill results included a 2 m core sample grading 6.18 g/t Au and 8.1 g/t Ag and a 0.38 m sample grading 8.62 g/t Au and 3.8 g/t Ag. The area has been intermittently explored for gold-bearing quartz veins since the late 19th century. The Doratha Morton mine produced 4627 oz Au and 10,736 oz Ag, mostly in 1898-99, with minor production in 1925 and 1934.

Privateer Gold Ltd. drilled at their **Surespan** project in the Zeballos gold camp, completing about 4400 m in 18 holes by the end of 2019. Some published intersections are consistent with narrow gold vein mineralization like that mined historically in the Zeballos Camp and include: 1386.5 g/t Au across 0.3 m in the recently discovered 88 vein; 5.81 g/t Au across 7.12 m in a 50 m step out from the Prident mine; and 24.20 g/t Au across 0.55 m in an 80 m step out from the White Star mine. Privateer is a private company working mainly on Crown-granted mineral claims and is not obligated to release results. They acquired additional mineral Crown grants (Central Zeballos property) from CanAlaska Uranium Ltd.

## 9.2. Selected porphyry (Cu-Au, Cu-Mo, Mo) projects

### 9.2.1. Northwest Region

The **Ball Creek** project was optioned from Evrim Resources in July 2019 for 80% interest in the 52,442-hectare property, which fully surrounds the Hank property. The property contains seven porphyry gold-copper targets and four epithermal gold-silver targets. Exploration in 2019 included collecting more than 4500 soil samples, geological mapping, and prospecting, which identified new mineralized targets. Approximately 1095 m of deep diamond drilling was completed to test the southwest extension of the Main zone and drilling at Goat zone was also done. The first drill hole testing the southwest extension of the Main zone intersected a feldspar-hornblende ± biotite porphyry containing localized potassic alteration and copper mineralization. This drill hole added 60 m of strike to the known mineralization at the Main zone. Drill highlights included 291.5 m at 0.14% Cu, 0.48 g/t Au, and 0.95 g/t Ag.

The **Castle** project (formerly known as the Kinaskan-Castle) adjoins the GT Gold property of Tatogga and is the target of potential porphyry Cu-Au and high-grade precious metal veins. Previous work included high-resolution aeromagnetic and radiometric surveys, soil and rock sampling, geological field mapping, and a recent IP survey. Late in 2019, 1555 m of drilling was conducted at the East Castle zone targeting coincident gold and copper anomalies (detected from sampling) and chargeability anomalies.

The **Hank** project contains epithermal-style (Boiling and

Creek zones) and porphyry-style mineralization (Williams zone). Drilling of 2952 m in 2019 was used to test the continuation of mineralization at depth and to the northeast at the Williams zone. Highlights from drilling included 278 m of potassic altered monzonite and Stuhini Group rocks grading 0.35% Cu, 0.28 g/t Au, and 1.71 g/t Ag. Other drilling tested the Boiling and Creek zones. Previous work at these zones produced drill highlights of 20 m grading 11.63 g/t Au and a 6.8 g/t Ag, but no significant drill intersections were encountered in follow-up work.

Additional brownfield drilling (within mine lease, but outside ultimate pit) of 23 holes totalling 9900 m was completed.

The **Schaft Creek** project is managed through the Schaft Creek Joint Venture (SCJV), where Teck Resources Limited is the operator and holds a 75% interest, while Copper Fox Metals Inc. holds the remaining 25%. In 2019, the SCJV continued environmental studies and revisions to key infrastructure at the main camp. Work is ongoing to complete technical and engineering improvements to reduce capital and operating costs associated with the 133 ktpy mine plan. Shaft Creek is an advanced-stage project where three main porphyry Cu-Au-Mo zones have been identified. Teck Resources (2019) reported a Measured plus Indicated resource of 1.29 Bt grading 0.26% Cu, 0.017% Mo, 0.16 g/t Au and 1.24 g/t Ag, and an Inferred resource of 316.7 Mt grading 0.19% Cu, 0.018% Mo, 0.14 g/t Au, and 1.12 g/t Ag.

GT Gold Corp's **Tatogga** project contains the Saddle South and Saddle North targets. Work in 2019 was concentrated on the Saddle North target. The Saddle North discovery at Tatogga was identified late in 2018, where follow-up drilling of an IP chargeability anomaly resulted in the discovery of porphyry Au-Cu mineralization from near surface to depths of greater than 1300 m. Initial drilling highlights included 0.62 g/t Au, 0.36% Cu, and 1.17 g/t Ag across 1150 m. Following these initial results, Newmont Corporation placed \$17.6 million into GT Gold with the intention of accelerating exploration and development. Another \$8.3 million was invested by Newmont Goldcorp and intended to finance a preliminary economic assessment. In 2019, GT Gold continued to expand mineralization to depth and along trend. Recent drilling also identified high-grade precious metal veins peripheral to the main body of porphyry mineralization, which included highlights of 4.11 m of 25.42 g/t Au, and 15.70 m of 6.21 g/t Au. A detailed geological model and resource estimate and economic evaluation of Saddle North is expected to be released by the end of the first quarter in 2020.

