

Exploration and mining in the Northwest Region, British Columbia



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1. Introduction

The Northwest Region (Fig. 1) is well known for its remarkable endowment of economic minerals. It has a long history of exploration and mining, which extends back more than a century. Including a loosely defined area popularly known as the ‘Golden Triangle’, the region has high potential for deposits such as large bulk-tonnage porphyry Cu-Au-Mo, high-grade Au-Ag precious metal, Ag-Pb-Zn polymetallic, ultramafic-hosted Ni-Co-Pt-Pd, anthracite coal, placer gold, and jade. The Skeena arch, host to many large past-producing Cu-Au porphyry projects, is seeing renewed exploration interest and investment. Continued improvements to infrastructure in the region will improve the economical viability of proposed projects. New outcrops exposed due to glacier retreat in the region will help exploration.

In 2019, exploration expenditures and other exploration metrics are captured in the British Columbia Mineral and Coal Exploration Survey. For the Northwest Region, exploration expenditures were estimated at \$180.8 million, while exploration drilling was approximately 266,700 m (Clark et al., 2020; EY LLP, 2020).

The Northwest Region contains three operating mines (**Brucejack**, **Red Chris**, and **Silvertip**) and five proposed projects (**Galore Creek**, **KSM**, **Red Mountain**, **Kutcho**, and **Tenas**). More than 80 exploration projects were tracked, of which more than 30 are discussed herein. The region is prospective for a diversity of deposits, although in 2019 exploration focussed on porphyry Cu-Au and high-grade precious metal mineralization. Several new large construction projects in the region are creating significant need for aggregate. Placer gold and jade mining continues throughout the region.

Major companies are making large investments in the region. This year Australian-based Newcrest Mining Limited invested \$804 million US for 70% interest in the **Red Chris** mine and Newmont Corporation placed a combined \$25.9 million financing and strategic investment into GT Gold Corp. to expedite exploration and development at the **Tatogga** project. Domestic acquisitions and optioning are ongoing; notably, Ascot Resources purchased the **Red Mountain** project from IDM Mining Ltd. for \$45 million.

Several companies reported positive drill results on recent discoveries, while other projects were advanced towards the feasibility stage. Step-out drilling by Teuton Resources Corp. at the Goldstorm zone of the **Treaty Creek** project intersected a large mineralized system and the company reported 2.006 g/t Au across 87 m, within 336 m averaging 1.004 g/t Au. GT Gold continued reporting positive drill intersections at their **Tatogga** project at the North Saddle target with the main porphyry body returning highlights of 500 m grading 0.91 g/t Au, 0.55% Cu, 1.34 g/t Ag. Adjacent high-grade precious metal veins returned 4.11 m grading 25.42 g/t Au and 15.70 m grading 6.21 g/t Au. At Brixton Metals Corporation’s **Thorn** project, drilling on the 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. At their **Hank** property, Golden Ridge Resources Ltd. followed up a 2018 porphyry discovery with continued drilling at Williams zone and reported 0.35% Cu, 0.28 g/t Au, and 1.71 g/t Ag across 278 m. Drilling at their **Ball Creek** project Main zone intersected 291.5 m at 0.14% Cu, 0.48 g/t Au, and 0.95 g/t Ag.

2. Geological overview

The mineral endowment of British Columbia, including the Northwest Region, is intimately tied to the tectonic evolution of the Canadian Cordillera (e.g., Nelson et al., 2013). Mineral deposits formed during protracted Neoproterozoic to Cambrian breakup of the supercontinent Rodinia, accretion of allochthonous terranes to the western flank of ancestral North America, and post-accretion deformation and magmatism. The Canadian Cordillera is commonly subdivided into five morphogeologic belts (from east to west, Foreland, Omineca, Intermontane, Coast, and Insular; Fig. 1) across which the Northwest Region extends. Late Triassic to Early Jurassic island arc volcanism, plutonism, and tectonics in the Stikine terrane were particularly important to the Northwest Region, generating many porphyry Cu-Au-Mo and Au-Ag vein deposits.

3. Mines and quarries

In 2019, three metal mines operated in the Northwest Region (**Brucejack**, **Red Chris**, and **Silvertip**). The region has one industrial mineral quarry and eight jade operations that were

