Technical Report Summary on the Initial Assessment of the Bornite Mineral Resource, Northwest Alaska, USA

Prepared for: Trilogy Metals Inc.

Prepared by: Wood Canada Limited

Report Date: November 30, 2022
Project No.: 253821

DATE AND SIGNATURE PAGE

This technical report summary (the Report), entitled "Technical Report Summary on the Initial Assessment of the Bornite Mineral Resource, Northwest Alaska, USA" is current as at November 30, 2022. The Report was prepared by Wood Canada Limited (Wood), acting as a Qualified Person Firm.

Dated: 9 February 2023

"signed"

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

Trilogy Metals Inc. (Trilogy Metals) retained Wood Canada Limited (Wood) to have their Qualified Persons (QP) review and prepare an updated mineral resource statement for the Bornite property (Project) and include it in a technical report summary of an initial assessment (Report) under the mining property disclosure rules of Subpart 229.1300-Disclosure by Registrants Engaged in Mining Operations under Regulation S-K (S-K 1300).

The Bornite property is part of the Upper Kobuk Mineral Projects (UKMP) mineral tenure package, which includes the Bornite deposit, as well as numerous additional mineral showings/deposits. The property is located in the Ambler Mining District of the southern Brooks Range, in the Northwest Arctic Borough (NWAB) of Alaska. The property is located 248 km east of the town of Kotzebue, 19 km north of the village of Kobuk, and 275 km west of the Dalton Highway, an all-weather state-maintained highway. Figure 1-1 shows the location of the property.

All units of measure in this Report are metric, unless otherwise stated.

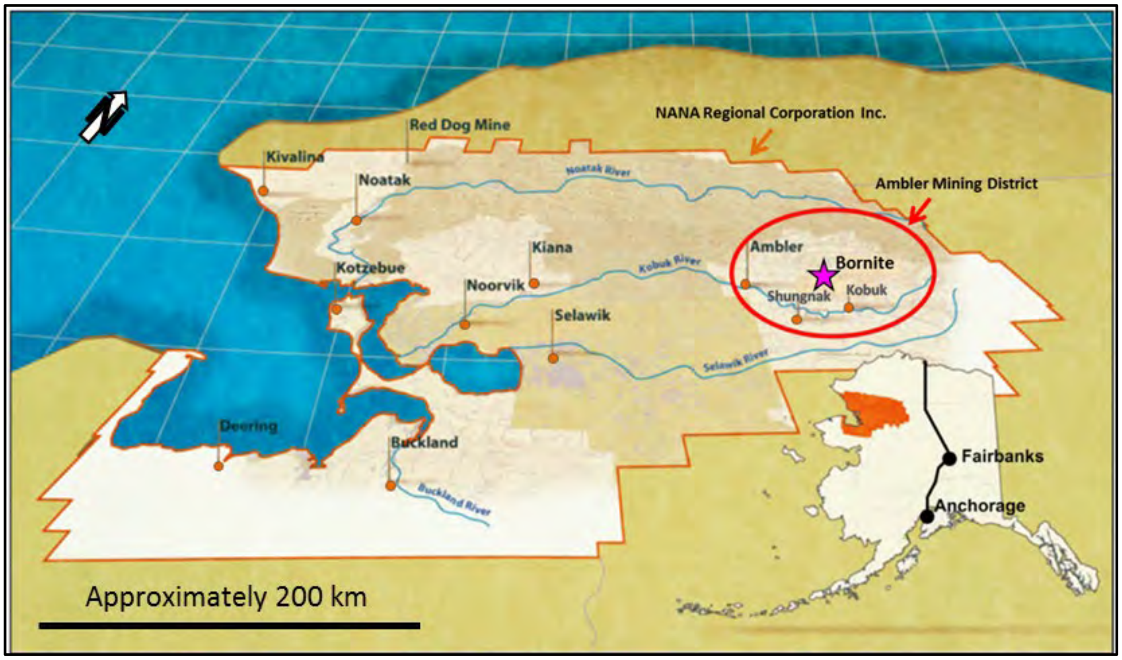
All amounts are in US dollars unless otherwise stated.

1.2 Mineral Tenure

In October 2011, Trilogy Metals entered into an exploration agreement with NANA Regional Corporation, Inc. (NANA), the owner of the property, for the development of the parties' collective resource interests in the Ambler Mining District. The agreement consolidated certain land holdings of the parties into a land package that currently totals approximately 181,387 ha of which the property contributes 97,483 ha (Bornite Property).

On February 11, 2020, Trilogy Metals transferred the UKMP to a 50/50 joint venture named Ambler Metals LLC (Ambler Metals). With NANA's approval, Trilogy Metals also contributed, along with the UKMP, its rights under the NANA Agreement to Ambler Metals while its joint venture partner, South32 Limited (South32), contributed $145 million dedicated to advancing the development of the properties.

Figure 1-1: Property Location Map



(Source: Trilogy Metals, 2013)

1.3 Geology and Mineralization

Mineralization in the UKMP area is characterized by two mineralized belts: the Devonian Ambler Schist Belt and the Devonian Bornite carbonate sequence. The Ambler Schist Belt is host to a series of volcanogenic massive sulphide (VMS) deposits related to metamorphosed volcanic and sedimentary rocks. Bornite Property mineralization is hosted in deformed Devonian clastic and carbonate sedimentary rocks lying immediately south of the Ambler Schist Belt across the Ambler Lowlands. Widespread hydrothermal dolomitization is characteristic of the belt and locally hosts the associated copper and cobalt mineralization.

Copper mineralization at Bornite is comprised of chalcopyrite, bornite, and chalcocite as stringers, veinlets, and breccia fillings distributed in stacked, stratabound zones exploiting favourable stratigraphy.

Cobalt mineralization at Bornite is comprised of cobaltiferous pyrite within and enveloping the copper mineralized zones and carrollite and cobaltite directly associated with copper bearing minerals.

1.4 Exploration

The Bornite Property has been explored using integrated programs, including geologic mapping; soil, stream, and rock chip geochemistry; geophysics; underground shaft sinking and drifting; and diamond and reverse circulation drilling. Trilogy Metals geologists continue to use these integrated approaches to explore for other Bornite-style mineral systems on the Bornite Property.

1.5 Drilling, Sampling, and Data Verification

There are 106,406 m of diamond drilling in 273 surface (222) and underground (51) holes completed between 1957 and 2019. Drill campaigns before 2011 were completed by Kennecott or its exploration subsidiary, Bear Creek Mining Company (BCMC), and drill campaigns since 2011 were completed by the predecessor companies to Trilogy Metals being NOVAGOLD RESOURCES INC., (NOVAGOLD), NovaCopper Inc. (NovaCopper), or Trilogy Metals.

The assay interval table contains 39,740 copper assays of which 14% are original historical values. Sampling and assaying since 2011 is supported by quality control (QC) sample result monitoring following standard industry practice. There is limited documentation available describing the sample preparation, security, analysis, and QC of drill core samples collected by Kennecott. Re-assaying of a significant amount of historical drill core which was generally confirmatory of the original assays, but did indicate a risk of a 12% high bias in zones of historical high copper grade. Only a few historical samples within the high-grade Lower Reef zone and no samples within the Upper Reef zone were re-assayed. The risk associated with the observed high bias for historical copper assays that remain in the database used for resource estimation, and the absence of any re-assaying within the Upper and Lower Reef zones is taken into consideration during mineral resource classification. Issues identified during data verification process are considered manageable by the restriction of the mineral resource to the Inferred category.

This issue discussed above only impacts the data within the Upper and Lower Reef and does not impact the South Reef.

A site visit was performed by a Wood QP.

1.6 Metallurgical Testing

Metallurgical testwork to date indicates that the Bornite mineralization can be treated using standard grinding and flotation methods to produce clean copper concentrates with good results being obtained. Copper recoveries range from 87 to 90% resulting in copper concentrate grades in the range of 26 to 28% Cu.

Cobalt occurs at grades that are of potential interest but are not included in the mineral resource. A portion of the cobalt reports to the copper concentrate tails with cobalt occurring as cobaltiferous pyrite, carrollite and cobaltite.

1.7 Mineral Resource Estimate

Wood reviewed and performed validation checks on the mineral resource model and based on the results prepared a revised mineral resource statement on a 100% basis that is summarized in Table 1-1. The mineral resource estimates are based on a combination of open pit and underground mining methods and a copper price of $4.05/lb. The assumed copper price is based on Wood's assessment of industry consensus of a long-term forecast price for mineral resource estimates. This provides a reasonable basis for establishing the prospects of economic extraction for mineral resources. The copper price used is fixed over an assumed 20-year timeframe that would be required under reasonable assumptions to mine the mineral resources. Mineral resources amenable to open pit methods are constrained within a pit shell above a marginal cut-off grade of 0.5% Cu and those amenable by underground methods are constrained within a grade shell defined by a break-even cut-off grade of 1.79% Cu. A portion of the in-pit mineral resource is well above the 1.79% Cu cut-off and would be amenable to underground mining methods providing flexibility on how to develop the deposit (Table 1-2). In the initial assessment Wood has addressed all the relevant technical and economic factors likely to influence the prospect of economic extraction to establish economic potential.

Trilogy Metals' interest in the Bornite Property is through its 50% ownership in the Ambler Metals joint venture.

Table 1-1: Mineral Resources for the Bornite Deposit

Class	Type/Area	Cut-off Cu (%)	Tonnes (Mt)	Average Grade Cu (%)	Contained Metal Cu (Mlb)
Inferred	In-Pit	0.50	170.4	1.15	4,303
	Outside-Pit, South Reef	1.79	22.0	3.48	1,690
	Outside-Pit, Ruby Zone	1.79	10.4	2.28	521
Total Inferred			**202.7**	**1.46**	**6,514**

Note: (1) The mineral resources are current as of November 30, 2022 and were prepared by a Wood QP.
(2) Mineral resources are prepared in accordance with the definitions in S-K 1300. No mineral reserves have been estimated on the Bornite Property.
(3) Mineral resources are constrained by: an open pit shell at a cut-off grade of 0.5% Cu, with an average pit slope of 43 degrees; and underground mining shapes with a cut-off grade of 1.79% Cu. The cut-off grades include the considerations of a $4.05/lb Cu price, process recovery of 87.2%, open pit mining costs of $3.21/t mined, underground mining cost of $73.62/t mined, process cost of $19.14/t processed, G&A cost of $4.14/t processed, treatment, refining, sales cost of $0.73/lb Cu in concentrate, road use cost of $8.04/t processed, 2% NSR royalty.
(4) Trilogy Metals' attributable interest is 50% of the tonnage and contained metal stated in the table.
(5) Figures may not sum due to rounding.

Table 1-2: Portions of South Reef Mineral Resource Amenable to Underground Mining

Class	Type/Area	Cut-off (Cu %)	Tonnes (Mt)	Average Grade Cu (%)	Contained Metal Cu (Mlb)
Inferred	In-Pit, South Reef[1]	1.79	11.0	3.56	864
	Outside-Pit, South Reef[2]	1.79	22.0	3.48	1,690
Total South Reef			**33.0**	**3.51**	**2,554**

Note: (1) Subset of the mineral resource and is not additive to the in-pit mineral resource reported in Table 1-1.
(2) Restatement of the mineral resources outside of the pit as reported in Table 1-1 and is not additive to Table 1-1.
(3) Trilogy Metals' attributable interest is 50% of the tonnage and contained metal stated in the table.

1.8 Permitting

Multiple permits are required during the exploration phase of the Bornite Property. After the formation of the joint venture, Ambler Metals has renewed the necessary permits for exploration and related camp operations.

1.9 Conclusions

The level of understanding of the geologic controls that influence the distribution of copper mineralization at the Bornite deposit is relatively good. The drilling, sampling and validation practices used by Trilogy Metals during the various campaigns follow accepted industry standards. Although a substantial re-assay program was conducted on the historical drill core, a high bias observed for high-grade historical copper results and the absence of direct quality control support or indirect support through re-assaying for almost all sampling within the high grade Upper and Lower Reef zones is a risk that should be resolved through re-assaying and new drilling.

Metallurgical testwork supports that potentially marketable copper concentrates can be produced using standard grinding and flotation methods. There has been limited metallurgical testwork that evaluates the extraction of cobalt. This testwork is recommended to properly assess the potential of economic cobalt extraction and recovery that could then be used to support the inclusion of cobalt in a mineral resource.

All of the current mineral resource occurs in the Inferred category and represents an early-stage evaluation of the potential of this Bornite Property. There is an opportunity for any future mine evaluation to focus on a high-grade portion of the mineral resource (South Reef) that could be mined by underground methods only.

1.10 Recommendations

Based on the mineral resource estimates and existing metallurgical testwork presented in this Report, the QPs recommend Trilogy Metals continue to improve their understanding of the Bornite Property's structural geology and their confidence in the database with additional re-sampling, drilling and database reviews, scoping study as well as conduct additional metallurgical testwork, hydrogeological and geotechnical assessments, and environmental studies totalling between $16.8 and $19.9 million.

2.0 INTRODUCTION

Trilogy Metals, a company involved in the exploration and development of projects in the UKMP in Alaska's Ambler Mining District, retained Wood to review and prepare an updated mineral resource statement for the Bornite Property and prepare a technical report summary of an initial assessment which supports the mineral resources.

2.1 Terms of Reference

Trilogy Metals is traded on the TSX and NYSE American stock exchanges. Trilogy Metals must file a Report to support mineral resources on the Bornite Property and it must file a technical report summary with the United States Securities and Exchange Commission under S-K 1300. Wood QPs have assessed the supporting information and resource classification. The contents of this Report follow the standards and definitions of S-K 1300. This Report supports the mineral resource estimate being current as of November 30, 2022.

2.2 Qualified Persons

Wood had appropriate geology, mineral resource and mineral process QPs prepare the content of this Report.

Wood engaged its mining experts for the development of a constraining pit shell, mining underground shapes and mining costs.

2.3 Site Visits

Wood's geology and resource QP visited the Bornite Property site between August 29 and September 8, 2022 in preparation for this Report. The following work was completed:

- Visited core storage facilities
- Reviewed drill core and compared against original logging data and assay results
- Visited trenches observing outcrops and mineralization (Lower Reef) extending to surface
- Located drill holes collars and measured coordinates with a handheld global positioning system (GPS).

Wood's process QP for mineral processing and metallurgical testing did not visit the Bornite Property because it is a greenfield property with no mineral process facilities to be observed.

2.4 Information Sources

Reports and documents listed in Chapter 24 were used as sources as information to support data contained in Report. Information provided by Trilogy Metals is identified in Chapter 25.

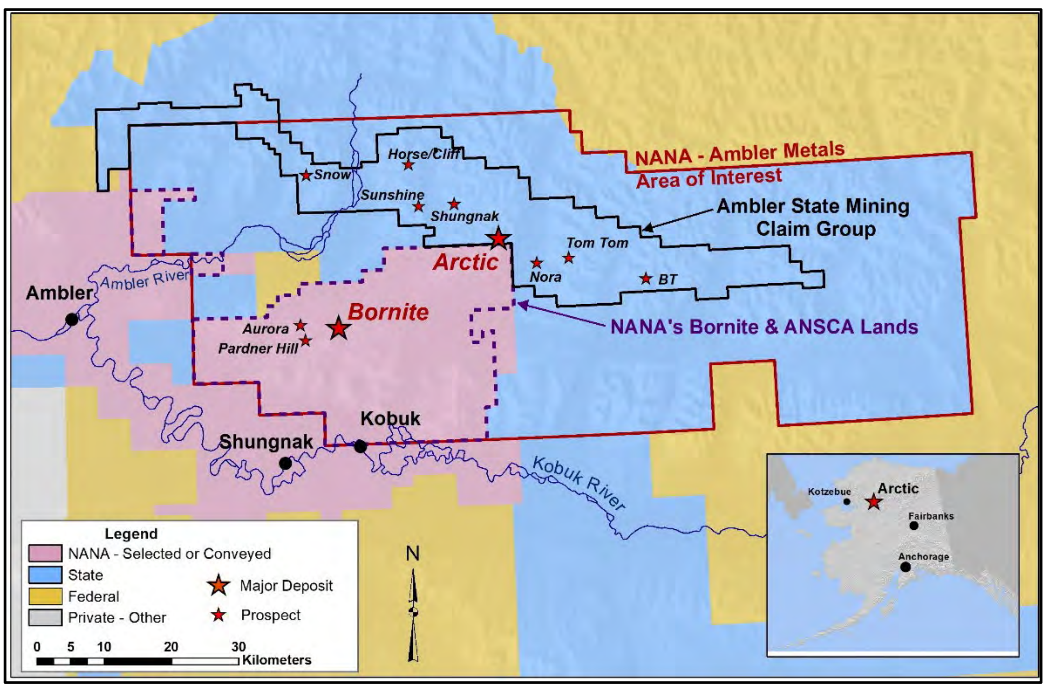
3.0 PROPERTY DESCRIPTION

3.1 Location

The Bornite Property is part of the UKMP mineral tenure package, which includes the Bornite deposit as well as numerous additional mineral showings/deposits (Figure 3-1 and Figure 3-2). The Bornite Property is located in the Ambler Mining District of the southern Brooks Range in the NWAB of the State of Alaska, USA. The Bornite Property is located in Ambler River A-2 quadrangle, Kateel River Meridian T 19N, R 9E, sections 4, 5, 8 and 9.

The Bornite Property is located 248 km east of the town of Kotzebue, 19 km north of the village of Kobuk, 275 km west of the Dalton Highway (an all-weather state maintained public road) with geographic coordinates of N67.07° latitude and W156.94° longitude which is the equivalent of Universal Transverse Mercator (UTM) North American Datum (NAD) 83, Zone 4W coordinates 7440449N, 589811E.

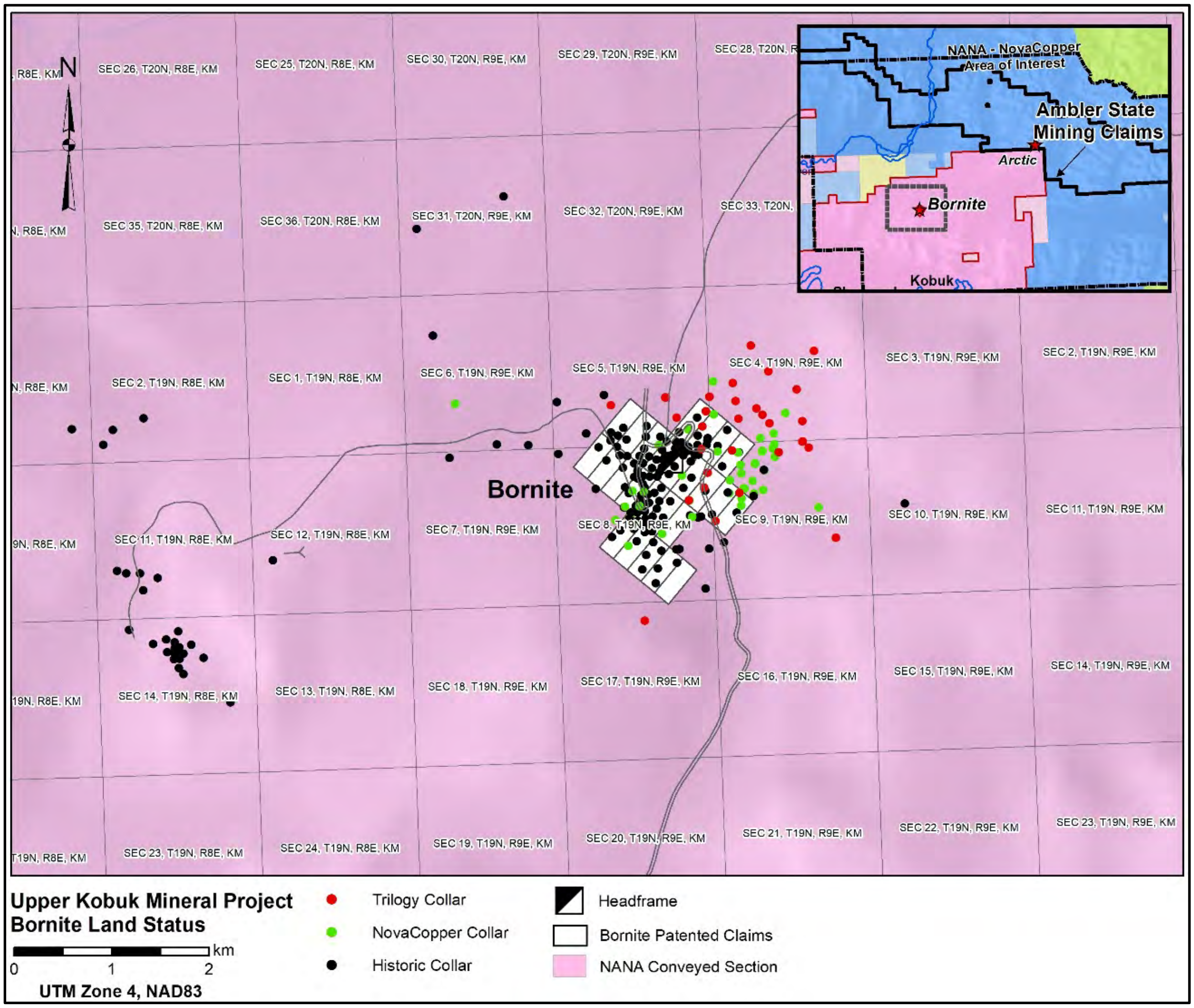
Figure 3-1: Upper Kobuk Mineral Properties



(Source: Trilogy Metals, 2022)

Note: Ambler State Mining Claims are not part of the Bornite Property.

Figure 3-2: Mineral Tenure Plan



(Source: Trilogy Metals, 2023)

3.2 Mineral Tenure

The Bornite Property consists of NANA-owned patented lands and NANA-selected ANCSA lands. A breakdown of these lands is provided in Table 3-1.

Table 3-1: Summary of Bornite Property

Owner	Number	Type	Acres	Hectares
NANA (ANCSA)	N/A	Selected/Patented	240,369	97,274
NANA (Bornite)	25 (2 USMS Patents)	Patented	517	209
Total			**240,886**	**97,483**

Note: The NANA (Bornite) 25 patented mining claims incorporated within U.S. Mineral Surveys (USMS) 2233 and 2234 are located in the State of Alaska within Sections 4, 5, 8 and 9, Township 19 North, Range 9 East, Kateel River Meridian aggregating approximately 536.99 acres more or less. Patented mining claims do not expire.

3.3 Royalties, Agreements and Encumbrances

3.3.1 Agreements

On March 22, 2004, Alaska Gold Company (Alaska Gold), a wholly owned subsidiary of NOVAGOLD, completed an *Exploration and Option to Earn an Interest Agreement* with Kennecott Exploration Company and Kennecott Arctic Company (collectively, Kennecott) on the Ambler land holdings.

On December 18, 2009, a *Purchase and Termination Agreement* was entered into between Alaska Gold and Kennecott whereby NOVAGOLD agreed to pay Kennecott a total purchase price of $29 million for a 100% interest in the Ambler land holdings, which included the Arctic deposit, to be paid as: $5 million by issuing 931,098 NOVAGOLD shares, and two installments of $12 million each, due 12 months and 24 months from the closing date of January 7, 2010.

The NOVAGOLD shares were issued in January 2010, the first $12 million payment was made on January 7, 2011, and the second $12 million payment was made in advance on August 5, 2011; this terminated the March 22, 2004 exploration agreement between NOVAGOLD and Kennecott. Under the *Purchase and Termination Agreement*, the seller retained a 1% net smelter return (NSR) royalty that is purchasable at any time by the landowner for a one-time payment of $10 million.

In 2011, NOVAGOLD incorporated the Trilogy Metals entities and transferred its Ambler land holdings, including the Arctic deposit, from Alaska Gold to Trilogy Metals. In April 2012, NOVAGOLD completed a spin-out of NovaCopper, with the Ambler lands, to the NOVAGOLD shareholders and made NovaCopper an independent publicly listed company, listed on the TSX and NYSE American exchanges. NovaCopper subsequently underwent a name change to Trilogy Metals Inc. in 2016.

On February 11, 2020, Trilogy Metals transferred the UKMP to a 50/50 joint venture named Ambler Metals. With NANA's approval, Trilogy Metals also contributed, along with the UKMP, its rights under the NANA Agreement to Ambler Metals while its joint venture partner, South32, contributed $145 million dedicated to advancing the projects.

3.3.2 NANA Agreement

In 1971, the US Congress passed the Alaska Native Claims Settlement Act (ANCSA) which settled land and financial claims made by the Alaska Natives and provided for the establishment of 13 regional corporations to administer those claims. These 13 corporations are known as the Alaska Native Regional Corporations (ANCSA Corporations). One of these 13 regional corporations is NANA Regional Corporation, Inc. ANCSA Lands controlled by NANA bounds the southern border of the Bornite Property claim block. National Park lands are within 25 km of the northern Bornite Property border. The Bornite deposit is located entirely on lands owned by NANA.

On October 19, 2011, Trilogy Metals and NANA Regional Corporation, Inc. entered into the *NANA Agreement* for the cooperative development of their respective resource interests in the Ambler Mining District. The NANA Agreement consolidates Trilogy Metals' and NANA's land holdings into an approximately 142,831 ha land package and provides a framework for the exploration and development of the area. The NANA Agreement provides that NANA will grant Trilogy Metals the nonexclusive right to enter onto, and the exclusive right to explore, the Bornite Lands and the ANCSA Lands (each as defined in the NANA Agreement) and in connection therewith, to construct and utilize temporary access roads, camps, airstrips, and other incidental works. The NANA Agreement has a term of 20 years, with an option in favour of Trilogy Metals to extend the term for an additional 10 years. The NANA Agreement may be terminated by mutual agreement of the parties or NANA if Trilogy Metals does not meet requirements of aggregate expenditures over two consecutive calendar years are not at least $600,000 on NANA's lands. Trilogy Metals has confirmed they met this expenditure requirement to date.

On February 11, 2020, Trilogy Metals transferred the UKMP to Ambler Metals. With NANA's approval, Trilogy Metals also contributed, along with the UKMP, its rights under the NANA Agreement to Ambler Metals while its joint venture partner, South32 Limited contributed $145 million dedicated to advancing the projects.

The NANA Agreement outlines a partnership agreement for the development the UKMP. If, following receipt of a feasibility study and the release for public comment of a related draft environmental impact statement, Ambler Metals decides to proceed with construction of a mine on the lands subject to the NANA Agreement, Ambler Metals will notify NANA in writing and NANA will have 120 days to elect to either (a) exercise a non-transferrable back-in-right to acquire between 16% and 25% (as specified by NANA) of that specific project; or (b) not exercise its back-in-right, and instead receive a net proceeds royalty equal to 15% of the net proceeds realized by Ambler Metals from such project. The cost to exercise such back-in-right is equal to the percentage interest in the property multiplied by the difference between (i) all costs incurred by Ambler Metals or its affiliates on the property, including historical costs incurred prior to the date of the NANA Agreement together with interest on the historical costs; and (ii) $40 million (subject to exceptions). This amount will be payable by NANA to Ambler Metals in cash at the time the parties enter into a joint venture agreement and in no event will the amount be less than zero.

In the event that NANA elects to exercise its back-in-right, the parties will, as soon as reasonably practicable, form a joint venture with NANA electing to participate between 16% to 25%, and Ambler Metals will own the balance of interest in the joint venture. Upon formation of the joint venture, the joint venture will assume all obligations of Ambler Metals and be entitled to all the benefits of Ambler Metals under the NANA Agreement in connection with the mine to be developed and the related lands. A party's failure to pay its proportionate share of costs in connection with the joint venture will result in dilution of its interest. Each party will have a right of first refusal over any proposed transfer of the other party's interest in the joint venture other than to an affiliate or for the purposes of granting security. A transfer by either party of a NSR royalty on the property or any net proceeds royalty interest in the property other than for financing purposes will also be subject to a first right of refusal.

In connection with possible development on the Bornite Lands or ANCSA Lands, Ambler Metals and NANA will execute a mining lease to allow Ambler Metals or the joint venture to construct and operate a mine on the Bornite Lands or ANCSA Lands. These leases will provide NANA a 2% NSR royalty as to production from the Bornite Lands and a 2.5% NSR royalty as to production from the ANCSA Lands.

If Ambler Metals decides to proceed with construction of a mine on its own lands subject to the NANA Agreement, NANA will enter into a surface-use agreement with Ambler Metals which will afford Ambler Metals access to the project along routes approved by NANA (the Surface Use Agreement). In consideration for the grant of such surface use rights, Ambler Metals will grant NANA a 1% NSR royalty on production and an annual payment of $755 per acre (as adjusted for inflation each year beginning with the second anniversary of the effective date of the NANA Agreement and for each of the first 400 acres (and $100 for each additional acre) of the lands owned by NANA and used for access which are disturbed and not reclaimed.

3.4 Environmental Liabilities

Under the NANA Agreement, NANA is required to complete a baseline environmental report following the cleanup of the former mining camp on the Bornite Lands; this work must be completed to Alaska Department of Environmental Conservation standards. Cleanup includes the removal and disposal, as required by law, of all hazardous substances present on the Bornite Lands. NANA has indemnified and will hold Trilogy Metals harmless for any loss, cost, expense, or damage suffered or incurred attributable to the environmental condition of the Bornite Lands at the date of the baseline report which relate to any activities prior to the date of the agreement.

In addition, there are no indications of any known environmental impairment or enforcement actions associated with Trilogy Metals' activities to date. There have been environmental disturbances associated with the airstrip, shaft, trenches, camp, roads, and exploration drilling. Trilogy Metals has indicated it has not incurred outstanding environmental liabilities in conjunction with its entry into the NANA Agreement.

3.4.1 Reclamation of Exploration Activities

Reclamation of mineral exploration activities at the Bornite Property is completed under the guidelines presented by the State of Alaska in the Multi-Year Hardrock Exploration Permit #2183 issued by the Department of Natural Resources Division of Mining, Land, and Water.

3.5 Permits

Multiple permits are required during the exploration phase of the Bornite Property. Permits are issued from Federal, State, and Regional agencies, including: the Environmental Protection Agency (EPA), US Army Corps of Engineers (USACE), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G), Alaska Department of Natural Resources (ADNR), and NWAB. The State of Alaska permit for exploration on the Bornite Property, known as the Annual Hardrock Exploration Activity (AHEA) Permit, is obtained and renewed every five years through the ADNR – Division of Mining, Land and Water. Trilogy Metals held an AHEA exploration permit in good standing with the ADNR and has done so each year since 2004 under Alaska Gold. The Bornite Property is within the NWAB therefore requiring a Title 9 Miscellaneous Land Use permit for mineral exploration, fuel storage, gravel extraction, and the operation of a landfill. The Bornite Camp, Bornite Landfill, and Dahl Creek Camp are permitted by the ADEC. After the formation of the joint venture, Ambler Metals has renewed the necessary permits for exploration and related camp operations.

As the Bornite Project progresses, additional permits for environmental baseline and engineering studies will be necessary at Federal, State, and Regional levels.

There have been no significant violations or fines on the Bornite Property.

3.6 Significant Risk Factors

The QP is not aware of any significant factors and risks that may affect access, title, or the right or ability to perform work on the Bornite Property other than what is described in the Report.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Accessibility

4.1.1 Air

Primary access to the Bornite Property is by air, using both fixed-wing aircraft and helicopters.

There are four well maintained, approximately 1,500 m long gravel airstrips located near the Bornite Property, capable of accommodating charter, fixed-wing aircraft. These airstrips are located 40 km west at Ambler, 23 km southwest at Shungnak, 19 km south at Kobuk, and 15 km south at Dahl Creek. There is daily commercial air service from Kotzebue to the village of Kobuk, the closest community to the Bornite Property. During the summer months, the Dahl Creek airstrip is suitable for larger aircraft, such as C-130 and DC-6.

There is also a 700 m airstrip located at the Bornite Camp. The airstrip at Bornite is suited to smaller aircraft, which support the Bornite Camp with personnel and supplies.

4.1.2 Water

There is no direct water access to the Property. During spring runoff, river access is possible by barge from Kotzebue Sound to Ambler, Shungnak, and Kobuk via the Kobuk River.

4.1.3 Road

A two-lane, two-wheel drive gravel road links the Bornite Camp to the 1,525 m Dahl Creek airstrip and village of Kobuk.

4.2 Climate

The climate in the region is typical of a sub-arctic environment. Exploration is generally conducted from late May until late September. Weather conditions at the Bornite Property can vary significantly from year to year and can change suddenly. During the summer exploration season, average maximum temperatures range from 10°C to 20°C, while average lows range from -2°C to 7°C (Alaska Climate Summaries: Kobuk 1971 to 2000). By early October, unpredictable weather limits safe helicopter travel to the Bornite Property. During winter months, the Bornite Property can be accessed by snow machine, track vehicle, or fixed-wing aircraft. Winter temperatures are routinely below -25°C and can exceed -50°C. Annual precipitation in the region averages at 500 mm for elevations lower than 600 m above sea level (masl) with the most rainfall occurring from June through September, and the most snowfall occurring from November through January. Any future mine operations should be able to operate year-round with proper equipment.

4.3 Local Resources

The Bornite Property is approximately 248 km east of the town of Kotzebue (on the edge of Kotzebue Sound), 19 km north of the village of Kobuk, 275 km west of the Dalton Highway, and 485 km northwest of Fairbanks. Kobuk (population 191; 2020 US Census) is a potential workforce source for the Bornite Property and is the location of one of the airstrips near the Bornite Property. Several other villages are also near the Bornite Property, including Shungnak located 23 km to the southwest (population of 272; 2020 US Census) and Ambler, 40 km to the west (population 274; 2020 US Census). Kotzebue (population of 3,102; 2020 US Census) is the largest population centre in the Northwest Arctic Borough. Kotzebue is a potential source of limited mining-related supplies and labourers and is the nearest centre serviced by regularly scheduled, large, commercial aircraft (via Nome or Anchorage). In addition, there are seven other villages in the region that will be potential sources of some of the workforce for the Bornite Property. Fairbanks (population 32,515; 2020 US Census) has a long mining history and can provide most mining related supplies and support that cannot be sourced closer to the Bornite Property.

Drilling and mapping programs are seasonal and have been supported out of the main Bornite Camp. The main Bornite Camp facilities are located on Ruby Creek on the northern edge of the Cosmos Hills. The camp provides office space and accommodations for the geologists, drillers, pilots, and support staff. There were four, two-person cabins installed by NANA prior to Trilogy Metals' tenure.

The 85-person capacity Bornite Camp consists of 35 structures most of which are metal-framed, insulated tents that house multi-occupancy sleeping accommodations, kitchen facilities, dining facilities, medical services, showers, washrooms, laundry, administrative offices, and a recreation tent. Early 1960s-era legacy structures constructed by Kennecott to support Bornite shaft sinking are used for equipment maintenance, storage, and sleeping cabins.

Core is logged in two, metal-clad buildings: one from the early 1970s and one 30 m x 9 m structure that was built in 2011.

Electricity is generated at site by one 275 kW primary and one 300 kW backup diesel-powered generator.

Potable water is sourced from a permitted well. Solid waste disposal is accomplished by a combination of diesel-fired incineration and permitted landfill placement. The Bornite Camp's domestic wastewater is treated in a packaged bioreactor-style treatment plant before it is discharged. Wastewater from a small portion of the camp is treated in a conventional septic system.

4.4 Infrastructure

Currently, the Bornite Property does not have access to Alaska grid power or road access (see below). and transportation infrastructure. Power to support mine operations would have to be generated on site.

On July 23, 2020, the United States Bureau of Land Management (BLM) and the National Park Service issued the Joint Record of Decision (JROD) for the Ambler Access Project that authorizes a right-of-way across federally managed lands to the Alaska Industrial Development and Export Authority (AIDEA). The northern or "A" route, which is under consideration for a 211-mile long (340 km) controlled industrial access road in the southern Brooks Range foothills to the Ambler Mining District, was selected as part of the decision. Along with the JROD, a Section 404 Permit, which is governed by the Clean Water Act (CWA), was issued by the USACE to AIDEA. Lawsuits were filed shortly thereafter by a coalition of national and Alaska environmental non-government organizations in response to the BLM's issuance of the JROD for the Ambler Access Project.

On January 6, 2021, AIDEA signed agreements for Right-of-Ways for the Ambler Access Project with the United States Bureau of Land Management and the National Park Service. The agreements grant a 50-year right-of-way on federally owned and managed land by the federal agencies for the future development of the Ambler Access Project. During the second quarter of 2021, AIDEA signed a land access agreement with Doyon Limited to conduct feasibility and permitting activities to advance the Ambler Access Project and in September 2021 AIDEA signed a land access agreement with NANA to conduct similar activities.

In February 2021 Ambler Metals, the joint venture operating company equally owned by Trilogy Metals and South32, entered into an Ambler Access Development Agreement with AIDEA.

The Ambler Access Development Agreement defines how AIDEA and Ambler Metals will work cooperatively together on the pre-development work for the Ambler Access Project to address funding and oversight of the project's feasibility and permitting activities until the parties reach a decision on the construction of the project. The cost of the pre-development work and activities will be paid 50% by AIDEA and 50% by Ambler Metals based on an annually agreed upon program and budget.

Under the Ambler Access Development Agreement, Ambler Metals and AIDEA agree to contribute up to $35 million each for pre-development costs of the Ambler Access Project through December 31, 2024. This proposed Development Agreement follows up on and is consistent with both the Interim Funding Agreement agreed to by AIDEA and Ambler Metals for pre-development work done on the project in 2020 and with the Memorandum of Understanding (MOU) between the parties signed on July 3, 2020.

On February 22, 2022, the United States Department of the Interior (DOI) filed a motion to remand the final Environmental Impact Statement (EIS) and suspend the right-of-way permits issued to AIDEA for the Ambler Access Project and in mid-March, the BLM and DOI suspended the right-of-way grant and the right-of-way permit over federal lands.

On September 20, 2022, the BLM published in the Federal Register a Notice of Intent that it will prepare a Supplemental Environmental Impact Statement (SEIS) for the proposed Ambler Mining District Industrial Access Road. The BLM anticipates publishing a draft SEIS during the second quarter of 2023 and a final SEIS within the fourth quarter of 2023.

The lawsuits have been temporarily suspended pending the additional work to be performed by the BLM on the EIS.

4.5 Physiography

The Bornite Property is located on Ruby Creek on the northern edge of the Cosmos Hills. The Cosmos Hills are part of the southern flank of the Brooks Range in Northwest Alaska. Topography in the area is moderately rugged. Maximum relief in the Cosmos Hills is approximately 1,000 masl with an average of 600 masl. Talus covers much of the upper portions of the hills; glacial and fluvial sediments occupy valleys.

The Kobuk Valley is located at the transition between boreal forest and Arctic tundra. Spruce, birch, and poplar are found in portions of the valley, with a ground cover of lichens (reindeer moss). Willow and alder thickets and isolated cottonwoods follow drainages, and alpine tundra is found at higher elevations. Tussock tundra and low, heath-type vegetation covers most of the valley floor. Patches of permafrost exist on the Bornite Property.

Permafrost is a layer of soil at variable depths beneath the surface where the temperature has been below freezing continuously from a few to several thousand years (Climate of Alaska, 2007). Permafrost exists where summer heating fails to penetrate to the base of the layer of frozen ground and occurs in most of the northern third of Alaska as well as in discontinuous or isolated patches in the central portion of the state.

Wildlife in the Bornite Property area is typical of Arctic and Subarctic fauna (Kobuk Valley National Park, 2007). Larger animals include caribou, moose, Dall sheep, bears (grizzly and black), wolves, wolverines, coyotes, and foxes. Fish species include salmon, sheefish, arctic char, and arctic grayling. The Kobuk River, which briefly enters the UKMP on its southwest corner, is a significant salmon spawning river. The caribou on the Bornite Property belong to the Western Arctic herd that migrates twice a year: south in August from their summer range north of the Brooks Range, and north in March from their winter range along the Buckland River.

4.6 Sufficiency of Surface Rights

Trilogy Metals has sufficient surface rights for its planned future mining operations, including sufficient land to construct various facilities, such as tailings storage areas and potential waste disposal areas, stockpile areas and processing plants.

5.0 HISTORY

5.1 Bornite Property History

Prospectors in search of gold, travelling up the Kobuk River in 1898 to 1899 (Grinnell, 1901) found several small gold placer deposits in the southern Cosmos Hills that were worked intermittently over the ensuing decades. Around this time, copper mineralization at Ruby Creek and Pardner Hill was explored using small shafts and adits (Smith, 1913). At Ruby Creek, Smith describes bornite and chalcopyrite and lesser amounts of galena and pyrite filling open spaces in brecciated zones in limestone and in places replacing dolomite breccia.

In 1947, Rhinehart “Rhiny” Berg staked claims over the Ruby Creek prospects, carried out extensive trenching and the first diamond drilling, and constructed an airstrip for access (alaskamininghalloffame.org 2012). In 1957, BCMC, Kennecott's exploration subsidiary, optioned the property from Berg. Refer to Section 3.3.1 for further details regarding the changes of ownership of the Bornite Property.

Exploration drilling in 1961 and 1962 culminated in the discovery of the “No.1 Ore Body” where drill hole RC-34 cut 20 m of 24% Cu (the “No. 1 Ore Body” is a historical term used by BCMC that does not connote economic viability in the present context; it is convenient to continue to use the term to describe exploration work in a specific area that was previously referred to as the Ruby Creek zone and is now referred to as simply the Ruby Zone). The discovery of the “No. 1 Ore Body” led to the development of an exploration shaft in 1965 through 1966, the development of an exploration drift and the completion of underground drilling in 1967 (Section 5.1.3).

The discovery of the Arctic Project in 1965 prompted a hiatus in exploration at Bornite, and only limited drilling occurred up until 1997.