In 2019, Brixton Metals Corporation increased its mineral claim tenure to 1858 km<sup>2</sup> for its **Thorn** project. Mapping and soil-rock geochemistry at the Chivas zone expanded the porphyry target 3 km along strike and it remains open. Brixton completed a 9.1 line-km IP-magnetotelluric survey across the Camp Creek copper corridor, which also contains the Oban diatreme breccia pipe and Glenfiddich zone. Exploration in 2019 included 8042 m of drilling; highlights from Oban were 0.57 g/t Au, 0.24% Cu, 43 g/t Ag, 0.55% Zn, and 0.28% Pb

across 554 m.

The **Treaty Creek** project is owned by Tudor Gold Corp. (60%), Teuton Resources Corp. (20%) and American Creek Resources Ltd. (20%), and borders the KSM property to the southwest and the Brucejack property to the southeast. Drilling in 2019 focussed on the Goldstorm zone, which resembles porphyry Au-Cu mineralization, but with a base-metal association. Drilling, which totalled 9780 m in 14 holes, returned highlights of 2.006 g/t Au across 87 m, within 336 m averaging 1.004 g/t Au. Silver and copper mineralization is associated with deeper gold horizons and remain open in all directions.

### 9.2.2. North Central Region

The **Atty** project (Serengeti Resources Inc.) is adjacent to Centerra Gold Inc.'s Kemess property. In 2019, 29.8 line-km of IP geophysics and follow-up diamond drilling (six holes, 2318 m) were carried out. Highlight drilling results included 87.7 m of 0.04% Cu, 0.14 g/t Au and 0.4 g/t Ag.

The **Chuchi** copper-gold project is at the northeast margin of the Hogen batholith (Early Jurassic to Early Cretaceous), where a cluster of porphyritic monzonite stocks, dikes, and sills intrude the Chuchi Lake succession of volcanic and sedimentary rocks. In 2019, Centerra Gold Inc. carried out a 731 line-km low-altitude aeromagnetic survey and 1755 m of diamond drilling in 4 holes.

Centerra Gold Inc.'s **Kemess East** project (KE), about 1 km east of KUG, is an underground operation that could be integrated into the KUG project and use facilities developed for KUG. KE has an Indicated resource of 113.1 Mt grading 0.38% Cu, 0.46 g/t Au and 1.95 g/t Ag and an Inferred resource of 63.8 Mt grading 0.34% Cu, 0.31 g/t Au, and 1.90 g/t Ag.

Kwanika Copper Corporation (65% Serengeti Resources Inc., 35% Posco International Corporation) was formed in 2017 to continue exploration on the **Kwanika** project. Since 2006, about 82,650 m of drilling has been done on Kwanika (Central and South zones). Based on open-pit and underground data, an updated resource was announced for the Central Zone in 2019, with Measured and Indicated values of 223.6 Mt grading 0.27% Cu, 0.25 g/t Au and 0.87 g/t Ag containing 1.32 Blbs of Cu, 1.83 Moz of Au and 6.27 Moz of Ag. The company planned to release a prefeasibility study but determined that it lacked the necessary funding and instead will focus on completing an interim study report.

At **Mt. Milligan**, Centerra Gold Inc. carried out a brownfield-greenfield low-altitude 640 km aeromagnetic survey and planned a 32 line-km IP survey near the mine site. Centerra reported that they had planned to complete 22,500 m of near-pit infill drilling by the end of 2019.

### 9.2.3. South Central Region

Troubadour Resources Inc. drilled 1075 m in four holes at their **Amarillo** project. Three targeted a coincident geochemical, IP, and magnetic anomaly and the fourth a chargeability high. Before drilling, they carried out mapping,

prospecting, and sampling. Amarillo is about 10 km south of the Brenda past-producing Cu-Mo porphyry. Like Brenda, the target is calc-alkaline porphyry mineralization related to the underlying Pennask batholith.

At their **Miner Mountain** project, SeGo Resources Inc. identified new targets through data compilation and reviewing existing drill core. Trench sampling returned 18 m grading 0.96% Cu and 0.31 g/t Au early in the year. Multiple targets at Miner Mountain are alkalic copper-gold type. SeGo reported targets at the Cuba, Empress, South, and Sovereign zones for potential drilling in 2020. They have a multi-year permit for drilling and trenching.

Dunnedin Ventures Inc. carried out 1766 m of drilling in 3 holes, mapping, prospecting, and sampling at their **MPD** project. MPD is a consolidation of the Man, Prime, and Dillard alkalic porphyry Cu-Au targets. Significant surface results include 0.89% Cu across 46 m in a trench sample at the Man area, and grab sample results of 0.80% Cu with 0.32 g/t Au at Dillard, 2 m of 0.49% Cu with 0.26 g/t Au and a grab sample grading 1.03 g/t Au with 9.40 g/t Ag at Prime.

Pacific Ridge Exploration Ltd. drilled 1087 m in 4 holes at their **Spilus** project, encountering low-grade copper-molybdenum mineralization and porphyry-style mineralization. They note the highest grades at the bottoms of two holes and in the north of their target area.

### 9.2.4. Southwest Region

During mapping and sampling reconnaissance work, ArcWest Exploration Inc. sampled up to 21.2 g/t Au and 15 g/t Ag in an apparent epithermal zone at their **Teeta Creek** project, primarily known as a porphyry Cu-Mo prospect. The area was drilled in 1968 and 1975 with at least one encouraging copper intersection. Teck Resources Limited has entered into an agreement to explore the property to earn an initial 60%.