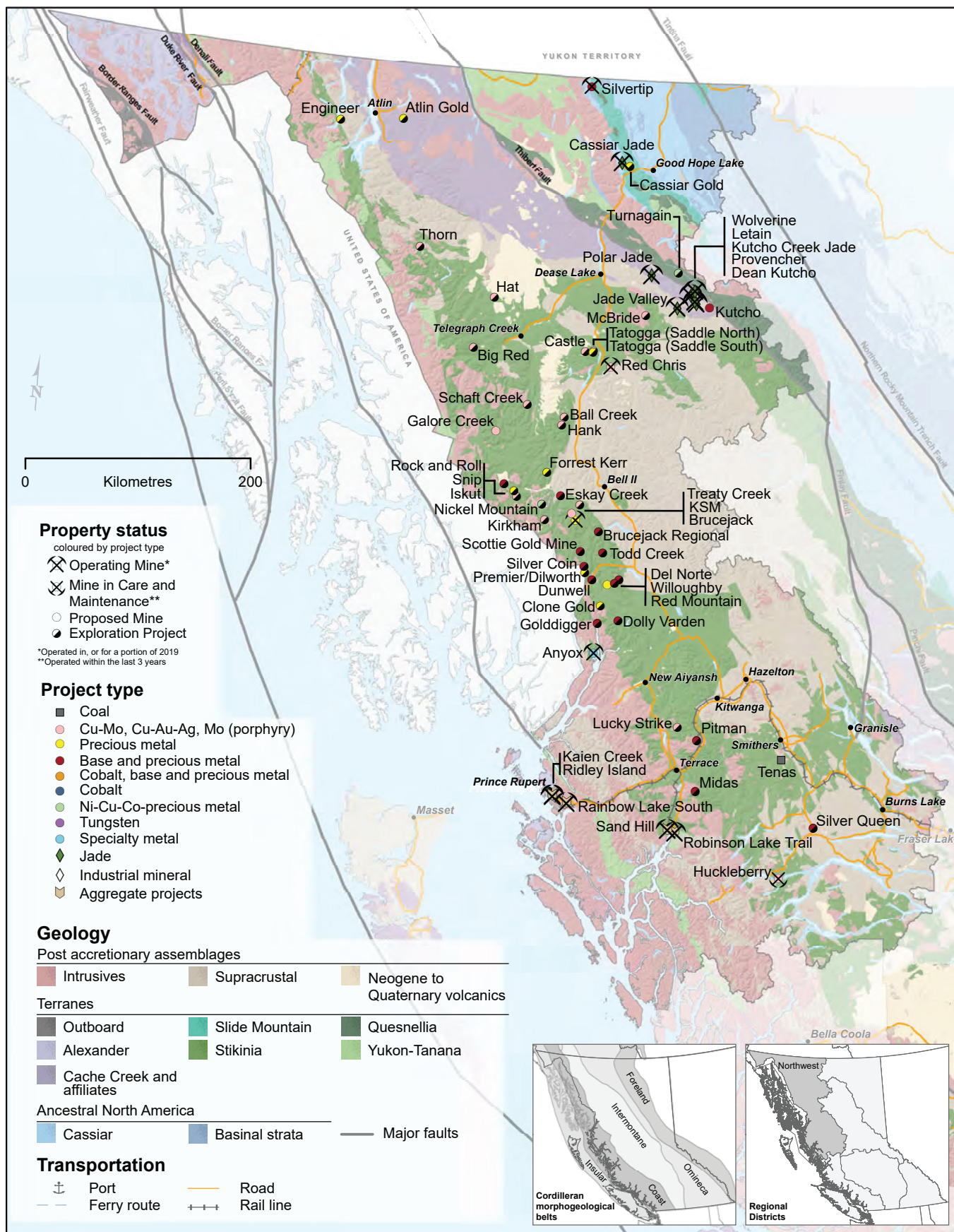


Fig. 1. Mines, proposed mines, and selected exploration projects, Northwest Region, 2019. Terranes after Nelson et al. (2013).

tracked. Placer mining is ongoing, predominantly in the Atlin and Turnagain areas. Numerous aggregate operations supply mainly the local townships throughout the region, although the need for aggregate material has increased significantly because of large LNG projects underway in the Kitimat area and infrastructure upgrades in Prince Rupert.

3.1. Metal mines

The Northwest Region contains three operating metal mines that operated continuously in 2019: **Brucejack**, **Red Chris**, and **Silvertip** (Fig. 1; Table 1).

3.1.1. Brucejack (Pretium Resources Inc.)

The **Brucejack** deposits comprise a high-grade Au-Ag resource in the high alpine approximately 65 km north-northeast of Stewart. The mine is an all-season operation, where 75 km of combined dirt and glacier road access is maintained between highway 37 and the underground mine. The site is powered via a 57 km long transmission line to the BC Hydro power grid and is currently processing at 3800 tpd throughput. For the first three quarters of this year, production totalled 258,168 oz of Au from 929,047 t of ore. All in sustaining costs for the operation in the same time averaged \$895 per ounce of gold sold.

The Valley of the Kings (VOK) zone, which is the current focus of underground mining, is described as a high-grade Au-Ag intermediate-sulphidation epithermal deposit. Syntectonic mineralized veins and stockworks are structurally controlled and crosscut metasedimentary and volcanic rocks of the Hazelton Group. A link between a causative porphyry with

epithermal mineralization has not yet been made at Brucejack, although continued deep drilling from underground exposures is ongoing. Deep diamond drilling has continued to extend gold mineralization to depth, and zones of anomalous Cu and Mo have been recognized in conjunction with propylitic alteration.

In May of 2019, Pretium Resources announced updated mineral reserves and resources, where the total is based on both the VOK and West zone. Combined Proven plus Probable reserves were reported at 16 Mt grading 12.6 g/t Au and 59.3 g/t Ag. Total Measured plus Indicated resources were reported at 18.7 Mt grading 14.2 g/t Au and 81.6 g/t Ag, with an additional Inferred resource of 7.8 Mt grading 12.0 g/t Au and 51.3 g/t Ag.

3.1.2. Red Chris (Newcrest Mining Limited 70%; Imperial Metals Corporation 30%)

The **Red Chris** open-pit Cu-Au mine is 17 km east-southeast of Iskut and is accessed by a mine road from highway 37. In August 2019, Newcrest Mining Limited acquired 70% interest in the project for a final purchase price of \$804 million US, creating a joint venture with Imperial Metals Corp. (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 Red Chris Cu-Au deposit is hosted in 203.8 Ma (U-Pb zircon; Rees et al., 2015) diorite-quartz monzonite stocks and dikes that intrude Upper Triassic Stuhini Group rocks. The deposit has recognized sequences of mineralized intrusions (P1-P3), where the main Red stock (P1) represents the largest (6.5 x 1.5 km) and most altered phase and is associated

Table 1. Metal mines, Northwest Region.

Mine	Operator (partner)	Commodity; deposit type; MINFILE	Forecast 2019 Production (based on Q1-Q3)	Reserves	Resource	Comments
Brucejack	Pretium Resources Inc.	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.
Red Chris	Newcrest Mining Limited (70%), Imperial Metals Corporation (30%)	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, 1.14g/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.
Silvertip	Coeur Mining Inc.	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: 0.53Mt 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.

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

with low-grade mineralization. The P2 stocks and dikes are volumetrically minor although have appreciable Au-Cu grades and are spatially associated with a rheological contact between metasedimentary rocks and overlying Stuhini Group volcanic rocks. Late-stage P3 stocks are lower grade, less altered, and tend to be lower in the system than the Stuhini Group volcanic rocks. Post-mineral mafic dikes cut the main porphyry stock throughout. Previously, Red Chris was recognized as a hybrid-type alkalic porphyry deposit, but Rees et al. (2015) suggested alkalic and calc-alkaline affinities.