5.1.1 Geochemistry

In the late 1990s, Kennecott resumed its evaluation of the Bornite deposit and the mineralization in the Cosmos Hills with an intensive soil, stream, and rock chip geochemical sampling program using a 32-element inductively coupled plasma (ICP) analyses. Grid soil sampling yielded 765 samples. Ridge and spur sampling resulted in an additional 850 soil samples in the following year. Skeletonized core samples (85 samples) from key historical drill holes were also analyzed using 32-element ICP analytical methods. Geochemical sampling identified multiple areas of elevated copper and zinc in the Bornite region (Kennecott Annual Ambler Project Reports, 1995-1997).

5.1.2 Geophysics

Kennecott completed numerous geophysical surveys as an integral part of exploration throughout its tenure on the Bornite Property. Various reports, notes, figures, and data files stored in Kennecott's Salt Lake City exploration office indicated that geophysical work included, but was not limited to, the following:

- Airborne magnetic and electromagnetic (EM) surveys (fixed-wing INPUT) (1950s)
- Gravity, single point (SP), audio-frequency magnetotelluric (AMT), EM, borehole and surface induced polarization (IP)/resistivity surveys (1960s)
- Gravity, airborne magnetic, and controlled-source audio-frequency magnetotelluric (CSAMT) surveys (1990s).

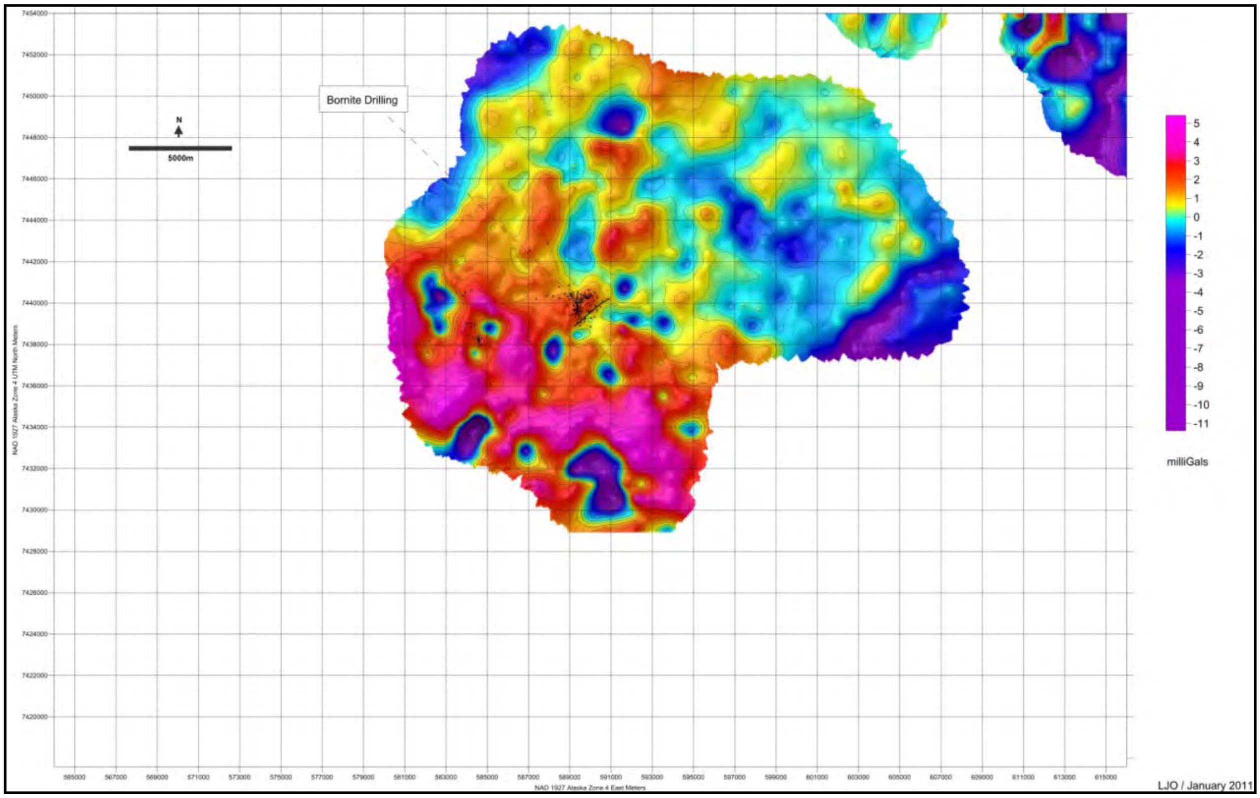
Trilogy Metals has minimal information or documentation associated with these geophysical surveys conducted prior to the 1990s. Where data are available in these earlier surveys, the lack of details in data acquisition, coordinate systems, and data reduction procedures limit their usefulness. The only complete geophysical report that is available concerns down-hole IP/resistivity results (Merkel, 1967).

Most notable is the 1996 Bouguer gravity survey from the Bornite deposit into the Ambler Lowlands. Figure 5-1 shows the terrain-corrected Bouguer residual gravity survey anomalies. The Bornite deposit itself is seen as a significant 3 milligal anomaly. Numerous 2 milligal to >6 milligal anomalies occur under cover in the Ambler Lowlands and near the Aurora Mountain and Pardner Hill occurrences.

The wide range of geophysical techniques used in and around the deposit over a span of 40 years indicates the level of difficulty experienced by Kennecott while trying to detect mineralization. When applying EM and IP/resistivity methods, the problem appears to be that deeper mineralization is often masked by the response of near-surface conductive rocks.

In addition to the geophysical surveys conducted by Kennecott, the Alaska Department of Natural Resources and Geometries completed an aeromagnetic survey of portions of the Ambler Mining District from 1974 to 1975 (Gilbert et al., 1977). Part of this survey is reproduced in Figure 7-3.

Figure 5-1: 1996 Kennecott Residual Gravity

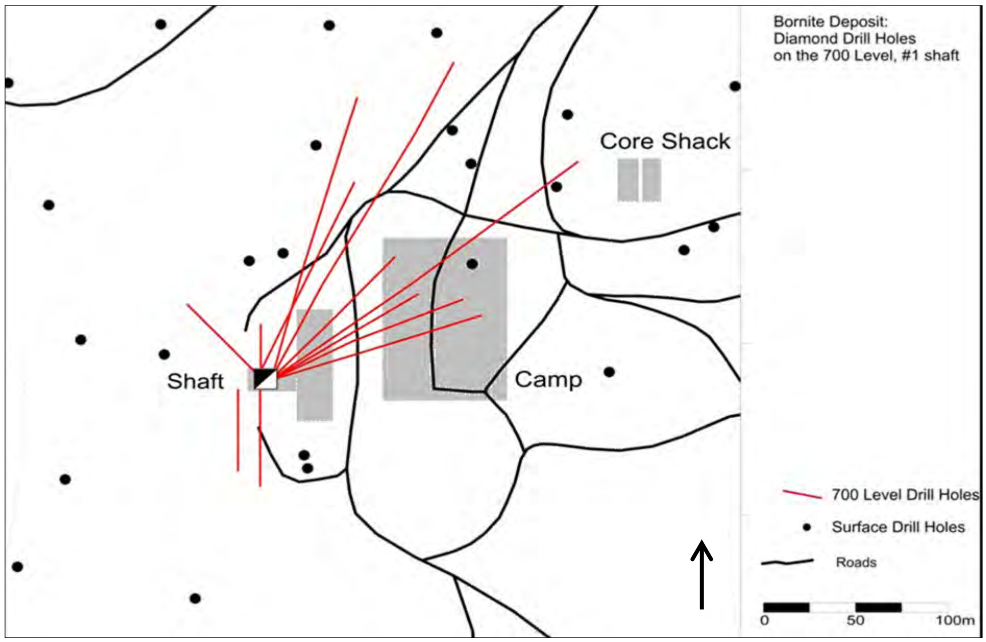


(Source: Trilogy Metals, 2011)

5.1.3 Drilling and Underground Workings

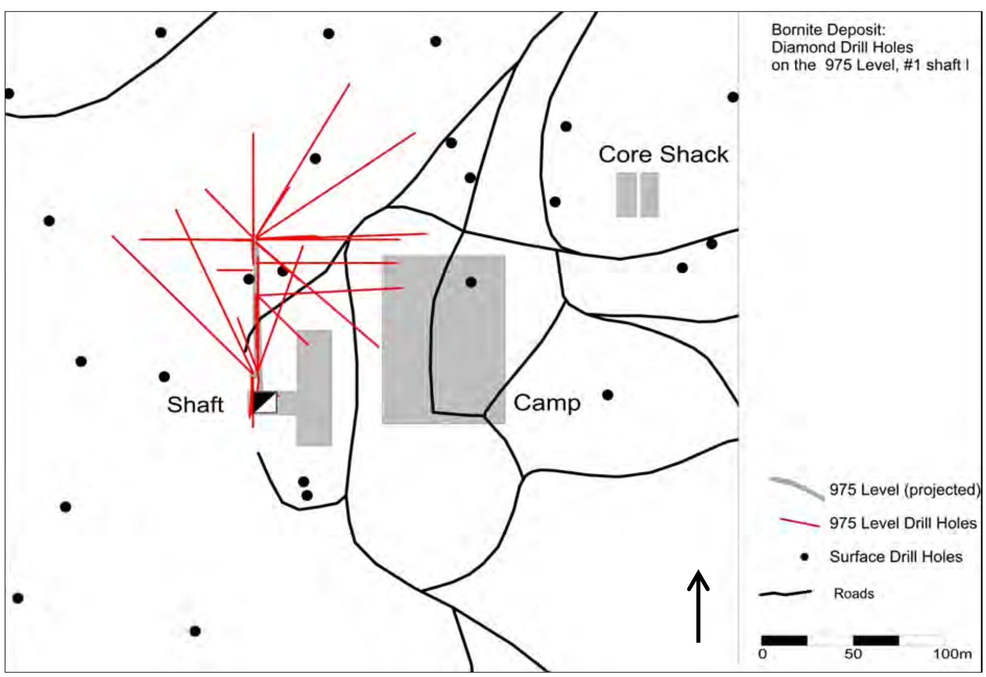
In October 1965, Kennecott began a shaft to further investigate the Ruby Zone Upper Reef "No. 1 Ore Body" mineralization. In 1966, the shaft reached the 297 m level. At this level, a 91 m crosscut was driven due north to the mineralized zone. The shaft was continued to 328 m deep to prepare a sump and loading pocket. On October 27, 1966, a small blast to excavate a bay at the bottom of the shaft opened a watercourse. The in-flow of water quickly exceeded the pump capacity and within 12 hours the 328 m shaft was flooded to within 13 m from the surface (Hawke, 1966). Prior to the shaft flooding, exploration drilling was completed from the 700-level shaft station and the 975-level shaft station and crosscut. In 1967, the shaft bottom was partially sealed and then pumped out, and additional exploration drilling completed from the 700 level and the 975 level shaft stations (see Figure 5-2 and Figure 5-3).

Figure 5-2: Diamond Drilling from the 700 Level of the No. 1 Shaft



(Source: Trilogy Metals, 2017)

Figure 5-3: Diamond Drilling from the 975 Level of the No. 1 Shaft



(Source: Trilogy Metals, 2017)

5.1.4 Petrology, Mineralogy, and Research Studies

Several studies have been conducted to review the geology and geochemistry of the Bornite deposit. Most notable is Murray Hitzman's PhD dissertation at Stanford University (Hitzman, 1983) and Don Runnel's PhD dissertation at Harvard University (Runnels, 1963). Bernstein and Cox reported on mineralization of the "No. 1 Ore Body" in a 1986 paper in Economic Geology (Bernstein et al., 1986).

In addition to the historical work, Ty Conner at the Colorado School of Mines completed a Master's thesis which reported on the timing of alteration and mineralization at the Bornite deposit (Conner, 2015), and Zachary Mahaffey at University of Alaska Fairbanks completed a Master's thesis on the mineralogical associations and distribution of cobalt at the Bornite deposit (Mahaffey, 2021).

5.1.5 Geotechnical and Hydrological Studies

Kennecott conducted two technical reviews of the groundwater conditions (Vance, 1962) and a summary of the findings related to the flooding of the exploration shaft (Erskine, 1970).

5.1.6 Metallurgical Studies

In 1961, Kennecott collected 32 coarse reject samples from five drill holes to support preliminary metallurgical testwork at Bornite. Samples targeted high-grade (>10%) copper mineralization from the Upper Reef at the Ruby Zone (Lutz, 1961). Further discussion of the historical and current metallurgical studies is presented in Chapter 10.

6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT

6.1 Regional Geology

The Bornite Property is located within the Arctic Alaska Terrane, a sequence of mostly Paleozoic continental margin rocks that make up the Brooks Range and North Slope of Alaska (Moore, 1992). It is within the Phyllite Belt geologic subdivision, which together with the higher metamorphic grade Schist Belt, stretches almost the entire length of the southern Brooks Range and is considered to represent the hinterland of the Jura-Cretaceous Brookian orogeny. The southern margin of the Phyllite Belt is marked by mélange and low-angle faults associated with the Kobuk River fault zone, while the northern boundary is thought to be gradational with the higher-grade metamorphic rocks of the Schist Belt (Till et al., 2008).

6.1.1 Tectonic and Metamorphic History

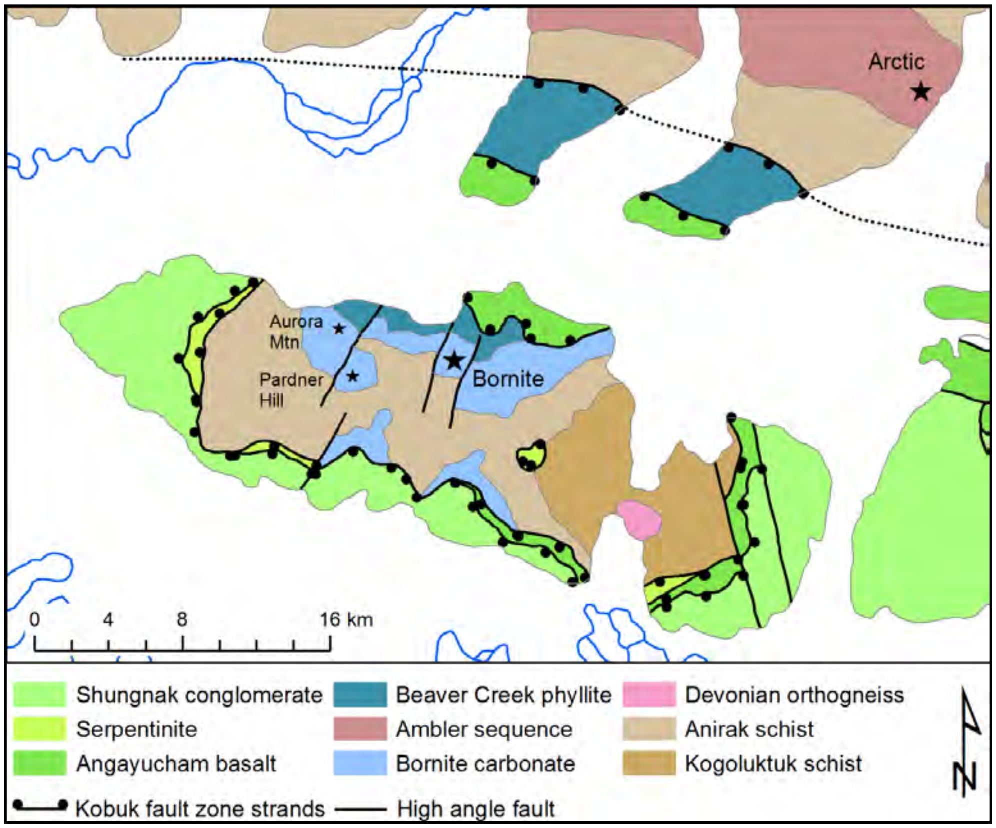
The tectonic setting of the project area during deposition of the host rocks (early Devonian) has been masked by subsequent Brookian deformation and remains difficult to reconstruct. Dillon et al. (1980) interpreted the existence of Devonian granites throughout the Brooks Range as supporting a volcanic arc environment, while Hitzman et al. (1986) pointed to bimodal volcanic rocks and abrupt lateral sedimentary facies transitions as supporting an extensional tectonic setting. Based on igneous geochemistry, Ratterman et al. (2006) suggest that the Ambler sequence volcanic rocks were emplaced in an extensional back-arc spreading environment; however, the original pre-deformation spatial relationship between the Bornite project area and the Ambler sequence remains poorly understood.

The project area underwent regional deformation and metamorphism during the Middle Jurassic to Early Cretaceous Brookian orogeny. The collision of the Koyukuk Arc Terrane from present-day south caused north-directed imbrication and partial subduction of the Arctic Alaska passive margin sedimentary succession. Rocks in the Schist Belt were metamorphosed to blueschist facies. The Schist Belt and the Phyllite Belt were exhumed from greenschist facies conditions during an episode of rapid extension and erosion in the Late Cretaceous beginning around 103 Ma (Moore et al., 1994; Vogl, 2003). Mapping conducted in 2021 found kinematic indicators in the Cosmos Hills that suggest these rocks have experienced top-south deformation.

In the project area, the low-angle Kobuk fault zone juxtaposes the Cosmos Hills stratigraphy (Schist Belt and Phyllite Belt) against the overlying Angayucham Terrane, and another low-angle fault likely juxtaposes the Cosmos Hills against the Ambler sequence to the north (Figure 6-1).

Bornite sequence carbonate rocks are also in low-angle fault contact with the structurally underlying Anirak schist and the overlying Beaver Creek phyllite.

Figure 6-1: Generalized Geologic Map of the Local Geology



(Source: Modified from Till et al., 2008 and Hitzman, 1986)

6.1.2 Stratigraphy

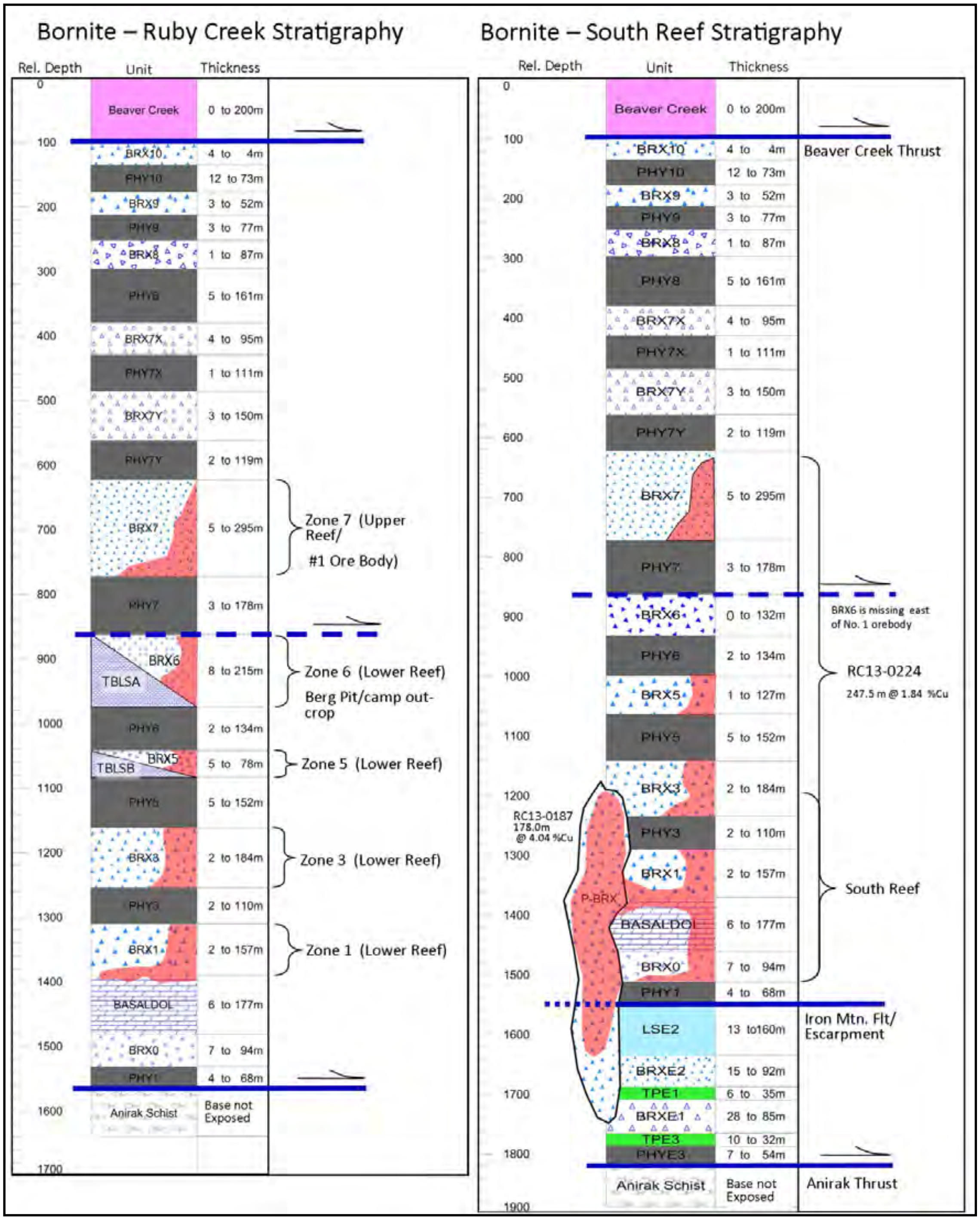
The tectonostratigraphy of the district is characterized by pelitic, carbonate and local volcanic rocks metamorphosed to lower greenschist to epidote-amphibolite facies as shown in Figure 6-1 and summarized in Table 6-1. Figure 6-2 shows a general stratigraphic column of the lithologic units in the Ruby Zone and South Reef areas.

Table 6-1: Tectono-Stratigraphic Units of the Cosmos Hills Area

Unit (age)	Lithology	Metamorphic Grade	Approximate Thickness (m)
Shungnak conglomerate (Cretaceous)	Pebble conglomerate, sandstone, siltstone, minor intermediate volcanics	Almost Unmetamorphosed	1,000
Angayucham terrane (Devonian-Mississippian) (allochthonous)	Pillow basalt, pillow breccia	Prehnite-Pumpellyite	>500
Beaver Creek phyllite (Devonian*)	Phyllite, quartzite, marble	Lower Greenschist	>2,000
Ambler sequence (Devonian*)	Metarhyolite, metabasite, tuffaceous metasediments, calcareous metasediments, pelitic schist	Blueschist to Greenschist	700–1,850
Bornite carbonate sequence (Lower Devonian to Upper Silurian*)	Marble, argillaceous marble, dolostone, phyllite, phyllitic marble	Lower Greenschist	200–1,000
Anirak schist (Devonian*)	Pelitic schist, quartzite, marble, minor metabasite	Greenschist	3,000
Kogoluktuk schist (Precambrian to Devonian*)	Pelitic schist, quartzite, metagabbro, minor marble	Epidote-Amphibolite	4,000

(Source: Modified from Hitzman et al., 1986. *Ages from Till et al., 2008)

Figure 6-2: General Stratigraphic Column for the Local Geology Identifying the Ruby Zone and South Reef Lithologies



(Source: Trilogy Metals, 2016)

6.1.3 Igneous Rocks

The intersection of the Cosmos Arch and the Kogoluktuk River drainage 14 km southeast of Bornite exposes a cataclastic orthogneiss of granitic composition that intrudes the Kogoluktuk Schist and has a uranium-lead (U-Pb) zircon age of 386 ± 3 Ma (Till et al., 2008, citing W.C. McClelland).

Higher in the tectono-stratigraphic section, the Kogoluktuk Schist is intruded by sub-horizontal sill-like bodies of metagabbro of unknown age. Other metamafic greenstones are interpreted to have originated as basaltic lava flows and/or tuffaceous volcaniclastic sedimentary rocks (Hitzman, 1986).

Although none occur in the Bornite resource area, discontinuous stratabound greenstone bodies occur in the Anirak schist and at the base of the Bornite carbonate succession, particularly west and southwest of Bornite, including at Aurora Mountain and near the base of the Beaver Creek phyllite west of Bornite (Hitzman et al., 1982). A gabbroic outcrop approximately 200 m wide is exposed 2 km east of Bornite that has been interpreted to be Cretaceous to Tertiary in age.

The most significant igneous rocks in the district are the bimodal volcanic rocks of the Ambler sequence that hosts volcanic massive sulphide (VMS) deposits and outcrop 20 km north of Bornite but are not observed in the Cosmos Hills (Table 6-1). These include sub-alkaline basaltic flows and sills with an un-depleted mantle geochemical signature. Sub-alkaline rhyolitic to andesitic tuffs and flows have geochemistry consistent with derivation from a source that includes melting continental crust. Geochemical data imply an origin in an extensional, back-arc basin setting (Ratterman et al., 2006). U-Pb zircon dating from Ambler sequence metarhyolites yields ages of 387–376 Ma (McClelland et al., 2006), which are syn- to early post-mineralization with respect to the Bornite (Ruby Zone) deposit.

6.1.4 Timing of Mineralization in the District

Sulphides (chalcopyrite, pyrite, and bornite) from Bornite (Ruby Zone) were dated by rhenium–osmium (Re-Os) techniques, yielding an age of 384 ± 4.2 Ma for main stage copper mineralization (Selby et al., 2009).

More recent work (Conner, 2015) suggests a post Jura-Cretaceous (i.e., Post-Brookian) age for mineralization based on 1) albite alteration associated with the mineralizing event cross-cuts the pronounced Jura-Cretaceous penetrative fabric at Bornite, and 2) the common presence of cymrite, a barium-rich blueschist-stable metamorphic mineral related to the Jura-Cretaceous deformation common within all the various mineralized assemblages. The Re-Os ages appear to be contradictory to the Conner (2015) geologic observations, and it seems unlikely for Re-Os to retain a syn-sedimentary age in a metamorphosed and orogenically modified terrane. The question of whether sulphides at Bornite are deformed by, cross-cut, or lie in the plane of Brookian deformation still needs to be further investigated.

The syngenetic VMS deposits in the Ambler sequence are constrained by dating of related felsic volcanic rocks. Early post-mineral metarhyolite at the Arctic deposit yielded a mean U-Pb zircon age of 378 ± 2 Ma. Uranium-lead zircon ages for metarhyolite at the Tom-Tom prospect, 11 km east of Arctic, and the Sun prospect, 60 km east of Arctic, are 381 ± 2 Ma and 386 ± 2 Ma, respectively (McClelland et al., 2006) suggesting that felsic magmatism migrated west over time.

6.2 Property Geology

The geology of the Bornite resource area is composed of alternating intervals of carbonate rocks (limestone and dolostone) and calcareous phyllite. Limestone transitions laterally into dolostone near zones of mineralization and is considered hydrothermally altered. Spatial relationships and petrographic work suggest that dolomitization is genetically related to early stages of the copper mineralizing system (Hitzman, 1986); however, recent re-logging has questioned this view.

Trilogy Metals geologists have been unable to identify any meta-igneous rocks in the resource area; all lithologies described are interpreted as meta-sedimentary in origin.

6.2.1 Lithology Units

The current logging system for lithology derives from early Kennecott core logs (1960). Original unit descriptions have not been found; however, the units were re-described during re-logging by NOVAGOLD geologists in the summer of 2010. The scheme encompasses not only primary lithology, but also alteration, and compositional and textural variations. Resource-scale geologic interpretation and modelling is based on the hierarchical generalization shown in Table 6-2.

Figure 6-3 shows typical dolomitized sedimentary breccias of the Bornite carbonate sequence, which are the principal host of mineralization at Bornite. Figure 6-4 shows typical phyllites of the Bornite carbonate sequence.

In 2015, Trilogy Metals tried to improve the understanding of the distribution and nature of the various lithologic units and their context within a sedimentary depositional model. A new interpretation, based on lithogeochemical signatures of the various units along with their historical visual logging, concluded that stacked debris flows composed of basal nonargillaceous channelized breccias were overlain by upward fining increasingly argillaceous breccias and capped by high calcium (Ca) phyllites occupying channels cut into either massive or thin-bedded carbonates.

Two mineralized stacked debrite successions were named the Lower and Upper Reefs. The Upper Reef grades upward into argillaceous limestones instead of discrete high Ca phyllites indicating a waning of debris supply. Based on this interpretation, a series of individual debrites were identified, and these units form the basis of the mineral resource model presented in Chapter 11.

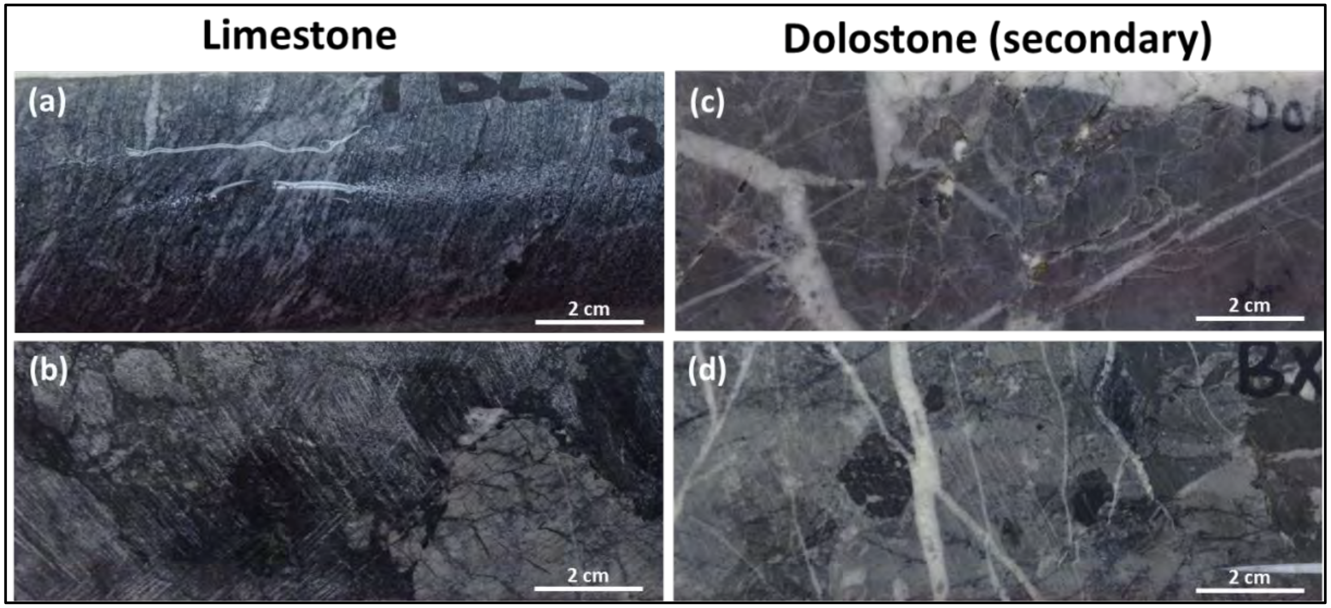
In contrast to the locally derived high-Ca phyllites of the debrite-dominated Bornite carbonate sequence, low calcium (Ca) phyllites are abundant in the allochthonous Anirak schist (quartz phyllite) and the Beaver Creek phyllite that underlie and overlie the Bornite carbonate sequence, respectively.

Table 6-2: Lithology Units on the Bornite Property

Area	Lithology	Codes	Description
Carbonate	Limestone	BXLC, LS, TBLS	Carbonate sedimentary breccia consisting of 10% to 90% polylithic carbonate clasts supported in a calcareous matrix. Clast lithologies include limestone, dolostone, ferroan dolostone, and locally massive pyrite.
	Dolostone (secondary)	BXDC, DOL, ADP	Dolomitized carbonate sedimentary breccia consisting of abundant (±90%), polylithic clasts (0.5 to 50 cm in diameter). Host for mineralization at Bornite.
Phyllite	Carbonaceous Calcareous Phyllite	AP, ALP, APL, ALS, ALCB	Weakly to moderately carbonaceous calcareous phyllite defined by presence of a significant (5 to 95%) shale-rich component in the carbonate section. Phyllites commonly act as limits or delimit mineralized bodies.
	Bleached Calcareous Phyllite	TS, TLP, TPL, CHPL	Texturally similar to the carbonaceous calcareous phyllite described above and interpreted as altered equivalents. Commonly characterized by strong sericite component historically misidentified as talc.
Anirak Achist	Quartz Phyllite (Anirak Schist)	QP	Moderately graphitic quartz-rich-phyllite, locally moderately calcareous.

Note: BXLC = Limestone Clastic Breccia; LS = Limestone; TBLS = Thin Bedded Limestone; BXDC = Dolostone Clastic Breccia; DOL = Dolostone; ADP = Argillaceous Dolomitic Phyllite; AP = Argillaceous/Carbonaceous Phyllite; ALP = Argillaceous Limestone Phyllite; APL = Argillaceous/Carbonaceous Phyllitic Limestone; ALS = Argillaceous Limestone; ALCB = Argillaceous Limestone Breccia; TS = Talc Schist; TPL = Tan Phyllitic Limestone; TLP = Tan Limey Phyllite; CHPL = Chloritic Phyllite; QP = Quartz Phyllite.

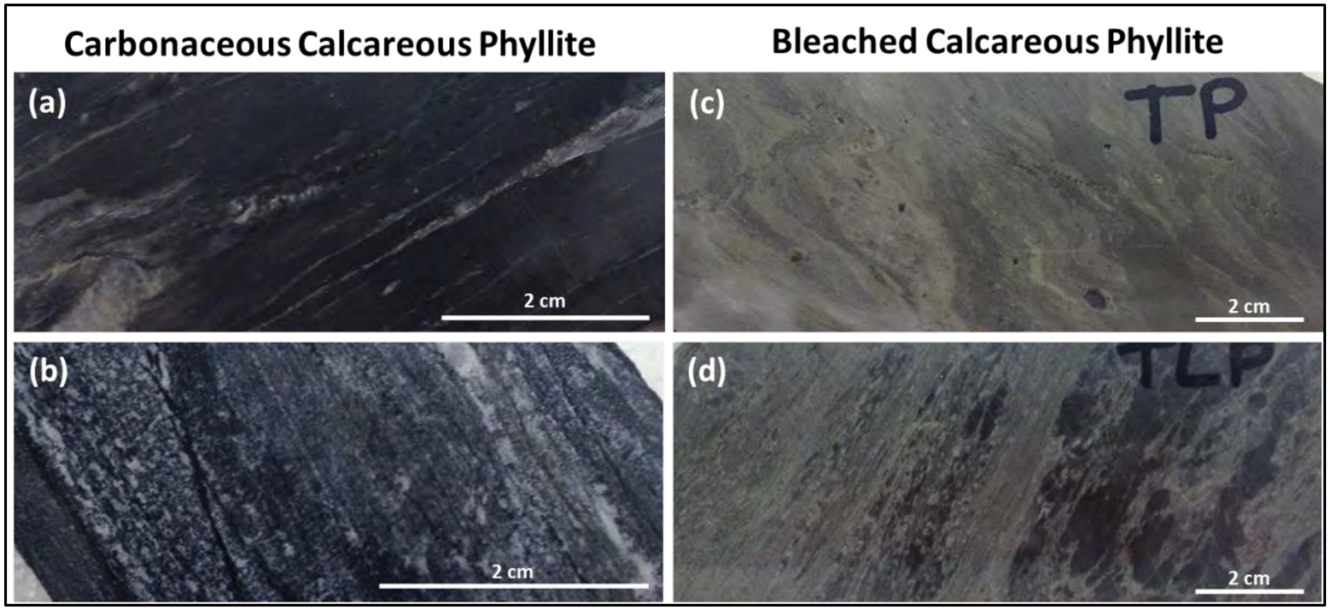
Figure 6-3: Typical Limestones and Dolostones of the Bornite Carbonate Sequence



(Source: Trilogy Metals, 2017)

Note: (a) Thin Bedded Limestone (TBLS): Limestone textural variant with 1 mm scale banding of light and dark grey carbonaceous seams; (b) Limestone Clastic Breccia (BXLC): Carbonate sedimentary breccia with carbonate clasts in a calcareous, locally phyllitic matrix; (c) Dolostone (DOL): Partially dolomitized carbonate with late dolomite-calcite veining; (d) Dolostone Clastic Breccia (BXDC): Polylithic clasts of dolostone in a dolostone matrix. Hydrothermal matrix or veins (low Fe) dolomite, pyrite, ± calcite, chalcopyrite, bornite, sphalerite.

Figure 6-4: Typical Phyllites of the Bornite Carbonate Sequence



(Source: Trilogy Metals, 2017)

Note: (a) Argillaceous/Carbonaceous Phyllite (AP): Carbonaceous to graphitic, weak to moderately calcareous phyllite with >75% phyllosilicates. Typically 1% to 2% pyrite; (b) Argillaceous/Carbonaceous Phyllitic Limestone (APL): Carbonaceous limestone (marble) with 5% to 20% phyllosilicates, especially in dark bands. Typically 1% to 2% pyrite; (c) Tan Phyllite (TP): Non-carbonaceous, weak-mod calcareous phyllite with > 75% phyllosilicates. Typically contains 1% to 2% fine-grained pyrite; (d) Tan Phyllitic Limestone (TPL): Non-carbonaceous limestone (marble) with 5% to 20% phyllosilicates, including white mica. Typically contains 1% to 2% very fine-grained pyrite.

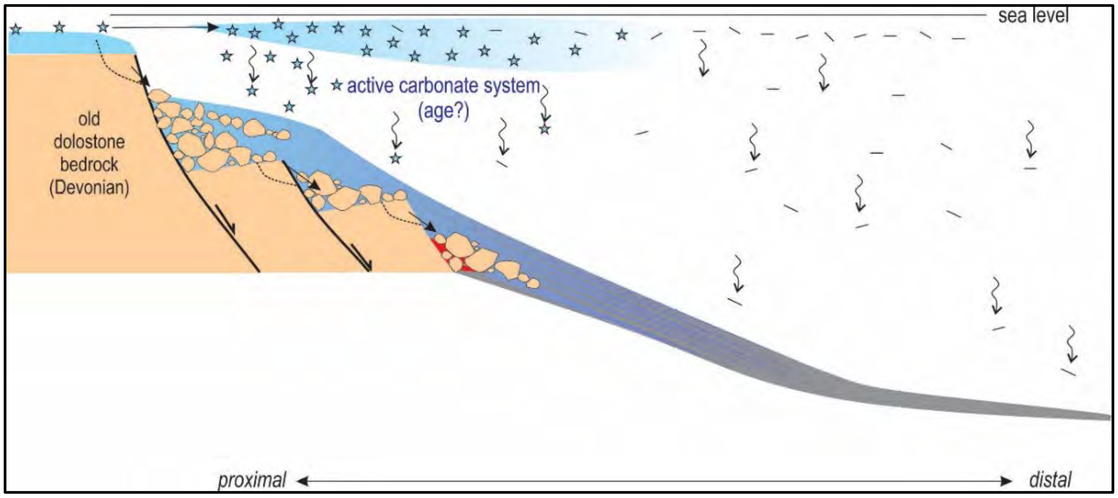
In addition to depositional lithostratigraphy, a cross-cutting mineralized breccia called the P-Breccia has been identified in and around the South Reef deposit. Though poorly defined due to lack of drilling in the area, the P-Breccia zone—which contains excellent copper grade—lies at the apex of the Iron Mountain discontinuity. Although clearly post-deformational, it remains unclear whether the P-Breccia is a post-depositional structural, hydrothermal or solution-collapse breccia.

A short lithostratigraphic project carried out during the 2021 field season updated the interpretation of the depositional environment of the Bornite succession; this resulted in significant differences when compared to the previously summarized interpretations. The Bornite succession is now understood to be a carbonate slope deposit characterized by (a) lime mudstone, exported to the slope from a contemporaneous shallow-marine carbonate factory, variably mixed with and interlayered with (b) background argillaceous sediment that is locally carbonaceous. Superimposed on these calcite-dominated normal slope strata are locally impressive thicknesses of dolomudstone-clast conglomerate (formerly breccia). Slope limestone and siltstone-mudstone were originally centimetrically to decimetrically bedded, but are commonly ductilely deformed, producing the variably limey phyllites that exhibit sub-mm scale foliation. In contrast, the dolostone-clast conglomerates and individual dolomudstone clasts responded brittlely to Brookian stress and show no significant shearing or plastic deformation. Instead, plastic deformation is largely restricted to the various phyllitic layers around the peripheries of the dolostone bodies.

6.2.2 Lithology Interpretation

The current lithostratigraphic understanding does not support the historical Kennecott interpretation of a talus-dominated fore-reef environment for the development of the high-energy carbonate breccias. The results of the 2021 lithostratigraphy project indicate that no reef is present in the area. Although there are minor debrites of slope-derived lime mudstone and calcareous siltstone casts, the dolomudstone-clast conglomerates are not the product of the active, normal carbonate system that produced lime mud that accumulated on the slope. Instead, the dolomudstone clasts are interpreted to have been derived from anomalous faulted sea-floor scarps that exposed older, unrelated dolostone bedrock to gravitational failure, resulting in deposition of dolostone-clast conglomerates by rockfall at and near scarp bases, and their further resedimentation downslope, mixed into the calcareous slope sediment as debrites (Figure 6-5). The syn-sedimentary faults that shed the conglomerates were probably the result of extension during accumulation of the Bornite succession. They also possibly acted as later conduits for mineralizing fluids. Dolostone-clast conglomerates are the main hosts of copper mineralization at Bornite, which is concentrated where the Bornite strata are most doloclast-conglomerate-rich.

Figure 6-5: Schematic Cross-sectional Diagram of Carbonate Environment Showing Position of Mineralization (red)



(Source: Turner, 2021)

6.2.3 Structure

Structural fabrics observed on the Bornite Property include rare bedding and two distinct metamorphic foliations. Bedding (S0) can be measured only rarely where phyllite and carbonate are interbedded, and it is unclear to what extent it is transposed. The pervasive foliation (S1) is often mylonitic and exhibits both an imprinted stretching lineation and preferred top direction. It is easily measured in phyllites and is commonly reflected by colour banding and/or stylolamination (flaggy habit in outcrop) of the carbonates. Some limestone outcrops, in particular the TBLS on Aurora Mountain and the marbles at the base of Coral Hill, also exhibit a stretching lineation. Core-logging shows that S1 is folded gently on a 10 m scale and locally tightly folded at the decimetre scale forming a common S2 axial planar cleavage. S2 is folded gently on a 10 m scale forming an upright mesoscale S3 foliation. S1 and S3 foliations are thought to be Jura-Cretaceous in age.