## 9.3. Selected polymetallic base and precious metal projects

### 9.3.1. Northwest Region

In 2019, Pretium Resources Inc. drilled more than 15,000 m at their **Brucejack Regional** project prospects. Drilling early in the year was focussed on epithermal (Tuck and Lilliane zones), and VMS targets (A6 and Canoe zones). Intrusion-related gold (Kooopa zone) targets were drilled later in the year. Regional grassroots sampling, regional mapping, prospecting, geophysics, and hyperspectral mapping were also conducted on the Bowser mineral claims. At the A6 zone, mineralization is in Iskut Formation mudstones in a section containing pillowed and massive basalts and a 150 m-thick interval of sericite-chlorite altered rhyolite. This bimodal volcanism is similar to that at the Eskay Creek deposit. Drill highlights from the mudstone are 1.5 m grading 2890 g/t Ag and 1.81% Cu.

The **Dolly Varden** project (Dolly Varden Silver Corporation) is an advanced-stage property that consists of the Torbrit, Dolly Varden, Wolf, Northern Star, and Bonus zones, where four mineralized facies of exhalative stratiform mineralization are recognized. In 2019, the company conducted preliminary

metallurgical testing, 11,000 m of drilling, geochemical sampling, prospecting and geological mapping. Drilling at the Chance target intersected highlights of 15.20 m grading 488.3 g/t Ag, 0.55% Pb, and 0.05% Zn. Dolly Varden released an updated mineral resource in 2019, with total Indicated resources of 3.42 Mt grading 299.8 g/t Ag and an additional Inferred resource of 1.29 Mt grading 277.0 g/t Ag.

Skeena Resources Limited drilled at their **EsKay Creek** project. The past-producing EsKay Creek mine is considered a VMS-type deposit and was one of the highest grade gold mines in the world and fifth-largest silver producer by volume, with 3.3 Moz of Au and 160 Moz of Ag (average grades of 45 g/t Au and 2224 g/t Ag). Drilling in 2019 focussed on upgrading areas of Inferred resources into the Indicated category. Highlights include 312.81 g/t Au and 95 g/t Ag across 2.21 m and separately 6.75 g/t Au and 285 g/t Ag across 27.50 m. A pit-constrained Indicated mineral resource is reported at 12.65 Mt at 4.3 g/t Au, 110 g/t Ag with an Inferred resource of 14.42 Mt at 2.3 g/t Au, and 47 g/t Ag. An underground Indicated resource of 819,000 t at 6.4 g/t Au and 139 g/t Ag and an Inferred resource of 295,000 t at 7.1 g/t Au and 82 g/t Ag were reported.

At the **Golddigger** project in 2019, Goliath Resources Limited discovered a new zone (Sure Bet) during field reconnaissance that followed-up targets generated by lidar and geochemical sampling data. Contained in a broad alteration halo, the zone is cut by multiple NW-SE trending structures that host polymetallic massive sulphide mineralization (galena-sphalerite-pyrite). A single channel sample resulted in 8.4 m of 7.37 g/t Au, including 3.4 m of 17.68 g/t Au. More than thirty chip samples were collected; most returned assays >1.4 g/t Au.

Etruscus Resources Corp.'s **Rock and Roll** project lies in the Iskut River valley and includes the Black Dog VMS deposit which was discovered 30 years ago. Black Dog has an Inferred mineral resource estimate of 2.02 Mt grading 0.71 g/t Au, 87.1 g/t Ag, 0.23% Cu, 0.23% Pb, and 0.98% Zn. Because of thick overburden, Etruscus Resources conducted a biogeochemical orientation survey, which tested pathfinder elements (Au, Ag, Ba, Cu, Fe, Hg, Pb, Se, Zn) in 58 bark samples over known and unknown mineralized areas. In addition to surface sampling, approximately 2500 m of diamond drilling was conducted.

The **Scottie Gold Mine** project is operated by Scottie Resources Corp., who changed their name from Rotation Minerals Ltd. early in 2019. The property hosts the past-producing Scottie Gold mine which produced 95,400 oz of gold. Mineralization consists of gold-bearing quartz-calcite sulphide veins that appear to be coeval with sub-parallel shear and fracture zones of the Texas Creek suite, specifically the Summit Lake pluton. In 2019, the company began surface geochemical sampling, completed 2050 m of diamond drilling, followed up on near-surface historic high-grade mineralization on the newly acquired Bow property, and explored recently deglaciated outcrops. The Domino zone, which is 1.9 km west of the past-producing Scottie Gold mine, produced assay results from grab samples of 536 g/t Au and 735 g/t Ag and a chip sample gave 10.5 g/t Au and 14 g/t Ag across 5.3 m. The

Domino zone consists of several discrete 200 m-wide shear structures that continue parallel for more than 700 m along strike.

Ascot Resources Ltd. acquired **Silver Coin** late in 2018. The deposit has similar host rocks and ore mineralogy to that of the Premier and Big Missouri deposits. Silver Coin contains existing underground infrastructure and the central parts of the deposit are drilled sufficiently to warrant resources being classified in the Indicated category. The 10,500 m drill program this year was designed to infill and provide geotechnical context. Drilling highlights include 52.67 g/t Au across 3.59 m. An Indicated mineral resource is reported at 0.70 Mt grading 4.46 g/t Au and 17.9 g/t Ag with an additional Inferred resource of 0.97 Mt grading 4.39 g/t Au and 19.0 g/t Ag.