As of 2014, open-pit/block cave Measured plus Indicated resources total 1.035 Mt with grades of 0.35% Cu, 0.35g/t Au, and 1.14g/t Ag. Additional Inferred resources total 787.1 Mt with average grades of 0.29% Cu, 0.32 g.t Au, and 1.04 g/t Ag.

3.1.3. Silvertip (Coeur Mining Inc.)

The **Silvertip** Ag-Pb-Zn mine is 8 km south of the British Columbia-Yukon border and 90 km west-southwest of Watson Lake. The mine is accessed via a 25 km-long mine road from Highway 1. The project was acquired by Coeur Mining in 2017 from JDS Silvertip Holdings for \$250 million, and rests on a land package totalling 37,000 ha. 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).

The Silvertip property is in the Cassiar terrane, and zones of mineralization are generally associated with manto and chimney-style mineralization in basal McDame Group fossiliferous limestones and are capped by overlying Earn Group greywackes and siltstones. The manto-style Ag-Pb-Zn mineralization replaces limestones in the McDame Group, whereas the chimney-style mineralization is reminiscent of structurally controlled brecciated feeder structures. The age of replacement is unknown, but mineralization is thought to be associated with local intrusions dated at 73 Ma (K-Ar biotite; Panteleyev, 1980). A Pb-Zn±Au exhalite deposit is also in overlying siliciclastic rocks of the Earn Group but is not part of an updated mineral resource.

Mining has mainly been conducted at the Silver Creek zone of the mine. Continued development will excavate to depth, enabling extraction from the 65 zone. Regional exploration in 2019 included soil sampling and an induced polarization geophysical survey.

In February 2019, Coeur released updated mineral resources and reserves estimates. The company reported Proven plus Probable reserves of 1.61 Mt grading 289 g/t Ag, 5.6% Pb, and 8.24% Zn. Measured plus Indicated resources were reported at 1.18 Mt grading 222.73 g/t Ag, 4.09% Pb, and 8.58% Zn. Additional Inferred resources were reported at 0.53 Mt grading 271.04 g/t Ag, 5.02% Pb, and 9.31% Zn.

3.2. Coal mines

In 2019, no coal mines operated in the Northwest Region; the **Tenas** project is listed below as a proposed mine.

3.3. Industrial mineral mines and quarries

True-Git Abrasives (Fig. 1; Table 2) is mining the slagheap at the historic **Anyox** site, where slag was created from smelting copper. The slag is mined, cleaned, and barged south where the material is used in making roofing shingles and sand for sand blasting. Mined since 1990, the slagheap represents a successful industrial recycling program.

3.3.1. Nephrite jade

Jade is the informal term for jadeite and nephrite. Jadeite is an aluminum-rich pyroxene, whereas nephrite, the only variety mined in British Columbia, is a rock consisting of fine-grained, interlocking, prismatic amphibole minerals (tremolite-actinolite). British Columbia jade deposits record Permo-Triassic sea-floor ultramafic rocks of Cache Creek terrane altered by high-pressure, relatively low-temperature dynamothermal metamorphic and metasomatic processes (serpentinites). Jade deposits are found both as in situ bedrock and as boulders. In the Northwest Region, these deposits are generally found north and east of Dease Lake (Fig. 1; Table 2).

3.4. Aggregate and industrial rock quarries

The decision was made late in 2018 to move ahead with a \$40 billion LNG project that will see immediate construction of a pipeline from Dawson Creek to Kitimat. Large amounts of aggregate material will be needed to supply construction phases of the project, which will mainly be drawn from the Kitimat and Houston areas in the Northwest Region. The **Sandhill** pit and quarry and **Robinson Lake Trail** pit are large sand and gravel and quarrying operations that will fill these needs. Prince Rupert was granted \$153.7 million from the federal government for trade infrastructure projects, where aggregate from the **Ridley Island**, **Kaien Creek**, and **Rainbow South** quarries will be used to upgrade existing transport and utility corridors. Several large aggregate pits and quarries are either now operational or working through the permitting process (Table 2) and are individually expected to produce anywhere from 5000-2,400,000 tpy of aggregate.

4. Placer operations

Placer mining operations have been ongoing in the Northwest Region for more than a century. Operations are concentrated in Atlin and Turnagain areas and to lesser extents north of Dease Lake and areas surrounding Cassiar. Due to the large number of mines and difficulty in obtaining information, these projects are not tracked.

5. Mine development

When a project acquires the necessary permits (Mines Act permit from the Ministry of Energy, Mines and Petroleum Resources and an Environmental Management Act permit from the Ministry of Environment) and secures the working capital to begin mine construction, the mine development stage is reached. There were no mine development projects in the Northwest Region in 2019.

Table 2. Selected industrial mineral mines, quarries and aggregate quarries, Northwest Region.

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

6. Proposed mines or quarries

Proposed mines are feasibility-stage projects for which proponents have begun or completed the environmental certification process (generally for late-stage projects) or have submitted or received approvals for Mines Act permits (for projects below British Columbia Environmental Assessment Act thresholds).

6.1. Proposed metal mines

The Northwest Region contains four proposed metal mines (Fig. 1; Table 3). The **Galore Creek**, **KSM**, and **Red Mountain** projects have been granted Environmental Assessment Certification, whereas the **Kutcho** project has begun the environmental assessment process with the Environmental Assessment Office.

6.1.1. Galore Creek (Galore Creek Mining Corporation)

The **Galore Creek** Cu-Au project is operated by the Galore Creek Mining Corporation (GCMC) and is jointly owned between Teck Resources Limited and Newmont Corporation,

where Newmont Corporation purchased their 50% share in the project in 2018 from NovaGold Canada Inc. At the same time, both owners of GCMC committed to complete a prefeasibility study over the next three to four years to improve overall project understanding and economics. The project is 70 km west of the Bob Quinn airstrip adjacent to highway 37, where a mine access road has been partially constructed.