Structural mapping in 2021 recognized a well-developed stretching lineation (i.e., L-tectonite) in the carbonate-phyllite rocks, typically oriented shallowly towards the north-northeast or south-southwest. Top directions indicate movement to the south or south-southwest along the vector of the stretching lineation. Moreover, new mapping indicates that stiff Bornite rocks, in particular metric to hectametric dolostone bodies, have been boudinaged into 3D ellipsoids. Slip is accommodated by phyllites. Interpretation of this mapping should be performed to determine whether such a tectonic style plays a role in the distribution of copper mineralization.

Owing to their greater rigidity, dolostone bodies of secondary dolostone manifest strain differently: tan hydrothermal dolostone tends to be broken into centimetre- to decimetre-scale blocks, whereas grey (diagenetic?) dolostone may exhibit unusual, contorted forms, some resembling human fingers or swan necks, as evident in outcrop. Dolostone is rarely cut by plastically deformed zones and instead forms metric to hectametric lenses (augens) encased in plastically deformed calc-mylonite and calc-phyllite. This deformation, presumably a product of the Jura-Cretaceous Brookian orogeny, complicates sedimentological interpretations.

Possibly the earliest and most prominent structural feature in the resource area is the northeast-trending Iron Mountain fault or discontinuity, which is still problematic in its interpretation because it is a cross structure that strikes northeast at a high angle to the overall Brookian structural trend, as well as that of the South Reef deposit. Numerous drill holes in the South Reef area intersect a thin zone of apparent basal quartz phyllite tectonostratigraphy overlying mineralized carbonate stratigraphy, a relationship that was also documented in a trench dug between Pardner Hill and Aurora Mountain in 2021.

Numerous explanations for the Iron Mountain discontinuity have been suggested, none of which completely accounts for all the logged observations. Inadequate drilling through the feature into lower stratigraphy and the assumption that the basal quartz phyllite is in fact the bottom has limited its resolution. Interpretations offered over time, include: 1) a normal growth fault (that would date to the Devonian); 2) a thrust fault; 3) a kink or fault-propagation fold; 4) a quartz phyllite lens intercalated within the basal part of the carbonate sequence; 5) a basement-involved drag fold formed during displacement of the Bornite sequence; and 6) a depositional unconformity. Interpretations 2 to 5 would all date to the Brookian orogeny.

Importantly, the recognition of the P-Breccia at or near the apex of the Iron Mountain discontinuity, and its interpretation as a post-depositional structural, hydrothermal, or solution-collapse breccia, suggests a post-lithification origin. Some data also suggest that the P-Breccia is a syn-depositional slump related to the Iron Mountain discontinuity and the eastern terminus of the thin QP wedge, suggesting that the Iron Mountain structure was already present during the Devonian. Although the spatial distribution of mineralization adjacent to the Iron Mountain feature is unequivocal, a direct link between the discontinuity and mineralization has yet to be demonstrated.

To the north, the Bornite carbonate sequence is in low-angle normal fault contact with the Beaver Creek phyllite along the north-dipping Beaver Creek fault. The fault, a thick, brittle structure of potentially regional significance, defines the approximately bedding-parallel contact of the structurally higher Beaver Creek phyllite with the structurally lower Bornite carbonate sequence in the immediate Bornite area. However, the fault is absent further west, where these units lie in apparent stratigraphic contact.

Both the Beaver Creek fault and the Bornite carbonate sequence were in the past thought to be cut by a series of north-trending high-angle brittle faults of apparent small displacement as shown in Figure 6-1 (Hitzman et al., 1982). These structures have not been identified in outcrop or in drilling at Bornite and are no longer thought to exist. However, recent mapping on Aurora Mountain has identified two high-angle brittle normal faults that strike northwest and west-northwest that have some 50 m to 100 m of throw across them. This set of normal faults may wind up being present in other parts of the Cosmos Hills.

6.3 Mineral Deposits

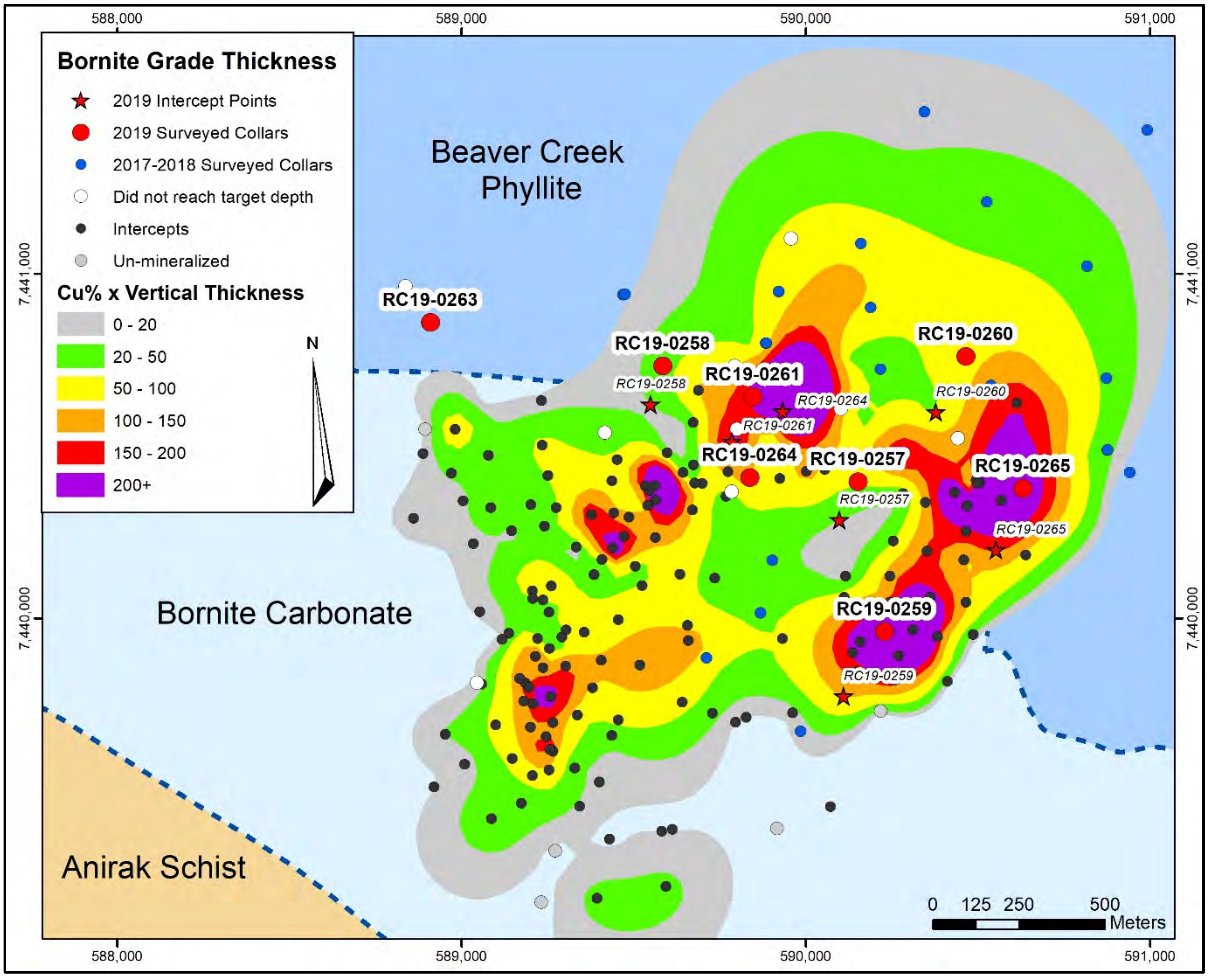
Mineralization at Bornite forms tabular mineralized zones that coalesce into crudely stratabound bodies hosted in dolostone conglomerate/breccia. Two significant dolomitic horizons that host mineralization have been identified by drilling and include: 1) the Lower Reef, a substantial 100 m to 300 m thick dolomitized zone lying immediately above the basal quartz phyllite unit of the Anirak schist and 2) the Upper Reef, a 100 m to 150 m thick dolomite horizon that sits roughly 300 m higher in the section. The Lower Reef is separated from the Upper Reef by a zone of ductilely sheared phyllites up to 60 m thick.

The Lower Reef dolostone outcrops along the southern margin of the Ruby Zone and is spatially extensive throughout the deposit area. It hosts a significant portion of the shallow mineral resources in the Ruby Zone as well as higher grade mineral resources down-dip and to the northeast in the South Reef area. The Upper Reef hosts relatively high-grade mineral resources to the north in the Ruby Zone. The Upper Reef zone appears to lie at an important northeast-trending facies transition to the northwest of the main drilled area and appears to be at least partially thrust over the Lower Reef stratigraphy to the southeast.

Drill results from 2013 show dolomitization and copper mineralization in the Upper and Lower Reefs coalescing into a single unit along the northern limits of current exploration. The northeast--trending Ruby Zone and South Reef areas also coalesce into a roughly 1,000 m wide zone of >200 m thick dolomite containing significant copper mineralization dipping north at roughly 5 to 10°. The 2017 drill results show that the mineralized dolomite interval continues for at least another 700 m down-dip to the northeast from mineralization in the Upper and Lower Reefs.

Figure 6-6 shows the grade thickness (Cu% x thickness in metres) distribution of copper mineralization for the Bornite deposit.

Figure 6-6: Copper Grade Thickness Plan Map for the Bornite Deposit

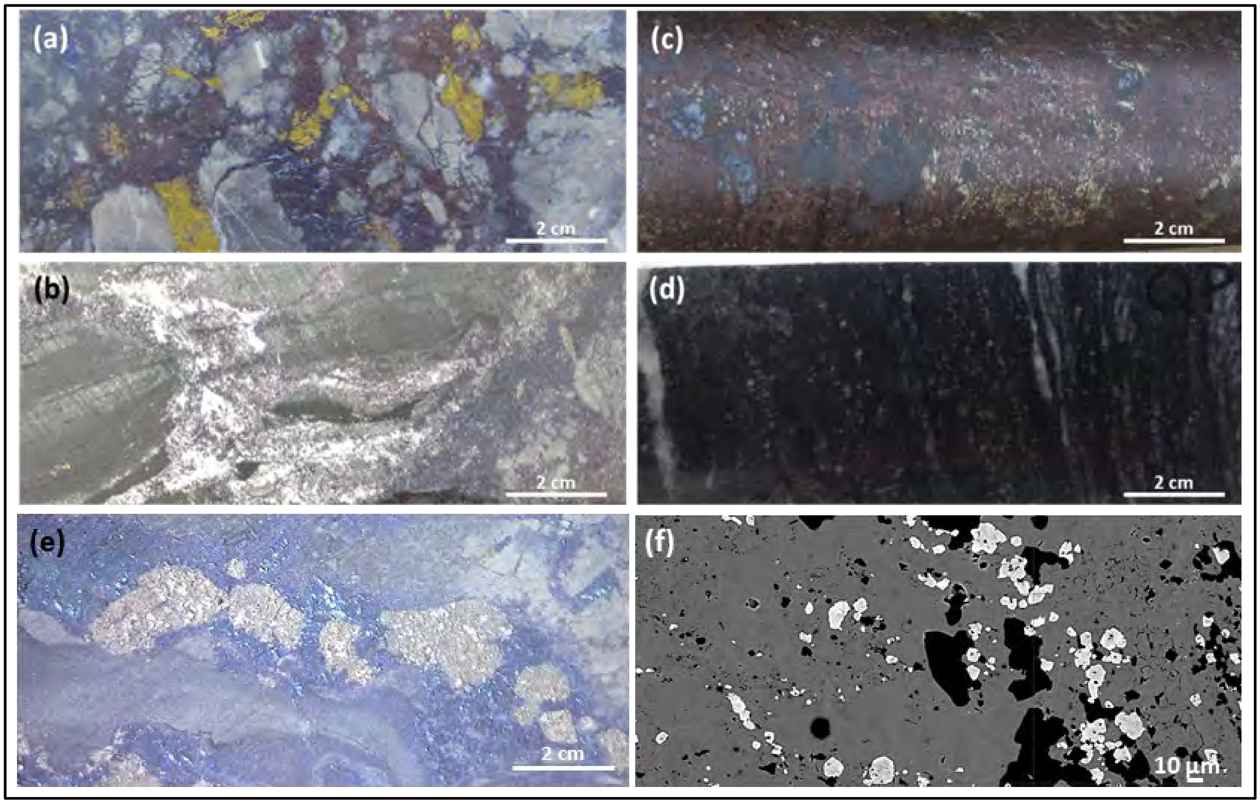


(Source: Trilogy Metals, 2019)

6.3.1 Mineralization

Copper mineralization at Bornite comprises chalcopyrite, bornite, and chalcocite distributed in stacked, stratabound zones exploiting favourable lithologies (conglomerate/breccia) within the Bornite sequence. Mineralization occurs, in order of increasing grade, as disseminations, irregular and discontinuous stringer-style veining, breccia matrix replacement, and stratabound massive sulphides. Figure 6-7 shows typical mineralization of the Bornite deposit characterized by chalcocite, bornite, chalcopyrite and pyrite.

Figure 6-7: Typical Mineralization of the Bornite Deposit



(Source: Trilogy Metals, 2017)

Note: (a) Typical high-grade chalcocite-bornite-chalcopyrite mineralization; commonly forms stringers, veinlets, disseminations, and breccia fillings; (b) Chalcocite (Cu_2S) appears dark grey to black, occurs in massive sulphide zones and typically replaces bornite. Note the boudinage of the carbonate beds in which the boudin necking zone is filled with white calcite; (c) Massive sulphide mineralization, chalcocite-bornite-chalcopyrite of the historically termed "No. 1 Ore Body" Ruby Zone Upper Reef; (d) Typical disseminated 1% and 2% pyrite in ductilely deformed Quartz Phyllite – Rock unit defines the base of the Bornite carbonate sequence, equivalent to the Anirak schist; attenuated foliation parallel white quartz stringers indicate significant ductile deformation has occurred in this unit; (e) Coarse-grained carrollite (Co_2CuS_4) appears shiny and highly reflective resembling aluminum foil and is often found associated with high-grade copper zones; (f) back-scattered electron image showing cobaltite (white rounded grains) growing on chalcopyrite (dark gray).

The distribution of copper minerals is zoned around the bottom-centre of each zone of mineralization, with bornite-chalcocite-chalcopyrite at the core progressing outward to a fringe of chalcopyrite-pyrite. Additional volumetrically minor copper minerals include carrollite, digenite, tennantite-tetrahedrite, and covellite (Bernstein and Cox, 1986). Stringer pyrite and locally significant sphalerite occur above and around the copper zones and locally massive pyrite and sparse pyrrhotite are associated with siderite alteration below copper mineralization in the Lower Reef.

Significant cobalt mineralization is found accompanying bornite-chalcocite mineralization (Chapter 7, Section 7.7). Cobalt often occurs with high-grade copper as carrollite (Co_2CuS_4) and as cobaltiferous rims on recrystallized pyrite grains (Bernstein and Cox, 1986). Preliminary geometallurgical work by Trilogy Metals showed that cobalt occurs primarily as cobaltiferous pyrite (approximately 80% of the contained cobalt) and within other cobalt minerals, such as carrollite and cobaltite (CoAsS).

In 2021, as part of his master's thesis, Mahaffey collected detailed handheld XRF analyses on 15 drill holes. Together with reflected light petrography, electron microprobe-based compositional maps, and electron microprobe analyses (EPMA), Mahaffey identified various carrollite and cobaltite compositions, textures and associations with copper sulphides as well as their spatial distribution in the Bornite deposit (Mahaffey, 2021).

Some appreciable silver values are also found at Bornite, particularly in association with bornite-rich mineralization in the South Reef area and the Ruby Zone.

6.3.2 Alteration

A long-held view regarding alteration at Bornite assumes that dolomite is the predominant product of hydrothermal alteration. Dolomite is particularly pronounced in 1) certain massive carbonate units; 2) the Lower and Upper Reef debris flow breccias; and 3) the P-Breccia and in some outcrops in the district, especially in the Pardner Hill area. Similar to the trend in copper grade, more intense and complete dolomitization is expressed at the base of both the Lower and Upper Reefs.

Importantly, copper grade generally has a positive correlation with the intensity of dolomite alteration expressed as Ca/Mg ratios of 0.4 to 0.67. Fe-compositions of the carbonates show a significant negative correlation with copper grade. High iron carbonate species, such as siderite and iron-rich ferroan dolomite, exhibit almost no grade, whereas low iron dolomites show strong copper mineralization.

The spatial distribution of the iron-rich dolomites is zoned with high iron siderite and ankerite localized down the plunge of the lowermost debrites in the Lower Reef. Low-iron dolomites, zoned around this basal core of high-iron dolomites, are well mineralized and form an annulus or horseshoe around the core of unmineralized iron-rich carbonates between the Ruby Zone and the South Reef area.

The overall dolomite alteration pattern suggests sourcing of a mineralizing fluid from the south and transport to the north down the principal axes of coarse-grained debris flows. Of critical importance is the limit of iron-dolomites and the strongly open down-dip extension of low-iron dolomites. This supports the possible continuation of significant grade down-dip on the combined Lower Reef/South Reef extension and could constitute a very effective targeting tool elsewhere in the district.

Alteration within the high calcium (Ca) phyllites capping successive debrites is expressed as albitization of pre-existing K-feldspar and the development of magnesium-phengite at the expense of early detrital muscovite, biotite, and chlorite. Increased albite and Mg-phengites are characteristically seen as bleaching of the high calcium (Ca) phyllites with highest intensities of alteration immediately below strong copper mineralization in the debrite breccias.

Work in 2021 suggests that dolostone (dolomite) may occur primarily or only as clasts within conglomerate (breccia) and pre-dates mineralization. Additional work is needed to resolve this important discrepancy.

Figure 6-8 in the following page shows a southwest-northeast-trending schematic cross-section across the South Reef, showing an interpretation of the geology, mineralization, and alteration from the drilling results.

6.4 Prospects/Exploration Targets

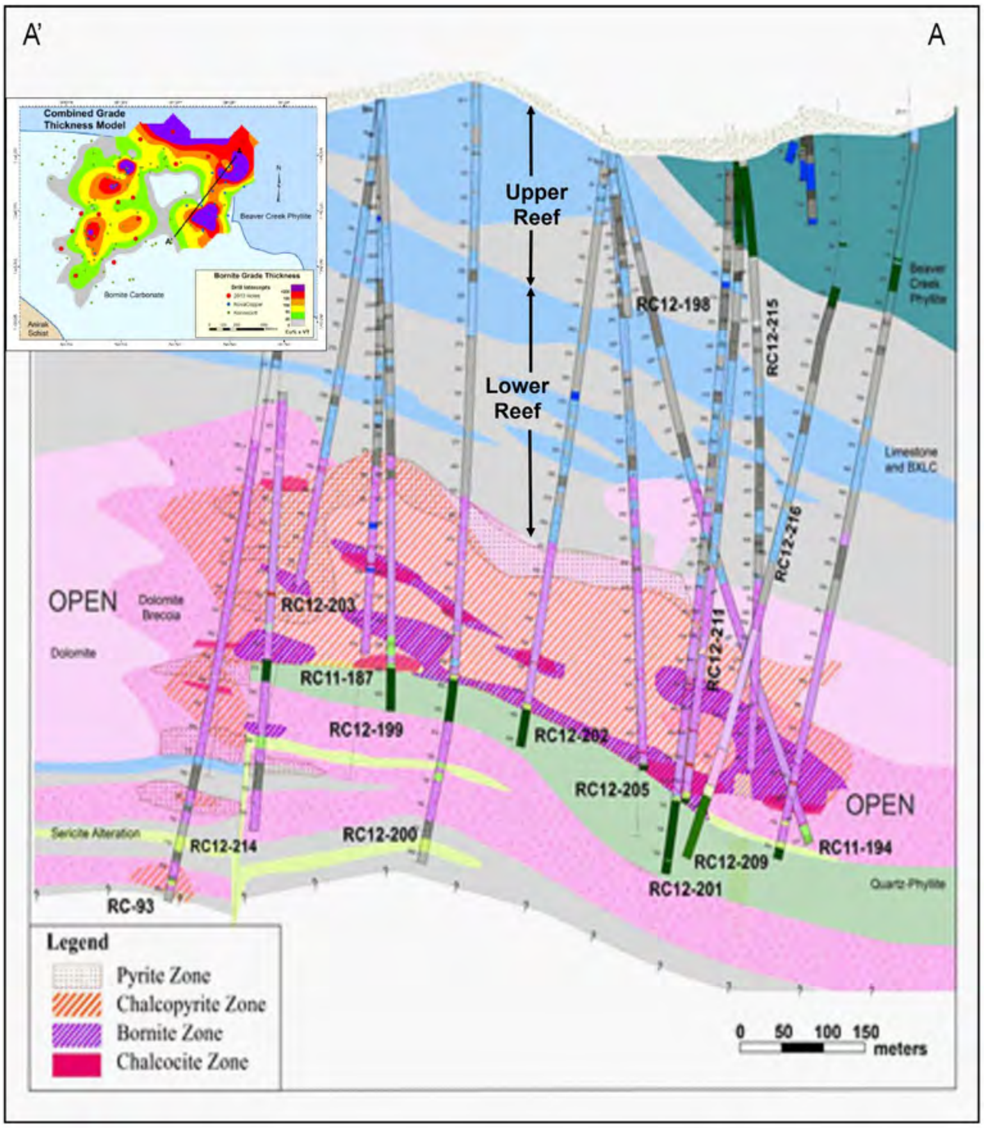
The Bornite carbonate sequence, host to the mineralization at Bornite, is exposed over approximately 16 km along the north slope of the Cosmos Hills and to a lesser extent on the southern margin of the Cosmos Hills arch (Figure 6-1). Numerous areas of hydrothermal dolomitization and copper mineralization occur across the entire width of outcropping carbonates and are the focus of ongoing regional exploration by Ambler Metals. Most notable of the known prospects are the Pardner Hill and Aurora Mountain areas, where outcropping mineralization was discovered and drill-tested during the Kennecott era.

The Pardner Hill prospect is located 5 km west of Bornite (Figure 6-1) and consists of a 3 km copper (± zinc) soil and rock geochemical anomaly in rubble cropping dolostone. Kennecott drilled 16 holes in the area and defined a stratabound copper mineralized zone approximately 150 m by 400 m and varying from 5 m to 35 m thick at the southern end of the geochemical anomaly. Mineralization is cut off by a low-angle fault but remains open down-dip to the north and to the south.

Dolomitization and anomalous copper and zinc geochemistry also characterize the Aurora Mountain prospect located 6 km west of Bornite (Figure 6-1). Anomalies are distributed along a 2 km mineralized horizon about a third of which has been tested by four Kennecott-era drill holes.

Importantly, the evolving understanding of the spatial distribution of the debrite breccias and their control on fluid flow along with the alteration vectoring pattern from high- iron dolomites through progressively iron-depleted dolomites provide an important opportunity to target additional mineralization both down-dip along the Upper and Lower Reefs and in the Pardner Hill and Aurora Mountain areas.

Figure 6-8: Southwest-Northeast Schematic Cross-section through South Reef Illustrating Geology, Alteration and Sulphide Mineral Zoning



(Source: Trilogy Metals, 2016)

6.5 Genesis/Genetic Implications

Recent development of a coherent sedimentary model for the Bornite deposit suggests a carbonate slope environment with a series of debrites characterized by extremely coarse-grained conglomerates (breccias). The lateral and vertical controls on the distribution of dolostone-clast conglomerate remain poorly understood but are likely a function of underlying structural controls, such as syn-sedimentary growth faults.

The overall distribution of dolomite alteration suggests sourcing of a mineralizing fluid from the south and transport to the north. The debrites may have provided important permeability and dolomitization would have been associated with volume reduction and permeability enhancement. Texturally, mineralization occupies breccia interstices and overprints dolostone wallrock via irregular fracture patterns.

From a genetic standpoint, the geochemical trends apparent in the alteration and mineralization along the south-to-north fluid path show initial or proximal high iron, magnesium, and potassium with overall low sulphur to distal high calcium, sodium and sulphur as the system evolved. Copper is broadly zoned around the high-iron core enclosed by low-iron dolomites. Importantly, the reduced (ferrous) iron present in the early assemblage of chlorite, siderite, and pyrrhotite does not support the model that the principal metal transport mechanism was an oxidized metalliferous brine with sulphide precipitation as a result of encountering reductants such as carbonaceous and pyritic phyllites or the surrounding halo of anthraxolite and other organic-C compounds.

6.6 Deposit Types

Copper-cobalt-silver-zinc mineralization at Bornite forms disseminations, veins, and massive sulphides in stacked, semi-stratabound bodies closely associated with secondary hydrothermal dolomitization. The cross-cutting nature of the mineralization along with the presence of early pyrite and sphalerite in sedimentary breccia clasts suggest an epigenetic origin that was temporally very close after the deposition of host strata. Re-Os dating supports this interpretation (Selby et al., 2009).

Data are limited regarding the sources and nature of the copper-rich fluids that formed the Bornite deposit, but they suggest that mineralizing fluids may have formed from the interaction of saline basin fluids with mafic volcanic rocks in the area.

Given these constraints, Bornite has characteristics similar to other districts and deposits including: the Mount Isa and McArthur River districts in Australia, the Tynagh deposit in Ireland, the Kipushi deposit in the Congo, and the Tsumeb deposit in Namibia. All of these deposits show early epigenetic characteristics, emplacement in carbonate stratigraphy, and early pyrite-dolomite alteration followed by sulphide mineralization.

These comparable deposits occur in intra-continental to continental margin settings undergoing extensional tectonics and bimodal volcanism similar to Bornite. Basin-margin faults seem to have been important in localizing mineralization (Hitzman, 1983) although basin margin structures at Bornite have not been directly identified.

An early epigenetic carbonate-hosted Cu-Co model is applicable for exploration targeting in the project area.

7.0 EXPLORATION

7.1 Introduction

Exploration work completed by Kennecott (1957 through 1998) is summarized in Chapter 5. In addition to extensive drilling, Kennecott completed widespread surface geochemical sampling, regional- and property-scale mapping, and numerous geophysical surveys. Most of the data was acquired by NOVAGOLD and has formed the basis for further exploration, targeting Bornite-style mineralization in the Bornite carbonate sequence. The following sections summarizes the QP's interpretation of the exploration information.

7.2 NOVAGOLD (2006)

In 2006, NOVAGOLD contracted Fugro Airborne Surveys (Fugro) to complete a detailed helicopter DIGHEM (frequency-domain EM), magnetic and radiometric survey of the Cosmos Hills. The survey covered a rectangular block approximately 18 km by 49 km which totalled 2,852-line km. The survey was flown at 300 m line spacing with a line direction of N20E. The DIGHEM helicopter survey system produced detailed profile data of magnetics, EM responses and radiometrics (total count, uranium, thorium, and potassium) and was processed into maps of magnetics, discrete EM anomalies, EM apparent resistivity, and radiometric responses.

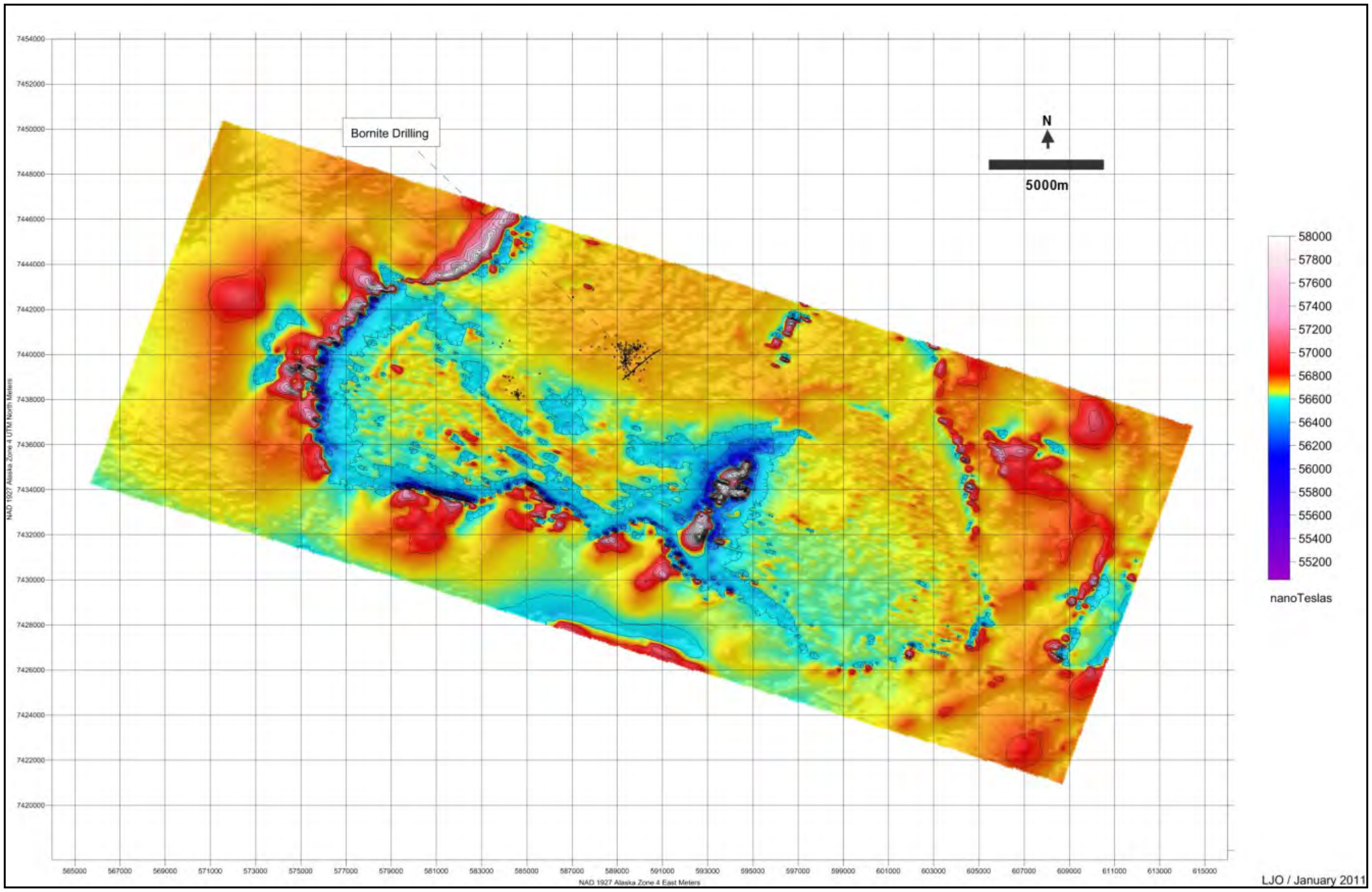
A report and Fugro-processed maps and grids are available (Fugro, 2007). Figure 7-1 shows total field magnetics from the survey.

7.3 NOVAGOLD (2010)

In 2010, in anticipation of completing the NANA Agreement, NANA granted NOVAGOLD permission to begin low level exploration at Bornite. This consisted of re-logging and re-analyzing select drill holes using a Niton™ portable XRF. A drill section across the Bornite deposit was made using Kennecott surface diamond drill holes: RC-27, -29, -32, -35, -53, -58, -62, and -102, and underground drill hole RU-16 that were re-logged and re-analyzed in the Bornite camp in July and August 2010 (Figure 7-2).

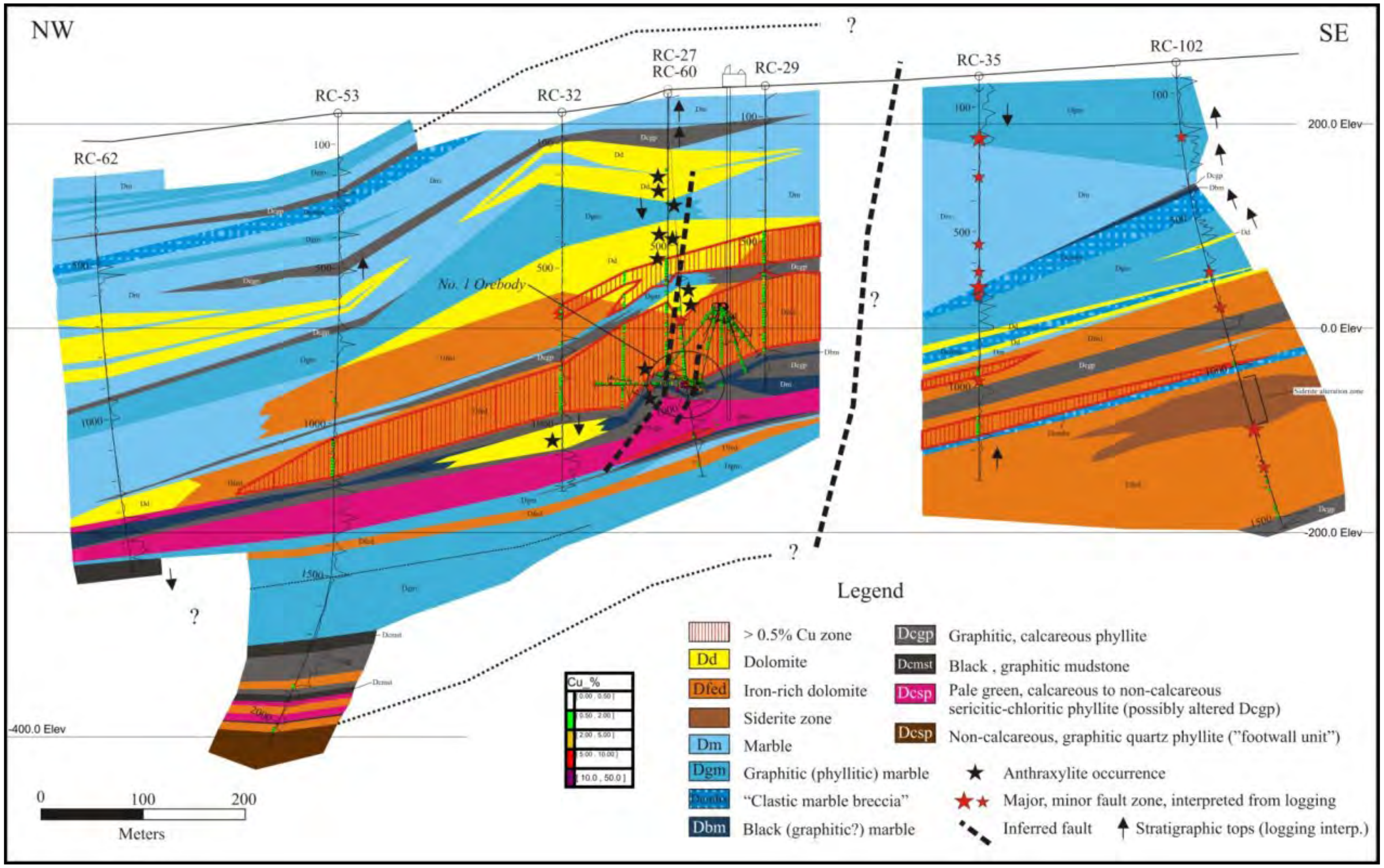
In general, the re-logging and re-interpretation compared moderately well with the 1996 Kennecott interpretation. General relationships apparent in Figure 7-2 include: a thick area of dolomitization centred approximately at drill hole RC-60 corresponding with mineralization and surrounding and overlying the Ruby Zone Upper Reef; iron-rich dolomite, forming an inner alteration zone; and a strong stratigraphic control with mineralization occurring in dolomitized limestones immediately overlying a graphitic phyllite.

Figure 7-1: Total Field Magnetics



(Source: Fugro, 2007)

Figure 7-2: Northwest-Southeast Re-interpreted Profile Across the Bornite Deposit



(Source: NOVAGOLD, 2010)

One notable difference from the Kennecott interpretation was the recognition of a significant stratigraphic and structural discontinuity between the southeastern and northwestern parts of the section. A sharp, apparent truncation or offset of mineralization, dolomitization, and stratigraphic units across this boundary is apparent in the re-logging effort. Interpretation of the discontinuity remains unclear at this time, but it could represent either a post-mineral offset or a major facies transition or both. Interpretation of this discontinuity between the Upper and Lower Reef dolomites continues to be problematic in developing a coherent structural and stratigraphic model for the deposit.

In addition to the 2010 re-logging effort, NOVAGOLD contracted a consulting geophysicist to compile an interpreted unified airborne magnetic map for the Ambler Mining District from Kennecott, Alaska DNR, and NOVAGOLD airborne geophysical surveys (Figure 7-3).

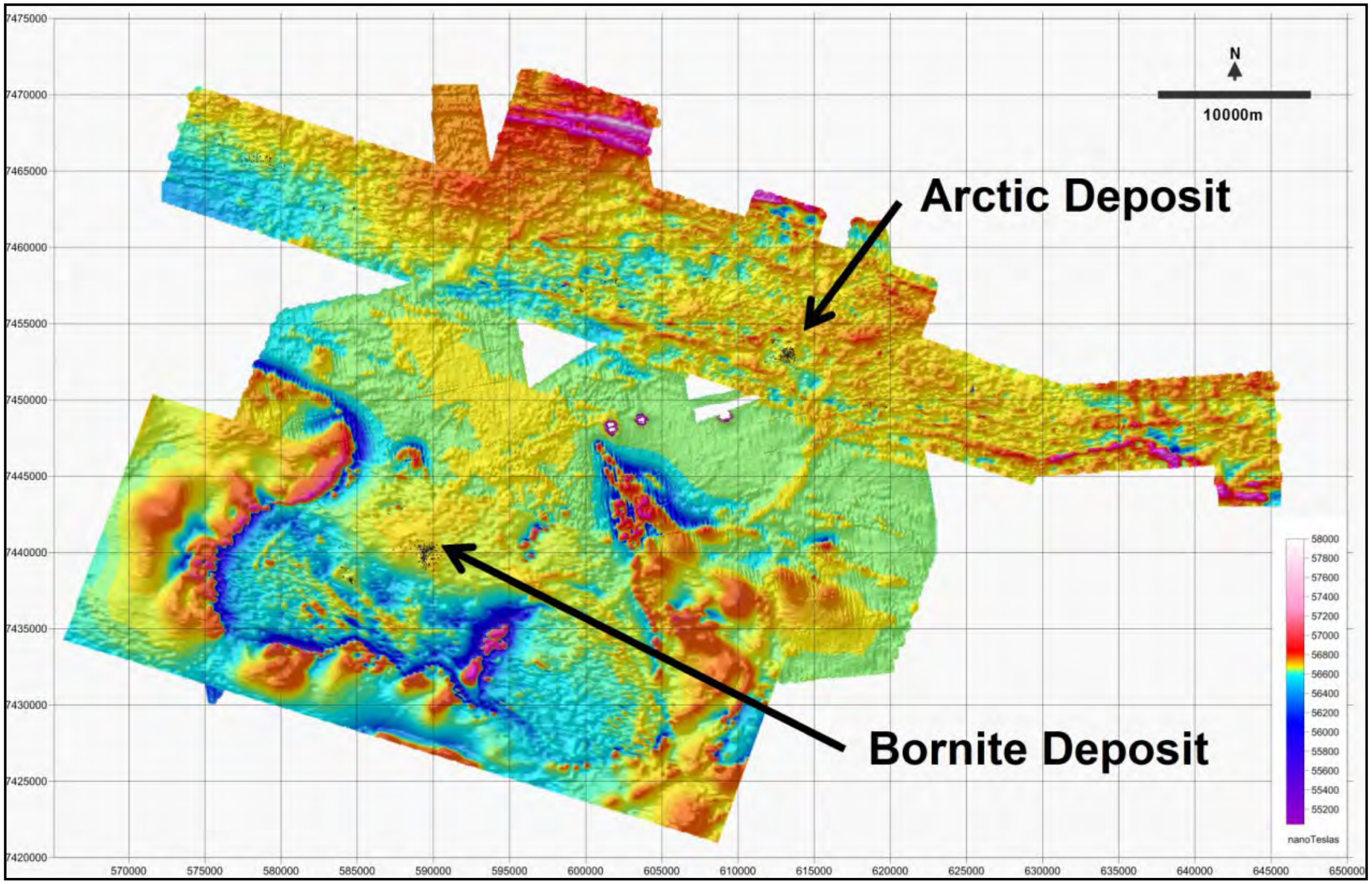
7.4 NOVAGOLD (2011)

In 2011, NOVAGOLD contracted Zonge International Inc. (Zonge) to conduct both dipole-dipole complex resistivity induced polarization (CRIP) and natural source audio-magnetotelluric (NSAMT) surveys over the northern end of Bornite to develop tools for additional exploration targeting under cover to the north.

NSAMT data were acquired along two lines totalling 5.15 line-km; one line is oriented generally north-south through the centre of the survey area and the other line is the southernmost east-west line in the survey area. CRIP data were acquired on five lines: four east-west lines and one north-south line, for a total coverage of 14.1 line-km and 79 collected CRIP stations. The initial objective of the survey was to investigate geological structures and the distribution of sulphides possibly associated with copper mineralization.

Results from the paired surveys show that wide-spaced dipole-dipole resistivity is the most effective technique to directly target the mineralization package. Broad, low-resistivity anomalies reflecting pyrite haloes and mineralization appear to define the limits of the fluid package. Well-defined and often very strong chargeability anomalies are also present but appear in part to be masked by phyllitic units which also have strong chargeability signatures. NSAMT shows similar resistivity features as the IP, but these are less well resolved.