In September, New Nadina Explorations changed its name to Equity Metals Corporation, and its flagship project is the **Silver Queen** project. Mineralization is similar to the Equity Silver mine, where it is characterized as a transitional porphyry-epithermal type deposit. Polymetallic mineralization is in 1-2 m-wide quartz-calcite-barite veins as disseminated to locally massive sphalerite, galena, chalcopyrite, and sulfosalts. In 2019, historic data were compiled and interpreted and, in August, a mineral resource estimate was released with Indicated resources of 0.815 Mt at 6.35% Zn, 3.24 g/t Au, 201.4 g/t Ag, 0.26% Cu, and 0.96% Pb with additional Inferred resources of 0.801 Mt at 5.21% Zn, 2.49 g/t Au, 184.3 g/t Ag, 0.31% Cu, and 0.88% Pb (resources at NSR cut-off of \$100/t).

Strikepoint Gold Inc. acquisitioned the **Willoughby** project in 2019 from ArcWest Exploration. The project is adjacent to Ascot's Red Mountain project and is approximately 30 km east of Stewart. The property has 4625 m of historic drilling on six zones and contains underground workings excavated in the 1990s. Gold-silver mineralization is in Early Jurassic volcanic and sedimentary rocks and is thought to be associated with the 'Goldslide suite' intrusive complex. In 2019, hand-trenching and channel sampling was conducted along with about 2000 m of diamond drilling. Drilling at the North zone produced highlights of 26.28 g/t Au and 95.00 g/t Ag across 4.0 m, and surface sampling near the Wilkie zone returned a grab sample of 67.3 g/t Au and 164.0 g/t Ag.

### 9.3.2. North Central Region

ZincX Resources Corp. continued exploration on its **Akie SEDEX** project, which includes the Cardiac Creek deposit. The deposit is hosted by siliceous, carbonaceous, fine-grained siliciclastic rocks of the Gunsteel Formation (Middle to Late Devonian). At a base case 5% zinc cut-off, the deposit has an Indicated resource of 22.7 Mt grading 8.32% Zn, 1.61% Pb and 14.1 g/t Ag and an Inferred resource of 7.5 Mt grading 7.04% Zn, 1.24% Pb and 12.0 g/t Ag. In 2019, ZincX carried 2347 m of diamond drilling in four holes, focussing on the high-grade core of the deposit. Highlight results included 10.94 m (true width) of 10.85% Zn, 2.23% Pb, and 17.0 g/t Ag and 14.65 m (true width) of 16.20% Zn, 3.39% Pb, and 27 g/t Ag.

InZinc Mining Ltd.'s **Indy** project area has been of exploration

interest since the early 1980s. Targets have generally been categorized as a Mississippi Valley-type (MVT), although SEDEX affinities have long-been recognized. A maiden drill program in 2018 identified a new SEDEX mineralized discovery (B-9 zone) and results included 6.29 m of 12.33% Zn, 2.98% Pb, and 24.5 g/t Ag. In 2019, soil geochemical surveys (1194 samples), mapping and prospecting were carried out. Results identified several targets, the largest being a 1.5 km-long multi-element geochemical target defined by distinctive SEDEX pathfinder elements in soil samples and rock exposures. This target is 5 km northwest of the B-9 zone.

The **Stardust** property was acquired by Sun Metals Corp. in 2017. Historically regarded as a skarn deposit, it was explored intermittently for many years. Historic work included more than 80,000 m of drilling, 5800 soil samples, airborne magnetic surveys, mapping, and prospecting. Mineralization is hosted by the Sowchea, Pope and Copely successions west of the Pinchi fault, in the Cache Creek terrane. In 2018, Sun Metals reported discovering a new zone (421 zone) and drilling results included a 100 m intersection grading 2.51% Cu, 3.03 g/t Au, and 52.5 g/t Ag. Sun Metals began drilling in May 2019, which continued into the fall with plans for extension into 2020. Estimated drilling for 2019 was 15,000 m in 27 holes. Highlight 2019 results for the 421 zone included 24.85 m of 3.13% Cu, 4.8 g/t Au and 93.45 g/t Ag, and 58.01 m of 2.49% Cu, 2.61 g/t Au and 44.3 g/t Ag. Results confirm continuity of mineralization down dip and to the south of the 2018 discovery hole.

### 9.3.3. South Central Region

Engold Mines Ltd. drilled its **Lac La Hache** project in early 2019, stepping out at the Aurizon target. Initial results extended narrow quartz-carbonate gold veins along strike. Engold resumed drilling late in the year and carried out soil surveys on four target areas. Drill results included 6.18 g/t Au, 0.80% Cu and 2.63 g/t Ag across an interval of 4.55 m. Lac La Hache has several different target types related to alkalic intrusions. Copper skarns have had much of the recent exploration attention, but there are also porphyry targets and the Aurizon Au-Ag-Cu vein and breccia zone which has a maiden resource estimate (Table 10).

At the **New Craigmont** project, Nicola Mining Inc. announced results of 2018 drilling on both historically mined material piled in waste terraces and in the Craigmont Central zone early in the year. They carried out additional drilling to test the Central zone in 2019. Highlights from the No. 3 mineralized body include 84 m of 0.34% Cu, 44 m of 0.45% Cu, and 13 m of 0.65% Cu with magnetite. Other work included soil geochemistry, mapping, analysis of historic core, and multispectral mapping. They are also developing a resource estimate for the Craigmont mine waste terraces. The material was tested using X-ray transmission sorting technology. In five out of eight tests, grades were increased to greater than 1% Cu with up to 50% Fe. They are also carried out flotation tests.