The deposit is a high-grade, silica-undersaturated, porphyry Cu-Au alkalic system that formed between 210.0 Ma (U-Pb zircon; Micko et al., 2014) and 197.2 Ma (U-Pb titanite; Micko et al., 2014) and intruded Late Triassic Stuhini volcanic rocks. Galore Creek contains thirteen known Cu-Au-Ag mineralized zones and is thought to have formed in two distinct mineralizing events: a northeast-trending main event with volcanic host replacement, and northwest-trending second event that is intrusion and breccia hosted. The main mineralizing event in the Central and Junction zones are spatially and temporally related to a sheeted syenite-monzonite intrusion and hydrothermal breccia body (Micko et al., 2014). Gold-rich mineralization is associated with potassic alteration and disseminated and

Table 3. Selected proposed metal mines, Northwest Region.

Project	Operator (partner)	Commodity; deposit type; MINFILE	Reserves	Resource	Comments
Galore Creek	Galore Creek Mining Corporation (Teck Resources Limited (50%)), Newmont Corporation (50%)	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.
KSM	Seabridge Gold Inc.	Cu, Au, 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.
Kutcho	Kutcho Copper Corp.	Cu, Pb, Zn; Noranda/Kuroko VMS; 104I 060	Pr: 10.4 Mt at 2.01% Cu, 3.19% Zn, 0.37 g/t Au, 34.61 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 sulfide minerals.
Red Mountain	Ascot Resources Ltd.	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.

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

replacement-style bornite-chalcopyrite-pyrite mineralization, where Au may be hosted in bornite.

In 2019, approximately 25,000 m of drilling was conducted on the property, focussing on resource and metallurgical drilling in the deposit area to improve orebody knowledge. In addition, brownfield exploratory drilling tested prospective targets adjacent to the deposit, and geotechnical drilling was completed in the deposit area and elsewhere on the property, focussing on infrastructure and access locations. Geological mapping, in conjunction with lidar and stream-sediment sampling, was conducted to better understand the geology and structural controls of mineralization. Environmental work, including baseline water testing, wildlife studies, and hydrogeological studies are ongoing.

The Galore Creek project contains a Measured resource of 256.8 Mt grading 0.72% Cu, 0.36 g/t Au, an Indicated resource of 846.7 Mt at 0.39% Cu, 0.23 g/t Au with an additional Inferred resource of 198.1 Mt grading 0.27% Cu, 0.21 g/t Au (Teck Resources Limited, 2019).

6.1.2. Kutcho (Kutcho Copper Corp.)

The **Kutcho** property is approximately 100 km east of Dease Lake and the site is accessible via a gravel airstrip about 10 km from the deposit. The shallowly dipping Kuroko-type VMS deposit has three zones in a narrow belt of Permian-Triassic volcanic rocks and Jurassic sedimentary rocks between the Nahlin fault and the King Salmon fault. Mineralization in the footwall is pyritic, with zoned Cu-Zn mineralization. A metallurgical program is underway, using a mineralogical study to determine the variability and abundance of Cu-sulphide minerals, and will be used in the feasibility study. The company 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, 33.9 g/t Ag. The average annual production is expected to be 33 Mlbs of Cu and 42 Mlbs of Zn.

6.1.3. KSM (Seabridge Gold Inc.)

The **KSM** project consists of four porphyry Cu-Au deposits: Kerr, Sulphurets, Mitchell, and Iron Cap. These deposits are on the western boundary of the Brucejack mineral claims and access is via helicopter. 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. Seabridge received provincial and federal Environmental Assessment approval in 2014, which was extended to 2024 early in 2019.

KSM includes a cluster of deposits in the Stikine volcanic arc terrane, where calc-alkaline porphyry mineralization occurred in four phases and is related to the hypabyssal, diorite-monzodiorite Mitchell intrusions (196-190 Ma; Febbo et al., 2015, 2019). This island arc tholeiite series of stocks and dikes intruded Late Triassic-Early Jurassic sedimentary and volcanic

rocks of the Stuhini and Hazelton groups. Mineralization is disseminated in clustered quartz-vein stockworks and sheeted quartz veinlet arrays as fine-grained chalcopyrite, bornite, molybdenite, and pyrite. The geological setting was complicated by mid-Cretaceous deformation related to the formation of the Skeena fold belt. All the KSM deposits are open at depth.

The KSM deposits may represent one of the largest undeveloped Cu-Au camps in the world (by reserves), where the total KSM Proven plus Probable reserve estimate is 2.198 Bt grading 0.55 g/t Au, 0.21% Cu, 2.6 g/t Ag, and 42.6 g/t Mo. The total KSM Measured plus Indicated mineral resource was reported at 2.902 Bt grading 0.54 g/t Au, 0.21% Cu, 2.7 g/t Ag, and 44 g/t Mo, and additional Inferred resource of 2.719 Bt grading 0.35 g/t Au, 0.32% Cu, 2.0 g/t Ag, and 29 g/t Mo.

6.1.4. Red Mountain (Ascot Resources Ltd.)

The **Red Mountain** gold project is a proposed high-grade underground mine 15 km northeast of the town of Stewart. In March of this year Ascot Resources completed the acquisition of the 17,125 ha Red Mountain project from IDM Mining, who received its Environmental 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. Since the acquisition, Red Mountain has been on care and maintenance, although the new owner envisions bulk underground mining methods with Au-Ag dore produced onsite. Early in 2019, Ascot Resources and the Nisga'a Nation signed a benefits agreement for the Red Mountain project.

Mineralization is contained in quartz-calcite veins and vein stockworks with northwesterly trends and moderate to steep southwesterly dips. Gold occurs in its native form, electrum, and a variety of gold-bearing tellurides; sulfosalts are also present. Pyrite is the predominant sulphide, although pyrrhotite occurs locally. Disseminated pyrite and pyrrhotite alteration may also surround stockwork zones.

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.

6.2. Proposed coal mines

There is currently one proposed coal mine, Allegiance Coal Limited's **Tenas** project (Fig 1.; Table 4).

6.2.1. Tenas (Allegiance Coal Ltd. 95%; Itochu Corp. 5%)

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. The Telkwa coalfield produced 433,000 t of thermal coal

Table 4. Selected proposed coal mines, Northwest Region.

Project	Operator (partner)	Commodity; deposit type; MINFILE	Reserves	Resource	Comments
Tenas	Allegiance Coal Ltd. (95%), Itochu Corp. (5%)	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.