Figure 7-3: District Airborne Magnetics Compiled from Kennecott, AK DNR and NOVAGOLD Surveys



(Source: O'Connor, 2011)

7.5 NovaCopper (2012)

Considering the success of the 2011 geophysical program, Trilogy Metals contracted Zonge to conduct a major district-wide dipole/dipole IP survey, a down-hole IP radial array survey in the South Reef area, and an extensive physical property characterization study of the various lithologies to better interpret the existing historical geophysical data.

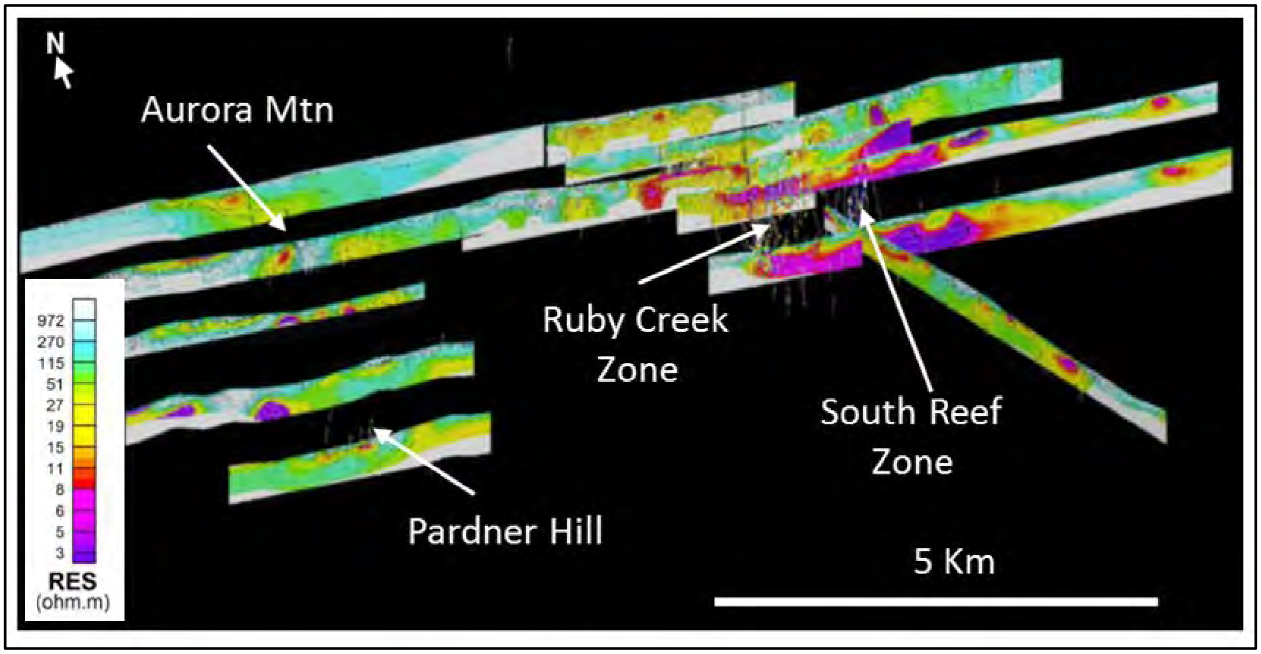
Zonge completed 48 line-km of 200 m dipole/dipole IP during 2012, infilling and expanding on the 2011 survey, and stretching across the most prospective part of the outcropping permissive Bornite carbonate sequence. Figure 7-4 and Figure 7-5 show isometric views and an interpretation of the combined 2011 and 2012 surveys for resistivity and IP, respectively. The results show a well-defined low resistivity area associated with mineralization and variable IP signatures attributed both to mineralization and the overlying Beaver Creek phyllite. Numerous target areas occur in the immediate Bornite area with lesser targets occurring in the Aurora Mountain and Pardner Hill areas and in the far east of the survey area. During the 2012 drill program at South Reef, a single drill hole was targeted on a low resistivity area approximately 500 m to 600 m southeast of the South Reef mineralization trend. Although the drill hole intersected some dolomite alteration in the appropriate stratigraphy, no significant sulphides were encountered.

In addition to the extensive ground IP survey, Zonge also completed 9 km of down-hole radial IP using an electrode placed in drill hole RC12-0197 to further delineate the trend and potential in and around the South Reef.

Extensive physical property data, including resistivity, chargeability, specific gravity, and magnetic susceptibility were captured for use in modelling the existing ground IP and gravity surveys, and the airborne EM and magnetic surveys. In general, some broad comments can be made concerning geophysical domains in and around mineralization at Bornite. Mineralization is characterized by low resistivity <20 ohms, ambiguous but elevated, often irregular chargeability highs (>35 milliradians) marginal to the mineralization, and 3-5 milligal gravity anomalies. Mineralization appears to lie along the flanks of 20-150 nT long wave magnetic anomalies which might reflect deep-seated mafic greenstones deeper in the stratigraphy.

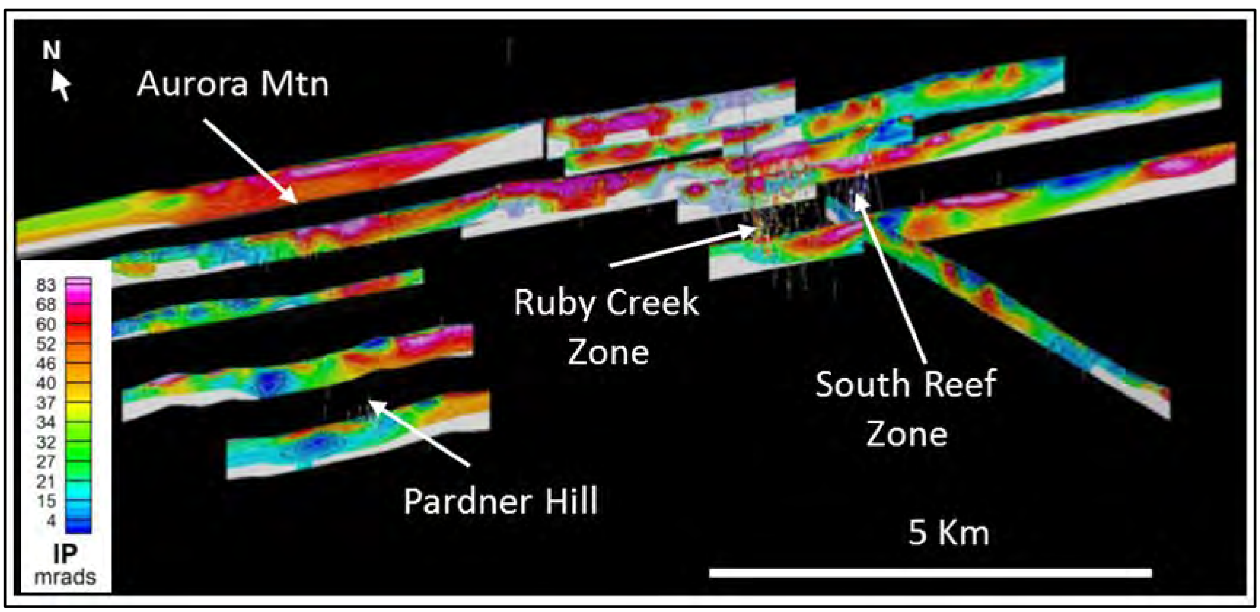
In addition to geophysical-focused exploration, a district-wide geologic map was compiled integrating Kennecott's 1970s mapping of the Cosmos Hills with selective Trilogy Metals mapping in 2012.

Figure 7-4: Isometric View of 2011 and 2012 Resistivity Profiles



(Source: NovaCopper, 2012)

Figure 7-5: Isometric View of 2011 and 2012 Chargeability Profiles



(Source: NovaCopper, 2012)

7.6 NovaCopper (2013)

The emphasis of the 2013 program was to further validate and refine the 2012 geologic map of the Cosmos Hills. A deep penetrating soil and vegetation geochemical orientation survey was completed over the South Reef deposit, using various partial leaches and pH methods. The initial, approximately 1 km test lines suggest a good response for several of the partial leaches of the soils but little response in the vegetative samples. Follow-up sampling was warranted to the north of the deposit into the Ambler Lowlands.

7.7 NovaCopper (2014)

During 2014, exploration work was limited to a re-logging and re-sampling program of historical Kennecott drill core. Work was conducted out of the Fairbanks warehouse and is described in Section 7.16.1.2.

7.8 NovaCopper (2015)

As a follow-up to the 2013 field program, a deep penetrating soil and vegetation geochemical survey was extended north of the deposit into the Ambler Lowlands. Trilogy Metals geologists completed a litho-geochemical desktop study and a comprehensive update to the 3D lithology model.

7.9 Trilogy Metals (2017)

The 2017 field program extended the 2013 and 2015 deep penetrating geochemical (DPG) soil survey another 500 m to the northeast. The 2013 soil line was extended 1,500 m to the east to test over the covered projection of the Two Grey Hills carbonate section. The 3D lithology model was updated to incorporate the 2017 drill program results.

Trilogy Metals also completed a ground gravity survey over a 2 km by 4 km grid with 100 m station spacing over the resource area and extending northeast over the 2017 drill target area. The complete Bouguer anomaly (CBA) residual plot (removes a strong decreasing to the northeast regional gradient) shows good correlation with the Lower Reef mineralization that outcrops on surface with the gravity high gradually decreasing down-dip to the northeast.

As part of the overall gravity program, Mira Geosciences (Mira) created a petrophysical model for the Bornite deposit that synthesized the expected gravity response on surface (forward model) for the 2017 gravity stations. This forward model matches very closely with the actual survey data over the deposit area but diverges on the south end where the expected response of gravity low is actually a strong gravity high that may reflect shallow mineralization up-dip along the South Reef trend. Mira also completed a geologically constrained 3D inversion using the 2017 gravity data. Two areas of anomalously high densities (>2.9 g/cc) were identified. The first area extends up to 750 m to the east-northeast of RC17-0239, which was one of the more successful holes in 2017 and is coincident with the Iron Mountain structure. The second anomaly is located just above the Anirak contact (Lower Reef) to the west of the 2017 target area and 700 m to the north of the closest drill hole (RC-53), which is weakly mineralized along that horizon. This area falls along the northwest-southeast high-grade thickness trend.

7.10 Trilogy Metals (2018)

During the 2018 field season, Trilogy Metals carried out additional DPG and a 2D seismic survey at Bornite. In addition, geophysical and geochemical data from Bornite were studied using existing datasets.

Soil sampling was completed on the westerly extension of the DPG lines on the northwestern portion of the Bornite deposit. DPG was used to assist with outlining the edges of the deposit as well as to corroborate gravity anomalies defined during the 2017 field season.

A 2D seismic survey was completed by HiSeis (3D seismic imaging) in June 2018. This 2D acquisition program was designed to test whether seismic reflection was suitable for the Bornite deposit and to understand the logistics of any future 3D seismic survey over the project area. Two 6 km 2D seismic lines, a dip line and a strike line, were acquired with a total of 792 unique source locations to attempt to image hanging wall and footwall shears; other faults and shears; folding of stratigraphy; internal (within Bornite sequence) phyllite units; facies changes within the dolostones; and direct detection of massive sulphide mineralization; and any alteration associated with mineralization. Acquisition of this 2D dataset used 500 g seismic charges as a means of producing seismic energy. All seismic vibrations were measured on a fully active line of 1,189 geophone receivers which provided up to 6 km of offset on either side of the source using the Aries I seismic acquisition system. Supporting rock property data were acquired from drill core stored in Fairbanks, Alaska.

HiSeis interpreted a zone of weak seismic reflectance (strong bleached zone) within the Bornite carbonate sequence, proximal to the Anirak schist contact. Vertical features (fault array?) extending >3 km deep were identified below this bleached zone. It was hypothesized that the bleached zone represents a zone of alteration within the carbonate sequence near vertical faults that could have acted as fluid-migration pathways. Therefore, this area was identified as prospective for hosting high-grade mineralization. Hole RC18-0254 was designed to target this area up-dip of hole RC18-0224, as the centre of this altered zone had not been adequately tested by previous drilling. The results of this test hole were positive and are discussed in the drilling results below. In conclusion, the results of the 2D survey demonstrate the ability of seismic to image stratigraphy, structure and alteration at Bornite, including zones of low reflectivity related to alteration and possibly indicative of pathways for mineralizing fluids.

Mira Geosciences completed a 3D inversion model of the 100 m spaced ground gravity data that were collected over the Bornite deposit during the 2017 exploration season. Using geology to constrain the model, three areas of anomalously higher gravity were defined. Unfortunately, none of these intervals were properly tested in 2017 with two holes, those at Anomaly "B" and "C", ending above the gravity anomalies. Two of the three identified anomalies from the 2017 inversion modelling changed in size and relative orientation with the updated geologic model. Anomaly B, which stretches to the northwest from hole RC17-0238 decreased in extent, likely the result of a thicker-than-previously-modelled Upper Reef carbonate section in RC17-0238. Anomaly C is much broader and less defined, indicating that it may be the result of underestimating the SG in the lithology model. This anomaly remains untested with the failures of drill holes RC17-0242 and RC18-0245 and should be redrilled in the future. Anomaly A is relatively unchanged and remains coincident with the Iron Mountain structure. Holes RC18-0246, RC18-0249, and RC18-0250 tested the southwest edge of the anomaly where it joins the South Reef trend. Hole RC18-0250 suggests that mineralization wanes to the east, though this hole may have just missed mineralization controlled by the Iron Mountain structure. The northeast extent of this anomaly is still considered a viable exploration target.

South32 completed a QAQC review, lithogeochemical-alteration assessment, and a vectoring/targeting exercise on downhole geochemical data on the Bornite deposit. The purpose of this exercise was to use downhole analyses to assess the geology, alteration, and mineralogy of the deposit to vector towards mineralization. The Bornite sequence can be classified into three geochemical groups including: 1) very low immobiles; 2) low immobiles; and 3) higher immobiles. The latter was then subdivided into five groups based on Al, Cr, and V concentrations. The very low and low immobile groups are predominately limestones and dolomites (including breccias), whereas increasing Al in higher immobiles represent the increasingly argillaceous/micaceous units (phyllites). High Al samples in the lower Bornite sequence can be discriminated from those in the upper sequence based on high Ni:Cu ratios. In the South Reef area, lithogeochemistry, supported Trilogy Metals' geologic model, identified the lower, central and upper Bornite sequence units and distinguished many of the logged phyllites from breccias. The results support Trilogy Metals' interpretation that the Ruby Zone in the Lower Reef is hosted in units corresponding to the South Reef central sequence. Interestingly, the Beaver Creek phyllite could not be distinguished geochemically from the Anirak schists.

Lastly, research on stable isotopes of oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$), based on Conner's 2015 Master's thesis, continued in 2018. Conner (2015) showed that $\delta^{18}O$ becomes depleted with alteration and mineralization in Hole RC12-0202. He concluded that a significant gradient in $\delta^{18}O$ from unaltered marble to dolostone to carbonates is associated with the presence of sulphide mineralization and that ^{18}O equilibrated at the highest temperature experienced by the fluid that interacted with the carbonates. To test this idea, approximately 200 samples were collected from eight drill holes to examine other parts of the Bornite deposit and from Pardner Hill (Hole PH-179). The results show a general pattern of ^{18}O depletion with increasing depth in the upper portions of the reefs that reverses and becomes heavier toward the bottom of the reef. Nevertheless, the result of this work suggests that a reasonable correlation between mineralization and depleted $\delta^{18}O$ exists. Also, Conner (2015) observed that there is a small population of the tan phyllite suite with the lightest $\delta^{13}C$ and among the lightest $\delta^{18}O$. Basal tan phyllites in or near the Anirak contact show this signature at Bornite and Pardner Hill, as do some tan phyllites higher in the section. However, other tan phyllites with values close to the middle of the trends are interpreted to have possible alteration overprints or have formed from a different protolith.

7.11 Trilogy Metals (2019)

In 2019, Trilogy Metals contracted Geotech Ltd. (Geotech) of Aurora, Ontario to complete VTEM Plus (versatile time domain electromagnetic) and ZTEM (z-axis tipper electromagnetic) airborne helicopter geophysical surveys over the Cosmos Hills and the Ambler VMS belt. These survey methods were a significant upgrade over the previous DIGHEM survey flown by Kennecott in 1998 over the VMS belt and the DIGHEM survey flown by NOVAGOLD over Bornite in 2006 due to greater resolution and deeper penetration ability. Magnetics were measured using a cesium vapour sensor, while radiometrics was not collected due to snow cover.

Resource Potentials PTY Ltd. (Resource Potentials), a geophysical consulting company in Perth, Australia designed the program with input from the Trilogy Metals technical team, managed the request for proposal process, supervised the survey program, and performed QAQC analysis of the data collected by Geotech. Resource Potentials also reprocessed the raw signal data from Geotech and modelled the data.

The VTEM survey was flown along 200 m spaced lines, oriented northwest-southeast over the entire Bornite carbonate sequence north of the Cosmos Arch (which hosts the Bornite deposit), with additional lines at 100 m spacing directly above the Bornite resource. A second set of perpendicular lines (southwest-northeast) were flown at 200 m spacing over just the general Bornite area. Tie lines at ~4,000 m spacing were flown perpendicular to the EM flight lines to provide control for the magnetic survey.

The VTEM results from the Bornite sequence are complex and appear to be mostly reflecting bedrock lithologies (the graphitic phyllites). The conductive plates that were modelled are generally coincident with the interpreted phyllite units, as are the apparent anomalies tested by holes RC19-0263 and RC19-0266.

7.12 Ambler Metals (2020)

Trilogy Metals and South32 decided not to proceed with the 2020 exploration program due to the coronavirus pandemic. The Bornite geologic model was updated using the 2019 drill program results. The Irish Centre for Research in Applied Geosciences initiated a machine-learning geochemical modelling project to help define the controls on high-grade copper mineralization.

7.13 Ambler Metals (2021)

During the 2021 field season, the understanding of the Bornite deposit and the potential for additional deposits was advanced with a new interpretation of the carbonate sequence at Bornite and an improved structural understanding of the Cosmos Hills.

A specialist in carbonate geology from Laurentian University re-logged two fences/sections of drill holes, east-west and north-south, through the Bornite deposit, to identify, distinguish and correlate lithofacies within the Bornite sequence and to identify and distinguish different types/ages of dolomitization, including, if possible, their relation to mineralization.

Turner describes the Bornite sequence as a tectonized normal carbonate slope deposit that consists of calcitic material (lime mud) derived from a nearby shallow-marine source area, interlayered with variable amounts of background terrigenous mud (argillaceous proportion increases with distance downslope). The observed sequence includes massive lime mudstone, thin-bedded argillaceous lime mudstone, lime mudstone centimetrically interbedded with terrigenous mudstone, calcareous siltstone, and limestone-clast slope conglomerates. Brookian deformation strained these argillaceous limestone slope deposits to varying degrees producing phyllites and recrystallized, strained limestones/marbles.

Importantly, superimposed on the active limestone slope system is the local presence of dolostone-clast conglomerate. Dolostone clasts are equant and irregular; predominantly dolomudstone (locally with fossil fragments) and are likely derived from subaqueous horst blocks of pre-existing older dolostone and shed into the slope limestone system. The fault scarp(s) that shed dolostone clasts were probably part of a seafloor paleotopographic system that developed during regional extension and associated fault-mediated syn-depositional subsidence.

The Bornite succession contains sedimentary evidence of proximal-distal relationships with respect to both the bedrock doloclast source and the active carbonate slope. Proximal-distal relationships may help locate structures that delivered mineralizing fluids because dolostone conglomerates dominate the stratigraphy in the mineralized areas of the Bornite deposit. Massive sulphide distribution and characteristics suggest that syn-sedimentary faults associated with dolostone-clast conglomerates may have later served as conduits for mineralizing fluids. Turner notes that massive sulphide mineralization seems to preferentially replace matrix of dolostone-clast conglomerates, especially where the dolostone-clast conglomerates dominate the stratigraphy and that sulphides in gangue-filled hydrothermal breccia interstices and veins are also localized to dolostone-clast conglomerates (Turner, 2021).

A better understanding of the configuration of the sedimentary system is recommended as its characteristics could assist in future exploration looking for other Bornite-style deposits. This could be facilitated by developing lithostratigraphic methods to pick out sedimentological characteristics indicating proximity to ancient sea-floor fault(s), lithofacies mapping of all local and regional carbonate exposures that may be affiliated with the Bornite sequence to establish their paleogeographic implications relative to the depositional model and geophysical methods to pick out possible evidence of stratigraphic offsets in the subsurface.

Also initiated in 2021 was structural mapping around Pardner Hill and Aurora Mountain. Initial results indicate: (1) Large carbonate bodies, such as Pardner Hill, Shield Mountain, and probably also Aurora Mountain, are fault klippen in allochthonous contact with the structurally subjacent Anirak schist; (2) Dolostone bodies are typically boudinaged forming metric to hectametric 3D ellipsoids encased in ductilely deformed phyllites and, in some places, calc-mylonites (limestone protolith); (3) Top-South (to SSW) deformation at a number of outcrops in the Cosmos Hills suggest that this entire structural block may have been juxtaposed southward from the position of the Ambler Lowlands or, potentially, from off the top of the Ambler Highlands (Arctic area) during exhumation that was part of the Brookian orogeny; (4) the fault contact with the overlying Beaver Creek phyllite is likely a low-angle normal fault that cuts out of the Bornite deposit to the southeast where Beaver Creek is in structural contact with Anirak schist.

Two diamond drill holes targeting the Bornite copper-hosting carbonate sequence in the Cosmos Hills and Ambler Lowlands were completed during the 2021 field season. Hole ALL21-001 targeted the northeast projection of the Bornite carbonate sequence under cover in the Ambler Lowlands about 7 km east-northeast of Bornite. The second hole, hole RC21-0267 was located at West Bornite, along the Coxcomb Ridge – Pardner Hill saddle, 3.5 km west of the Bornite deposit.

Hole ALL21-001 intercepted alternating units of limestone clastic breccia, dolostone clastic breccia, limestone and dolostone with textures similar to the Beaver Creek carbonates; alternating intervals of argillaceous phyllite, argillaceous limey phyllite, argillaceous phyllitic limestone, and argillaceous limestone clastic breccias. The phyllitic units host trace pyrite mineralization and have geochemical signatures that are similar to Beaver Creek phyllites. Unfortunately, the hole was lost at 335 m without drilling through the carbonate stratigraphy.

Hole RC21-0267 tested the down-dip projection of weakly mineralized dolomitic breccia mapped in the saddle between Coxcomb Ridge and Pardner Hill. The hole intersected argillaceous phyllite (probable Beaver Creek) followed by Bornite sequence: alternating tan phyllitic limestone, tan limey phyllite, argillaceous/carbonaceous phyllitic limestone, limestone clastic breccia, limestone, and argillaceous limestone clastic breccias and dolostone clastic breccia. Trace to locally 1% chalcopyrite, with lesser amounts of sphalerite, and tennantite/tetrahedrite occur through-out a 180 m thickness of dolostone clastic breccia, mostly as disseminations within the breccia matrix and in this carbonate veins. Within this zone a 54.9 m thick interval averages 0.165% Cu starting from 196.5 m. RC21-0267 ended in a quartz phyllite fault zone at 435 m.

7.14 Ambler Metals (2022)

During the 2022 field season, structural mapping around Pardner Hill and Aurora Mountain carried out in 2021 was extended to the south to Cosmos Mountain and to the east to Inerevuk Mountain. In addition, two holes were drilled, hole RC22-0268 at Bornite West to follow up the mineralized interval encountered during the 2021 drilling, and the other at Pardner Hill, hole PH22-0180 to test the down-dip potential of the historical Pardner Hill resource to the south. The results of these two holes are being compiled and interpreted.

7.15 Exploration Potential

Outcropping exposures of the mineralization-hosting carbonate stratigraphy along with large areas of dolomite alteration occur over approximately 18 km of strike along the northern flank of the Cosmos Hills. Historical exploration drilling focused solely on outcropping mineralization and subsurface extensions at the Bornite, Aurora Mountain, and Pardner Hill areas. Much of the carbonate belt has still yet to be evaluated. In addition, airborne geophysics completed in 2006 show the Bornite carbonate sequence and the bounding stratigraphy dip to the north under the Ambler Lowlands toward the Ambler Schist Belt. This opens a large area to explore for deposits beneath the till and recent sediments that occupy the lowlands.

Exploration by Kennecott and Trilogy Metals has used a variety of methodologies. In 1996, Kennecott completed an initial gravity survey of the Ambler Lowlands showing significant gravimetric anomalies that may indicate structural dislocations and potential alteration and mineralization (Figure 5-1). In 2011, Trilogy Metals investigated both deep IP and NSAMT geophysical techniques. Results from the 2011 program led to a 2012 district-wide, 200 m dipole-dipole, deep-penetrating IP survey. Along with extensive physical property data captured for all lithologies, airborne EM and magnetic data, the IP data was used to develop a comprehensive geophysical model of the district to support future exploration targeting. In 2017, Trilogy Metals conducted a more detailed gravity survey that delineated significant north-northeast to northeast oriented structures which appear in part to control local basin morphology and mineralization.

Geochemical methods include conventional and DPG and lithogeochemical vectoring. Test lines using DPG methods with various selective partial leaches of metals proved effective in recognizing margins of South Reef mineralization at significant depths under cover. A recent analysis of the extensive ICP trace element data set at Bornite demonstrates some significant alteration vectors including iron content of various hydrothermal dolomites. Simple XRF analysis of dolomites in the field might prove effective in vectoring toward Fe-poor mineralized dolomite sections.

A better understanding of the basin development and its structural framework is critical to the exploration of Bornite-style systems. Dating of mineralization in the Ambler Mining District suggests that the Ambler schist belt that hosts the Arctic deposit and the Bornite carbonate-hosted mineralization are close to contemporaneous. However, some textural and metamorphic observations suggest a possible Jura-Cretaceous or younger age for Bornite and as such, mineralization at Bornite is suspected to slightly post-date host stratigraphy. This early and extensive syngenetic/early epigenetic signature, along with the overall fluid chemistry of the system investigated by early workers, such as Hitzman (1983 and 1986), point to large saline basin-generated fluid transport as the mechanism controlling the metallogeny of the Ambler Mining District. Importantly, similar metallogenies related to saline, basin-generated fluids and their associated deposits form some of the largest copper districts in the world.

7.16 Drilling

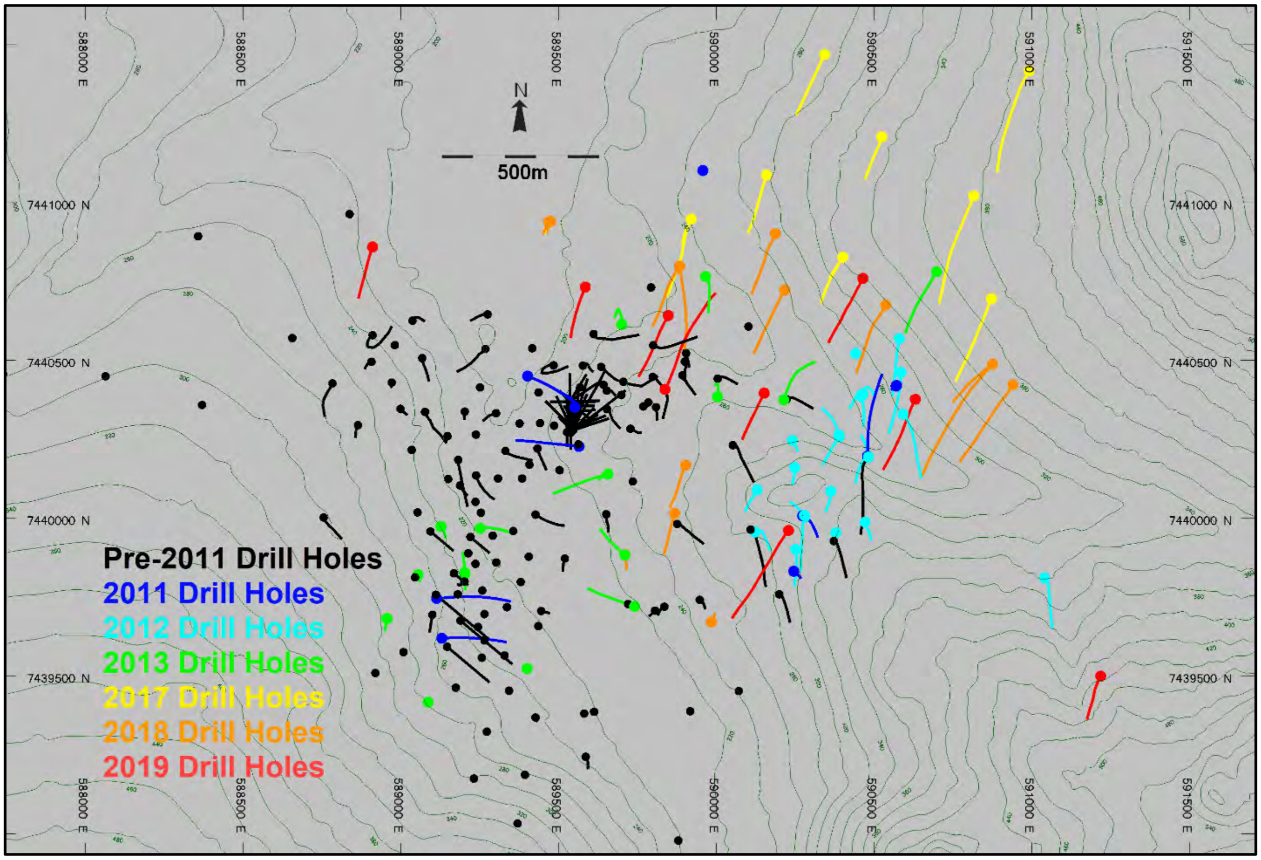
From 1957 to 2019, a total of 273 holes targeted the Bornite deposit during 24 different campaigns; 222 surface core holes and 51 underground core holes were drilled, totalling 106,406 m. All drill campaigns prior to 2011 were completed by Kennecott or its exploration subsidiary, BCMC, and the drill campaigns since 2011 were completed by NOVAGOLD (2011), NovaCopper (2012 and 2013) or Trilogy Metals. The drill campaigns are summarized in Table 7-1. The distribution of drilling by year is shown in Figure 7-6.

Split core from all drill holes, except for Kennecott-era drill holes resampled from 2012 to 2014 by NovaCopper/Trilogy and RC13-230 and RC13-232, has been retained in a storage facility at site for future reference or to provide material for metallurgical studies.

Table 7-1: Summary Bornite Drill Hole Campaigns

Year	Surface Drill Holes	Underground Drill Holes	Metres	Operator	Core Size	Drill Contractor
1957	8	-	1,749	BCMC	AX	Sprague and Henwood
1958	10	-	2,150	Kennecott/BCMC	AX	Sprague and Henwood
1959	15	-	4,932	Kennecott/BCMC	AX & BX	Sprague and Henwood
1960	14	-	4,482	Kennecott/BCMC	AX & BX	Sprague and Henwood
1961	33	-	13,590	Kennecott/BCMC	AX, BX, & NX	Sprague and Henwood
1962	24	-	8,450	Kennecott/BCMC	AX, BX, & NX	Sprague and Henwood
1963	1	-	396	Kennecott/BCMC	BX	Sprague and Henwood
1966	0	26	1,384	Kennecott/BCMC	EX & AX	Sprague and Henwood
1967	0	21	1,862	Kennecott/BCMC	EX & AX	Sprague and Henwood
1968	8	4	3,210	Kennecott/BCMC	BX & AX	Sprague and Henwood
1969	2	-	781	Kennecott/BCMC	BX	Sprague and Henwood
1970	2	-	733	Kennecott/BCMC	BX	Sprague and Henwood
1971	2	-	829	Kennecott/BCMC	BX?	Sprague and Henwood
1972	1	-	466	Kennecott/BCMC	BX?	Sprague and Henwood
1974	2	-	702	Kennecott/BCMC	NX & BX	Sprague and Henwood
1975	1	-	316	Kennecott/BCMC	NX & BX	Sprague and Henwood
1976	6	-	2,170	Kennecott/BCMC	NXWL & BXWL	Sprague and Henwood
1997	3	-	928	Kennecott/BCMC	NX & HQ	Tonto
2011	14	-	5,819	NOVAGOLD	NQ & HQ	Boart Longyear
2012	23	-	16,046	NovaCopper	NQ & HQ	Boart Longyear
2013	17	-	8,140	NovaCopper	NQ & HQ	Boart Longyear
2017	11	-	9,302	Trilogy Metals	NQ & HQ	Tuuq & Major Drilling
2018	15	-	10,363	Trilogy Metals	NQ & HQ	Tuuq & Major Drilling
2019	10	-	7,610	Trilogy Metals	NQ & HQ	Major Drilling
Total	**222**	**51**	**106,406**			

Figure 7-6: Plan Map Showing Drill Hole Locations by Year



(Source: SIM et al., 2022)

In the summer of 2017, Trilogy Metals initiated eleven holes, but four were abandoned due to drilling problems. The seven remaining drill holes stepped-out to the north for distances between 250 m to 400 m from the previous drill holes; these were distances considered too far to support the estimation of mineral resources at that time.

In the summer of 2018, Trilogy Metals conducted a drilling program that included the completion of 12 holes that infilled gaps in previous drilling in the northern, down-dip part of the deposit as well as in the central area between the Ruby Zone and South Reef area. Three additional holes were collared but were abandoned due to drilling problems.

In the summer of 2019, Trilogy Metals completed another drilling program comprising eight holes that tested the continuity of the mineralization within the Bornite deposit and two holes that tested exploration targets located about 1 km south and southeast of the deposit.

Between 2012 and 2014, Trilogy Metals geologists re-logged and re-sampled legacy drill holes in the Ruby Zone and South Reef area which were previously drilled and only selectively sampled by Kennecott. Table 7-2 summarizes the target areas and drill holes by year. These assays were used in the estimation of the current mineral resource, except where duplicates of Kennecott samples were collected. In the case of duplicates, the original assay information was given priority in the mineral resource database.

Table 7-2: Kennecott Drill Holes Re-logged and Re-assayed by Trilogy Metals

Year Re-logged / Re-assayed	Area	Drill Holes
2012	South Reef	RC-92, RC-93, RC-95, RC-96, RC-99, RC-102, RC-163, RC-168, RC-174
2013	Ruby Zone	RC-3, RC-4, RC-19, RC-29, RC-30, RC-34, RC-35, RC-35W, RC-37, RC-48, RC-50, RC-51, RC-54, RC-55, RC-57, RC-61, RC-64, RC-66, RC-67, RC-68, RC-73, RC-83, RC-84, RC-86, RC-87, RC-111, RC-151, RC-152, RC-153, RC-165, RC-166, RC-169, RC-172
2014	Ruby Zone	RC-22, RC-25, RC-26, RC-32, RC-33, RC-40, RC-44, RC-45, RC-47, RC-49, RC-53, RC-56, RC-58, RC-59, RC-60, RC-65, RC-69, RC-70, RC-71, RC-72, RC-74, RC-77, RC-79, RC-80, RC-81, RC-85, RC-97, RC-100, RC-105, RC-107, RC-112, RC-114, RC-150, RC-157, RC-164, RC-170, RC-173

7.16.1 Drill Core Procedures

In the initial years of drilling at Bornite, Kennecott relied on AX diameter core (30.2 mm diameter), but, as drilling migrated towards deeper targets, a change to BX diameter core (41.3 mm diameter) was implemented to help limit deviation.

From 1966 to 1967, drilling activity at Bornite moved underground, and EX diameter core (21.5 mm diameter) was implemented to define the Ruby Zone Upper Reef "No. 1 Ore Body". In 1968, drilling activity moved back to the surface and from 1968 to 1972, BX diameter core was most commonly drilled.

In later years, core size increased to NX (54.0 mm diameter) and finally, in 2011, core size increased to NQ (47.6 mm diameter) and HQ (63.5 mm diameter). Over the years, progressively larger diameter drill rods have been used in an effort to minimize drill hole deviations.

The Kennecott/BCMC and Trilogy Metals drilling was conducted with drill equipment that used imperial measurement units. For the purposes of data management, all imperial units were converted to metric units in the Trilogy Metals database. Trilogy Metals works exclusively in metric units.

7.16.1.1 BCMC/Kennecott

There is limited information with respect to the specific drill core handling procedures used by BCMC/Kennecott. All drill data collected during 1957 to 1997 were logged on paper drill logs, with copies stored in the Kennecott office in Salt Lake City, Utah. Electronic, scanned copies of the paper logs are held by Trilogy Metals and stored in the Fairbanks field office.

Drill core was sawed or split in half with a splitter; half was submitted to various assay laboratories and the remainder was stored in the Kennecott/BCMC core storage facility at the Bornite deposit. In 1995, Kennecott converted the drill assay data, geologic core logs, and down-hole collar survey data into an electronic format. In 2009, NOVAGOLD geologists verified the geologic data from the original paper logs against the Kennecott electronic format and then merged the data into a Microsoft™ SQL database.

Sampling of drill core by Kennecott/BCMC focused primarily on the moderate- to -high grade mineralized zones. Intervals of visible sulphide mineralization containing roughly >0.5% to 1% Cu were selected for analysis by Union Assay Office Inc. of Salt Lake City, Utah. This approach left numerous intervals, containing weak to moderate copper mineralization, un-sampled in the historical drill core. During the 2012 exploration program, Trilogy Metals began sampling a portion of this remaining drill core in select holes in the South Reef area. Trilogy Metals extended this sampling program to the Ruby Zone in 2013 and 2014.

7.16.1.2 Trilogy Metals

The following core handling procedures have been implemented (including programs conducted by NOVAGOLD and NovaCopper). Core is slung by helicopter or transported by truck or all-terrain vehicle from the drill rig to the core-logging facility. Upon delivery, geologists and geo-technicians open and inspect the core boxes for any irregularities. They first mark the location of each drilling block on the core box, and then convert footages on the blocks into metric equivalents. Geo-technicians or geologists measure the intervals (or from/to) for each box of core and include this information, together with the drill hole ID and box number, on a metal tag stapled to the end of each box.

Geo-technicians then measure the core to calculate percent recovery and rock quality designation (RQD). RQD is the sum of the total length of all pieces of core in a run over 12 cm. The total length of core in each run is measured and compared to the corresponding run length to determine percent recovery.

Core is then logged with lithology and visual alteration features captured on observed interval breaks. Mineralization data, including total sulphide species (recorded as percent), sulphide type (recorded as a relative amount), and gangue and vein mineralogy are collected for each sample interval with an average interval of approximately 2 m. Structural data is collected as point data.

Geologists then mark sample intervals to indicate each lithology or other geologically appropriate intervals. Sample intervals of core are typically between 1 m and 3 m long but are not to exceed 3 m long. Occasionally, if warranted by the need for better resolution of geology or mineralization, smaller sample intervals have been used. Geologists staple sample tags on the core boxes at the start of each sample interval and mark the core itself with a wax pencil to designate sample intervals. This sampling approach is considered sound and appropriate for this style of mineralization and alteration.

Drill core is digitally photographed prior to sampling.

Drill core is cut in half using diamond core saws. Specific attention to core orientation is maintained during core sawing to ensure that representative samples are obtained. One-half of the core is retained in the core box for storage on site or at Trilogy Metals' Fairbanks warehouse, and the other half is bagged and labelled for analysis. Samples are selected for specific gravity measurements as discussed in Chapter 8.

In 2013 and 2014, 33 historical drill holes and 37 historical drill holes, respectively, in the Ruby Zone area were re-logged, re-sampled, and re-assayed because these holes had only been selectively sampled by Kennecott. Entire holes were re-logged using Trilogy Metals protocols discussed above. Samples were submitted either as half-core where previously sampled or whole core where un-sampled (to ensure that a sufficient volume of material was provided for analysis). Sample intervals were matched to legacy intervals whenever possible or selected to reflect Trilogy Metals sampling procedures described above.

The objectives of the re-assay/re-logging program were threefold: to implement a QAQC program on intervals previously sampled by Kennecott to confirm the validity of its results; to identify additional lower grade (0.2% to 0.5% Cu), which was not previously sampled; and to provide additional multi-element ICP data to assist in the geologic interpretation of the deposit. A further discussion of the program and its results are incorporated into Chapters 8 and 11.

The 2011 through to 2014 and 2017 NOVAGOLD/Trilogy Metals diamond drilling and re-logging/re-sampling programs used a commercial, computer-based core-logging system for data capture (GeoSpark Logger© developed by GeoSpark Consulting Inc. (Geospark)). During each drill program, all logging data was captured on individual laptops in a Microsoft™ SQL database and then validated and merged into the Bornite camp server. In 2012, the system was modified to allow each laptop to sync daily to the Data Logger database residing on the Bornite camp server. The server was periodically backed up, and the database was sent to Vancouver, British Columbia for integration into the master database. The camp server was stored in the Fairbanks field office at the end of each field season. Hardcopies of the 2011 through 2013 drill core logs are stored in the Fairbanks office.

7.17 Drill Core Recovery

Generally, core recovery has been very good throughout all drilling programs conducted at Bornite. Overall recoveries average 88%, with recoveries in the early programs, conducted in the 1950s through 1970s averaging >86%, and recoveries in drilling since 2011 averaging 90%. There is minimal difference in core recovery by rock type, with phyllites averaging 87% recovery and dolomites averaging 89% recovery. There is no apparent relationship between recovery and grade in the database. There were no adjustments or omissions to the mineral resource database in response to drill core recoveries.