The Merritt Mill is at the Craigmont mine site. It has undergone about \$3 million in recent modifications but is not

yet recommissioned. The mill is a 200 tpd crushing, grinding, and flotation mill with a gravity jig and table. Originally constructed in 2012 to process ore from Treasure Mountain, Nicola operates it as a custom mill and uses the Craigmont tailings storage facility.

GSP Resources Corp. had a seven-hole 1200 m November drill program at its **Olivine Mountain** project in the Tulameen complex. Grab sampling returned encouraging Cu, Au, and Pd values from target areas and initial drilling intersected visible sulphide. Drilling follows mapping, soil geochemistry, and an airborne VLF-EM survey in 2018. The Tulameen complex is an Alaskan-type Late Triassic mafic-ultramafic intrusion.

### 9.3.4. Southeast Region

Rokmaster Resources Corp. previously compiled historic data and resampled historic drill core for their **Duncan** project. Results include 7.5 m grading 6.2% Zn + 6.3% Pb, 4.8 m grading 11.4% Zn + 0.8% Pb, and 6.9 m grading 7.1% Zn + 4.6% Pb. New forestry cutblocks on the property in 2019 exposed additional outcrops, and additional mapping, soil geochemistry, and rock sampling was done. The company also conducted environmental baseline work, and drill permits were received late in the year. The Duncan property has been intermittently explored since the 1950s. Drilling by Cominco between 1989 and 1997 outlined zinc-lead mineralization along a 650 m strike length. Several zones of mineralization exist on the property as steeply dipping, stratiform, bodies on the east limb of the Duncan anticline.

Magnum Goldcorp Inc. has been drilling at their **LH** project in the past few years, with intersections including 8.5 m grading 7.10 g/t Au. Gold mineralization appears to be associated with pyrrhotite+/-arsenopyrite, which provide conductive targets that are coincident with ground geophysics magnetic anomalies. In 2019, they completed a helicopter-supported drill program (4 DD holes, 250 m) to follow up on 2015 drilling on the western end of a magnetic anomaly. Present and historic drilling has identified at least two mineralized intervals 1 to 8.75 m thick. Highlight results from 2019 include 5.58 m grading 4.068 g/t Au, with 0.27 m grading 22.8 g/t Au.

Apex Resources Inc.'s **Ore Hill** project was under option to Margaux Resources Ltd. in 2017 and 2018. Margaux carried out mapping and sampling along a gold soil geochemical anomaly and identified gold mineralization in a 10 m wide breccia zone along a north-trending fault. The soil anomaly traced the fault for more than 1500 m across the Summit and Ore Hill claims, and rock sample results included 119 g/t and 105 g/t Au collected across an area 950 by 150 m. In 2019, Apex Resources Inc. compiled historic data, and identified two linear, north-trending magnetic anomalies from an airborne Heliogeotem survey that was flown in 2009. The western anomaly coincides with the soil and rock geochemical anomaly, whereas the eastern anomaly coincides with historic production from the Queen mine at its northern end. Apex mapped and sampled to confirm grades from the previous work and late in the year began a 600 m drill program, which encountered visible gold. The Ore

Hill property is in the historic Sheep Creek gold mining camp.

Affinity Metals Corp.'s **Regal** project covers 5891 ha and hosts multiple past-producing mines including the Regal Silve mine, the Allico silver mine and the Snowflake mine. In 2011, Northaven Resources Corp. completed 1354 line-km of airborne geophysical work over the area and identified linear magnetic and conductive anomalies that are coincident with historic MINFILE showings. In 2018, Affinity Metals Corp. optioned the property, compiled historic data, and did additional mapping. At the Allico property, 22 grab samples assayed up to 4420 g/t Ag, 2.27% Cu, 26.4% Zn, >20% Pb, and 5.68 g/t Au. Further interpretation was done on the 2011 geophysical survey, and drilling was completed late in 2019 at Allico (10 DD holes), and Regal (11 DD holes). Total combined metreage was 1846.

Teck Resources Limited continued work at their **Sweet Spot** project in 2019. Recent focus in the Purcell anticlinorium has been on geophysical methods to further identify structures and thickness variations in the Aldridge Formation that may indicate sub-basin development and potential SEDEX mineralization. In the last several years, the company has re-logged core, mapped, and sampled and identified target areas. They conducted additional geophysical work, including magnetotelluric studies to delineate targets, and in 2019 they drilled (2 DD holes, 1371 m) continued mapping and conducted petrophysical studies.

#### 9.3.5. Southwest Region

Bayhorse Silver Inc. has optioned the **Brandywine** past producer and began compiling historical data and preliminary work at the site, including resampling of 2010 drill core. Metallic screen assays in some cases yielded significantly higher Au results (e.g., 11.42 vs. 3.73 g/t across 3.1 m and 20.20 vs. 6.23 g/t Au across 1.6 m). In 1977-78, about 10,000 t of ore from Brandywine yielded 23,000 oz Ag and 11,000 oz Au, with Pb, Zn and Cu co-products.