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

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 entered the provincial Environmental Assessment process last November and the project is estimated to produce approximately 775,000-825,000 t of steelmaking coal annually with a mine-life of about 25 years. In 2017, Allegiance Coal Ltd. 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.

7. Selected exploration activities and highlights

Exploration projects are described on a continuum from early to advanced stages. Early-stage operations are generally defined as grassroots operations that collect rock and soil samples for geochemical analysis, usually combined with regional mapping and ground- or air-based geophysical surveys. This initial geological and geophysical testing may be done on sample grids, where the purpose is to generate targets to further test, usually by drilling. At early stages it is a common to establish base-line environmental testing and engage with communities and First Nations regarding the project direction. At advanced-stage operations, a mineral resource has been delineated by drilling. Later stages of exploration will generally coincide with mine-evaluation and feasibility studies, which involve environmental, social, engineering, and financial consideration to properly evaluate a proposed mine.

7.1. Selected precious metal projects

The Northwest Region is host to many precious metal projects (Fig. 1; Table 5), with a large concentration of projects in the area commonly referred to as the Golden Triangle.

7.1.1. Atlin Gold (Brixton Metals Corp.)

The **Atlin Gold** project includes a 933 km² area near Atlin. Mesothermal-style mineralization 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.

7.1.2. Cassiar Gold (Margaux Resources Ltd.)

Margaux Resources and Wildsky Resources 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 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.

7.1.3. Clone Gold (Teuton Resources Corp. 75%; Silver Grail Resources Ltd. 25%)

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

7.1.4. Engineer (Engineer Gold Mines Ltd.)

Centered 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,

Table 5. Selected exploration projects, Northwest Region.

Project	Operator (partner)	Commodity; Deposit type; MINFILE	Resource (NI 43-101 compliant unless indicated otherwise)	Comments
Atlin Gold	Brixton Metals Corporation	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.
Ball Creek	Golden Ridge Resources Ltd. (80%), Evrim Resources Corp. (20%)	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.
Big Red	Libero Copper & Gold Corporation	Cu, Au; Porphyry	na	588 m of drilling.
Brucejack Regional	Pretium Resources Inc.	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.
Cassiar Gold	Margaux Resources Ltd.	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.
Castle	Colorado Resources Ltd.	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.
Clone Gold	Teuton Resources Corp. (75%), Silver Grail Resources Ltd. (25%)	Au, Ag, Pb, Zn; LS-epithermal and polymetallic veins; 103P 251	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.
Del Norte	Teuton Resources Corp.	Ag, Zn, Pb; Polymetallic; 104A 176	na	Four drill holes drilled following up on a 2018 ZTEM survey.
Dolly Varden	Dolly Varden Silver Corporation	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.

Table 5. Continued.

Dunwell	American Creek Resources Ltd.	Au, Ag, Pb, Zn; Polymetallic veins; 103P 052	na	2000 m was drilled to test multiple targets.
Engineer	Engineer Gold Mines Ltd.	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.
Eskay Creek	Skeena Resources Limited	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.
Forrest Kerr	Aben Resources Ltd.	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.
Golddigger	Goliath Resources Limited	Au, Cu, Pb, Zn; Polymetallic veins	na	Field reconnaissance to follow-up 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.
Hank	Golden Ridge Resources Ltd.	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.
Hat	Doubleview Capital Corp.	Cu, Au; Alkalic porphyry	na	Drilling to test deep IP anomalies at the Lisle deposit.
Iskut	Seabridge Gold Inc.	Cu, Au; Porphyry	na	IP surveys, surface geochemical sampling, and detailed mapping to follow up the initial diatreme discovery in 2018. The geophysical footprint was expanded to the south and southwest and was shown to plunge to the south.
Kirkham	Metallis Resources Inc.	Cu, Au; Porphyry	na	4000 m of diamond drilling followed-up gold-rich targets at the Cole-Etta zone, where porphyry-style mineralization was previously recognized.
Nickel Mountain	Garibaldi Resources Corp.	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.
Lucky Strike	Goliath Resources Limited	Cu, Au, Mo; Calc-alkaline porphyry	na	Three drill holes totalling 1741 m following up on gold-bearing chalcopyrite and molybdenum stockwork mineralization discovered in 2018.

Table 5. Continued.

McBride	Hawkeye Gold and Diamond Inc.	Cu, Au; Porphyry	na	An IP survey identified two separate chargeability anomalies, one of which was drilled (703 m).
Midas	Juggernaut Exploration Ltd.	Ag, Cu, Ag; Polymetallic veins; 103I 131	na	Nine holes totalling 2548 m.
Pitman	Casa Minerals Inc.	Cu, Au, Zn, Pb, Mo; Polymetallic and porphyry; 103I 046	na	2037 m of drilling on the Golden Dragon and Dragon Tale zones.
Premier/Dilworth	Ascot Resources Ltd.	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.
Rock and Roll	Etruscus Resources Corp.	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.
Scottie Gold Mine	Scottie Resources Corp.	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.
Schaft Creek	Teck Resources Limited (75%), Copper Fox Minerals Inc. (25%)	Cu, Mo, Au; 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.
Silver Coin	Ascot Resources Ltd.	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.
Silver Queen	Equity Metals Corporation	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.
Snip	Skeena Resources Ltd.	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 5. Continued.

Tatogga; Saddle North	GT Gold Corp.	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.
Tatogga; Saddle South	GT Gold Corp.	Au, Ag; IS-epithermal; 104G 433	na	Drill highlights from the final holes of the 2018 season include 18.08 g/t Au and 313.38 g/t Ag across 2.13 m and 8.15 g/t Au and 5.40 g/t Ag across 5.85 m, which extended the epithermal system.
Thorn	Brixton Metals Corporation	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.
Todd Creek	ArcWest Exploration Inc.	Cu, Au, Pb, Zn; Porphyry, volcanogenic, hydrothermal; 104A 001	na	After sampling of VMS East zone, a 900 m overall strike length of mineralization has been recognized. 400 m to the west of VMS East zone a newly discovered zone of outcropping VMS mineralization was traced across 400 m N-S. Grab samples from this zone (VMS West) with assays of 2.05 g/t Au and 1.21% Cu.
Treaty Creek	Tudor Gold Corp. (60%), 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.
Turnagain	Giga Metals Corporation	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.
Willoughby	Strikepoint Gold Inc.	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.