7.18 Collar Surveys

7.18.1 Kennecott

Kennecott provided NOVAGOLD with collar coordinates for all legacy holes in UTM coordinates using the NAD27 datum. During the 2011 field season, the collar locations of 63 legacy surface holes were re-surveyed in UTM NAD83 zone 4N datum. The results of this re-survey were compared to the original Kennecott collar survey data as follows:

- Horizontal errors were found to cluster tightly around zero, with a mean difference of +1.61 m Easting and -0.80 m Northing. Absolute total horizontal error ranged from 0.39 m to a maximum 24.27 m, with a median absolute error of 1.22 m. The 24.27 m difference was considered to be the result of an individual surveying error. Based on these results, the remaining 68 un-surveyed Kennecott drill hole collars were accepted without application of a horizontal correction.
- Vertical errors were identified in the 2011 collar re-survey campaign. The checks revealed a semi-systematic elevation error of about +10 m vertical for most of the legacy collar locations compared to the 2011 re-survey. Elevation differences in the existing database were found to range from -2.17 m to +10.91 m, with a median error of +9.61 m. While these errors show some systematic patterns in space and time, a unifying correction factor for elevation based on the survey results was considered inappropriate. Ultimately, Trilogy Metals assigned collar elevations for all legacy drill holes that could not be re-surveyed

based on the 2010 PhotoSat 1 m resolution digital terrain model (DTM). The collar elevations for the 63 re-surveyed holes were assigned elevations from the 2011 re-survey.

- The benchmark for the shaft and the elevation control for the underground drill hole collar surveys could not be located during the re-survey exercise to provide a reasonable elevation check between the underground survey and the surface elevations of the DTM. Therefore, the underground holes were given a standard +10 m vertical correction consistent with the error observed in the re-surveyed surface holes around the underground workings. As a quantitative check, it was confirmed that the lithological contacts constructed from the adjusted drill holes aligned well with the lithological contacts encountered in the 2011 drilling.

7.18.2 Trilogy Metals

In 2011, collar locations for the 14 holes drilled that year were surveyed by NOVAGOLD using a differential GPS relative to benchmark AAA-1 established by Karl Spohn, PLS, WH Pacific, Inc. (WHPacific), in 2010. An Ashtech Promark 2 GPS instrument was used for these surveys.

In 2012, collar locations for 17 of the 23 holes drilled that year were surveyed by WHPacific professional land surveyors using a differential GPS relative to benchmark "AAA-1". The remaining six holes were surveyed by Trilogy Metals using an Ashtech Promark 2 GPS instrument relative to benchmark AAA-1.

In 2013, collar locations for all 17 drill holes were surveyed by Trilogy Metals using an Ashtech Promark 2 GPS instrument relative to benchmark AAA-1.

The 2017 collar locations were originally surveyed using a hand-held GPS. Following the 2018 drilling program, the 2017 and 2018 collars were surveyed by DOWL (A.W. Stoll) using a differential GPS relative to benchmark AAA-1.

The 2019 drill hole collars were surveyed by Windy Creek Surveys using a differential GPS.

All collar surveys completed since 2011 were conducted in the UTM NAD83 zone 4N datum coordinate system relative to benchmark AAA-1.

Trilogy Metals provided a topographic digital terrain surface derived from a 2010 PhotoSat 1 m resolution model. Drill hole collar locations, surveyed using a differential GPS, correlate very well with the local, digital terrain (topographic) surface.

7.19 Down-Hole Surveys

Approximately 63% of the drill holes in the database have associated down-hole surveys. On a core-length basis, this represents approximately 82% of the drilling, because the more recent holes, which typically have down-hole surveys, tend to be longer compared to the historical drilling.

Since 1961, Sperry-Sun single-shot surveys were conducted on drill holes that encountered significant mineralization. Drill holes with marginal mineralization were often not surveyed. In 1961, Kennecott attempted to conduct down-hole surveys in holes drilled in 1959 and 1960. Of the 51 underground holes, only 11 were surveyed. From 1968 through 1997, down-hole surveys were sporadic. The first six holes of the 1968 campaign, and all holes drilled in 1971 and 1997, were not surveyed.

Four Kennecott drill holes at South Reef that were never surveyed have been assigned projected deviations based on nearby (surveyed) holes (down-hole surveys have been assigned to holes RC-96, RC-95, RC-99 and RC-163). The resulting locations of mineralized intervals in these drill holes mesh better with the overall geologic interpretation of the deposit.

Many of the Kennecott holes in the Ruby Zone are relatively short and, therefore, deviation is not a significant issue. In the deeper drilling at South Reef, Trilogy Metals has appropriately used implied deviations based on local experience.

NOVAGOLD (in 2011) and NovaCopper/Trilogy Metals (in 2012, 2013 and 2017) completed down-hole surveys of all their drill holes using a Reflex Easy-Shot instrument. Trilogy Metal's 2018 program used the Reflex Easy-Trac instrument and the 2019 program used both the Reflex Easy-Trac and Gyro-Sprint instruments. Down-hole surveys were taken on 30 m intervals in 2011, 2017, 2018 and 2019 and on 45 m intervals in 2012 and 2013.

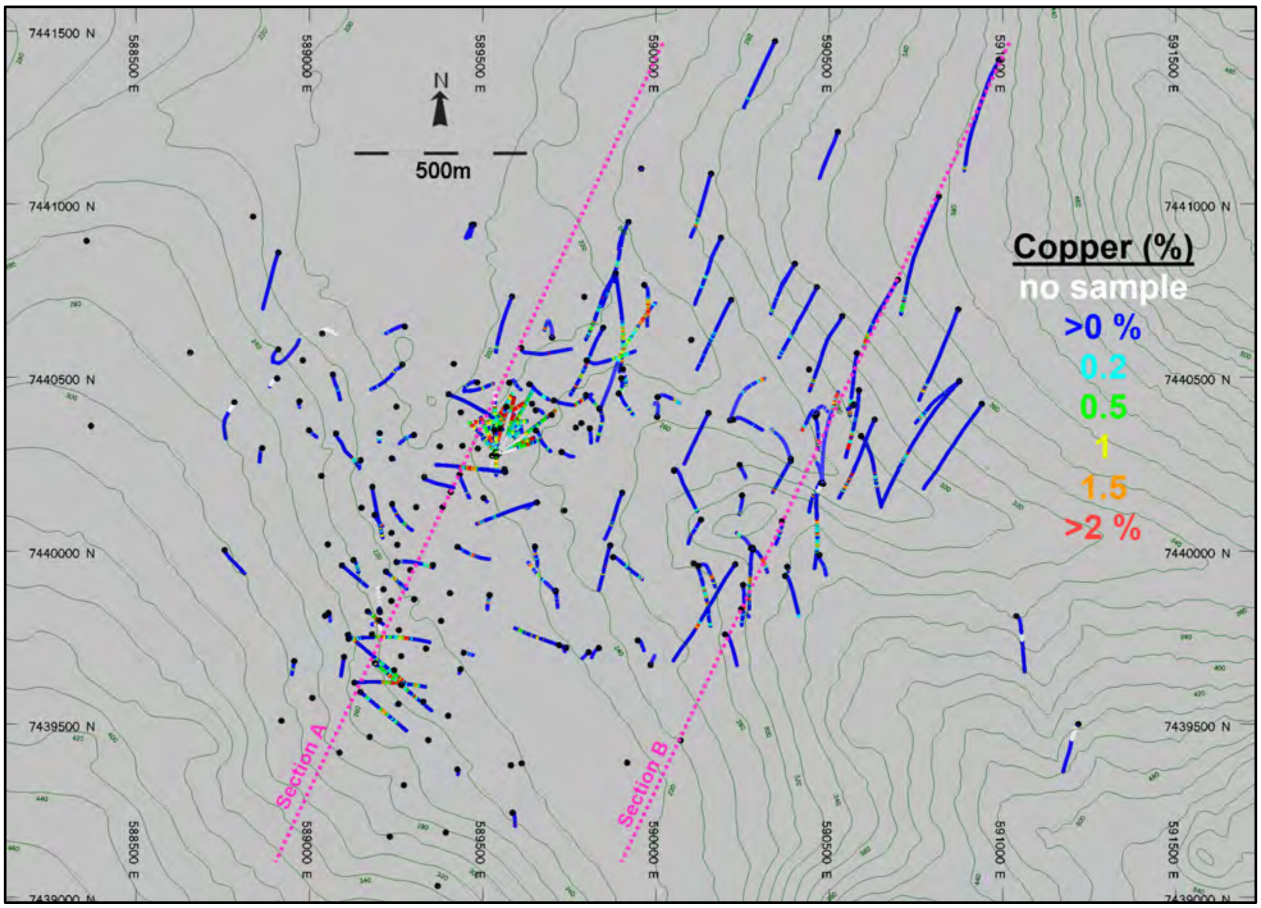
7.20 Summary of Drill Results

Drilling on the Bornite deposit covers an area measuring roughly 2,500 m east-west by 2,500 m north south with holes that approach 1,200 m below surface. The distribution of copper grades in the drilling is shown in plan in Figure 7-7 and in vertical cross-sectional views through the Ruby Zone area in Figure 7-8 and through the South Reef area in Figure 7-9. The distribution of cobalt grades in the drill holes is shown in Figure 7-10. Table 7-3 shows representative drill hole intersections with cobalt grades. In general, drill holes within the South Reef outside pit area show wider ranges of cobalt grades, with higher average grade than the drill holes in-pit. Further interpretation of the geology and mineralization from the drilling results is presented in Figure 6-8, Figure 11-3, Figure 11-4, Figure 11-15, Figure 11-16, Figure 11-19, and Figure 11-20.

7.21 QP Comments on Chapter 7

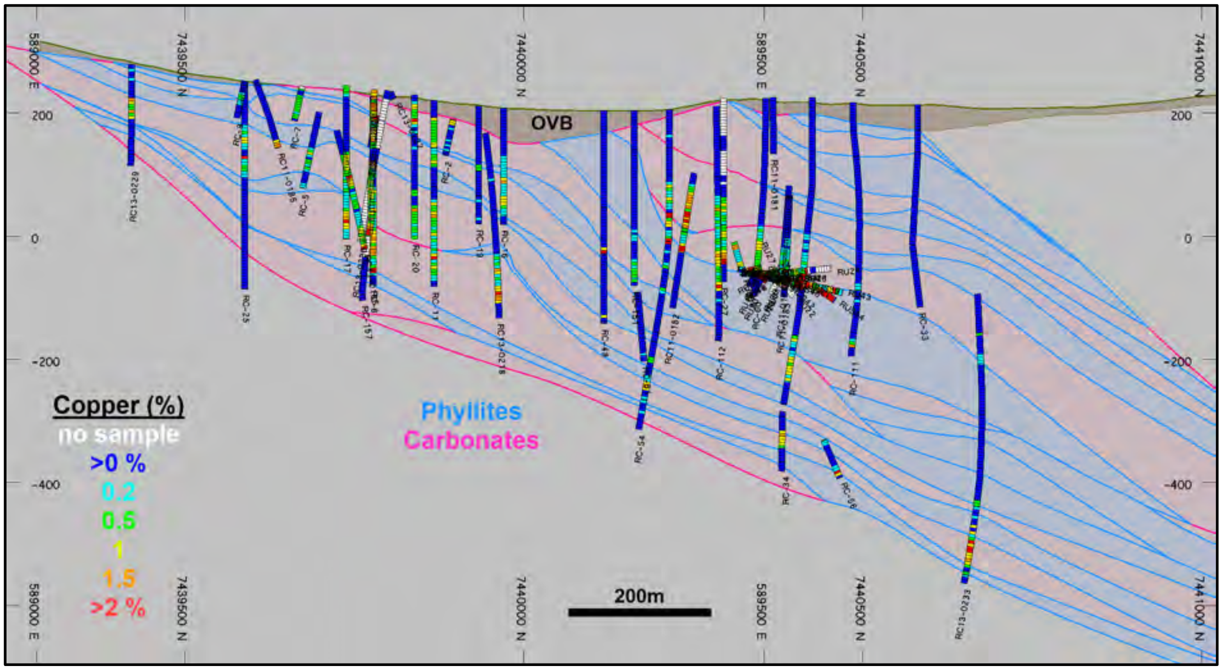
The QP is not aware of any drilling, sampling or recovery factors that could materially impact the accuracy and reliability of the copper results supporting the mineral resource estimate. Preliminary geotechnical data was collected from drill core such as RQD and limited hydrogeology data has been obtained which is sufficient to support early-stage resource estimation.

Figure 7-7: Plan Map Showing Copper in Drilling on the Bornite Deposit



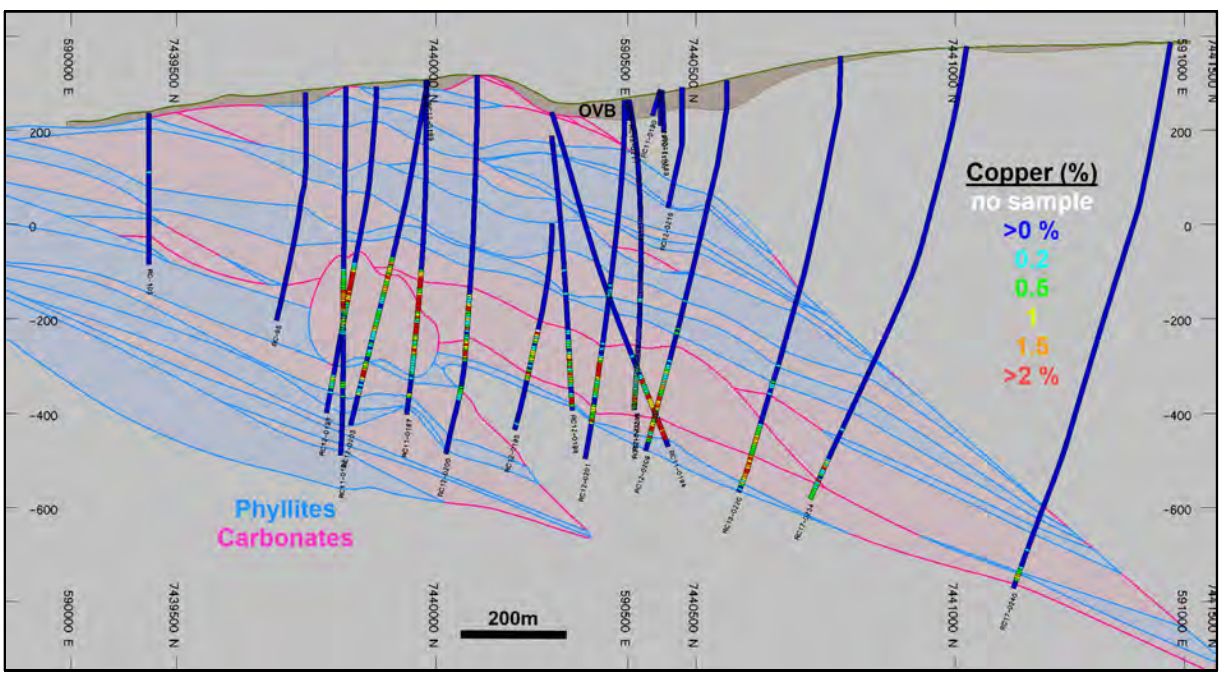
(Source: SIM et al., 2022)

Figure 7-8: Vertical Cross-section (Section A) Showing Copper in Drilling in the Ruby Zone Area



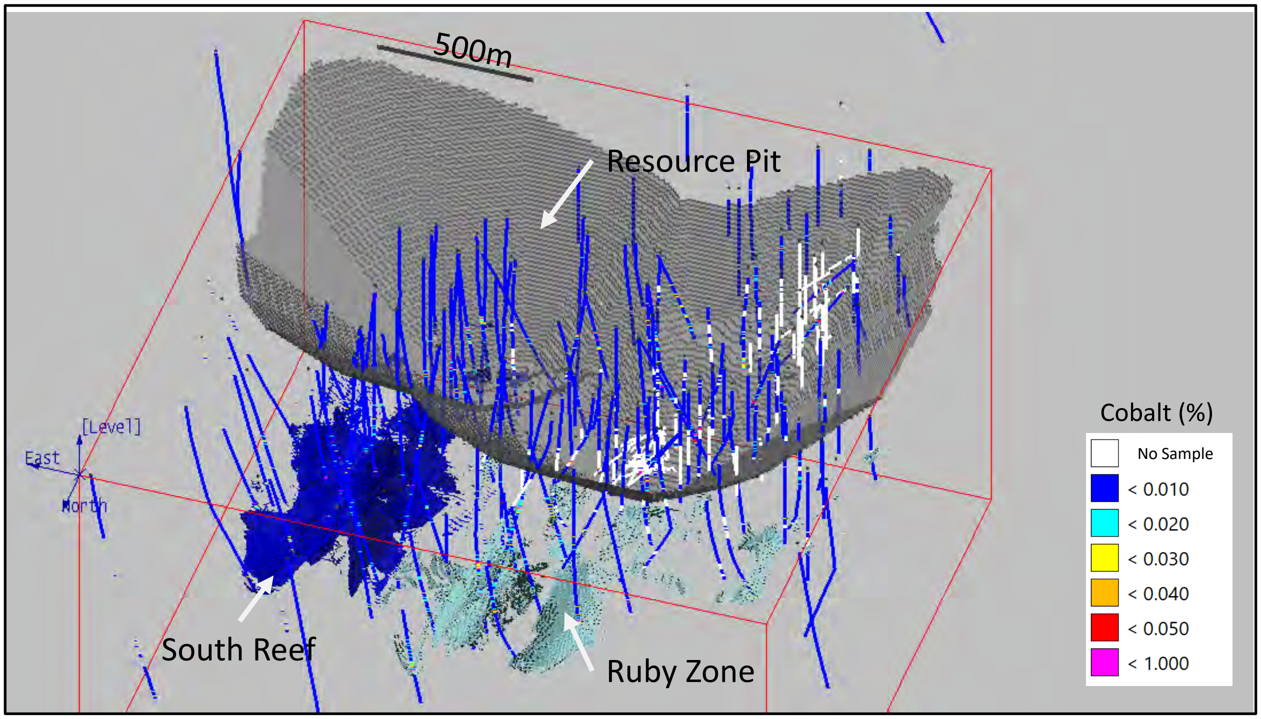
(Source: SIM et al., 2022)

Figure 7-9: Vertical Cross-section (Section B) Showing Copper in Drilling in the South Reef Area



(Source: SIM et al., 2022)

Figure 7-10: Cobalt Grades in the Drill Holes



(Source: Wood, 2023)

Table 7-3: Representative Drill Intersections with Cobalt Grades

Area	Hole-ID	From (m)	To (m)	Sample-ID	Co (%)	Year Drilled
In-Pit	RC11-0186	12.80	15.55	2100472	0.005	2011
	RC11-0186	15.55	16.41	2100473	0.003	2011
	RC11-0186	16.41	19.33	2100474	0.011	2011
	RC11-0186	19.33	22.33	2100475	0.024	2011
	RC11-0186	22.33	25.33	2100476	0.028	2011
	RC11-0186	25.33	28.33	2100478	0.011	2011
	RC11-0186	28.33	31.33	2100479	0.091	2011
	RC11-0186	31.33	32.95	2100480	0.044	2011
	RC13-0229	54.04	54.71	2123467	0.035	2013
	RC13-0229	54.71	57.21	2123468	0.022	2013
	RC13-0229	57.21	59.71	2123470	0.013	2013
	RC13-0229	59.71	62.02	2123471	0.015	2013
	RC13-0229	62.02	64.52	2123472	0.016	2013
	RC13-0229	64.52	67.02	2123473	0.026	2013
	RC13-0229	67.02	69.52	2123475	0.005	2013
South Reef	RC12-0214	480.31	482.19	2114356	0.009	2012
Outside Pit	RC12-0214	482.19	485.05	2114358	0.009	2012
	RC12-0214	485.05	487.94	2114359	0.008	2012
	RC12-0214	498.07	500.10	2114365	0.288	2012
	RC12-0214	500.10	501.70	2114366	0.070	2012
	RC12-0214	501.70	504.62	2114368	0.185	2012
	RC12-0214	504.62	507.55	2114369	0.025	2012
	RC12-0214	507.55	510.27	2114370	0.141	2012
	RC12-0216	701.76	703.36	2114833	0.009	2012
	RC12-0216	703.36	705.67	2114835	0.034	2012
	RC12-0216	705.67	707.29	2114836	0.014	2012
	RC12-0216	707.29	708.24	2114837	0.036	2012
	RC12-0216	708.24	709.90	2114838	0.741	2012
	RC12-0216	709.90	711.22	2114839	0.368	2012
	RC12-0216	711.22	713.08	2114841	0.021	2012

8.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

References to Trilogy Metals applies to its previous name of NovaCopper.

8.1 BCMC/Kennecott

There is limited documentation available describing the sample preparation, security, and analysis of drill core samples collected between 1957 and 1997. The original samples were analyzed by Union Assay in Salt Lake City (Union) or Kennecott's on-site laboratory. The details of the original analytical methods are not available. The on-site laboratory may have used titration for the early years (1952 to 1962) for copper analysis. The Union laboratory used atomic absorption from 1963 onwards. These assumptions are based on the old assay certificates and some sample ledgers with mixed in QAQC check assays. Gold and silver were likely analyzed by fire assay off site.

Between 2012 and 2014, Trilogy Metals completed a re-assay and re-sampling program of the historical drill holes. As a result, 67% of the historical hole assay values are now supported by a current and documented QAQC program. Sample preparation and analysis for these results are described in this section.

8.2 NOVAGOLD/Trilogy Metals

8.2.1 Sample Preparation

The drill core sampling procedures are described in Chapter 7.

After the drill core was sawed in half, one half was retained for future reference and the other half was sent to ALS Minerals (formerly ALS Chemex) in Vancouver, British Columbia for analyses.

Core samples were shipped from the Bornite camp when backhaul capacity was available on the chartered aircraft; this was generally five to six days a week. Rice bags, containing two to four individual poly-bagged core samples were marked and labelled with the ALS Minerals address, project name (Bornite), drill hole number, bag number, and the enclosed sample numbers. Rice bags were secured with a pre-numbered plastic security tie, assembled into loads for transport by chartered flights on a commercial airline to Fairbanks, Alaska, and delivered directly to the ALS Minerals preparation facility by a contracted expeditor. Control samples were also inserted into these shipments at the approximate rate of one standard, one blank, and one duplicate per 17 core samples, as follows:

- *Standards*: Typically, four to five certified standards were used each year (Table 8-1). Standard reference material was purchased from a commercial supplier (CDN located in Vancouver, British Columbia or OREAS located in Melbourne, Australia). Standards were blindly incorporated into the sample sequence. When required, the core cutter inserted a sachet of the appropriate standard, as well as the sample tag, into the sample bag.
- *Blanks*: Blanks were composed of unmineralized marble drill core from an abandoned hole and split to mimic a regular core sample. Blanks were also incorporated blindly into the sample sequence. When required, the core cutter inserted about 150 g of a blank, as well as the sample tag, into the sample bag.
- *Duplicates*: The assay laboratory was instructed to split the duplicate sample and run both splits as two separate samples. The core cutter inserted a sample tag into an empty sample bag.

On arrival, samples were logged into a tracking system at ALS Minerals and weighed. Samples were then crushed and dried, and a 250 g split was pulverized to greater than 85% passing 75 µm.

Table 8-1: Standard Reference Materials Used by Year

2011	2012	2013	2014	2017	2018	2019
Std-ME09	CDN-ME-09	CDN-ME-09	CDN-ME-09	CDN-ME-09	CDN-ME-09	CDN-ME-09
Std-OREAS-111	CDN-ME-18	CDN-ME-18	CDN-ME-1201	CDN-ME-1208	CDN-ME-1208	CDN-ME-1208
Std-OREAS-75a	GBMS304-5	OREAS-24b	CDN-ME-1210	CDN-ME-1409	GBM 911-11	-
Std-OREAS-90	Std-OREAS-90	OREAS-92	OREAS-24b	GBM 911-11	GBM 301-8	-
-	-	Std-OREAS-90	-	OREAS-165	OREAS-165	OREAS-165
-	-	-	-	OREAS-24b	OREAS-24b	-

8.2.2 Density Determinations

Density determinations were not conducted by BCMC/Kennecott on any of the older drill holes. Trilogy Metals conducted specific gravity (SG) measurements on some select historical drill holes during the 2013 and 2014 re-sampling programs.

NOVAGOLD and Trilogy Metals collected 7,476 full-assay-width SG measurements from available historical split core and NOVAGOLD/Trilogy Metals whole core. The samples averaged 2.01 m long and were collected continuously within mineralized zones estimated to have ≥1% chalcopyrite (CuFeS2) or its equivalent copper content (0.3% Cu). In unmineralized zones, samples were collected every 10 m to 15 m.

A digital Intell-Lab Balance was used to determine a weight-in-air value for dried core, followed by a weight-in-water value. The wet value was determined by submerging the entire assay interval within a wire basket into a water-filled tote. The SG value was then calculated using the following formula:

Weight in air / (Weight in air – Weight in water)

Samples were not sealed with wax prior to measuring the weight-in-water. There is minimal porosity evident in the rocks at Bornite and, as a result, this is not considered to be a significant factor in determining density measurements. The density measurements are appropriate for a deposit of this type but wax-coated water immersion checks to confirm porosity does not impact the SG determination, have not been completed.

SG values range from 2.12 to 5.20. One anomalously high SG value of 8.3 was excluded from the database.

8.3 Security

Security measures taken during historical Kennecott and BCMC programs are not known to Trilogy Metals; however, Trilogy Metals is not aware of any reason to suspect that any of these samples have been tampered with. The 2011 to 2019 samples were either in the custody of NOVAGOLD or Trilogy Metals personnel, or the assay laboratories at all times and the chain of custody of the samples is well documented.

8.4 Assaying and Analytical Procedures

The laboratories used during the various exploration, infill, and step-out drill and re-assay programs are summarized in Table 8-2.

Copper and cobalt data were derived using a 48-element suite assayed by inductively coupled plasma-mass spectrometry (ICP-MS) and atomic emission spectroscopy (ICP-AES) methodologies, following a four-acid digestion. The lower detection limits for copper and cobalt are 0.2 ppm and 0.1 ppm, respectively. The upper limits were 10,000 ppm. Over limit (>1.0%) copper and cobalt analyses were completed by atomic absorption (AA), following a four-acid digestion. In 2011 and 2012, gold assays were determined using fire analysis followed by an atomic absorption spectroscopy (AAS) finish. Gold was not analyzed in 2013 or 2014. The lower detection limit was 0.005 ppm Au; the upper limit was 10 ppm Au.

Table 8-2: Analytical Laboratories Used by Operators

Laboratory Name	Laboratory Location	Years Used	Accreditation	Comment
Unknown	Unknown	Pre-2011 specific years unknown	Unknown	-
ALS Analytical	Fairbanks, Alaska	2011 2012–2013 2014 2017 2018 2019	• In 2004, ALS Chemex held ISO 9002 accreditations but changed to ISO 9001 accreditations in late 2004. ISO/International Electrotechnical Commission (IEC) 17025 accreditation was obtained in 2005.	• 2011 to 2014 and 2017 to 2019 • Preparation Laboratory Facility
ALS Analytical	Vancouver, BC	2011 2014 2017 2018 2019	• In 2004, ALS Chemex held ISO 9002 accreditations but changed to ISO 9001 accreditations in late 2004. ISO/International Electrotechnical Commission (IEC) 17025 accreditation was obtained in 2005.	• 2011 to 2014 and 2017 to 2019 • Primary Assay Laboratory
Acme	Vancouver, BC	2012 2013 2015 2017	• Holds ISO 9001 and ISO/IEC 17025:2005 accreditations	• 2012 and 2013 • Secondary Check Sample Laboratory and DPG soil geochemistry
SGS	Vancouver, BC	2014 2017 2018 2019	• ISO/IEC 17025 Scope of Accreditation	• 2014, 2017 to 2019 • Secondary Check Sample Laboratory

ALS Minerals has attained International Organization for Standardization (ISO) 9001:2000 registration. In addition, the ALS Minerals laboratory in Vancouver is accredited to ISO 17025 by the Standards Council of Canada for several specific test procedures, including fire assay of gold by AA, ICP and gravimetric finish, multi-element ICP, and AA assays for silver, copper, lead and zinc. Trilogy Metals has no relationship with any of the primary or check assay laboratories.

8.5 Quality Assurance Quality Control

8.5.1 Core Drilling Sampling QAQC

In 2012, 2013, 2014, and 2017 through to 2019, Trilogy Metals staff performed continuous validation of the drill data during the logging process and after the field program was complete (West, 2013). Trilogy Metals also retained independent consultant GeoSpark Consulting Inc. (GeoSpark) to import digital drill data to the master database and conduct QAQC checks upon import; conduct a QAQC review of paired historical assays and Trilogy Metals 2012, 2013 and 2014 re-assays; monitor an independent check assay program for the 2012, 2013 and 2014 campaigns; and generate a QAQC report for each of the drilling campaigns conducted in 2012, 2013, 2017, 2018 and 2019, including a 2017 review of the cobalt data. QAQC monitoring by GeoSpark included assessment laboratory precision and accuracy using assay results from certified reference standards, blanks and duplicates inserted into the sample stream by Trilogy Metals personnel.

8.5.1.1 Historical Sample Re-assay Review

Historical drilling at Bornite was conducted by Kennecott. It was a leading technical exploration company during its tenure, known for rigorously controlled drilling programs which typically included the insertion of quality control samples. Unfortunately, records from the Kennecott era are incomplete and direct validation of some portions of the database cannot be completed. The current assay database contains results for 39,740 sample intervals including 17,103 (43%) historical hole sample intervals. Between 2012 and 2014 Trilogy Metals completed a re-sampling program of Kennecott historical drill holes. As a result, 11,540 (67%) historical hole intervals now have assay results from ALS Minerals. This includes 863 re-assays of previously assayed historical hole sample interval, representing approximately 15% of the original sample intervals in the historical holes. In the database reviewed by the Wood QP, the original copper values from the KCC/Utah laboratory results are given priority over ALS laboratory results for the 863 re-assay intervals (2% of the database). The database does not distinguish between previously sampled and newly sampled historical intervals or original and new assay values. The Wood QP used the presence and absence of cobalt values to establish re-sampling and re-assay frequency.

A Reduced to Major Axis (RMA) chart prepared by the Wood QP (Figure 8-1) comparing the paired original historical and re-assay copper values indicates there is a 12% high bias in the historical copper after exclusion of 29 outliers. An inflection in the trend of the paired copper values starting at 1% Cu may indicate the bias may be related to an upper detection limit for the original assay procedure and or a change to an overlimit method.

8.5.1.2 Review of 2011 to 2019 QC Results

QAQC reviews are documented in a series of memos (Vallat 2012, 2013a, 2013b, 2014, and 2017 to 2020). The results are summarized in the following subsections by year of campaign.

2011

The 2011 exploration program QAQC was monitored by NOVAGOLD and reported no indication of significant assay quality deficiency.

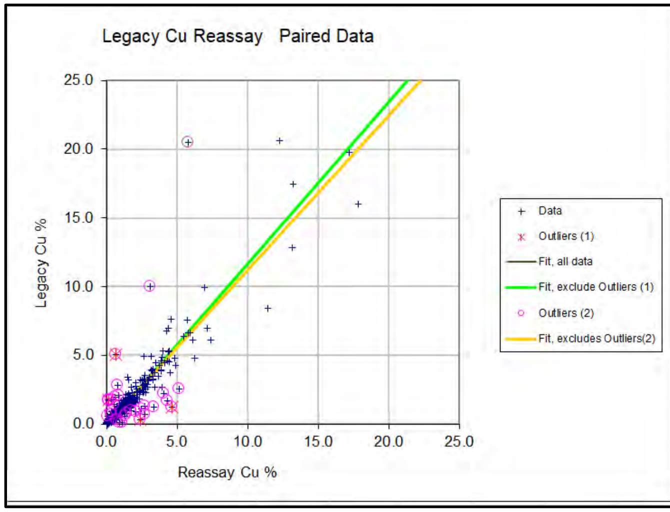
2012

The 2012 exploration program included the drilling of 23 new holes. Review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of the mineralization intersected in drill holes.

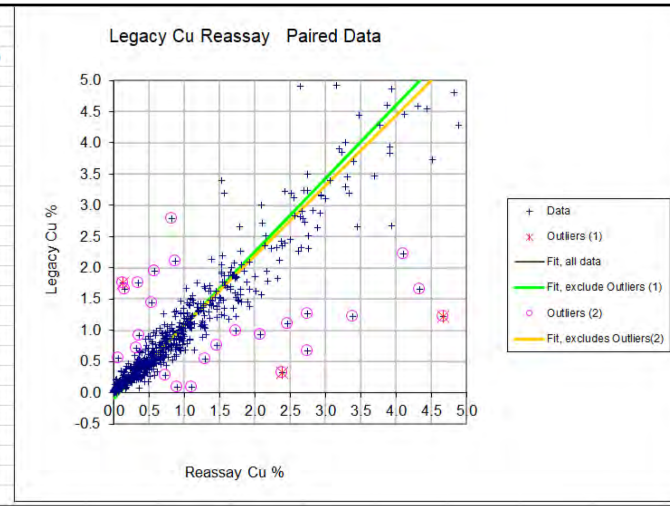
2013

The 2013 exploration program included the drilling of 17 new holes. A review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of mineralization intersected in drill holes.

Figure 8-1: Historical Copper Re-assay RMA Chart



	All Data	Excluding Outliers (1)	Excluding Outliers (2)
N	836	832	807
Percent Rejected	0.0%	0.5%	3.5%
R squared	0.877	0.886	0.953
R	0.936	0.941	0.976
slope m	1.174	1.175	1.123
intercept b	-0.088	-0.088	-0.044
error in slope	0.014	0.014	0.009
error in intercept	0.031	0.030	0.018



(Source: Wood, 2022)

2014

The 2014 exploration program included a large re-sampling and re-assaying program on 37 historical drill holes. Of the 5,819 submitted samples, 5,134 (11,149 m) were from previously un-sampled and un-assayed drill core. The remaining 685 samples (1,503 m) were from drill core that was previously sampled by Kennecott and sent for re-assaying to confirm results.

A review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of mineralization intersected in drill holes.

2017

The 2017 exploration program included eleven drill holes (four were abandoned due to drilling problems) that primarily tested the northern, down-dip area of the deposit. Four additional holes were initiated during the program but were abandoned due to drilling problems. A review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of mineralization intersected in drill holes.

2018

The 2018 exploration program included 15 holes, but three of these holes were abandoned due to drilling problems. A review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of mineralization intersected in drill holes.

2019

The 2019 exploration program included the drilling of 10 new drill holes. A review of the control sample analytical results indicates that the assay results are of sufficient quality to adequately represent the tenor of mineralization intersected in drill holes.

8.5.1.3 Review of 2011 to 2017 Cobalt Assays

The quality control of cobalt was not actively monitored until 2018. In 2017 GeoSpark conducted a review of all cobalt analyses collected between 2011 and 2017. The control samples, duplicate sample pairs, and secondary laboratory check duplicates show good quality for cobalt results within the 2011 to 2017 assay database.

8.5.2 Density Determinations QAQC

A QAQC review of the 2011, 2012, 2013, and 2017 SG determinations were conducted by Trilogy Metals staff and are documented in a series of memos. Where SG determinations have matching assay from/to intervals, a stoichiometric check was completed (West, 2014). The wet/dry measurements compare well with the stoichiometrically estimated values. In addition, outlier SG determinations (below 2.0 and above 5.0) were flagged and evaluated individually by the project geologist.

8.6 QP Comments on Chapter 8

The drill core sampling procedures at site, the laboratory sample preparation and analytical procedures, and the QAQC and security procedures applied by NOVAGOLD and Trilogy Metals for samples collected and analyzed since 2011 are appropriate for the mineralization style observed at Bornite.

Trilogy Metals re-sampled 67% of the historical drill core from the Kennecott drilling completed prior to 2011. These drill holes are now supported by a current and documented QAQC program. Historical copper values greater than 1% that remain in the primary assay database have a risk of being biased high. This issue only impacts the data within the Upper and Lower Reef and does not impact the South Reef.

The QP considers the sample preparation, security, and analytical procedures are adequate to support an Inferred mineral resource.

9.0 DATA VERIFICATION

9.1 Drill Hole Data Transcription Error Checks

9.1.1 Previous Checks

In 2007, historical data (1957 to1997) were compiled from both digital and paper logs supplied by Kennecott into a central Microsoft™ Access database. In 2008, the Microsoft™ Access database was imported into DataShed, a SQL-based data management software program created by Maxwell GeoServices Pty Ltd. In September 2011 (Davis and Sim, 2013; Davis et al., 2014), NOVAGOLD contracted an independent data management consultant to carry out an audit of the 1957 to1997 collar, down-hole survey, sample interval, and assay data. After initial review, collar, down-hole survey, sample interval, and assay data were re-entered into the database from the original data sources in NOVAGOLD 's possession using double entry procedures. All remaining data, including lithology, alteration, and mineralization were not re-entered or validated at the time. Overall, very few errors (<3%) were found between the 2007 and 2008 NOVAGOLD compiled historical database and the re-entered database files. Collar errors were mostly transformation problems between coordinate systems, and errors in down-hole survey data were small azimuth and dip calculation problems. Minor errors in the sample data were generally meterage typos. All errors were addressed and corrected.

In 2011, NOVAGOLD began using a customizable data logger (GeoSpark Logger©) created by GeoSpark. This Microsoft™ Access-based software was used to capture all drilling and surface data. A data entry technician entered the geological information, collar, and down-hole survey data at the Bornite camp. Data were then exported by geologists on-site to Microsoft™ Excel or Microsoft™ Access format and posted on a secure file transfer protocol (FTP) site for the Database Manager in Vancouver. These exports were then imported directly into the DataShed database in Vancouver. Assay data were imported directly from electronic files provided by the laboratories. At the end of the field season, all geological information, collar, and down-hole survey information was visually verified by NOVAGOLD geologists by comparing original files against an export of the database.

Sim et al. (2022) randomly selected 2012 and 2013 drill holes for manual validation. The collar, survey, and assay information for these holes in the electronic database was checked against original data sources, and no significant errors or differences were found.

Sim et al. (2022) randomly selected an additional 16 Trilogy Metals-era drill holes and compared the copper and cobalt grades the certified assay certificates. No significant errors were found.

9.2 Drill Collar Validation

9.2.1 Previous Checks

In 2011 (Davis and Sim, 2013), the collar coordinates for 63 historical surface holes, including fourteen 2011 drill holes used in the 2012 Ruby Creek (now known as Ruby Zone) resource estimate, were surveyed or re-surveyed in 2011 using UTM NAD 83 zone 4 coordinates. The remaining 119 surface and underground drill holes had the original collar horizontal coordinates directly converted to UTM NAD83 zone 4 coordinates. The comparisons of new and historical collar elevations indicated an inconsistent, but approximate, +10 m variance. The surface drill holes that were not re-surveyed had the collar elevations assigned the surface elevation from the 2010 PhotoSat 1 m resolution DTM. The underground drill hole collars had a +10 m adjustment assigned to the original collar survey data.

In 2012, five of the six historical drill holes, that are part of the South Reef resource, were located and surveyed. The original horizontal Kennecott collar coordinates for drill hole RC-163 (the one drill hole not found) was accepted and included. The collar elevation for drill hole RC-163 was assigned the surface elevation from the 2010 PhotoSat 1-m resolution DTM.

9.2.2 Current Checks

During a site visit in 2022, the Wood's geology and resource QP measured five surface drill collars with a handheld GPS unit. Out of five drill collars, one drill collar was off more than 40 m when compared to the collar database. After further investigation, Ambler Metals identified seven drill collars in the database with planned coordinates, rather than the surveyed coordinates. Wood's geology and resource QP recommends additional validation of the drill collar database for the next resource model update; however, considers the existing database sufficient to support Inferred mineral resources.

Underground drill holes have not been resurveyed.

9.3 Down Hole Survey Validation

The drill plan view map shows several drill collars with no drill trace evident, indicating vertical holes with no down hole deviation. Inspection of the drill hole survey file revealed 111 drill holes have no down hole surveys, 66 of which are vertical and 30 of which are 300 m long. The plan map also shows drill hole traces with excessive deviation or unusual kinks, usually between the collar and the first down hole survey. A check for the presence of any large discrepancies between sequential dip and azimuth readings revealed 10 holes with between-survey measurement reading in excess of 2x an expected tolerance of 5° in 30 m and 14 holes with between-survey measurement readings in excess of 1.5x an expected tolerance of 5° in 30 m. All but three of the suspect drill traces are from the historical drill programs.

9.4 Assessment of Historical Assay Data

The high grade Upper and Lower Reef zones are primarily supported by holes drilled pre-1960 (Lower Reef) and between 1966 and 1967 (Upper Reef). Although NOVAGOLD and Trilogy Metals completed a substantial re-assay program, very few samples within the high-grade Lower Reef zone and no samples within the Upper Reef zone are re-assayed. A comparison of historical samples that were re-assayed in 2012 and 2013 indicates a potential significant high bias in historical copper grades greater than 1% Cu. While this is not a direct assessment of the pre-1960 samples within the Upper Reef zone it does indicate that historical copper assay results that have not been replaced by re-assay results may be biased high in copper. The three or four holes drilled post-2011 within each of these zones do not provide enough samples to make a reliable assessment of possible bias in the original results within these zones. There are also no original or re-assay cobalt results for most of the Lower Reef zone drill hole samples and no original or re-assay cobalt results for any of the drill hole samples supporting the Upper Reef zones.

9.5 Site Visit Observations

Wood's geology and resource QP visited the Bornite Property from August 29 to September 9, 2022. During the visit, he reviewed drill core, measured drill collars with a handheld GPS unit, visited the historical trench area and viewed the deposit area by helicopter.

The geologic descriptions appeared to be reasonable, and visual observations of the copper-bearing minerals present reflected the grades in the sample database. No witness samples were taken by the Wood geology and resource QP to verify the results during the site visits, as there had been extensive re-sampling of drill core by Trilogy Metals and there was clear visual evidence of mineralization in the core. In the opinion of Wood's geology and resource QP, the exploration activities used at Bornite follow generally accepted industry standards.

9.6 Metallurgical Data Verification

The QP has reviewed the metallurgical testwork reports, the analytical procedures, qualification of the laboratory, and presentation of the test results and considers all to have followed industry accepted practice.