### 9.4. Selected Ni-Cu-Co-precious metal projects

#### 9.4.1. Northwest Region

Drilling in 2017 at the **Nickel Mountain** project (Garibaldi Resources Corp.), which contains the E&L zone, returned 16.75 m of core with 8.3% Ni, 4.2% Cu, 0.19% Co, 1.96 g/t Pt, 4.5 g/t Pd, 1.1 g/t Au, and 11.1 g/t Ag. Exploration in 2019 was designed to infill the five known zones of mineralization and further explore at depth and along strike. Approximately 25,000 m were drilled in 2019 and highlights include 18.2 m grading 7.04% Ni, and 3.81% Cu in a broader zone of mineralization of 86.5 m grading 1.88% Ni and 1.32% Cu.

Giga Metals Corporation's **Turnagain** project has four main zones of mineralization (Horsetrail, Northwest, Hatzl, and Duffy) that contain sulphide mineralization as pyrrhotite, pentlandite, chalcopyrite, and trace bornite, in the Turnagain ultramafic intrusion (Early Jurassic). In September of 2019, an updated Measured plus Indicated resource was reported of 1.073 Bt grading 0.220% Ni and 0.013% Co, and an Inferred

resource of 1.142 Bt grading 0.217% Ni and 0.013% Co. These Measured plus Indicated resources equate to 5.2 Blbs of Ni and 312 Mlbs of Co, a 28.3% increase in Ni from the previous estimate. The updated estimate was based on an additional 36 infill drill holes totalling 8940 m drilled previously in 2018. A Preliminary Economic Assessment is expected as early as first quarter of 2020.

#### 9.4.2. North Central Region

FPX Nickel Corp.'s **Decar** project contains ultramafic rocks mineralized with the naturally occurring nickel-iron alloy, awaruite. In 2019, FPX Nickel reported bench-scale test results for metal extraction and are considering testing a 10,000 t bulk sample. A conventional flow sheet based on grinding, magnetic separation, and flotation processes consistently produced clean nickel concentrates grading 63 to 65% Ni with significant improvements in recovery relative to previous testing. By-product iron ore concentrates graded 60 to 65% Fe.

### 9.5. Selected specialty metal projects

Specialty metal exploration projects include Defense Metals Corp.'s **Wicheeda** project in the North Central Region and Delrey Metals Corp.'s **Peneece** project in the Southwest Region.

#### 9.5.1. North Central Region

Defense Metal Corp.'s **Wicheeda** project is a deformed carbonatite intrusion that hosts light rare earth elements (LREE). The core of the intrusion is a dolomite carbonatite, which transitions outward to a calcite carbonatite. Hydrothermal veins and plugs in the dolomite carbonatite are mineralized with REE fluorocarbonates, ancylite (cerium, lanthanum) and monazite (cerium, lanthanum, neodymium). Minor concentrations of niobium are present as well. In 2019, Defense Metals completed a 30 t bulk sample and in June released a report that set out, at a 1% LREE cutoff, an Inferred resource of 11.37 Mt grading 1.14% Ce, 0.53% La, 0.23% Nd, 0.04% Nb, 0.01% Sm and 1.96% LREE. In September, the company completed drilling a total of 2005 m in 13 holes which left the deposit open to the north and west. Highlight results included 83 m of 4.43% light rare earth oxides (LREO; lanthanum, neodymium, praseodymium, and samarium oxides) and 58 m of 4.01% LREO.

#### 9.5.2. Southwest Region

Delrey Metals Corp. flew an airborne survey and identified a large magnetic anomaly at its **Peneece** iron-titanium-vanadium project. Delrey increased the size of their land holdings to cover the anomaly. Previously called Wigwam Magnetite, this prospect comprises a large, low-grade (5-10%) titaniferous magnetite deposit. Magnetite also has elevated vanadium. It was first recognized as a large magnetic anomaly in the late 1950s or early 1960s. Relatively little work has been done but it appears as though diorite, metasedimentary and metavolcanic rocks host fine- to coarse- gabbro or hornblende pyroxenite

dikes or veins with 5-10% magnetite.

## 9.6. Selected coal projects

Coal exploration projects included Colonial Coal International Corp.'s **Huguenot** project in the Northeast Region and Pacific American Coal Limited's **Elko** project in the Southeast Region.

### 9.6.1. Northeast Region

Colonial Coal International Corp. announced a Preliminary Economic Assessment for an open-pit-only mine for its **Huguenot** project. This revises a previous PEA for a combined open-pit and underground operation. Two scenarios for the open-pit-only mine capital expenditures were reported. Based on the purchased equipment scenario the financial analysis suggested that the coal price required to achieve a zero NPV at discount rates of 5%, 7.5% and 10%, respectively, is about US\$113, US\$120 and US\$125 t. A coal price of US\$137 per t is required for an IRR of 15%. Based on the leased equipment option, the financial analysis suggested that the coal price required to achieve a zero NPV at discount rates of 5%, 7.5% and 10%, respectively, is about US\$114, US\$119 and US\$125 per t. A coal price of US\$137 per t is required for an IRR of 15%. Measured and Indicated surface mineable coal resources total 132.0 Mt, with an additional Inferred resource of 0.5 Mt. The conceptual open pit would yield 72 Mt of product coal during a mine life of 27 years.