M = Measured; I = Indicated; Inf = Inferred

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.

7.1.5. Forrest Kerr (Aben Resources Ltd.)

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.

7.1.6. Premier/Dilworth (Ascot Resources Ltd.)

Approximately 20 km 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.

7.1.7. Scottie Gold Mine (Scottie Resources Corp.)

The **Scottie Gold Mine** project is operated by Scottie Resources, 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

returned 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.

7.1.8. Silver Coin (Ascot Resources Ltd.)

Ascot Resources acquired **Silver Coin** late in 2018. The deposit hosts similar host rocks and ore mineralogy to that of Premier and Big Missouri. Silver Coin contains existing underground infrastructure and central parts of the deposit are drilled sufficiency 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.

7.1.9. Snip (Skeena Resources Limited)

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 totalling 1934 m and intersected 1131.91 g/t Au across 1.5 m. The Snip deposit is in the Bronson structural corridor and the southwest-dipping shear-vein system is hosted within Upper Triassic Stuhini Group metasedimentary rocks that are cut by Early Jurassic stocks and plutons.

7.1.10. Tatogga (Saddle South; GT Gold Corp.)

The **Tatogga** project is approximately 14 km west of the Red Chris mine, where access to site is via helicopter from Iskut. The Saddle South zone is characterized as an intermediate-epithermal deposit. Mineralization in the highest grade sections contains pyrite and subordinate sphalerite, galena, chalcopyrite, and trace sulphosalts in semi-massive quartz-calcite sulphide veins and vein breccias. Drill highlights from the final holes of the 2018 season and released in 2019 include 18.08 g/t Au and 313.38 g/t Ag across 2.13 m and 8.15 g/t Au and 5.40 g/t Ag across 5.85 m, which extended the epithermal system originally discovered in 2017 along strike by several 100 m. With the discovery of the adjacent Cu-Au porphyry deposit at Saddle North in 2018, exploration efforts have shifted to this zone.

7.1.11. Willoughby (Strikepoint Gold Inc.)

Strikepoint Gold 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.

7.2. Selected porphyry projects

The Northwest Region hosts many significant porphyry projects (Fig. 1; Table 5), and the region is highly prospective for Au-Cu-Mo bulk-tonnage mineralization related to Triassic-Jurassic island arc accretion to the western margin of ancestral North America and post accretionary intrusive complexes.

7.2.1. Ball Creek (Golden Ridge Resources Ltd. 80%; Evrim Resources Corp. 20%)

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 Ball Creek 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.

7.2.2. Big Red (Libero Copper & Gold Corporation)

The **Big Red** project is 45 km southwest of Telegraph Creek and is accessible by road. Copper-gold-molybdenum anomalies are centered on a magnetic high that is coincident with a radiometric potassic anomaly and spatially associated with a Jurassic porphyritic intrusion. A five-year exploration permit for geophysics and drilling was granted to the company in September, and drilling was completed on the Copper Bowl porphyry Au-Cu target. A total of 588 m was drilled, and mineralization appears to be associated with quartz and pyrite and banded calcite-chlorite veins. Geochemical sampling was also completed in 2019 and new targets have been delineated at the northern extent of the Copper Bowl target and the Terry target.

7.2.3. Castle (Colorado Resources Ltd.)

The **Castle** property (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.

7.2.4. Hank (Golden Ridge Resources Ltd.)

The **Hank** property 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 6.8 g/t Ag, but no significant drill intersections were encountered in follow-up work.

7.2.5. Hat (Doubleview Capital Corp.)

The Lisle zone at the **Hat** project is an alkalic porphyry Au-Cu deposit that was discovered by drilling in 2014. Sulphide mineralization (primarily chalcopyrite) is in fractured quartz-filled stockworks in dioritic intrusive rocks and highly altered Upper Triassic volcanic and volcanoclastic andesites. Drilling in 2019 tested deep IP anomalies at in the Lisle deposit.

7.2.6. Iskut (Seabridge Gold Inc.)

The **Iskut** property includes the former Johnny Mountain gold mine and the Bronson Slope copper-gold deposit. In 2018, Seabridge drilled 2700 m into the Quartz Rise lithocap focussing on high-grade epithermal precious metal occurrences. This drilling discovered a diatreme containing clasts of veined diorite porphyry with copper-gold mineralization. In 2019, this discovery was following up on with IP surveys, surface geochemical sampling, and detailed mapping. The geophysical footprint was expanded to the south and southwest and was shown to plunge to the south.

7.2.7. Kirkham (Cole-Etta; Metallis Resources Inc.)

Near the Eskay Creek mine, the **Kirkham** project is a grassroots property with potential for porphyry Au-Cu, precious metal vein, and Ni sulphide deposits. In 2018, high-resolution VTEM and satellite imagery surveys were completed. A series of coincident conductive and magnetic targets were identified from this work. In 2019, Metallis Resources drilled approximately 4000 m to follow up gold targets at the Cole-Etta zone, where porphyry-style mineralization was previously recognized.

7.2.8. Lucky Strike (Goliath Resources Limited)

The **Lucky Strike** property is 40 km north of Terrace, in the Skeena arch. At the Lorne Creek zone, mineralization is defined

by a 1200 by 700 m alteration system. Bedrock sampling of surface stockworks and veins at surface in 2018 found gold-bearing chalcopyrite and molybdenum-bearing stockwork mineralization that is coincident with phyllic alteration of a monzonite porphyry. In 2019, follow-up drilling in three holes totalling 1741 m intersected a pyritic alteration zone with potassic alteration.