9.7 QP Comments on Chapter 9

9.7.1 Geology and Resource QP Comments

Drilling, surveying, sampling, and assaying by NOVAGOLD and Trilogy Metals since 2011 have been conducted using appropriate tools and methods for quality control and data entry procedures.

Inspection of the historical drill hole data has revealed some issues with collar, down hole survey and assay results. There are 183 historical holes representing 46% of the total drilled metres in the Bornite database 177 of which are in the Ruby Zone and six of which are in the South Reef area. There are no significant concerns with the current collar survey records. Errors such as using planned instead of actual coordinates are minor and were corrected in the database when identified. Coordinates determined from calculated transformations of drill holes that cannot be resurveyed are reasonable. The absence of down hole survey measurements for a large portion of the historical database is partly mitigated by the limited length of the holes. The few long holes without down hole survey measurements and the local suspect measurements are not expected to have a material impact on the outcome of the mineral resource estimate. Twenty-three percent of the historical assays have no available supporting quality control, many of which are within the two high-grade Ruby Zones. Re-assay work indicates a potential high bias for the higher-grade portion of these original results. Issues identified are manageable by the significant number of drilling and sampling that has been undertaken, and restriction of the resource classification to the Inferred category.

Wood's geology and resource QP's review of the database transcription error checks is considered adequate and provides sufficient support for the database to be judged as acceptably error free.

9.7.2 Metallurgical QP Comments

In the opinion of the QP the metallurgical data is adequate for the purposes used in this Report.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

10.1 Introduction

A number of metallurgical studies have been completed on samples collected from the Bornite deposit with metallurgical testwork campaigns conducted at the Kennecott Research Centre (KRC), ALS Metallurgy (Kamloops) and SGS Mineral Services (Vancouver). A majority of the testwork has been completed under the direction of Trilogy Metals. Studies to date are limited to the recovery of copper from the Bornite deposit samples. There have been no detailed studies to date that evaluate the process characteristics of the cobalt mineralization present at the Bornite deposit.

10.2 Historical Testwork

In 1961, Kennecott collected 32 coarse reject samples from five drill holes intersecting the Bornite deposit (RC-34, RC-54, RC-60, RC-61, and RC-65) to support preliminary metallurgical testwork conducted at KRC. Samples targeted high-grade (>10%) copper mineralization from the Ruby Zone Upper Reef ("No. 1 Ore Body") (BCMC, 1961).

All sample intervals, weighing approximately 68 kg in total, were composited using weighted compositing methodology. Prior to compositing, each sample was crushed and screened to pass a 10-mesh screen. The grade of the composited sample, based on the assay results of the individual samples, was 13.9% Cu.

Locked-cycle laboratory testwork suggested that 97.64% of the copper was recoverable in a concentrate assaying 43.90% Cu. Fine-grinding to 5% passing +200-mesh was required to obtain the liberation of copper minerals from pyrite necessary for such a high recovery. Mineralogical testwork on the composite sample showed high-grade mineralization of the Ruby Zone Upper Reef is dominated by bornite with subordinate chalcocite and chalcopyrite.

It is not known whether the testwork conducted by Kennecott used samples representative of the various types of high-grade mineralization or whether any deleterious elements were encountered during the tests.

10.3 Metallurgical Testwork Programs Initiated by Trilogy Metals

A total of four metallurgical testwork programs have been conducted on materials from the Property under the supervision of Trilogy Metals. A summary of the testwork schedule and samples completed is shown in Table 10-1.

In 2012, Trilogy Metals contracted ALS Canada Limited (ALS Metallurgy), located in Kamloops, British Columbia which is ISO 9001:2008 certified and ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories accreditation and independent of Trilogy Metals, to conduct preliminary sample characterization and flotation testwork on mineralized samples collected from the South Reef area. To the extent known, the samples are representative of the styles and types of mineralization present in the South Reef area. The program at ALS Metallurgy was based on traditional grinding and flotation testwork aimed at producing saleable copper concentrates. The testwork continued into 2013, and the results were summarized in ALS Metallurgy (2013).

In 2017, Trilogy Metals contracted SGS Canada Inc. (SGS), located in Burnaby, British Columbia and independent of Trilogy Metals to conduct detailed metallurgical testwork on a series of samples that represent the lower grade mineralization within the constraining pit shell. The certification of SGS is unknown. This work followed the preliminary flowsheet and process options outlined in the 2012/2013 testwork. This testwork continued into 2018, and the results were summarized in SGS Canada (2018).

Additional metallurgical testing was conducted by ALS Metallurgy in 2018/2019 and again in 2020/2021 which followed on from the process development of the earlier testwork. The results of these test programs were presented in ALS Metallurgy (2019, 2021).

Table 10-1: Summary of Bornite Metallurgical Testwork Programs Initiated by Trilogy Metals

Year of Testwork	Research Facility, Project Number, and Report Date	Comments on Testwork Program
2012/2013	ALS Metallurgy, KM3621: June 20, 2013	Testwork on four high-grade South Reef composites
2017/2018	SGS CAVM 50296-001: July 4, 2018	Flotation and Comminution Testing Five composites
2018/2019	ALS Metallurgy, KM5705: April 18, 2019	Flotation and Comminution Testing Nine composites
2020/2021	ALS Metallurgy, KM6184: March 12, 2021	Flotation and Comminution Testing Five composites

10.3.1 Test Samples

The various composites used in metallurgical testing are summarized in Table 10-2. Details of all test sample intervals are contained within the respective testwork reports.

Table 10-2: Summary of Chemical Analyses of Metallurgical Composites

Sample	Cu (%)	Co (ppm)	Fe (%)	S (%)	Zn (%)	Au (g/t)	Ag (g/t)
2012/2013 Samples KM3621							
Composite 0.5–1.0	0.65	-	4.9	2.04	0.02	0.01	<1.0
Composite 1.0–2.0	1.21	-	4.9	3.29	0.01	0.01	1.0
Composite 2.0–10.0	4.04	-	11.6	13.9	0.70	0.12	1.0
Composite >10.0	17.3	-	14.6	18.1	0.71	0.24	13.0
2017/2018 Samples CAVM 50296-001							
Dev. Composite 1	1.11	200	7.72	8.29	0..21	0.02	<0.02
Dev. Composite 2	0.91	200	5.97	4.91	0.11	0.05	<0.02
Dev. Composite 3	0.91	200	6.01	4.87	0.1	0.03	<0.02
Dev. Composite 4	1.45	300	10.4	11.6	0.09	0.04	<0.02
Dev. Composite 5	1.00	300	9.12	10.2	0.16	0.03	0.04
2018/2019 Samples KM5705							
Composite 1	1.56	413	6.7	5.88	0.18	0.03	2
Composite 2	0.95	229	10.0	10.4	0.28	0.02	1
Composite 3	1.03	154	8.2	8.4	0.03	0.02	2
Composite 4	2.29	682	6.6	5.77	0.22	0.04	3
Composite 5	1.80	294	4.6	4.19	0.02	0.01	2
Composite 6	0.76	153	5.8	4.69	0.03	0.01	1
Composite 7	1.98	244	7.4	7.48	0.05	0.04	1
Composite 8	3.00	560	7.5	6.94	0.17	0.03	2
Composite 9	4.16	257	6.2	6.65	0.01	0.13	1
2020/2021 Samples KM6184							
Composite 10	1.30	264	7.1	7.22	-	0.04	2
Composite 11	2.01	379	10.6	11.2	-	0.06	5
Composite 12	3.21	901	6.5	5.13	-	0.04	1
Composite 13	1.88	150	3.4	1.62	-	0.04	3
Composite 14	2.12	163	5.4	4.08	-	0.10	1

The 2012/2013 testwork program used 71 individual drill core (half core) sample intervals totalling 262 kg of material from the South Reef area located between 400 m and 600 m below surface. Individual samples were combined into four composites, which were prepared to represent a range of copper grades (0.5% to 1.0% Cu, 1.0% to 2.0% Cu, 2.0% to 10.0% Cu, and >10.0% Cu).

The 2017/2018 testwork program prepared five large composite samples (development composites) from two drill holes for use in detailed flotation testwork. As well, 15 variability samples were prepared as sub-samples for use in grinding testwork from this same drill core. These samples represent lower grade mineralization within the constraining pit shell.

The 2018/2019 test program was conducted on nine large composite samples, each representing approximately 40 m of drill core intercept. Composites were selected over a range of grades that generally reflect both open pit and underground mining scenarios. Significant differences in overall copper recovery were observed, with the higher-grade samples showing higher copper recoveries when compared to the lower grade samples. Detailed recovery data are shown in Table 10-4 in Chapter 10.3.4.

The 2020/2021 test program was conducted on five large composite samples, each representing approximately 40 m of drill core intercept. These were higher grade samples that generally reflect material that may be amenable to underground mining methods.

10.3.2 Mineralogical Investigation

All of the metallurgical testwork programs contained some component of mineralogical analysis of the various Bornite feed samples. Details of mineralogical evaluations are contained in the respective testwork reporting.

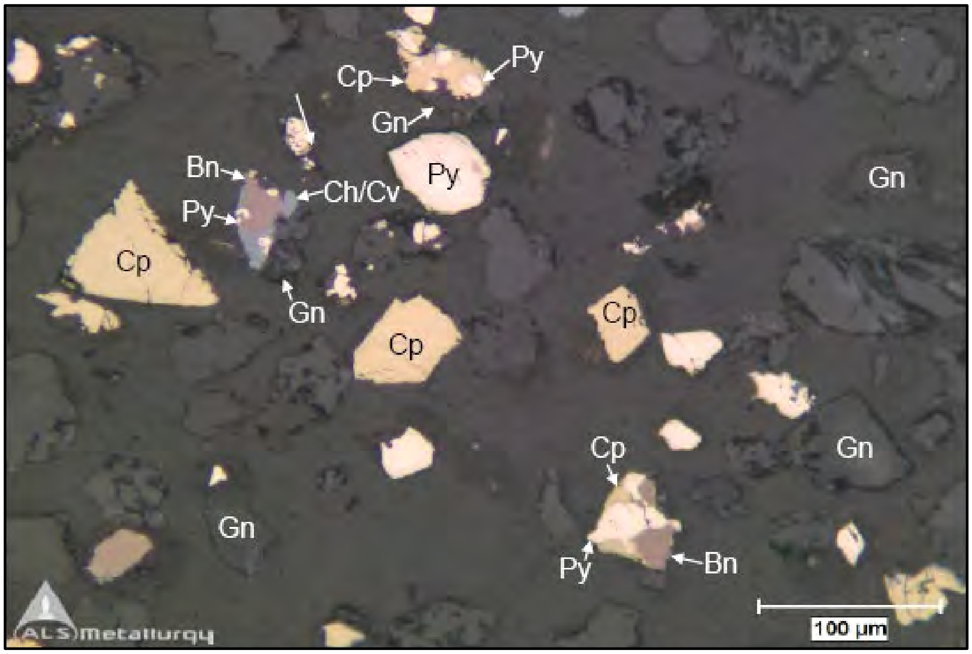
In summary, the Bornite materials require grinding to approximately 100 microns to achieve liberation targets supporting a rougher flotation stage to maximize the recovery of copper.

Re-grinding of copper rougher flotation concentrates requires fine grinding in the range of 10 to 20 microns to achieve liberation targets for final concentrate production. A portion of the copper mineralization is fine grained and associated with gangue minerals requiring the fine re-grind prior to flotation cleaning stages.

A typical photomicrograph of the 1.0% to 2.0% Cu composite from the 2013 ALS Metallurgical test program is shown in Figure 10-1; typical, liberated copper minerals are shown as well as somewhat complex chalcopyrite/pyrite/bornite multiphase particles.

The higher-grade materials contain significant concentrations of bornite, chalcocite and covellite which may lead to the production of higher-than-average grade copper concentrates, when the flotation process is finally optimized.

Figure 10-1: Typical Grain-Size Distribution Observed (KM3621)



(Source: Trilogy Metals, 2018)

Note: Cp = Chalcopyrite; Bn = Bornite; Ch/Cv = Chalcocite/Covellite; Py = Pyrite; Gn = Gangue

10.3.3 Sample Hardness Test Results

Composite samples from all four of Trilogy Metals metallurgical testwork programs were subject to a Bond Ball Mill Work Index determination, and the results are summarized in Table 10-3. Based on these results, the Bornite materials can be considered as soft, or easily ground in traditional grinding mills. It is also apparent that the Bornite materials are consistent in terms of hardness, with little variation between samples. The classification size used in all testwork was 150 microns.

Table 10-3 Summary of Bond Ball Mill Work Index Determinations

Sample	Unit	Bond Ball Mill Work Index
Number of Samples Tested	#	33
Average Bond Ball Mill Work Index	kWh/tonne	9.52
Maximum Bond Ball Mill Work Index	kWh/tonne	10.90
Minimum Bond Ball Mill Work Index	kWh/tonne	7.80

10.3.4 Flotation Test Results

ALS Metallurgy and SGS have both provided detailed test reports outlining the results of flotation testwork programs (refer to Table 10-1). All test composites responded well to the recovery of copper minerals using the flowsheet shown in Figure 10-2. The proposed recovery process, generally considered standard in the industry, is expected to incorporate the following key unit operations:

- Primary crushing
- Semi-autogenous grinding (SAG) and ball milling to approximately 100 microns
- Rougher flotation
- Rough concentrate re-grinding to approximately 10 to 20 microns
- Flotation cleaning to produce final copper concentrates
- Concentrate de-watering
- Tailings deposition of tailings solids.

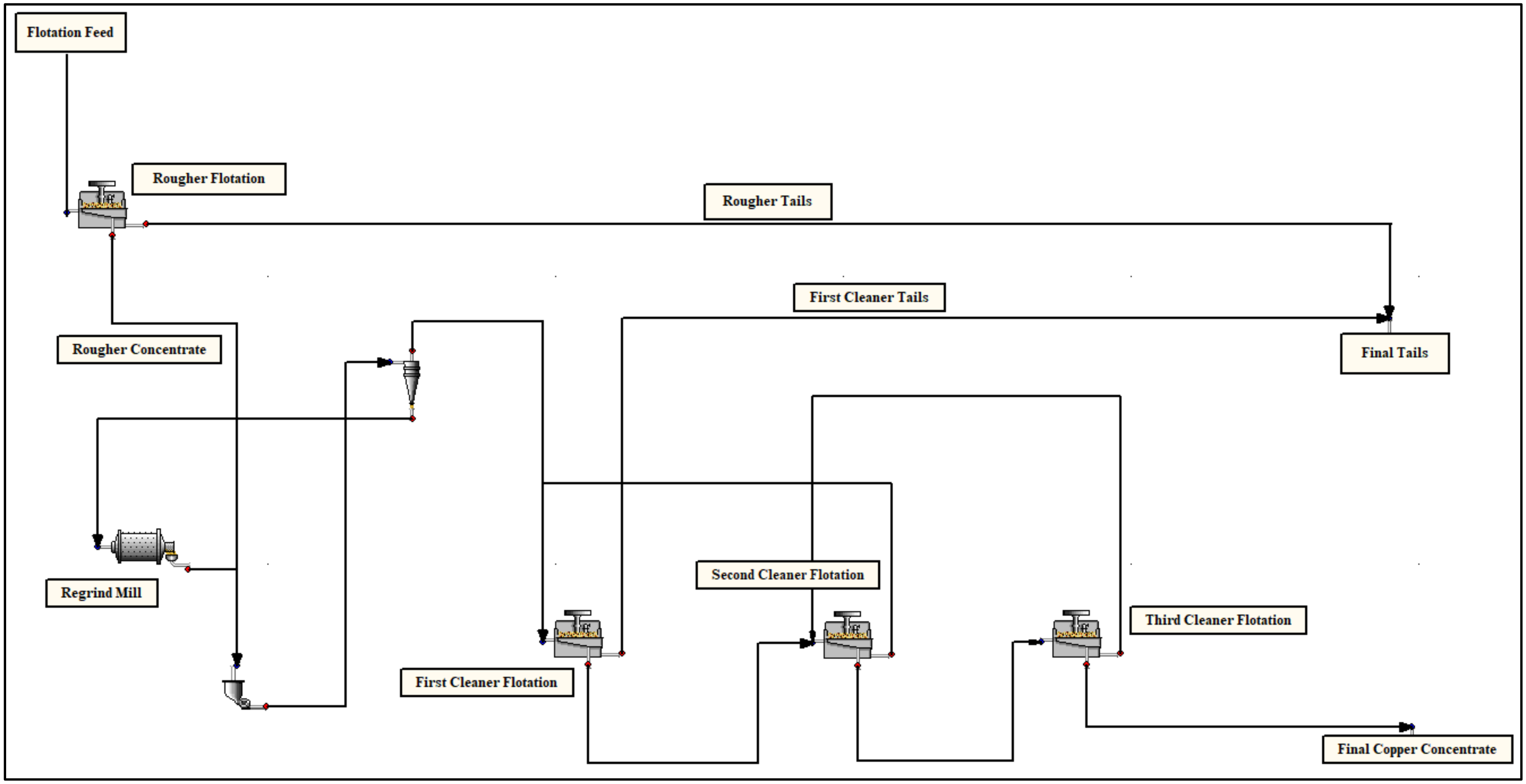
The recovery of copper and related copper concentrate grades observed in the ALS Metallurgy and the SGS testwork is summarized in Table 10-4. Generally speaking, the testwork conducted in the ALS Metallurgy testwork program KM3621 was not optimized and is preliminary in terms of results. The SGS flotation testwork and the balance of ALS Metallurgy testwork, by comparison, is more exhaustive in terms of process optimization, and these results show higher copper recoveries and better overall results.

Flotation parameters used in the testwork are considered typical of a copper operation and included copper flotation collectors such as xanthates and Aerophine® copper collectors. Lime was used for pH control in the flotation process.

The latter ALS Metallurgy programs and the SGS program followed similar metallurgical testwork protocols, and fairly consistent metallurgical results were obtained across all samples tested. The copper recovery and concentrate grades from process simulation testing is also summarized in Table 10-4. These results show a consistent trend of copper recovery increasing with higher copper feed grades. This is consistent with mineralogical observations and points to higher expected recoveries for higher grade mineralization.

Testwork results point to estimated copper recoveries of 87% to 90% for lower grade feed samples of 1% to 2% Cu and increased copper recoveries of 90% to 94% for higher grade mineralized material, in excess of 2% Cu, that would likely be amenable to underground mining methods.

Figure 10-2: Proposed Bornite Flotation Flowsheet



(Source: Wood, 2022)

Table 10-4: Summary of Process Simulation Testwork Results – Locked Cycle Tests

Sample	Feed Grade (% Cu)	Copper Recovery (%)	Final Conc. Grade (% Cu)
2012/2013 ALS Metallurgy KM3621			
Composite 0.5–1.0	0.65	67.5	30.9
Composite 1.0–2.0	1.21	78.0	29.4
Composite 2.0–10.0	4.04	85.2	24.5
Composite >10.0	17.3	98.0*	30.0*
2017/2018 SGS CAVM 50296-001			
Dev. Composite 1	1.11	90.4	30.3
Dev. Composite 2	0.91	87.0	24.3
Dev. Composite 3	0.91	89.7	25.6
Dev. Composite 4	1.45	91.6	33.5
Dev. Composite 5	1.00	90.9	28.0
2018/2019 ALS Metallurgy KM5705			
Composite 1	1.56	88.6	25.8
Composite 2	0.95	75.6	16.7
Composite 3	1.03	87.8	25.0
Composite 4	2.29	88.3	27.2
Composite 5	1.80	89.3	29.8
Composite 6	0.76	80.5	26.4
Composite 7	1.98	94.1	24.0
Composite 8	3.00	94.1	28.5
Composite 9	4.16	94.7	34.2
2020/2021 ALS Metallurgy KM6184			
Composite 10	1.30	76.1	26.7
Composite 11	2.01	86.3	26.4
Composite 12	3.21	90.3	32.3
Composite 13	1.88	88.9	36.9
Composite 14	2.12	85.5	34.1

Note: *open circuit test result only due to high-grade feed sample.

10.3.5 Concentrate Quality Targets

Analysis of the final copper concentrates was completed within the various testwork programs, and the results are summarized in Table 10-5.

The concentrates are unlikely to contain payable precious metals as these appear to be below accepted splitting limits within traditional concentrate sales terms.

The concentrates are also considered to contain low levels of penalty elements such as arsenic, antimony, mercury, cadmium, and selenium. The concentrates will likely not incur any financial penalty under traditional sales terms. Zinc may incur a payable penalty if levels are consistently above about 3% Zn. There would be an added transportation expense at those levels as well. Zinc is typically not payable within copper concentrates.

Table 10-5: Typical Concentrate Analysis – KM5705 Final Copper Concentrates

Element	Symbol	Unit	Comp 1	Comp 3	Comp 5	Comp 8
Antimony	Sb	%	0.0021	0.0136	0.145	0.0099
Arsenic	As	%	0.023	0.018	0.130	0.120
Cadmium	Cd	%	0.0084	0.0026	0.0017	0.0055
Cobalt	Co	ppm	1,515	516	1,466	1,505
Copper	Cu	%	25.8	25.0	29.8	28.5
Iron	Fe	%	26.4	29.9	27.9	28.0
Mercury	Hg	ppm	6	7	10	9
Sulphur	S	%	32.8	34.8	32.6	33.7
Zinc	Zn	%	2.60	0.56	0.23	1.16

10.3.6 Cobalt Speciation Studies

A preliminary cobalt mineral speciation investigation was conducted by Trilogy Metals in 2017 using both the tails- and concentrate-test products of the 2012/2013 and 2017 metallurgical testwork. Microprobe analysis and backscatter electron mapping of the products show that the majority of cobalt (~80%) is contained within cobaltiferous pyrite at low cobalt contents, while the remaining cobalt (20%) occurs as carrollite and/or cobaltite. A majority of the cobalt contained in the Bornite deposit is contained within pyrite minerals and not as a distinct cobalt mineral.

10.3.7 Opportunities for Cobalt Recovery

Drill sample results have identified areas of the Bornite deposit such as South Reef contain significantly higher grades of copper and cobalt than the overall deposit.

Preliminary metallurgical testwork indicates that a pyrite-cobalt concentrate can be produced from the copper concentrate tails. Future studies on metallurgical testwork and mine sequencing will likely identify the higher-grade portions of the deposit as offering more favourable economic outcomes because of expected better overall copper and cobalt recovery. This potentially higher cobalt grade in the concentrate would make it more attractive for marketing purposes.

Metallurgical testwork should also focus on reduction of the pyrite mass pull to the pyrite-cobalt concentrate, which would consequently result in a reduction of the concentrate transportation costs to an offsite treatment facility.

Future testwork should also examine amenability of the pyrite-cobalt to known process alternatives such as pressure oxidation to produce a cobalt product on site.

10.4 QP Comments on Chapter 10

Testwork was performed on material from selected samples and composites. The testing program included mineralogical analysis, comminution and flotation. The selected samples for the testing campaigns cover a wide range of copper and cobalt content.

The available metallurgical testwork information is considered of an acceptable quality and sufficient to support a copper resource estimate. The copper concentrate that would be produced is considered in general terms a clean concentrate, and it is unlikely that penalties would be imposed as no significant amounts of deleterious elements are contained in the concentrate.

In the opinion of the QP the metallurgical data is adequate for the purposes used in this Report.

Cobalt has potential for reasonable prospects of economic extraction, but further metallurgical testwork is deemed necessary to support a resource estimate, and better processing definitions. This processing definition must aim to improve the quality of pyrite-cobalt containing concentrate that would allow a significant reduction of the concentrate transportation costs to an offsite facility.

10.5 Recommended Testwork

Additional metallurgical testwork is required to support more advanced studies. Key areas that require additional testwork are as follows:

- Additional grinding and flotation testwork, similar to the recently completed metallurgical testwork programs
- Detailed testwork involving settling and filtering of concentrates and tailings
- Flotation testwork focused on reducing the amount of cobalt reporting to copper concentrate
- Flotation testwork on the copper flotation tails to reduce the mass pull of the pyrite concentrate and improve cobalt recovery to produce a better cobalt grade concentrate, thus reducing pyrite containing cobalt concentrate transportation costs
- Evaluate the marketability of a pyrite-cobalt containing concentrate to properly assess its economic potential.

11.0 MINERAL RESOURCE ESTIMATES

11.1 Introduction

This section describes the updated mineral resource estimate for the Bornite Project. Wood's QP reviewed and validated the resource model previously prepared and based on that review prepared a revised mineral resource statement. In doing so, Wood's QP interpreted the location, quantity, grade continuity, and other geological characteristics of the mineral resource from specific geological evidence and knowledge, including sampling, Wood's QP used current economic parameters in the initial assessement to demonstrate reasonable prospects of economic extraction.

11.2 Sample Database and Other Available Data

Trilogy Metals provided the Bornite database in Microsoft™ Excel format, exported from the master database (GeoSpark Core Database System). The files contain collar, survey, assay, lithology, and specific gravity data, and other geological and geotechnical information. The Bornite database comprises a total of 273 diamond drill (core) holes totalling 106,406 m; 203 holes target the Ruby Zone to the west and 58 holes target the South Reef area to the east. The remaining 12 holes in the database are exploratory in nature and test for satellite mineralization proximal to the Bornite deposit or represent holes that encountered problems and were therefore abandoned. A total of 242 drill holes are used in the mineral resource estimate which contains a total of 39,740 samples that were analyzed for copper content and 34,177 that were analyzed for cobalt content. Most holes drilled by Trilogy Metals, plus a few select historical holes drilled by Kennecott, contain additional analyses for elements such as zinc, lead, gold, silver, and cobalt. At this time, only copper has established reasonable prospects for economic extraction.

During the 2012, 2013 and 2014 field seasons, Trilogy Metals collected samples from drill hole intervals that were not previously sampled. It is assumed that Kennecott did not sample these intervals because, visually, they did not exhibit the presence of high-grade copper mineralization (amenable to underground mining). In previous mineral resource estimates, these un-sampled intervals were assigned a default grade of 0% Cu. At this current stage, the majority of the core drilled by Kennecott has been sampled and analyzed for copper content and are included in the database. The sampling and assaying for cobalt is less extensive. Where assay data are not available, these intervals are assigned a zero grade for cobalt (0% Co) when the host rocks are phyllite, or they are left blank when the host rocks are carbonates.

Individual sample intervals range from 3 cm to 39.58 m long and average 2.09 m.

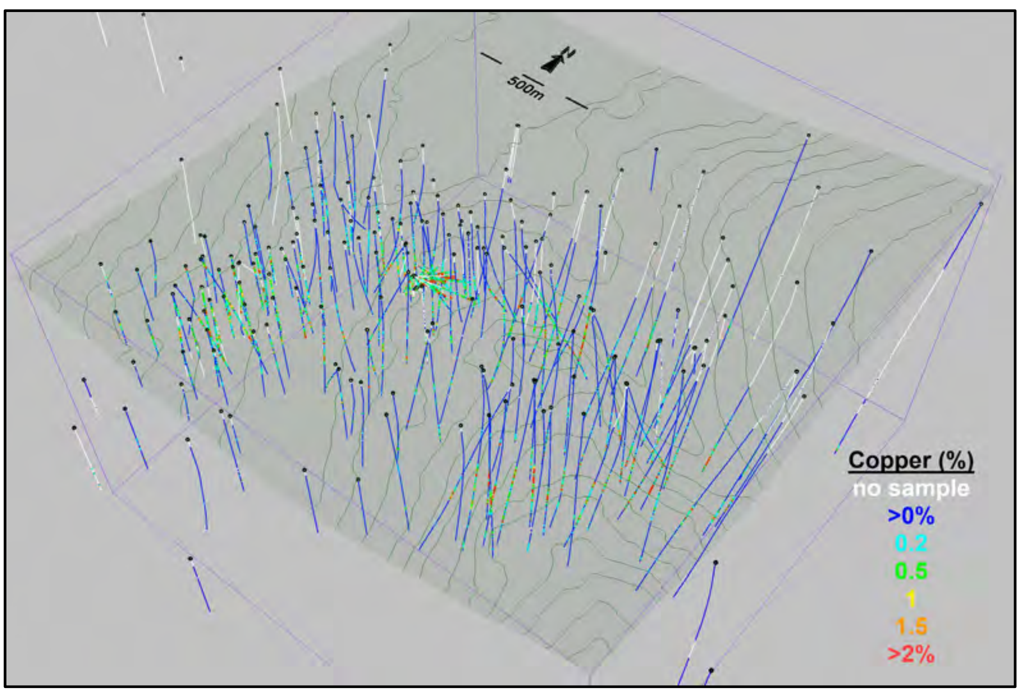
Drill hole spacing at the Ruby Zone varies from approximately 10 m to 20 m for underground holes and 50 m to 100 m or more for holes drilled from surface. All holes testing the South Reef area are collared from surface and typically intersect mineralization at approximately 100 m to 200 m spacing.

SG measurements were conducted on 7,476 samples in the database and range from a minimum of 2.12 to a maximum of 5.20 and average 2.89. The distribution of SG data is considered sufficient to support resource estimation.

The distribution of copper grades in drill holes is shown in Figure 11-1. The distribution of drilling by campaign, including the re-sampling completed in 2012, 2013 and 2014, is shown in Figure 11-2.

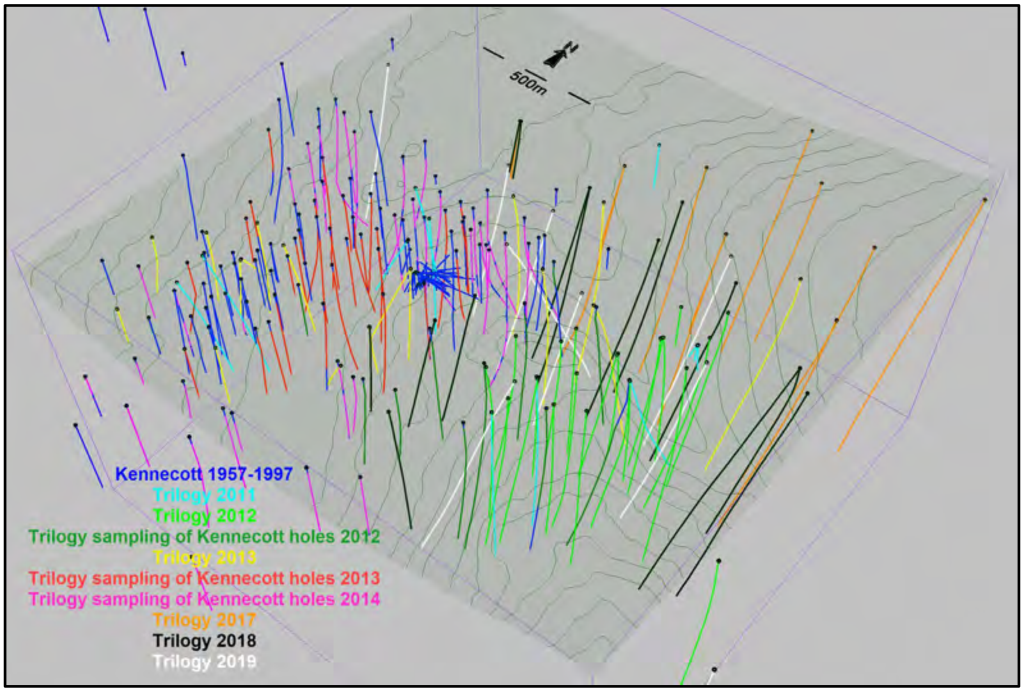
With the drilling completed by Trilogy Metals, plus the additional re-sampling of the historical drill core, the original Kennecott sample data represent a relatively minor proportion of the overall database. All of the historical drilling has been included in the Bornite mineral resource estimate, and no adjustments were made to any of this historical data.

Figure 11-1: Copper Grades in Drill Holes



(Source: SIM et al., 2022)

Figure 11-2: Drilling by Campaign



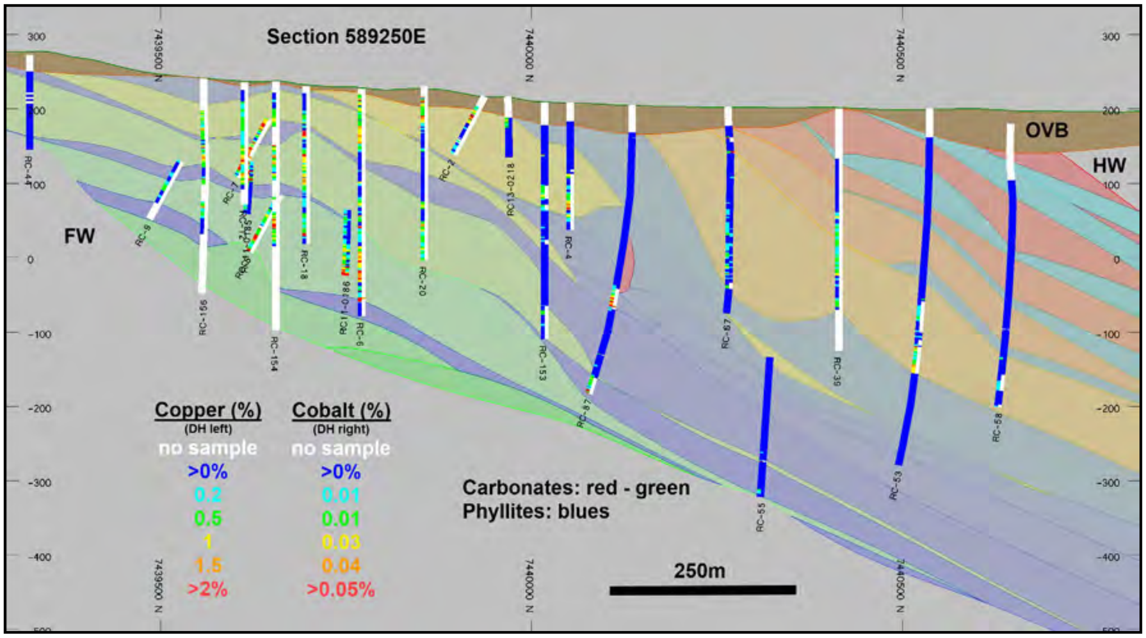
(Source: SIM et al., 2022)

11.2.1 Geologic Model

The geologic model interpreted for the Bornite deposit consists primarily of a series of inter-bedded carbonate and phyllitic rocks that dip gently to the north and overlay a quartz-phyllite footwall. The geologic model comprises 18 individual phyllite domains and 16 separate carbonate domains plus a series of separate domains representing the hanging wall (Beaver Creek phyllite), the footwall (quartz-phyllite Anirak schist), and the overlying overburden. Some of the phyllite and carbonate units are continuous across the entire deposit area and others pinch out and are more localized.

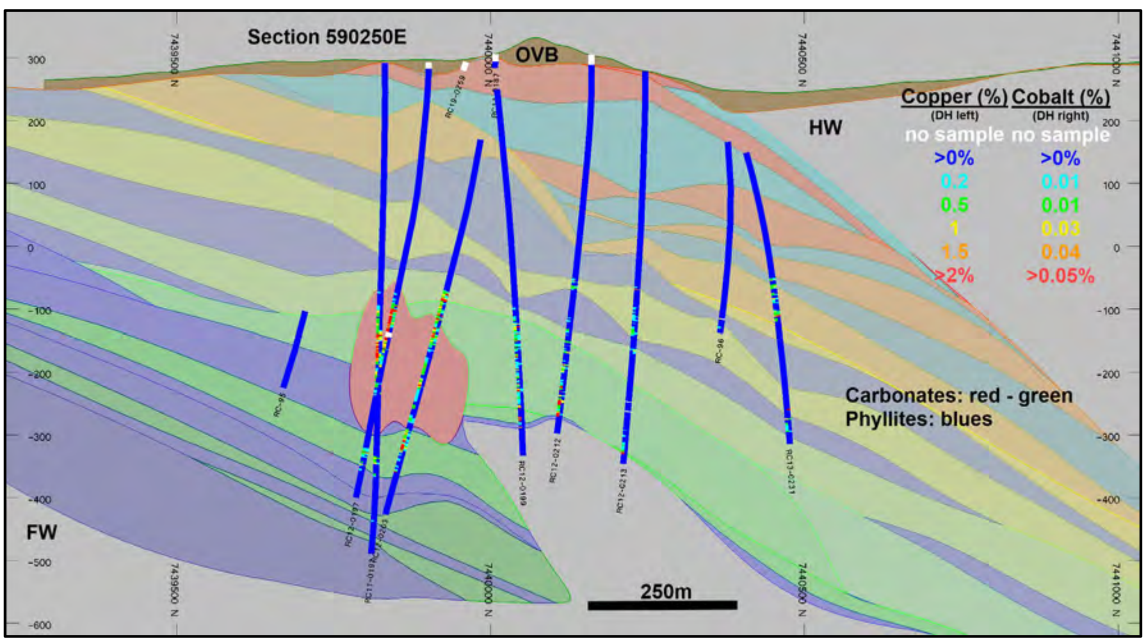
Figure 11-3 and Figure 11-4 show vertical cross-sections through the lithologic model in the Ruby Zone and South Reef areas, respectively and illustrate a summary of the interpretation of the geology and mineralization from the drill results.

Figure 11-3: Cross-section Showing Lithology Domains in the Ruby Zone



(Source: SIM et al., 2022)

Figure 11-4: Cross-section Showing Lithology Domains in the South Reef Area



(Source: SIM et al., 2022)

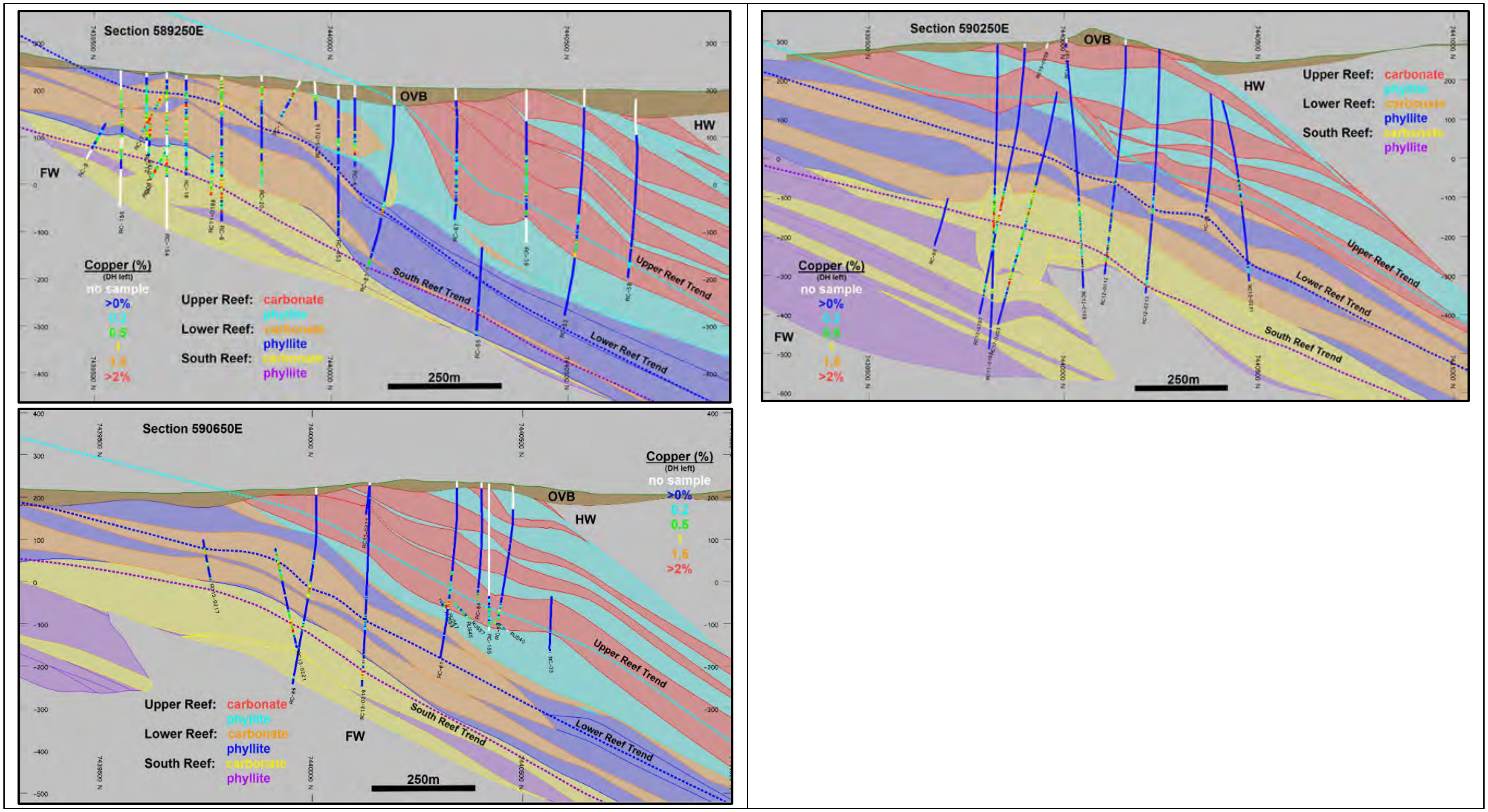
To replicate the stratabound nature of the mineralization in the mineral resource model, a dynamic anisotropy approach relative to the overall trend of copper and cobalt mineralization was applied. Three-dimensional (3D) surfaces were interpreted and represent the general trend of the copper mineralization: one plane for the South Reef units, one for the Lower Reef units, and another for the Upper Reef lithologic units. The vertical cross-sections in Figure 11-5 show the interpreted trend planes, indicated by dashed lines, across several areas of the deposit. These trend planes are used to control search orientations during subsequent interpolations in the model. Variograms are generated using distances relative to the trend planes rather than the true sample elevations. This approach essentially flattens out the zone during interpolation relative to the defined trend plane.