### 9.6.2. Southeast Region

Pacific American Coal Limited released results of their 2018 drilling, and continued work on their **Elko** project. In the 2018 drilling (RC and large-diameter; 3451 m), six coal seams were encountered in the Mist Mountain formation, ranging in thickness from 2.41 to 12.70 m. Geological modeling suggests that these seams are continuous across the property. Three additional seams were encountered in the overlying Elk Formation, and range in thickness from 1.77 to 2.60 m. Coal quality test results indicate seven of the nine seams are mid-volatile, low-ash coking coal. The bottom two seams are mid-volatile, semi-hard coking coal to PCI metallurgical coal, but more work needs to be conducted to determine the characteristics of a blended product. In 2019, the company used the 2018 drilling results to update their JORC resource estimate of 117.6 Mt Measured + 93.2 Mt Indicated + 92.3 Mt Inferred. Block modeling indicates potential for a small open-cut operation and a larger underground operation.

## 9.7. Selected industrial mineral projects

Industrial mineral exploration projects include Sil Industrial Minerals Ltd.'s **Sil** project in the Northeast Region, Leo Lindinger's **Mont** property in the South Central Region, and MGX Minerals Inc.'s **Gibraltar** project in the Southeast Region.

### 9.7.1. Northeast Region

Sil Industrial Minerals Ltd. continued to explore the 17-001, 002, and 003 targets on their **Sil** project. In 2018, the company completed initial exploration on a multi-year project in search of frac sand resources in sandy post-glacial sediments. In 2019, the 17-001 target area was sampled with 70 drill holes totalling 500 m, the 17-002 target area was sampled with 10 drill holes totalling 50 m and the 17-003 target area was also sampled with 10 drill holes totalling 50 m.

### 9.7.2. South Central Region

Following test pits in 2018, Leo Lindinger drilled the **Mont** property, a bentonite prospect in an accessible area. All three holes intersected bentonite clay. Results so far suggest this is a large deposit. Historically the area has been explored mainly for gold, copper, zinc, and silver in epithermal, hot spring or porphyry and transitional vein environments. Recognition of a potentially economic bentonite deposit is recent.

### 9.7.3. Southeast Region

In 2019, MGX Minerals Inc. continued to explore at their **Gibraltar** project. In 2018, MGX shipped a one-ton sample to an independent lab in Germany (Dorfner Anzaplan) for testing. Results indicated that the material could be suitable as medium quality feedstock for metallurgical-grade silicon metal production. They mapped and sampled on the property, reporting assay results between 97.8 and 99.9% SiO<sub>2</sub>, and began an eight-hole drill program late in the year. In 2019, they drilled (5 DD holes, 200 m) to follow up on their 2018 work.

## 10. Publically funded geoscience

### 10.1. The British Columbia Geological Survey

The British Columbia Geological Survey (BCGS) conducts research to establish the geological evolution and mineral resources of the province. It partners with federal, provincial, and territorial geoscience agencies, and other national and international organizations. Drawing on continuously advancing concepts and technologies, the Survey creates knowledge to guide societal decisions centred on the Earth sciences. It connects government, the minerals industry, and communities to the province's geology and mineral resources. The information provided by the Survey is used for effective mineral exploration, sound land use management, and responsible governance, benefitting decisions that balance the economy, the environment, and community interests. The Mineral Development Office is the Vancouver base of the British Columbia Geological Survey. It links the more than 800 exploration and mining companies headquartered in Vancouver to provincial mineral and coal information. The MDO distributes Survey data and provides technical information and expertise about mineral opportunities to the domestic and international investment community. Celebrating its 125<sup>th</sup> anniversary in 2020, the British Columbia Geological Survey is the oldest scientific organization in the province.

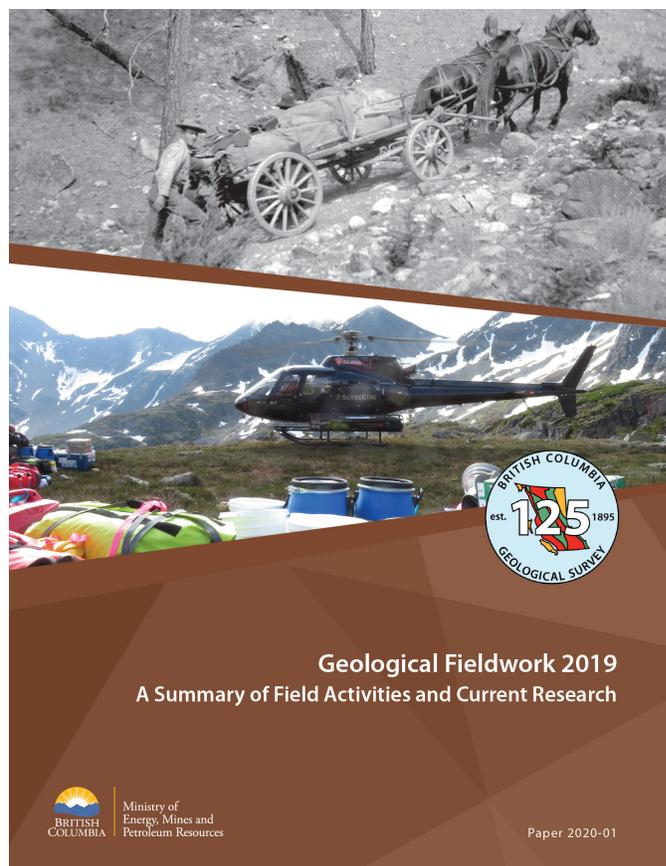
The largest field project in 2019 was centred on northern