7.2.9. McBride (Hawkeye Gold and Diamond Inc.)

Hawkeye's **McBride** property is about 12 km north of the Red Chris mine. Previous work included mapping and grassroots soil, stream, and rock sampling to identify porphyry Cu-Au targets. Exploration in 2019 included a ground-based IP survey, which identified two separate chargeability anomalies in the northern and western parts of the property. The northern anomaly encompasses a 2 km long trend with geochemical anomalies indicated by grab sample assays with up to 5.18 g/t Au and 1.89% Cu. The western anomaly was tested by diamond drilling in 2019 and 703 m of core was produced.

7.2.10. Shaft Creek (Teck Resources Limited 75%; Copper Fox Minerals Inc. 25%)

The **Shaft Creek** project is managed through the Shaft Creek Joint Venture (SCJV), where Teck Resources is the operator and holds a 75% interest, while Copper Fox Metals 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 Limited (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.

7.2.11. Tatogga (Saddle North; GT Gold Corp.)

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 Corporation and intended to finance a preliminary economic assessment. In 2019, GT Gold 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, 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.

7.2.12. Thorn (Brixton Metals Corporation)

In 2019, the **Thorn** project increased its mineral claim tenure to 1858 km². Mapping and soil-rock geochemistry at the Chivas zone has 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.

7.2.13. Treaty Creek (Tudor Gold Corp. 60%; Teuton Resources Corp. 20%; American Creek Resources Ltd. 20%)

The 17,913 ha **Treaty Creek** project 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.

7.3. Selected polymetallic base and precious metal projects

The Northwest Region is host to many polymetallic base and precious metal projects (Fig. 1; Table 5). Base metals are explored for throughout the Northwest Region, primarily as polymetallic vein and VMS deposits and to lesser extent SEDEX and manto-style replacement deposits.

7.3.1. Brucejack Regional (Pretium Resources Inc.)

In 2019, more than 15,000 m of core were drilled at the regional Brucejack 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 massive and pillowed 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.

7.3.2. Del Norte (Teuton Resources Corp.)

In 2019, Teuton Resources drilled four holes at its **Del Norte** property, 30 km east of Stewart. A ZTEM survey carried out in 2018 detected an anomaly, which was the main target for drilling. The anomaly was named the A2 zone and is coincident with an EM anomaly defined by a VTEM survey completed in 2005. On the ground, mapping has highlighted a bimodal volcanic sequence with the presence of anhydrite in a pyrite-bedded mudstone. Anomalous zinc and silver values

are contained in the same mudstone. The 2019 drilling was inconclusive, and the company plans geophysical surveys to recognize possible VMS-mineralization next year.

7.3.3. Dolly Varden (Dolly Varden Silver Corporation)

The **Dolly Varden** (Dolly Varden Silver Corporation) project 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.

7.3.4. Dunwell (American Creek Resources Ltd.)

American Creek's **Dunwell** project is between Ascot Resource's Premier and Red Mountain projects near Stewart. The historic Dunwell mine produced 45,657 t grading 6.63 g/t Au, 223.91 g/t Ag, 1.83% Pb, 2.43% Zn. In 2018, American Creek collected 30 samples from multiple locations on the Dunwell property, where high-grade assays persisted along strike for 3 km. As part of the 2019 exploration program, 2000 m was drilled to test multiple targets.

7.3.5. Eskay Creek (Skeena Resources Limited)

The past-producing **Eskay Creek** mine 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). Considered a VMS-type deposit, mineralization is in a section of submarine siliciclastic and bimodal felsic-mafic volcanic rocks deposited in north-trending rift. High-grade precious metal mineralization (associated with orpiment-realgar-stibnite) is not hosted homogeneously throughout the mudstone sequences and is spatially associated with vents fed from the lower-grade, syn-mineral rhyolite-hosted feeders. 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 (Fig. 2), 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, 47 g/t Ag. An underground Indicated resource of 819,000 t at 6.4 g/t Au and 139g/t Ag and an Inferred resource of 295,000 t at 7.1 g/t Au and 82 g/t Ag were reported.

7.3.6. Golddigger (Goliath Resources Limited)

Field reconnaissance work at the **Golddigger** property in 2019, designed to follow up targets generated via lidar and geochemical sampling data, led to the discovery of a new zone, the Sure Bet zone. Contained in a broad alteration halo,

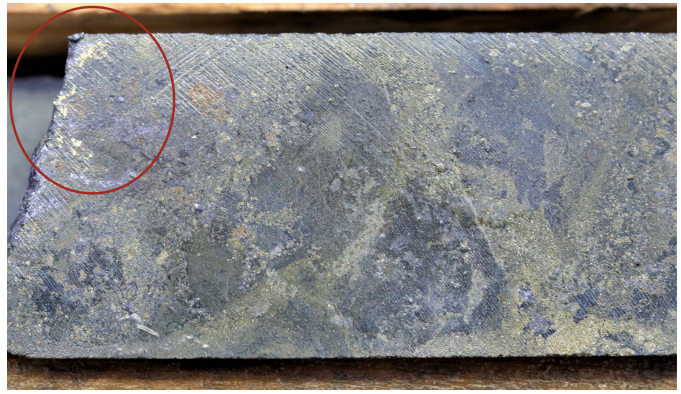


Fig. 2. Eskay Creek NQ diamond drill core from hole SK-19-063 at 111.8 m with 2.21 m grading 312.81 g/t Au and 95 g/t Ag. Visible electrum (top left; circled in red) is found in an interval of mineralized mudstone containing galena and sphalerite with disseminated pyrite in 21A zone.

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.

7.3.7. Midas (Juggernaut Exploration Ltd.)

In 2018, Juggernaut completed an exploration program on **Midas** that was designed to better understand the controls on mineralization. The 2019 drill program included nine holes totalling 2548 m and was focussed on expanding possible VMS mineralization at depth and along strike, which were identified initially by subsurface IP chargeability and resistivity anomalies. Polymetallic veins with silver-copper-gold and generally associated with silica-sericite altered volcanic rocks were encountered.