The parts of the deposit with the highest grades occur within areas where semi-massive and massive sulphides are present. The density of drilling is insufficient in most areas to allow for the interpretation of these massive sulphide domains, and a probability shell approach is used to identify areas where higher grade mineralization is likely to occur.

Two probability shells were generated: one at a threshold of 2% Cu and another at a threshold of 0.2% Cu. The 2% Cu shell generally correlates with the presence of massive and semi-massive zones of bornite and chalcopyrite mineralization, and the 0.2% Cu shell correlates with the visual presence of chalcopyrite mineralization. Cobalt mineralization is strongly associated with both sets of copper mineralization. The higher grade shell occurs mainly in the South Reef area and is based primarily on visual observations of the distribution of sample data suggesting that a relatively continuous zone of higher grade copper mineralization occurs above a threshold grade of 2% Cu. Approximately 90% of the sample data in the South Reef area is below 2% Cu and 10% of the data is greater than 2% Cu. A relatively small (>2%) copper probability shell is also generated in the Upper Reef area of the Ruby Zone.

Approximately one half of the samples in the carbonate domains have copper grades above the lower grade threshold of 0.2% Cu. This limit roughly segregates areas of mineralized versus unmineralized rocks and is still below the anticipated cut-off grade of the mineral resource, ensuring that sufficient internal dilution is retained in the mineral resource model. There are also areas where the phyllite domains contain appreciable copper grades (above the 0.2% Cu threshold), but these tend to be rare and localized occurrences.

Figure 11-5: Vertical Cross-sections Showing Trend Planes Used to Control Dynamic Isotropy



(Source: SIM et al., 2022)

Indicator values are assigned to 2 m composites at the grade thresholds, and indicator variograms are produced. Probability values are estimated in model blocks using ordinary kriging; the vertical range and locations are controlled dynamically using elevations relative to the trend planes described previously. A series of shells are generated at varying probability thresholds and are then compared to the distribution of the underlying sample data. The higher grade shell represents areas where there is greater than a 30% probability that the grade will be more than 2% Cu. The lower grade shell envelopes areas where there is a greater than 50% probability that the grade will exceed 0.2% Cu. The shape and location of the probability shells are shown in Figure 11-6.

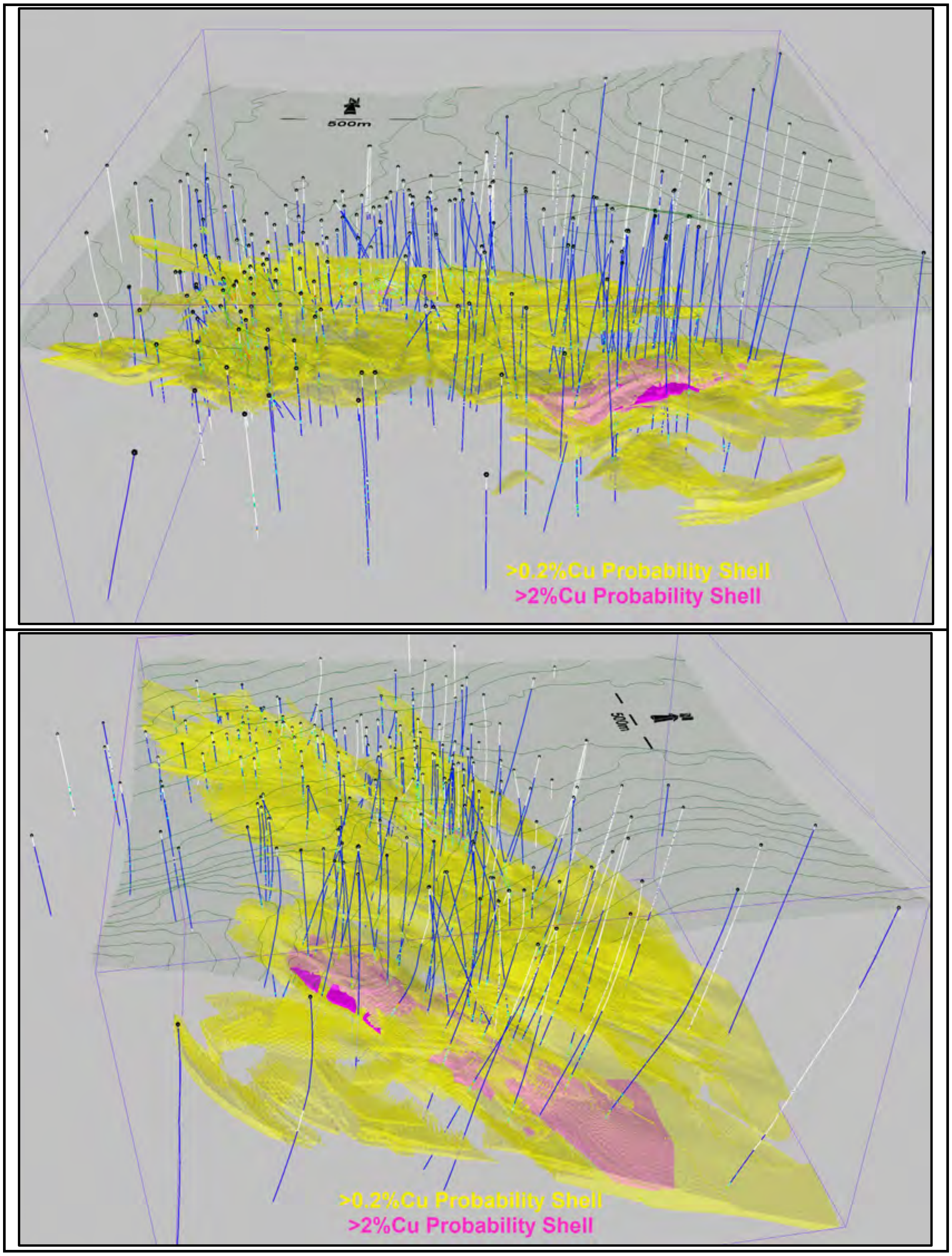
11.3 Compositing

Compositing drill hole samples standardizes the database for further statistical evaluation. This step eliminates any effect the sample length may have on the data. To retain the original characteristics of the underlying data, a composite length that reflects the average, original sample length is selected; a composite that is too long can sometimes result in a degree of smoothing that can mask certain features of the data.

The average sample length at both the Ruby Zone and South Reef areas is 2.09 m. As a result, a composite length of 2 m was selected for the Bornite deposit.

Drill hole composites were length-weighted and generated down-the-hole, meaning composites began at the top of each drill hole and were generated at constant intervals down the length of the drill hole. Composites were broken at lithology domain boundaries. Once composites were generated, probability shell codes were assigned on a majority basis. Several holes were randomly selected, and the composited values were checked for accuracy. No errors were found.

Figure 11-6: Copper Probability Shells



(Source: SIM et al., 2022)

11.4 Exploratory Data Analysis

Exploratory data analysis (EDA) involves statistically summarizing groups of samples to quantify the characteristics of the data. The main purpose of EDA is to determine whether there is any evidence of spatial distinctions in grade; if this occurs, a separation and isolation of domains during interpolation may be necessary. An unwanted mixing of data is prevented by applying separate domains during interpolation; the result is a grade model that better reflects the unique properties of the deposit. However, applying domain boundaries in areas where the data are not statistically unique may impose a bias in the distribution of grades in the model.

A domain boundary, which segregates the data during interpolation, is typically applied if the average grade in one domain is significantly different from that of another domain. A boundary may also be applied when there is evidence that a significant change in the grade distribution exists across the contact.

The original variable length drill hole samples were composited to 2 m intervals prior to analysis. The interpreted wireframe domains were then used to backtag the composited sample data, assigning unique domain codes. The EDA described here is based on composited sample data which are segregated based on the interpreted wireframe domains.

This EDA consists primarily of a series of boxplots and contact profiles. Boxplots summarize many aspects of the frequency distributions of the data in simple graphical displays for comparison purposes. Contact profiles evaluate the nature of grade trends between two domains: they graphically display the average grades at increasing distances from the contact boundary. The numbers beside the data points represent the amount of data averaged together at a particular separation distance. Those contact profiles that show a marked difference in grade across a domain boundary indicate that the two domain datasets should be isolated during interpolation. Conversely, if a more gradual change in grade occurs across a contact, the introduction of a hard boundary (e.g., segregation during interpolation) may result in a much different trend in the grade model; in this case, the change in grade between domains in the model is often more abrupt than the trends seen in the raw data. Finally, a flat contact profile indicates no grade changes across the boundary; in this case, hard or soft domain boundaries will produce similar results in the model. The boxplots and contact profiles presented in this section of the report are based on all available sample data following the 2018 drilling program; they do not include information from the few additional drill holes completed in 2019 because the impact of the 2019 drill hole results would be negligible.

The boxplot in Figure 11-7 shows there is a major difference between the copper grades in the carbonate breccias versus the phyllite domains. The contact profile, shown in Figure 11-8, shows the difference in the vicinity of the boundaries. The carbonate breccias delimit zones of higher copper grades.

Figure 11-9 shows the boxplots for copper in the phyllites in the Lower Reef. Note that while a large majority of the sample grades fall below 0.1% Cu, there are a few high-grade samples present which show that localized copper mineralization does exist in the phyllite units. This is a pattern that is also repeated in the South and Upper Reefs. Some of these mineralized phyllites are proximal to well-mineralized carbonates, but the majority of the very high grades occurring in the phyllites tend to be isolated and cannot be associated with high grades in other units or any geological feature, such as structure.

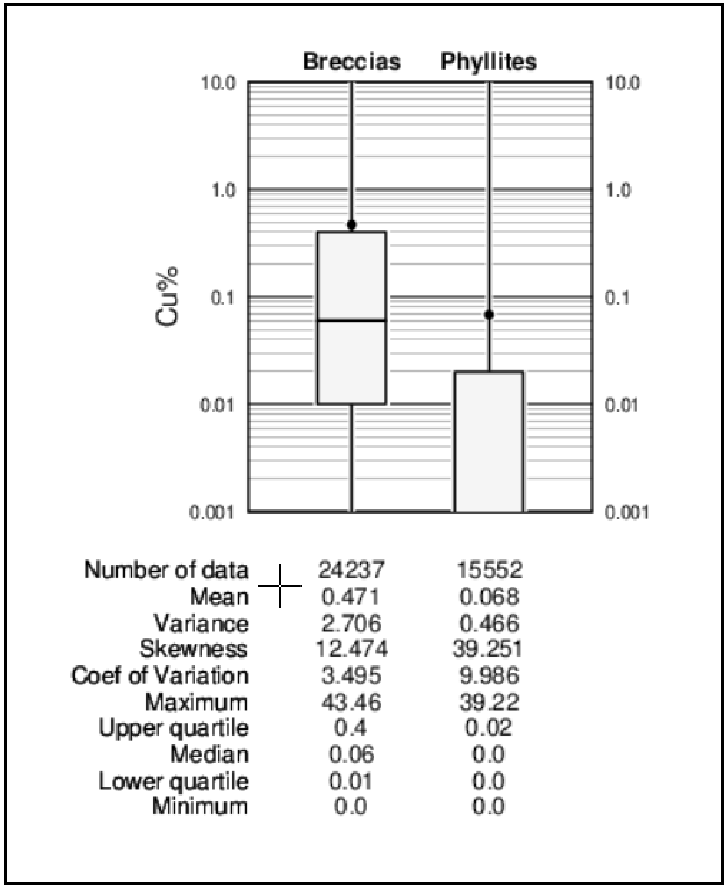
Figure 11-10 shows the copper sample grade distribution boxplots for the Lower Reef breccias. The distributions have a significantly greater number of high-grade areas than in the phyllites. The carbonate breccia domains tend to be a better host to mineralization, but as the boxplots show, there are still volumes of lower grade within the carbonate breccia units.

Figure 11-11 and Figure 11-12 show boxplots for copper in the phyllites and carbonate breccias for the Upper Reef. The phyllites are less mineralized than in the Lower Reef, but rare very high values continue to occur in most of the phyllite units. Breccia units higher up in the stratigraphic section tend to contain less mineralization, as seen in Figure 11-13.

The boxplots in Figure 11-13 and Figure 11-14 show the grade distributions in South Reef. The grade distribution in phyllite unit PHY1L tends to be more like a carbonate breccia grade distribution due to local mineralization related to shearing. The copper grade in carbonate breccia BRXE1 resembles a phyllite-grade distribution due to its location on the unmineralized footwall side of the Iron Mountain fault structure. As in the other reefs, the phyllite units continue to host a sprinkling of high-grade samples.

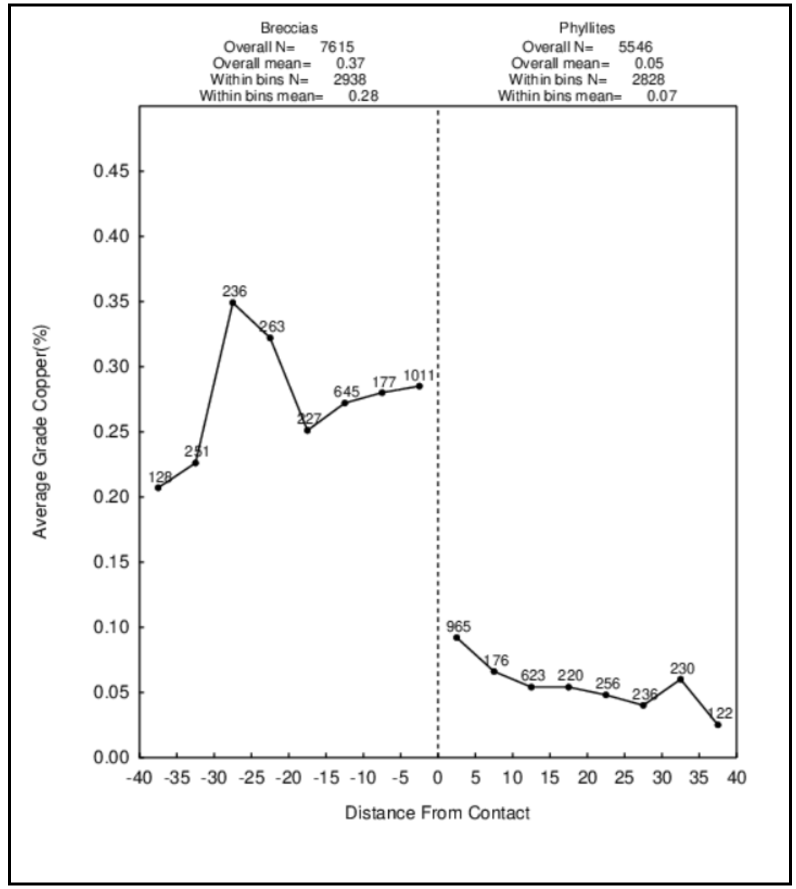
Figure 11-15 shows a drill hole vertical section with the sample grades and the interpreted phyllite and carbonate breccia units. The section illustrates the fact that mineralization in breccia units occurs in more limited volumes and, therefore, it is necessary to confine the interpolation of grades in the breccias, and rarely in the mineralized phyllites, to the mineralized volumes. To properly constrain the interpolation of grade, probability shells were constructed, as described in Section 11.2, and they are used in conjunction with the stratigraphic units, segregating areas using both stratigraphy and probability shell domains during block grade interpolation. Figure 11-16 shows an example of the 0.2% Cu probability shell overlain on the stratigraphic units.

Figure 11-7: Boxplots of Total Copper in Carbonate Breccias and Phyllites



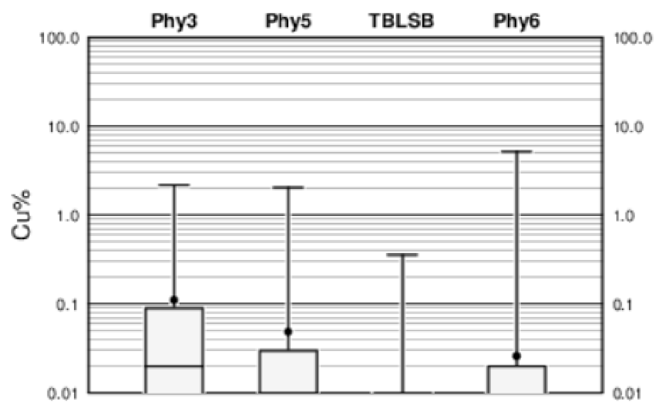
(Source: SIM, March 2019)

Figure 11-8: Contact Profiles for Total Copper between Carbonate Breccias and Phyllites



(Source: SIM, March 2019)

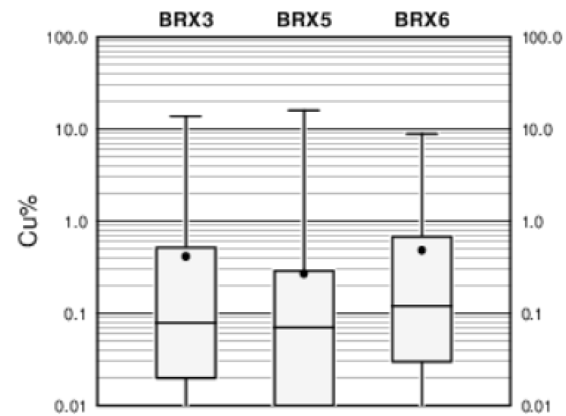
Figure 11-9: Boxplots for Copper in the Lower Reef Phyllite Domains



	Phy3	Phy5	TBLSB	Phy6	
Number of data	824	1942	185	2595	Number of data
Mean	0.111	0.049	0.005	0.026	Mean
Variance	0.063	0.025	0.001	0.018	Variance
Skewness	4.406	7.423	13.63	24.59	Skewness
Coef of Variation	2.259	3.242	5.235	5.19	Coef of Variation
Maximum	2.19	2.05	0.36	5.18	Maximum
Upper quartile	0.09	0.03	0.01	0.02	Upper quartile
Median	0.02	0.01	0.0	0.0	Median
Lower quartile	0.0	0.0	0.0	0.0	Lower quartile
Minimum	0.0	0.0	0.0	0.0	Minimum

(Source: SIM, March 2019)

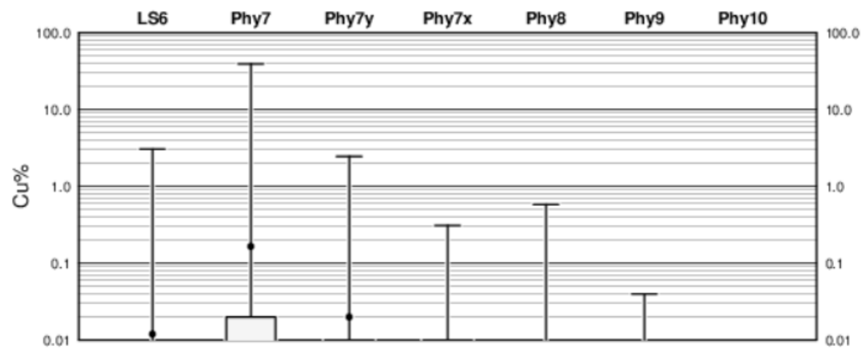
Figure 11-10: Boxplots for Copper in the Lower Reef Carbonate Breccia Domains



	BRX3	BRX5	BRX6	
Number of data	3566	2954	1095	Number of data
Mean	0.418	0.27	0.487	Mean
Variance	0.722	0.329	0.691	Variance
Skewness	5.725	8.793	4.095	Skewness
Coef of Variation	2.033	2.121	1.708	Coef of Variation
Maximum	13.77	15.97	8.92	Maximum
Upper quartile	0.52	0.29	0.68	Upper quartile
Median	0.08	0.07	0.12	Median
Lower quartile	0.02	0.01	0.03	Lower quartile
Minimum	0.0	0.0	0.0	Minimum

(Source: SIM, March 2019)

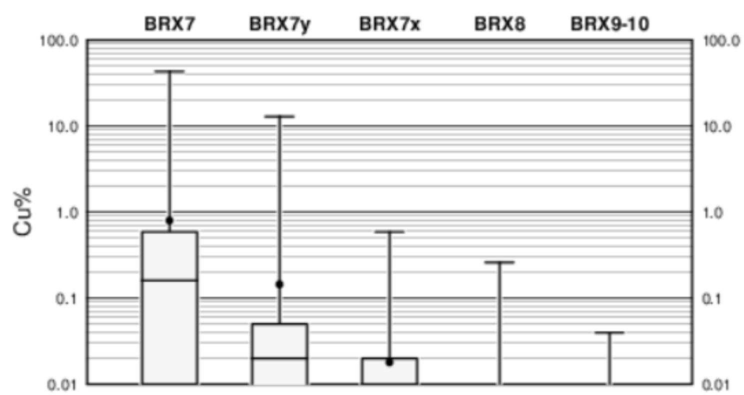
Figure 11-11: Boxplots for Copper in the Upper Reef Phyllite Domains



	LS6	Phy7	Phy7y	Phy7x	Phy8	Phy9	Phy10	
Number of data	865	2098	1044	992	1630	335	9	Number of data
Mean	0.012	0.166	0.02	0.008	0.003	0.002	0.0	Mean
Variance	0.015	2.919	0.008	0.0	0.0	0.0	0.0	Variance
Skewness	19.48	17.759	12.608	8.427	25.838	3.445	0.0	Skewness
Coef of Variation	10.478	10.267	4.452	2.322	5.751	2.835	0.0	Coef of Variation
Maximum	3.06	39.22	2.46	0.31	0.58	0.04	0.0	Maximum
Upper quartile	0.0	0.02	0.01	0.01	0.0	0.0	0.0	Upper quartile
Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Median
Lower quartile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Lower quartile
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Minimum

(Source: SIM, March 2019)

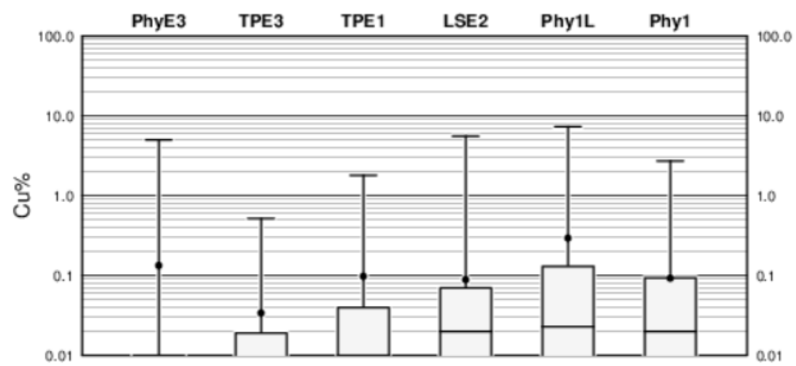
Figure 11-12: Boxplots for Copper in the Upper Reef Carbonate Breccia Domains



	BRX7	BRX7y	BRX7x	BRX8	BRX9-10	
Number of data	5472	1721	1264	1037	182	Number of data
Mean	0.8	0.145	0.018	0.003	0.002	Mean
Variance	8.001	0.319	0.001	0.0	0.0	Variance
Skewness	8.455	11.517	7.89	11.684	4.099	Skewness
Coef of Variation	3.536	3.891	2.072	4.008	2.753	Coef of Variation
Maximum	43.46	12.97	0.59	0.26	0.04	Maximum
Upper quartile	0.59	0.05	0.02	0.0	0.0	Upper quartile
Median	0.16	0.02	0.01	0.0	0.0	Median
Lower quartile	0.01	0.0	0.0	0.0	0.0	Lower quartile
Minimum	0.0	0.0	0.0	0.0	0.0	Minimum

(Source: SIM, March 2019)

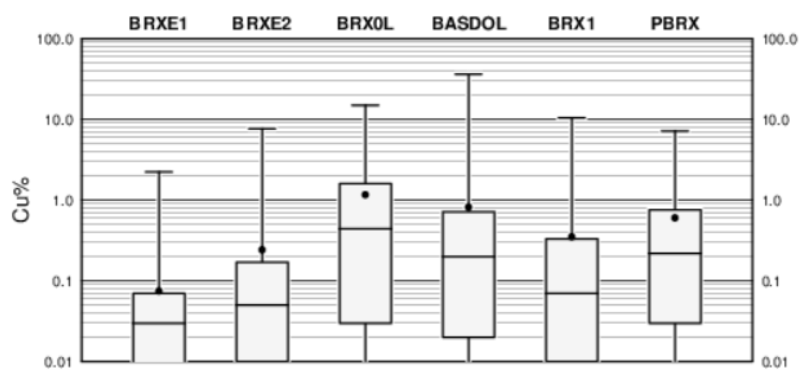
Figure 11-13: Boxplots for Copper in the South Reef Phyllite Domains



	PhyE3	TPE3	TPE1	LSE2	Phy1L	Phy1	
Number of data	95	57	150	489	217	304	Number of data
Mean	0.134	0.034	0.098	0.089	0.295	0.093	Mean
Variance	0.5	0.009	0.081	0.109	0.812	0.056	Variance
Skewness	6.209	3.83	3.893	11.252	5.164	6.386	Skewness
Coef of Variation	5.277	2.763	2.9	3.698	3.053	2.557	Coef of Variation
Maximum	5.01	0.52	1.81	5.59	7.32	2.74	Maximum
Upper quartile	0.01	0.019	0.04	0.07	0.13	0.094	Upper quartile
Median	0.0	0.0	0.01	0.02	0.023	0.02	Median
Lower quartile	0.0	0.0	0.0	0.0	0.0	0.0	Lower quartile
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	Minimum

(Source: SIM, March 2019)

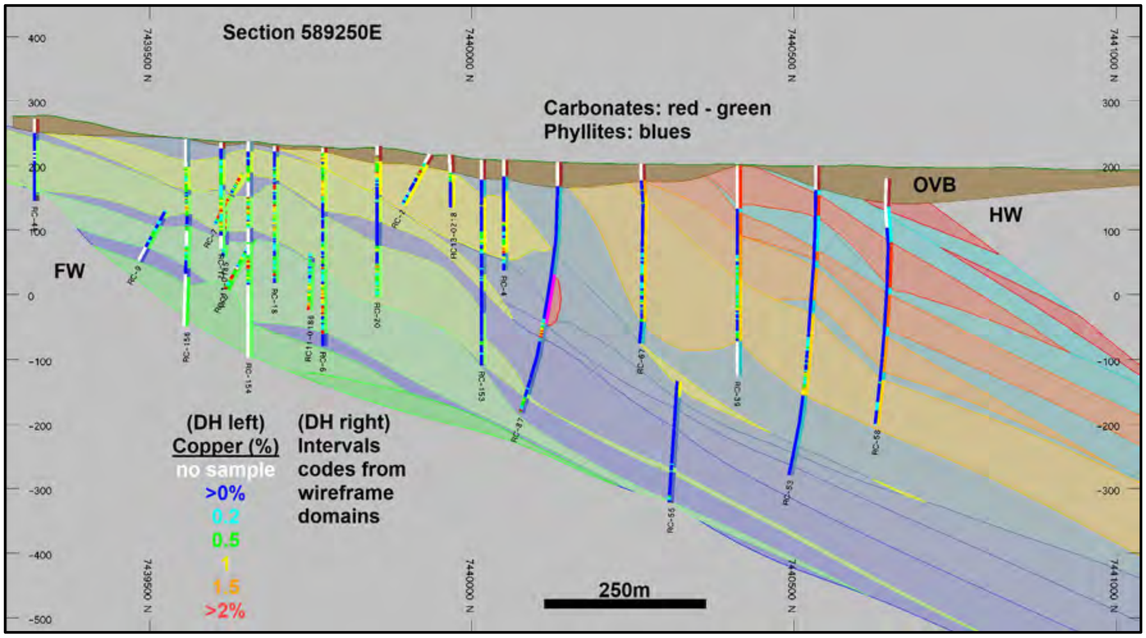
Figure 11-14: Boxplots for Copper in the South Reef Carbonate Breccia Domains



	BRXE1	BRXE2	BRX0L	BASDOL	BRX1	PBRX	
Number of data	406	632	693	1844	2490	881	Number of data
Mean	0.075	0.243	1.172	0.821	0.352	0.605	Mean
Variance	0.035	0.401	3.578	5.34	0.552	0.917	Variance
Skewness	7.238	6.212	3.128	8.532	5.339	2.759	Skewness
Coef of Variation	2.517	2.602	1.614	2.815	2.113	1.582	Coef of Variation
Maximum	2.24	7.68	15.0	36.4	10.45	7.2	Maximum
Upper quartile	0.07	0.17	1.604	0.72	0.33	0.76	Upper quartile
Median	0.03	0.05	0.44	0.2	0.07	0.22	Median
Lower quartile	0.0	0.01	0.03	0.02	0.01	0.03	Lower quartile
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	Minimum

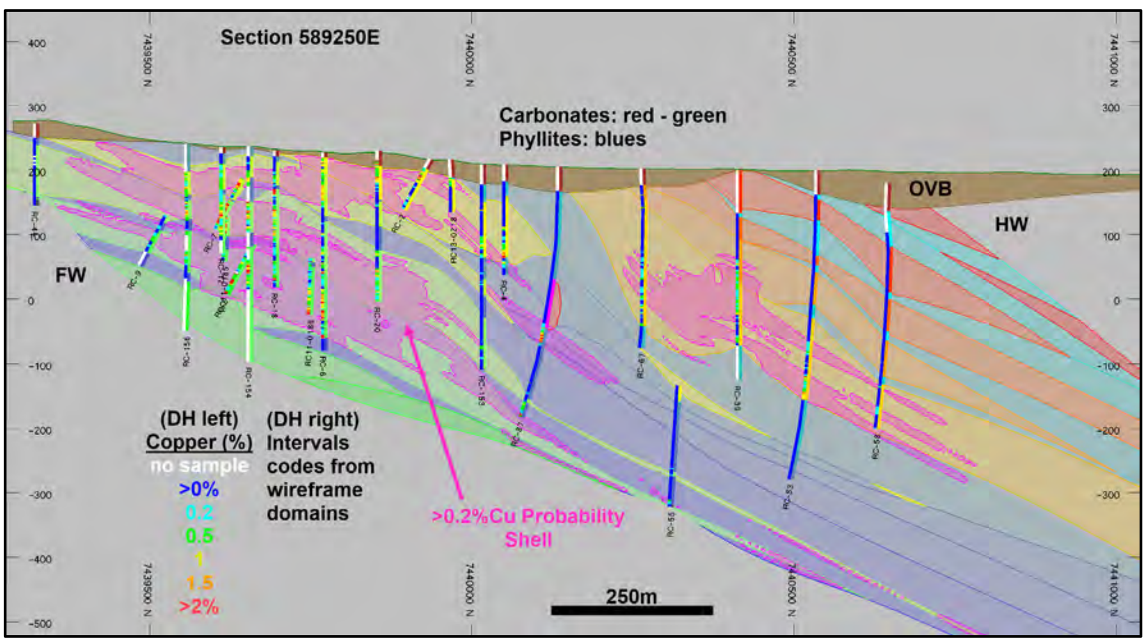
(Source: SIM, March 2019)

Figure 11-15: Section 589250 E with Interpreted Stratigraphic Units



(Source: SIM et al., 2022)

Figure 11-16: Section 589250 E with 0.2% Cu Probability Shell



(Source: SIM et al., 2022)

Figure 11-17 shows copper sample grades inside the 2% Cu shell with samples inside the surrounding 0.2% Cu shell. There is a pronounced change in copper grade at this boundary suggesting that it should be recognized during block-grade estimation.

Figure 11-18 shows distinct changes in copper grade at the 0.2% Cu shell boundary. This is an indication that the 0.2% Cu shell does, in general, segregate mineralized from unmineralized rocks.

11.4.1 Modelling Implications

The boxplot and contact profile analysis shows distinct differences in sample data contained in carbonate and phyllite domains, indicating that these data should remain segregated during the estimation of copper grades in the block model. Analysis of the probability grade shells also indicates that these encompass differing populations of samples that should not be mixed during copper grade interpolations.

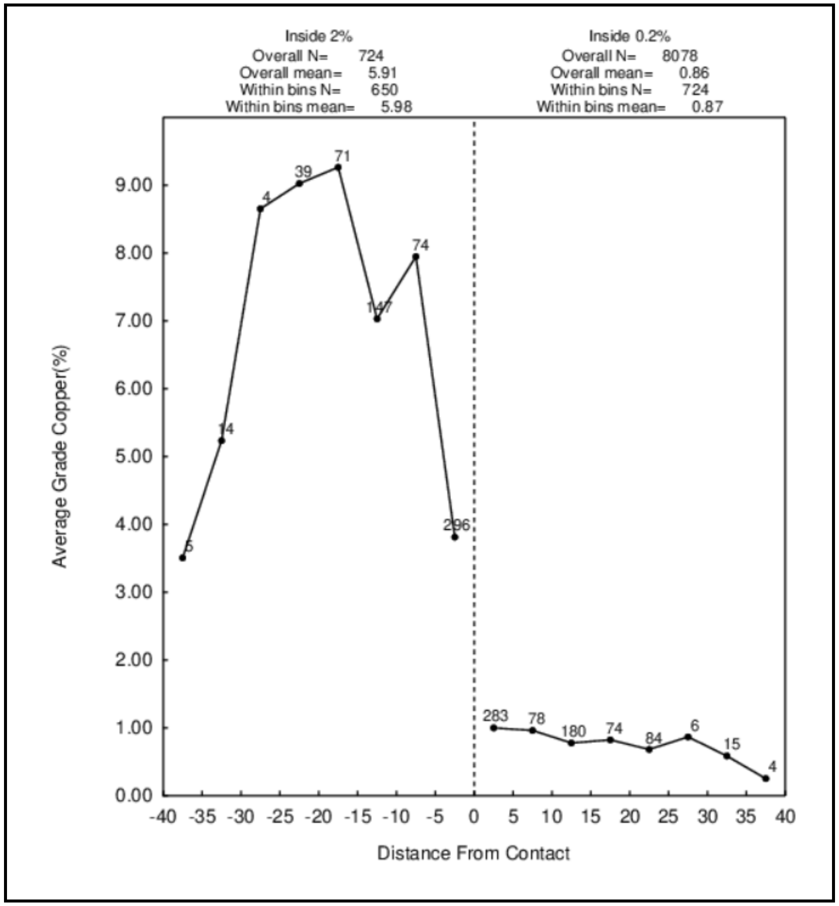
Based on these results, a combination of lithology and probability grade shell domains are used to control the distribution of copper in the mineral resource block model.

11.5 Treatment of Outlier Grades

Histograms and probability plots were generated from 2 m composited sample data to show the distribution of copper in each estimation domain. These were used to identify the existence of anomalous outlier grades in the composite database. The physical locations of these potential outlier samples were reviewed in relation to the surrounding data, and it was decided that their effects could be controlled primarily through the use of outlier limitations.

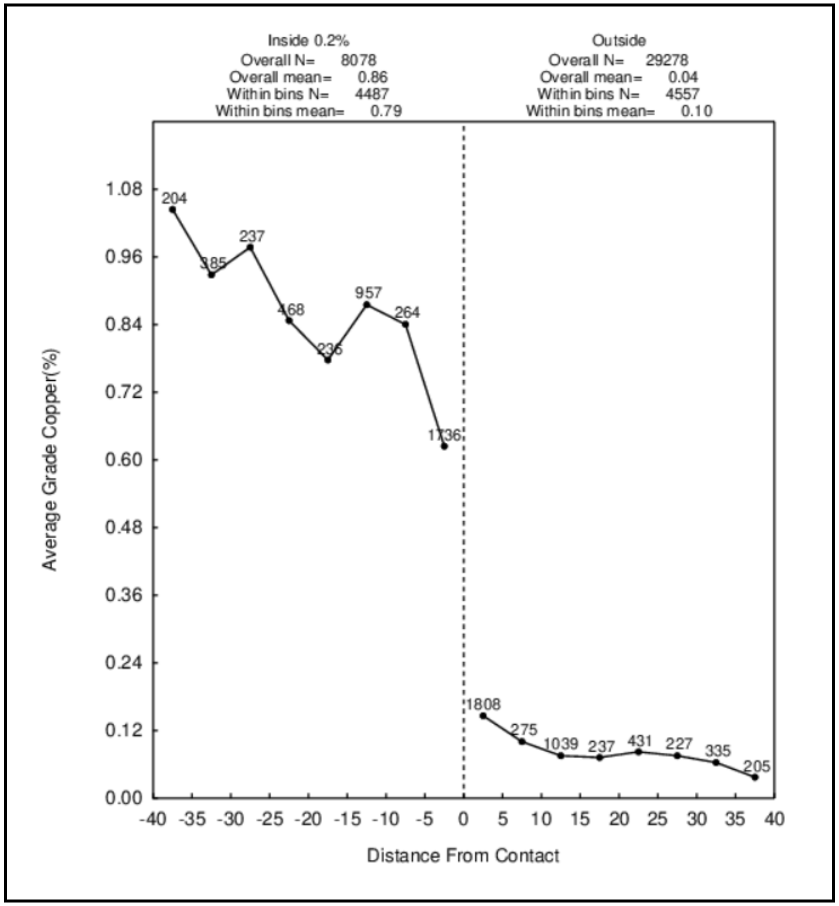
An outlier limitation approach limits samples above a defined threshold to a maximum distance of influence during grade estimates. In the South Reef domains, drill holes tend to intersect the mineralized zone at roughly 100 m intervals, and as a result, samples above the outlier threshold are limited to a maximum distance of influence of 50 m during block grade interpolation (½ the distance between drill holes).

Figure 11-17: Contact Profile of Copper in 2% and 0.2% Cu Shells



(Source: SIM, March 2019)

Figure 11-18: Contact Profile of Copper In/Out of the 0.2% Cu Shell



(Source: SIM, March 2019)

In the Lower and Upper Reef domains, drilling tends to be more closely spaced and, therefore, samples above the outlier thresholds are limited to a maximum distance of influence of 25 m during block grade interpolation. One exception applies to the 2% Cu shell in the Upper Reef, which is densely drilled with numerous closely spaced underground drill holes. Here, samples above the outlier threshold grade of 20% Cu are limited to a maximum range of 10 m during block grade interpolation. In addition to the outlier limitations described here, samples inside the 2% Cu probability shell in the South Reef area were top-cut to 30% Cu prior to block grade interpolation.

Table 11-1 summarize the treatment of outlier sample data and the resulting effects on the estimate of contained metal in the models.

The proportion of metal lost is calculated in resource model. Overall, these measures have reduced the total amount of contained copper by 5.8%. The amount of copper metal lost in the carbonate domains, which host the majority of the mineral resources at Bornite, is considered appropriate for a project at this level of delineation drilling. The greater losses exhibited in the phyllites are due to the effects of these limitations on the skewed grade distributions in these domains. The effect of these measures also tends to have a greater impact on the high-grade parts of the deposit inside the 2% Cu probability shell. Overall, the proportions of metal lost due to top-cutting and outlier restriction measures are considered appropriate for a project with this level of exploration.

Table 11-1: Metal Lost Due to Treatment of Outlier Copper Sample Data

Domain Group	% Metal Lost (%)
Carbonates	-4.3
Phyllites	-12.0
2% Cu Probability Shell	-10.5

11.6 Specific Gravity Data

SG measurements were conducted on 7,476 samples in the database with a minimum of 2.12 and two highest values of 5.20 and 8.30 and an average 2.89. Approximately 40% of the available SG data occur in the probability grade shell domains. Copper content and SG are moderately correlated. There is minimal variation in the SG values for the various estimation domains with coefficient-of-variation values that are typically less than 0.1.

SG data are available for the majority of drill holes with measurements typically made at 10 m to 20 m intervals down drill holes with continuous sampling through the mineralized areas.

The distribution of SG data is considered sufficient to support estimation in the mineral resource model.

11.7 Variography

The degree of spatial variability and continuity in a mineral deposit depends on both the distance and direction between points of comparison. Typically, the variability between samples is proportionate to the distance between samples. If the variability is related to the direction of comparison, then the deposit is said to exhibit anisotropic tendencies which can be summarized by an ellipse fitted to the ranges in the different directions. The semi-variogram is a common function used to measure the spatial variability within a deposit.

The components of the variogram include the nugget, the sill, and the range. Often samples compared over very short distances (including samples from the same location) show some degree of variability. As a result, the curve of the variogram often begins at a point on the y-axis above the origin; this point is called the nugget. The nugget is a measure of not only the natural variability of the data over very short distances, but also a measure of the variability which can be introduced due to errors during sample collection, preparation, and assay.

Typically, the amount of variability between samples increases as the distance between the samples increase. Eventually, the degree of variability between samples reaches a constant or maximum value; this is called the sill, and the distance between samples at which this occurs is called the range.

The spatial evaluation of the data was conducted using a correlogram instead of the traditional variogram. The correlogram is normalized to the variance of the data and is less sensitive to outlier values; this generally gives cleaner results.

Many of the individual estimation domains do not contain sufficient sample data from which reasonable correlograms can be generated. As a result, separate correlograms for copper were generated for samples inside the 0.2% Cu probability shell in each of the South, Lower and Upper Reefs, and these were applied to each of the respective carbonate domains. A separate correlogram was produced from all samples outside of the 0.2% Cu probability shell, and this was used to estimate grades in the phyllite domains. Finally, a correlogram was used to estimate the distribution of copper inside of the 2% Cu probability shell domain.

- Correlograms were generated using the commercial software package SAGE2001 developed by Isaaks & Co. Correlograms were generated using elevations relative to the trend planes described in Section 11.2. This ensures that the local undulations of the typically banded mineralization are replicated in the block model. The correlograms are summarized in Table 11-2. Experimental correlograms are modelled with a nugget and two spherical structures..