Hogem batholith. In its second year, the project will provide a modern understanding on the controls of diverse mineralization types in the region and includes both bedrock and surficial mapping. An ancillary project evaluated the production of digital elevation models from drone-mounted optical systems, and how these models can be used to support field mapping and exploration. North of the Hogem batholith, the second year of a TGI-5 partnership with the Geological Survey of Canada was completed. This study, designed to establish the geological framework and geochronology of the Polaris ultramafic intrusion, will be integrated with work on the Tulameen ultramafic body to create a new model for Ni-CU-PGE ore-forming processes in these Alaskan-type intrusions. Another study in the North Central Region, conducted in conjunction with the University of British Columbia, examined alteration and protoliths in serpentinized rocks of the Trembleur ultramafic unit in the Decar area to better understand the formation, distribution, and abundance of brucite, which is capable of sequestering atmospheric CO<sub>2</sub>, and awaruite, a potential source of nickel. In the Golden Triangle of northwestern British Columbia, a new multi-year mapping project was started near Kitsault to further refine the stratigraphy of the Hazelton Group and associated mineralization. A pilot project was undertaken in northern Vancouver Island to test panned stream-sediment and water geochemistry combined with Pb isotopic compositions to explore for metallic deposits in glaciated terranes. Program results are presented each year at an Open House held in Victoria and at annual meetings such as Roundup, the PDAC, KEG, Minerals North, and Minerals South. Results are also published in *Geological Fieldwork* (Fig. 16), a volume of papers released each January, and by GSC and Geoscience BC partners.

As the steward of mineral and coal resources in the province, the Survey has an important role in stimulating activity, attracting investment, and providing continuous research based on a corporate memory that extends back more than 125 years. As custodian of all provincial public geoscience data, the BCGS preserves, archives, and provides free web-based access to information. The BCGS houses, maintains and regularly updates numerous databases, including MINFILE, COALFILE, Property File, the Assessment Reports Indexing System (ARIS), digital bedrock geology, regional geochemical surveys, and a publications catalogue. MapPlace, the BCGS geospatial web service, provides open geoscience data and custom map-making tools to help decision-makers from diverse disciplines reduce the costs of accessing and analyzing information.

## 10.2. The Geological Survey of Canada

The BCGS and the Geological Survey of Canada (GSC) continue to deliver projects through the second iteration of the Geo-mapping for Energy and Minerals (GEM 2) program, which is aimed at advancing geological knowledge and further developing modern geological maps and data sets and will run until 2020, and through the Targeted Geoscience Initiative 5



**Fig. 16.** The British Columbia Geological Survey is celebrating its 125<sup>th</sup> anniversary in 2020. Each year it publishes *Geological Fieldwork*, a Summary of Fieldwork and Current Research, the Provincial Overview of Mining and Exploration in British Columbia (this volume), and the British Columbia Coal Industry Overview. Top photo of camp move to Highland Valley in 1910. Bottom photo of camp move near eastern Hogem batholith in 2018.

(TGI-5) program. The TGI-5 program is directed at building knowledge and developing methods to better target buried mineral deposits. It aims to understand the geological processes responsible for deriving, transporting, and depositing ore metals. In addition, surficial geology and glacial history studies will provide vital knowledge for mineral exploration in covered regions.

## 10.3. Geoscience BC

Geoscience BC, a not-for-profit, non-government geoscience organization funded by provincial government grants, also provides provincial geoscience information. Geoscience BC is industry-led and supports mineral and oil and gas investment to British Columbia through the funding and delivery of geoscience data produced by third parties. Geoscience BC awards contracts for large geophysical and geochemical programs and provides grants to universities and consultants for targeted geoscience projects typically generated through requests for proposals. Geoscience BC is governed by a volunteer board of directors and receives technical direction

from volunteer technical advisory committees (mineral exploration, oil and gas, and geothermal) whose membership is largely drawn from the exploration industry.

### **11. Foreign investment initiatives**

Opportunities exist for companies to attract foreign investment using government services and staff. The province participates in international investment missions showcasing mineral and coal opportunities. If you are interested in profiling your projects or investment opportunities in upcoming events, connect with the Mineral Development Office in Vancouver for more information.

### **12. Concluding remarks**

Exploration expenditures decreased slightly from 2018 but explorationists continued to define, and expand porphyry and porphyry-related Cu-Au and Cu-Mo deposits, gold deposits of various types, and stratiform base-metal, specialty metals, industrial minerals, and coal deposits. Even though exploration expenditures were down slightly, there were several investments highlighting British Columbia as a favourable mining jurisdiction. Newcrest Mining Limited acquired a 70% interest in the Red Chris mine for a final purchase price of \$804 million US, creating a joint venture with Imperial Metals Corp. (remaining 30% interest), Ascot Resources Ltd. acquired IDM Mining Ltd. for \$45 million, Newmont Corporation invested \$25.9 million in GT Gold Corp.'s Tatogga project, Osisko Gold Royalties Ltd. acquired Barkerville Gold Mines Ltd. for about \$338 million and Talisker Resources Ltd. acquired Bralorne Mines Ltd. for shares and a cash payment of \$8.7 million.

At the end of 2019, nine metal mines and seven coal mines were in production. During the year one metal mine (Mount Polley) and two coal mines suspended production (Quinsam and Coal Mountain). One new industrial mineral mine (Kootenay West) was under construction.

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