7.3.8. Pitman (Casa Minerals Inc.)

Casa Mineral's **Pitman** project is approximately 20 km north of Terrace and lies adjacent to the Skeena river. Hazelton Group intermediate flows and fragmental volcanic rocks are cut by Coast Plutonic complex quartz diorite-monzonite rocks and in turn cut by granite porphyry and andesite dikes. The two main zones at Pitman are the Golden Dragon and Dragon tale, and previous sampling returned 574 g/t Au in quartz veins across 1 m at the Golden Dragon zone. Both prospects were drilled in 2019, totalling 2037 m.

7.3.9. Rock and Roll (Etruscus Resources Corp.)

Access to the **Rock and Roll** property is via helicopter from the Forest Kerr hydroelectric facility, where the claim block lies in the Iskut River valley. The Black Dog VMS deposit was a discovery made 30 years ago and provides the Rock and Roll property with 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. Two phases of sulphide mineralization are recognized at the Black Dog deposit and mineralization

is in Stikine assemblage and Stuhini Group rocks, which consist of interbedded andesite volcanic rocks and siltstones. 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.

7.3.10. Silver Queen (Equity Metals Corporation)

In September, New Nadina Explorations changed its name to Equity Metals Corporation, where its flagship property is the **Silver Queen** project. The property is south of Houston, close to past producing mines (Huckleberry and Equity Silver). 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, chalcocopyrite, 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).

7.3.11. Todd Creek (ArcWest Exploration Inc.)

The 34,000 ha **Todd Creek** property adjoins mineral claims to the north and west of Pretium's Brucejack claim boundary and is 30 km northeast of Stewart. The project contains a 3 by 12 km alteration corridor and mineralized showings immediately adjacent to a regional N-S structure in Hazelton Group rocks. Locally, volcanic rocks are cut by monzodiorite dikes that are cut by east-west sulphide-bearing hydrothermal breccias along a 3-km strike length. In 2018, the VMS East zone was sampled and returned highlight assays of 1.98% Cu, 9.15% Zn, 0.392 g/t Au and 112 g/t Ag. The 2019 exploration program included additional sampling of VMS East zone and a 900 m overall strike length of mineralization was recognized. Four hundred metres to the west of VMS East zone a newly discovered zone of outcropping VMS-style mineralization was discovered and has been traced for 400 m north-south. Grab samples from this new zone (VMS West) returned assays of 2.05 g/t Au and 1.21% Cu.

7.4. Selected mafic- and ultramafic-hosted projects

The Northwest Region contains only a few mafic- and ultramafic-hosted prospects (Fig. 1; Table 5).

7.4.1. Nickel Mountain (Garibaldi Resources Corp.)

The 6300 ha **Nickel Mountain** project contains the E&L zone and is Garibaldi Resources flagship project. A new high-grade zone was discovered in 2017, and 16.75 m of diamond drill core assayed 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 (Fig. 3). Exploration in 2019

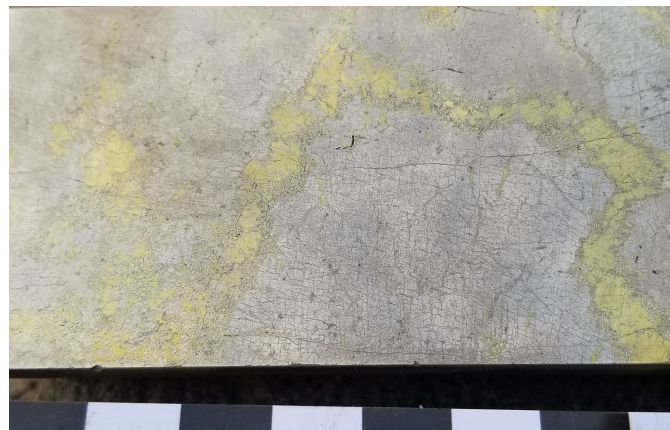


Fig. 3. Nickel Mountain NQ diamond drill core from Discovery Hole 14. Massive pyrrhotite with chalcocopyrite intergrowths are rimmed by pentlandite. Assays from this 0.5-m section returned 7.78% Ni, 3.14% Cu, 0.48g/t Au, 0.78g/t Pt, 1.35 g/t Pd, 7.1 g/t Ag. Scale in cm.

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 within a broader zone of mineralization of 86.5 m grading 1.88% Ni and 1.32% Cu.

7.4.2. Turnagain (Giga Metals Corporation)

The Turnagain ultramafic-mafic complex (190 Ma; U-Pb titanite; Scheel et al., 2005) includes cumulate sequences with dunite bounding wehrlite, olivine clinopyroxene, and clinopyroxene. The complex is elongate and broadly follows the regional northwesterly trend. Four main zones of mineralization (Horsetrail, Northwest, Hatzl, and Duffy zones) have been recognized at **Turnagain** and contain and contain sulphide mineralization as pyrrhotite, pentlandite, chalcocopyrite, and trace bornite. 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 (PEA) is expected as early as first quarter of 2020.

8. Geological research

Febbo et al. (2019) documented the magmatic and structural evolution of the Mitchell deposit (**KSM**), emphasizing the role of basement structures in controlling Triassic-Early Jurassic porphyry systems. Bouzari et al. (2019) found the potential for deeper porphyry Cu-Au deposits beneath areas previously known for shallow epithermal deposits in the Toadoggonne region. Angen et al. (2019a) published a compilation of new and previous mapping with interpretations guided by new aeromagnetic data (Angen et al., 2019b) in the western Skeena

arch. Hunter and van Straaten (2020) began a multi-year program mapping Stuhini Group and Hazelton Group rocks in the Kitsault Lake area near the **Dolly Varden** property and provided facies analysis and the preliminary results of new U-Pb zircon geochronology. Working nearby at Kinskuch Lake, Miller et al. (2020) identified a major tectonostratigraphic break at the transition between the Stuhini Group and the Hazelton Group and provided a new U-Pb zircon age from the Big Bulk porphyry prospect.

9. Summary

The Northwest Region has several producing mines and many proposed and advanced-stage projects. In 2019, the region saw numerous active early-advanced stage projects that focussed mainly on precious, base metal, and porphyry deposits. Exploration activity increased for the third consecutive year. Many companies reported positive exploration results, and many new targets were generated. Large international companies are beginning to move into the Northwest Region.

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