Table 11-2: Copper Correlogram Parameters

Domain	Nugget	S1	S2	1st Structure Range (m)	1st Structure AZ	1st Structure Dip	2nd Structure Range (m)	2nd Structure AZ	2nd Structure Dip
Upper Reef Carbonates	0.100	0.784	0.116	23	319	61	554	212	11
		Spherical		11	170	25	538	54	78
				6	74	13	73	123	-4
Lower Reef Carbonates	0.150	0.761	0.089	96	91	43	1,079	181	0
		Spherical		28	333	26	95	91	0
				10	223	36	38	32	90
South Reef Carbonates	0.150	0.787	0.063	24	77	34	2,427	215	0
		Spherical		21	292	51	562	125	0
				9	179	18	33	146	90
Phyllites	0.450	0.519	0.031	27	280	51	573	343	37
		Spherical		22	38	21	413	77	5
				12	321	-31	381	354	-52
2% Cu Probability Shell	0.200	0.724	0.076	35	216	80	1,871	137	0
		Spherical		11	111	3	438	47	42
				6	20	10	52	46	-48

Note: Correlogram generated from 2 m composited sample data using elevations relative to trend plane of mineralization.
S1 = sill of the first structure; S2 = sill of the second structure

11.8 Model Setup and Limits

A block model was initialized with a nominal block size of 5 x 5 x 5 m which is considered appropriate, based on current drill hole spacing, for a project at this stage of evaluation.

Because the deposit contains mineral resource that are amendable to both underground and open pit mining methods, the 5 x 5 x 5 m selective mining unit (SMU) is driven primarily by the underground extraction potential of the deposit. Evaluations of the open pit extraction potential of the mineral resource may require that these blocks are combined into a larger SMU size.

Further engineering studies are required to evaluate the viability of the Bornite deposit. The limits of the block model are represented by the purple rectangle shown in the previous isometric views (Figure 11-1, Figure 11-2, and Figure 11-6).

Using the domain wireframes, blocks in the model are assigned estimation domain code values on a majority basis. Blocks with more than 50% of their volume inside a wireframe domain are assigned a zone code value of that domain.

11.9 Interpolation Parameters

Copper grades in the resource model were estimated using ordinary kriging. SG was estimated using inverse distance squared (ID^2) and all estimation domains were recognized as hard boundaries. The ordinary kriging models were evaluated using a series of validation approaches as described in Section 11.10. The interpolation parameters were adjusted until the appropriate results were achieved. In general, the ordinary kriging models were generated using a relatively limited number of composited sample data. This approach reduces the amount of smoothing (also known as averaging) in the model, and while there may be some uncertainty on a localized scale, this approach produces reliable estimates of the grade and tonnage for the overall deposit. Interpolation parameters for copper in the various estimation domains are summarized in Table 11-3.

During grade and SG estimation, search orientations were designed to follow the mineralization trend surfaces interpreted to represent the general trend of the mineralization in the deposit. Although the maximum XY range is set at 500 m, block grades are generally estimated using data limited to the nearest three or four drill holes; this criterion is often met within a maximum distance of less than 100 m. In areas where drill holes are spaced at 200 m intervals, at depth or on the fringes of the deposit, the search range is large enough so that multiple drill holes are captured, and guided by the variogram, used in the block-grade estimates. Although actual search ranges may extend for more than 200 m in some areas, only blocks within a maximum distance of 100 m from a drill hole are included in the Inferred category.

Table 11-3: Copper and SG Interpolation Parameters

Domain	Search Ellipse Range (m)			No. of Composites (2 m)			Other
	X	Y	Z[1]	Min/block	Max/block	Max/hole	
Upper Reef Carbonates	500	500	3	1	9	3	1DH per Octant
Lower Reef Carbonates	500	500	3	1	12	3	1DH per Octant
South Reef Carbonates	500	500	3	1	9	3	1DH per Octant
Phyllite	500	500	4	1	15	5	1DH per Octant
2% Cu Probability Shell	500	500	5	1	15	5	1DH per Octant
SG	500	500	7	1	21	7	ID^2

Note: (1) Vertical range relative to distances from trend plane of mineralization. DH = drill hole

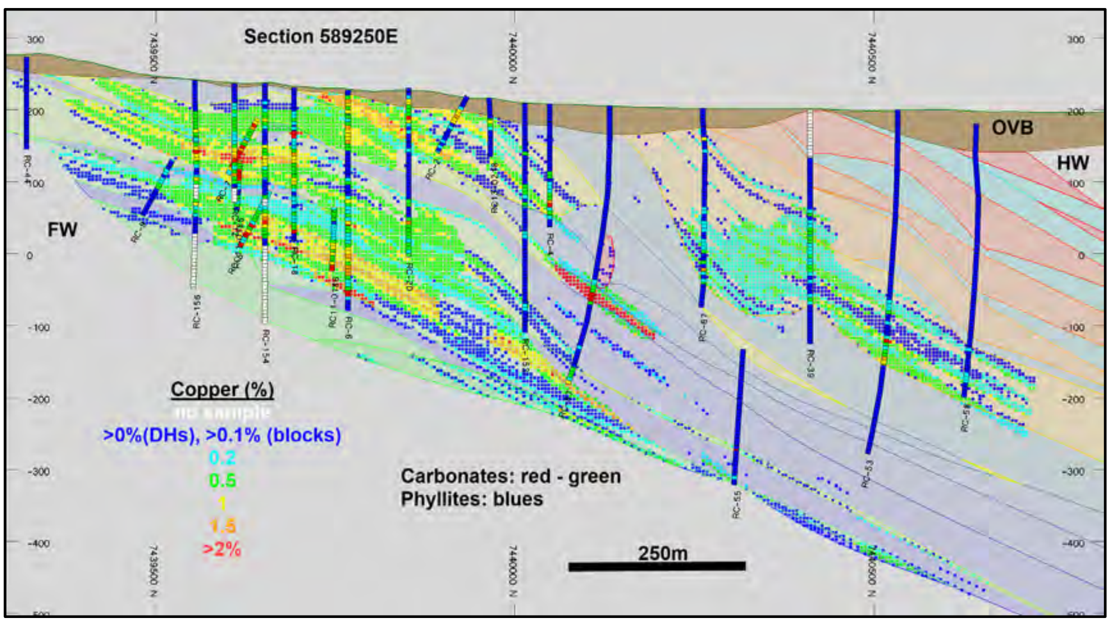
11.10 Block Model Validation

The block models were validated using a thorough visual review of the model grades in relation to the underlying drill hole sample grades, comparisons with the change of support model, comparisons with other estimation methods, and grade distribution comparisons using swath plots.

11.10.1 Visual Inspection

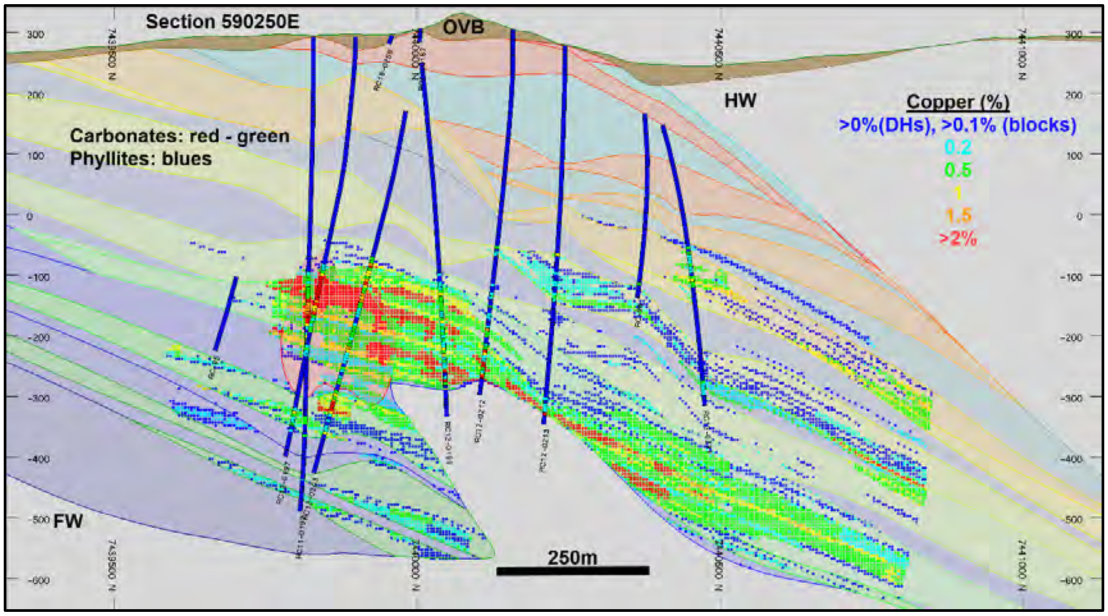
Detailed visual inspection of the block model was conducted in both section and plan to compare estimated grades against underlying sample data. This included confirmation of the proper coding of blocks within the respective domains. Examples of the distribution of copper grades in the block model are shown in section in Figure 11-19 and Figure 11-20.

Figure 11-19: North-South Vertical Section of Copper Estimates in the Block Model in the Ruby Zone



(Source: SIM et al., 2022)

Figure 11-20: North-South Vertical Section of Copper Estimates in the Block Model in the South Reef Area



(Source: SIM et al., 2022)

11.10.2 Model Checks for Change of Support

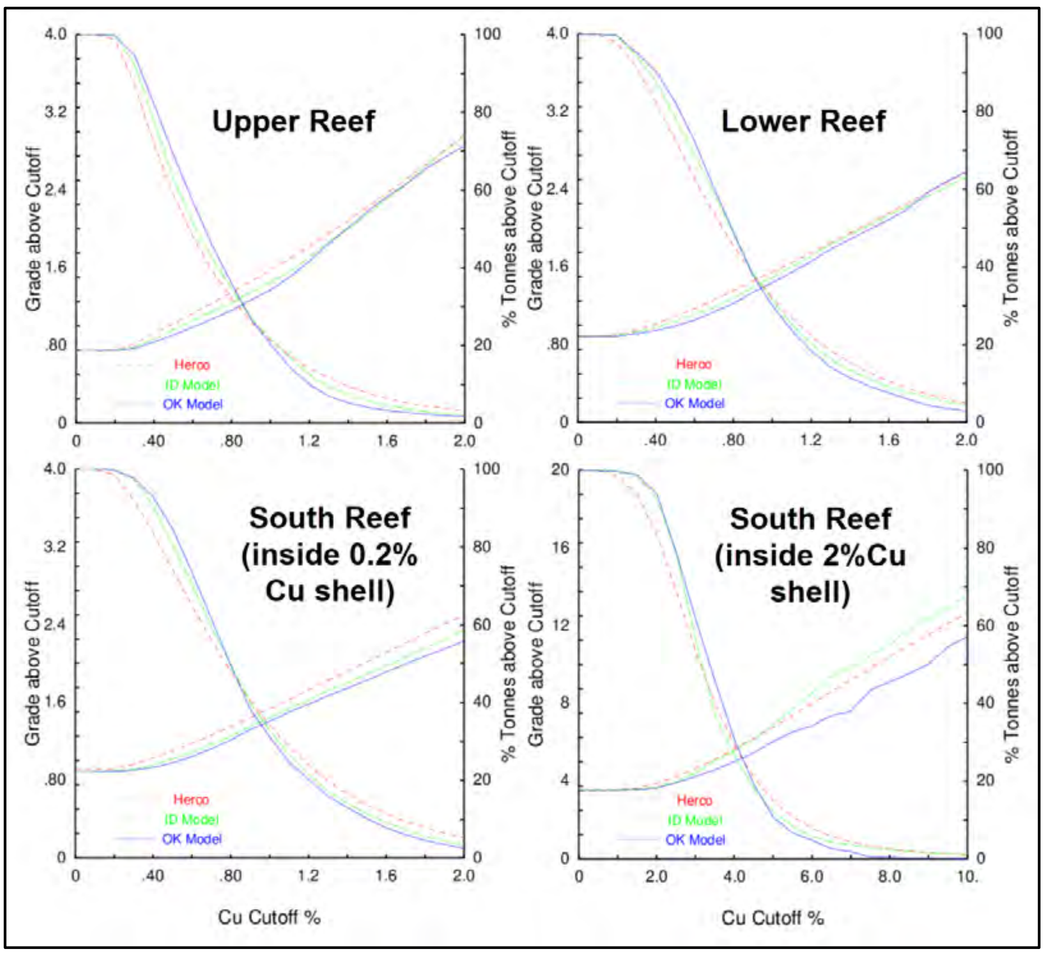
The relative degree of smoothing in the block estimates was evaluated using the Discrete Gaussian or Hermitian Polynomial Change of Support method (Rossi and Deutsch, 2014). With this method, the distribution of the hypothetical block grades can be directly compared to the estimated ordinary kriging model through the use of pseudo-grade/tonnage curves. Adjustments are made to the block model interpolation parameters until an acceptable match is made with the Herco (*Her*mitian *Co*rrection) distribution. In general, the estimated model should be slightly higher in tonnage and slightly lower in grade when compared to the Herco distribution at the projected cut-off grade. These differences account for selectivity and other potential ore-handling issues which commonly occur during mining.

The Herco distribution is derived from the declustered composite grades which are adjusted to account for the change in support moving from smaller drill hole composite samples to the larger blocks in the model. The transformation results in a less skewed distribution, but with the same mean as the original declustered samples.

Examples of Herco change of support grade/tonnage plots for copper are shown in Figure 11-21; they are calculated for each reef formation limited to blocks inside the copper probability shells.

Overall, the desired degree of correlation between models has been achieved. The change of support model is a theoretical tool intended to direct model estimation. There is uncertainty associated with the change of support model, and its results should not be viewed as a final or correct value.

Figure 11-21: Herco and Model Grade/Tonnage Plots for Copper Inside Probability Shells



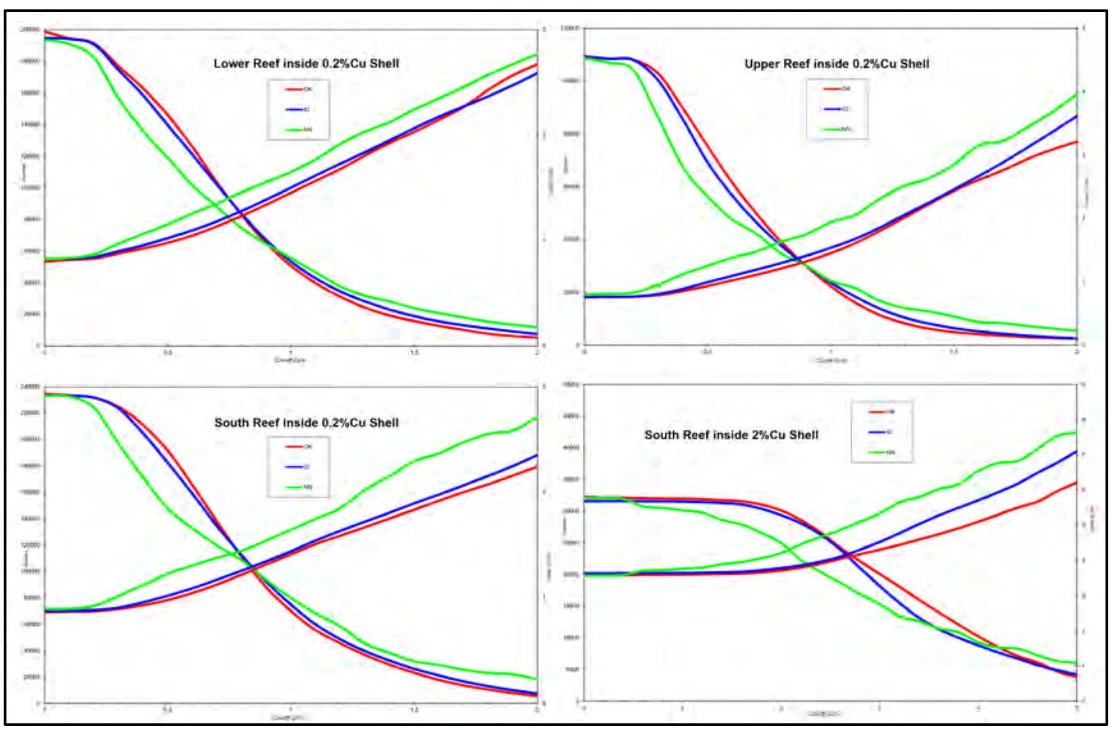
(Source: SIM et al., 2022)

11.10.3 Comparison of Interpolation Methods

For comparison purposes, additional grade models were generated using the ID^2 and nearest neighbour (NN) interpolation methods. The NN model was created using data composited to 5 m lengths to ensure all sample data are used in the model. The results of these models were compared to the ordinary kriging models at various cut-off grades using a grade/tonnage graph. The example shown in Figure 11-22 compares copper models within the combined 2% Cu and in the 0.2% Cu shells for the Upper, Lower and South Reefs. There is good correlation between the ordinary kriging and ID^2 models.

The correspondence among the grade tonnage curves is typical for the compared interpolation methods. The NN grades and tonnages above cut-off are correct assuming that the perfect selection of material above and below the cut-off can be executed at the scale of the composite samples. It is included to show the results of the averaging that occurs in the other two methods. The ordinary kriging curves show the lowest grades and highest tonnages. The correct amount of averaging for the chosen block size is ensured for the ordinary kriging by the change of support calculation described in the preceding section.

Figure 11-22: Comparison of Copper Model Types in Carbonates Inside Grade Shell Domains



(Source: SIM et al., 2022)

11.10.4 Swath Plots

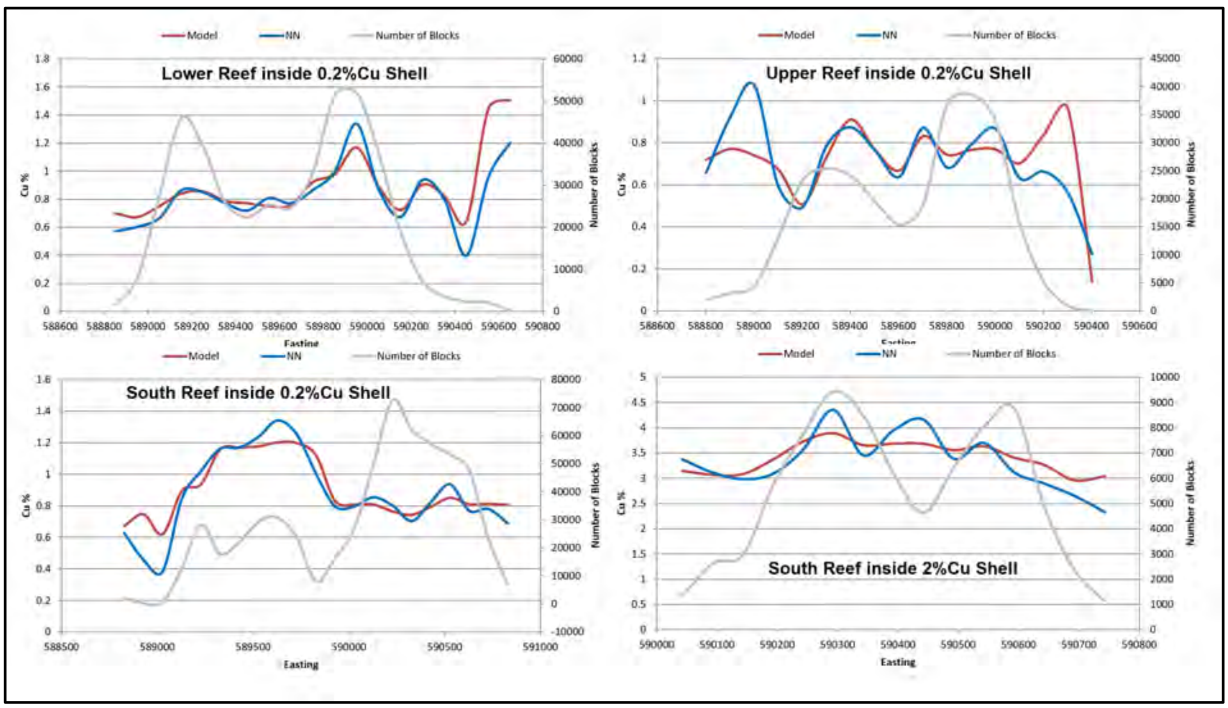
A swath plot is a graphical display of the grade distribution derived from a series of bands, or swaths, generated in several directions throughout the deposit. Using the swath plot, grade variations from the ordinary kriging model are compared to the distribution derived from the declustered NN grade model.

On a local scale, the NN model does not provide reliable estimations of grade, but on a much larger scale, it represents an unbiased estimation of the grade distribution based on the underlying data. Therefore, if the ordinary kriging model is unbiased, the grade trends may show local fluctuations on a swath plot, but the overall trend should be similar to the NN distribution of grade.

Swath plots were generated in three orthogonal directions that compare the ordinary kriging and NN estimates for copper in each of the estimation domains.

Examples from each of the three reefs, limited to blocks inside the 0.2% Cu probability shell, together with the 2% Cu shells for copper are shown in Figure 11-23.

Figure 11-23: Swath Plots of Copper in Carbonates Inside Grade Shell Domains



(Source: SIM et al., 2022)

There is good correlation between models and the degree of smoothing in the ordinary kriging model (shown in red) is evident in the swaths. Areas where there are large differences between the models tend to be the result of edge effects, where there are less available data to support a comparison. The validation results indicate that the ordinary kriging copper model has reasonable reflections of the underlying sample data.

11.11 Mineral Resource Classification

The mineral resources were classified in accordance with S-K 1300 requirements and definitions. The classification parameters are defined relative to the distance between sample data and are intended to encompass zones of reasonably continuous mineralization that exhibit the desired degree of confidence in the estimate and at a grade and within a constraining surface suitable for the assumed mining method.

Copper indicator variograms were evaluated to provide information regarding the range of continuity of mineralization. This was combined with visual observations regarding the nature of the deposits with respect to the distribution of available sample information.

All sources of uncertainty were considered by the Wood QP classifying the confidence classification of the mineral resource estimates including the following factors:

- The Wood QP observed high-grade portions of the Upper and Lower Reef Ruby Zone where the drill hole spacing and continuity of geology and mineralization would have been sufficient to support Indicated confidence classification. However, there was an absense of documented QAQC results by Kennecott for this drilling that was completed between 1959 and 1968. Trilogy Metals completed some limited in-fill drilling in this area that included a proper QAQC program and performed considerable re-assay of drill core surrounding this area but that program did not include these Kennecott close-spaced drill holes (presumably because they were narrow diameter holes drilled from underground). This resulted in additional uncertainty to the accuracy of the grades that limited the confidence classification to the Inferred in this area
- The extensive re-sampling program that was completed by Trilogy Metals with proper QAQC allowed the comparison of the re-sampling data to the original data (Section 8.5.1.1). This comparison showed there to be a potential copper high bias in these higher-grade assays. This uncertainy in accuracy limits the confidence classification to Inferred. This uncertainty is limited to the Upper and Lower Reef Ruby Zone and does not affect the South Reef.

As a result of the above, the confidence classification was limited to the Inferred category.

The classification criteria for defining Inferred mineral resources for the Bornite deposit is the requirement of a minimum of one drill hole within a maximum distance of 100 m and exhibit sufficient confidence in the grade and continuity of mineralization.

The Wood QP expects the majority of Inferred mineral resources could be upgraded to Indicated mineral resources with additional exploration.

11.12 Reasonable Prospects for Economic Extraction

The requirement for reasonable prospects for economic extraction generally implies that quantity and grade estimates meet certain technical and economic thresholds and that mineral resources are reported at an appropriate cut-off grade and within a constrained mining shape that considers the extraction scenarios, processing recovery, costs and revenues.

At this stage of project evaluation, copper is the only economic contributor at Bornite. There is potential for reasonable prospects of economic extraction for cobalt with additional drill information and metallurgical testwork to establish the appropriate process options available to produce a marketable pyrite-cobalt concentrate. Currently there is insufficient information to identify a reasonable process method for economic recovery of cobalt or a market for the pyrite-cobalt concentrate.

The Bornite deposit comprises several zones of relatively continuous moderate- to high-grade copper mineralization that extends from surface to depths of more than 800 m below surface. The deposit is amenable to either open pit or underground mining methods. Underground mining assumes a combination of longhole stoping and cut-and-fill methods with an average assumed mining cost $73.62/t mined. The primary input parameters used to develop a constraining pit shell and constraining underground mining shapes are summarized in Table 11-4. Using these parameters an open pit marginal cut-off grade of 0.5% Cu and an underground breakeven cut-off grade of 1.79% Cu were determined.

The underground mining shape is based on a 1.79% Cu grade shell and then a filter was applied to remove isolated blocks that are outside of the underground mining shape that would not meet reasonable prospects for economic extraction. A 20 m pillar was imposed between mining the pit shell and underground mining shapes.

Table 11-4 Parameters Used to Constrain the Mineral Resource

Item	Unit	Value
Open Pit Mining Cost	$/t mined	3.21
Underground Mining Cost	$/t mined	73.62
Process Cost	$/t processed	19.14
G&A	$/t processed	4.14
Treatment, Refining and Sales Cost	$/lb Cu in concentrate	0.73
Road Use Cost	$/t processed	8.04
NSR Royalty	%	2
Pit Slope	degree	43
Metallurgical Recovery	%	87.2
Copper Price	$/lb	4.05

Note: No adjustments for mining recovery (except for the 20 m pillar between open pit and underground mining shapes) or dilution

11.12.1 Basis of Copper Price and Cost Assumptions

Copper futures are exchange-traded contracts on all of the world's major commodity exchanges. Copper is the world's third most widely used metal after iron and aluminum and is primarily consumed in industries such as construction and industrial machinery manufacturing.

To establish the long-term copper price forecast the Wood QP used a combination of information derived from 22 financial institutions, from pricing used in technical reports filed with Canadian regulatory authorities over the previous 12-month period, from pricing reported by major mining companies in public filings such as annual reports in the previous 12-month period, spot pricing, and three-year trailing average pricing. From this assessment the Wood QP considers industry consensus on a long-term price forecast on mineral reserves and cash flows of $3.50/lb Cu is reasonable.

It is in accordance with industry-accepted practice to use higher metal prices for the mineral resource estimates than the pricing used for mineral reserves. The copper price forecast of $3.50/lb was increased by approximately 15% to provide the mineral resource estimate copper price assumption of $4.05/lb.

In the initial assessment the Wood QP used a fixed price of $4.05/lb Cu over an assumed 20-year timeframe that the Wood QP considers reasonable to produce the stated mineral resources.

The cost inputs that were applied for establishing the mineral resource cut-offs are based on a combination of relevant information from the nearby Arctic project and similar projects in Wood's database. In the initial assessment these costs were fixed over an assumed 20-year timeframe that would be required to produce the mineral resources.

11.13 Bornite Mineral Resource Statement

Using the parameters stated in Table 11-4, a pit shell was generated to constrain mineralization amenable to open pit extraction (in-pit) with the mineralization outside the pit amenable to underground mining methods (outside-pit).

Table 11-5 summarizes the pit constrained and undergound mineral resources for the Bornite deposit in accordance with the standards required under S-K 1300. The mineral resources are reported in place (point of reference). There are no mineral reserves on the Bornite Property. The distribution of mineral resources is presented with a series of isometric views in Figure 11-24.

The South Reef and Ruby Zone extend below the constraining resource pit and are constrained within mineable shapes and are reported above a 1.79% Cu cut-off.

Trilogy Metals' interest in the Bornite Property is through its 50% ownership in the Ambler Metals joint venture.

Table 11-5: Bornite Mineral Resource Statement

Class	Type/Area	Cut-off (Cu %)	Tonnes (Mt)	Average Grade Cu (%)	Contained Metal Cu (Mlb)
Inferred	In-Pit	0.50	170.4	1.15	4,303
	Outside-Pit South Reef	1.79	22.0	3.48	1,690
	Outside-Pit Ruby Zone	1.79	10.4	2.28	521
Total Inferred			**202.7**	**1.46**	**6,514**

Note: (1) The mineral resources are current as of November 30, 2022 and were prepared by a Wood QP.

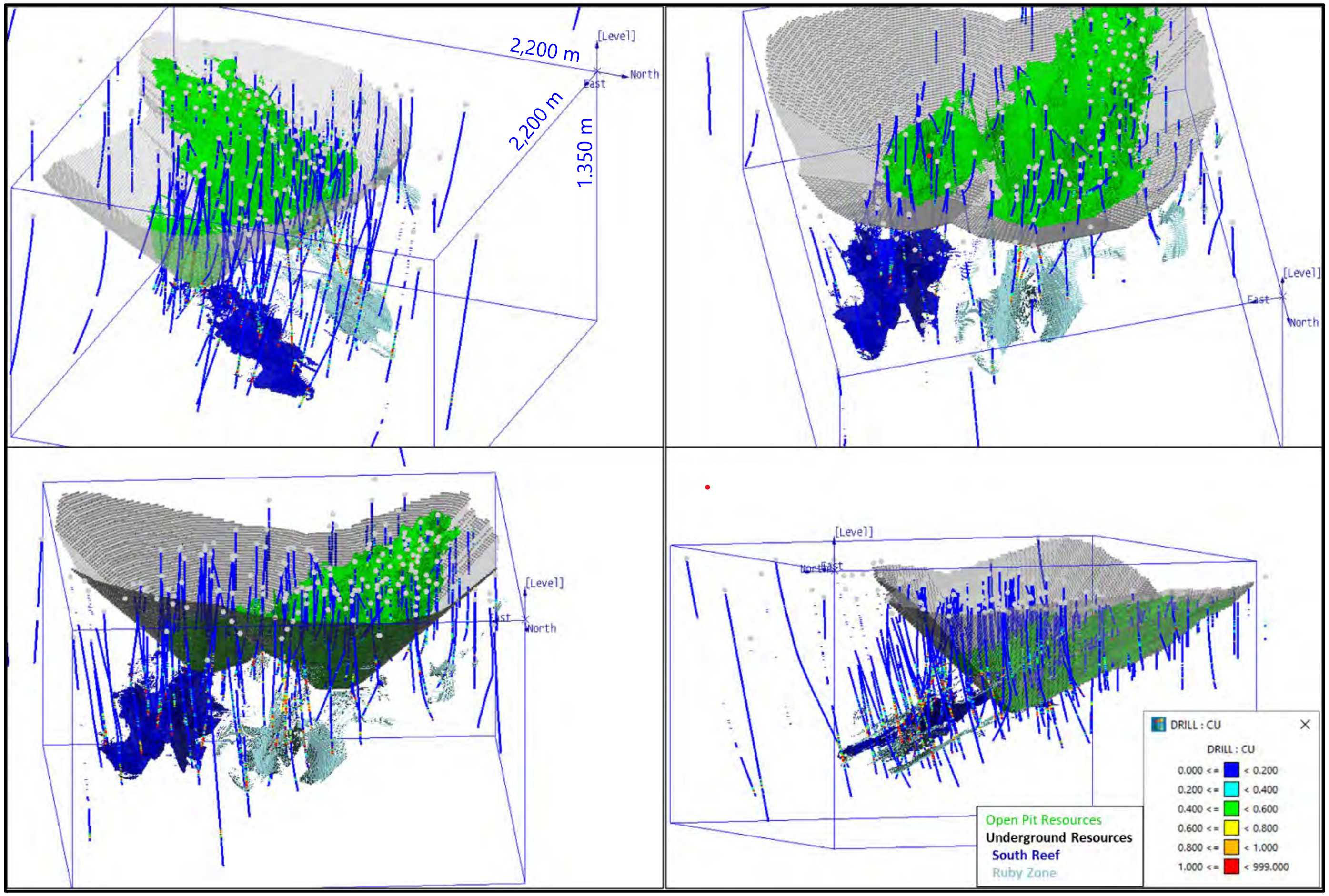
(2) Mineral resources are prepared in accordance with the definitions in S-K 1300. No mineral reserves have been estimated on the Bornite Property.

(3) Mineral resources are constrained by: an open pit shell at a cut-off grade of 0.5% Cu, with an average pit slope of 43 degrees; and underground mining shapes with a cut-off grade of 1.79% Cu. The cut-off grades include the considerations of a $4.05/lb Cu price, process recovery of 87.2%, open pit mining costs of $3.21/t mined, underground mining cost of $73.62/t mined, process cost of $19.14/t processed, G&A cost of $4.14/t processed, treatment, refining, sales cost of $0.73/lb Cu in concentrate, road use cost of $8.04/t processed, 2% NSR royalty.

(4) Trilogy Metals' attributable interest is 50% of the tonnage and contained metal stated in the table.

(5) Figures may not sum due to rounding.

Figure 11-24: Isometric Views of the Bornite Inferred Mineral Resource



(Source: Wood, 2023)

11.13.1 Portions of South Reef Mineral Resource Amenable to Underground Mining

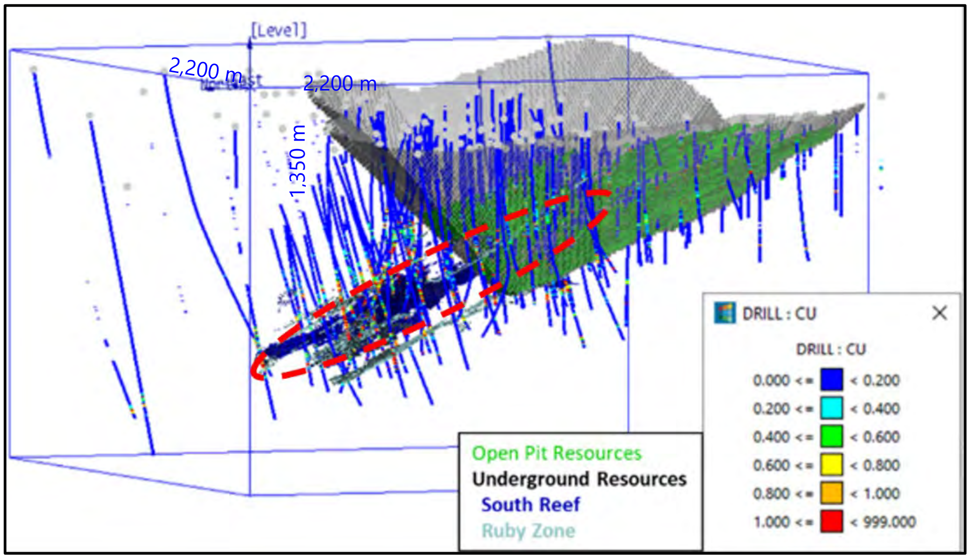
A relevant factor to consider in any future development of the Bornite mineral resource is the opportunity to focus on a much higher grade, lower tonnage mine operation. The Bornite mineral resource contains a relatively large tonnage of a relatively high-grade copper deposit based on a combination of open pit and underground mining methods. Within the mineral resource is a significant tonnage of a much higher-grade copper zone (South Reef). This offers the opportunity to develop the deposit by focusing only on the high-grade deposit by underground mine methods. This may be of benefit by limiting the footprint of any proposed mining operation, reducing initial capital costs, and be advantageous to the permitting process. To illustrate this opportunity, Table 11-6 presents the high-grade portion of the South Reef that is contained within the constraining pit shell; this is a subset of the in-pit mineral resource in Table 11-5 at a 1.79% Cu cut-off. Table 11-6 also shows the extension of the South Reef below the pit shell presented in Table 11-5. This subset of the South Reef resource represents the tonnes and grade of the high-grade portion of the Bornite mineral resource that could be mined by underground methods. An illustration of this area is presented in Figure 11-25.

Table 11-6: Portions of South Reef Mineral Resource Amenable to Underground Mining

Class	Type/Area	Cut-off (Cu %)	Tonnes (Mt)	Average Grade Cu (%)	Contained Metal Cu (Mlb)
Inferred	In-Pit South Reef[1]	1.79	11.0	3.56	864
	Outside-Pit South Reef[2]	1.79	22.0	3.48	1,690
	Total South Reef		33.0	3.51	2,554

Note: (1) Subset of the mineral resource and is not additive to the in-pit mineral resource reported in Table 11-5 .
(2) Restatement of the mineral resources outside of the pit as reported in Table 11-5 and is not additive to Table 11-5.
(3) Trilogy Metals' attributable interest is 50% of the tonnage and contained metal stated in the table.

Figure 11-25: Area of South Reef Amenable to Underground Mining Methods (depicted by dashed red line)



(Source: Wood, 2023)

11.14 Factors that Could Affect the Mineral Resource Estimate

Some of the in-pit mineral resources are of sufficiently high grade to allow mining by underground mining methods which allows flexibility on how they could eventually be extracted.

Additional factors that could affect the mineral resource estimate include:

- Unrecognized complexity and other changes to the interpretation of the geological model and grade shell
- Changes to the mineral resource estimate methodology
- Adjustments to address the perceived high-grade bias in the higher-grade copper
- Unrecognized metallurgical variability
- Additional work may allow the inclusion of cobalt in future updates to the mineral resource statement and expand the mineral resource
- Approval for developing road access to the site.

11.15 QP Comments on Chapter 11

The QP is of the opinion that all issues relating to relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

12.0 MINERAL RESERVE ESTIMATES

This chapter is not required for this Report.

13.0 MINING METHODS

This chapter is not required for this Report.

14.0 PROCESSING AND RECOVERY METHODS

This chapter is not required for this Report.

15.0 INFRASTRUCTURE

This chapter is not required for this Report.

16.0 MARKET STUDIES

This chapter is not required for this Report.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

This chapter is not required for this Report.

18.0 CAPITAL AND OPERATING COSTS

This chapter is not required for this Report.

19.0 ECONOMIC ANALYSIS

This chapter is not required for this Report.

20.0 ADJACENT PROPERTIES

This chapter is not required for this Report.

21.0 OTHER RELEVANT DATA AND INFORMATION

This chapter is not required for this Report.

22.0 INTERPRETATION AND CONCLUSIONS

The current assumptions about the geologic controls that influence the distribution of copper mineralization and the geological model that forms the basis of the current Bornite mineral resource estimate are reasonable. The recent lithostratigraphy project improved the understanding of the geological model. The drilling, sampling and validation practices used by NOVAGOLD and Trilogy Metals adhere to accepted industry standards and have resulted in a reliable database for data collected since 2011. Data verification completed by NOVAGOLD and Trilogy Metals that included re-surveying historical drill collar location and re-entering 100% of the historical down hole survey and re-assay of 67% of the historical samples provides reasonable confidence in the reliability of the database. A perceived high bias observed for high-grade historical copper results and the absence of direct quality control support or indirect support through re-assaying for almost all sampling within the high grade Upper and Lower Reef zones remains a risk that should be resolved through re-assaying and new drilling.

Metallurgical testwork to date indicates that the Bornite mineralization can be treated using standard grinding and flotation methods to produce clean copper concentrates. Initial testing indicates copper recoveries of approximately 87% resulting in concentrate grades of approximately 27% Cu with low potential penalty elements. Further metallurgical testwork is warranted to test these assumptions. There has been very limited metallurgical testwork that evaluates the extraction of cobalt. This work is recommended to properly assess the potential of economic cobalt extraction and recovery.

Based on the information to date, the Bornite Property hosts a relatively large copper resource that is potentially amenable to a combination of open pit and underground mining methods. There is an opportunity for any future mine evaluation to focus on a high-grade portion of the mineral resource (South Reef) that could be mined by underground methods only.

All of the current mineral resource occurs in the Inferred category and represents an early-stage evaluation of the potential of the Bornite Property. Risk factors include:

- Unrecognized complexity and other changes to the interpretation of the geological model and grade shell
- Changes to the mineral resource estimate methodology
- Adjustments to address the perceived high-grade bias in the higher-grade copper in the historical drill holes
- Unrecognized metallurgical variability
- Approval for developing road access to the site.

These risk factors and uncertainties were considered in the classification of the Inferred mineral resource.

23.0 RECOMMENDATIONS

23.1 Geology and Database

Considerable geological mapping has been completed in 2021 and 2022. This information should be used to improve the understanding of the interpreted tectonic style and the role it plays in the distribution of copper mineralization. Interpretation of a discontinuity between the Upper and Lower Reef dolomites continues to be problematic in developing a coherent structural and stratigraphic model for the deposit. Additional subsurface structural interpretation to improve the understanding of discontinuities is recommended. The estimated cost of this work is $50,000.

To help improve the confidence in the resource estimate primarily with historical holes within the Upper and Lower Reef zone, the core boxes of the remaining archived historical core should be laid out, sample intervals flagged where possible, and the integrity of the core examined to determine if re-sampling is possible. Assuming the re-sampling program is feasible, a budget for labour, assay and data analysis is estimated at $200,000.

To improve the confidence in the resource estimate and to justify gaining access to the South Reef underground, 20 drill holes totalling 16,000 m is recommended. This total drilling cost is estimated to be approximately $8 million. A scoping study to better define where these holes would be drilled (from surface) is recommended at a cost of $0.4 million.

The Upper and Lower Reef zones should be re-drilled to validate a representative number of historical holes and to infill drill and improve confidence in the estimate. Because underground access is not currently available, these holes must be drilled from surface. Assuming 50 m sample spacing within the Upper and Lower Reef zones could support Indicated mineral resources, 25 to 35 drill holes totalling 10,000 to 15,000 m is recommended. This program total drilling cost is estimated to be $5 million to $8 million.

To improve confidence in the database quality, a quantified data entry transcription error check should be completed on the entire drill hole database. A random 5% selection, by year, of collar, down hole survey, and assay data should be re-entered from original source documents and compared with the database entries. If the entry error rate exceeds 1% in the random selection, then a new 100% data entry program should be considered. Care should be taken to ensure transformations of collar locations and down hole survey depth from feet to metres, collar transformation from UTM NAD 27 to UTM NAD 83, and down hole survey bearing from quadrant to azimuth are correct and that the source documents are appropriate. The initial database review is estimated to cost $8,000 to $10,000. A full database document review and re-entry is estimated to be an additional $25,000.

23.2 Metallurgical Testwork

Additional metallurgical testwork is required to support more advanced studies. Key areas that require additional testwork are as follows:

- Additional sample material will be needed to better understand the metallurgical variability present in the deposit. This additional testwork can take the form of additional grinding and flotation testwork.
- The improvement of concentrate quality should be the objective in any future testwork.
- Testwork to determine settling and filtering characteristics is required for concentrates and tailings.
- Flotation testwork focused on reducing the amount of cobalt reporting to the copper concentrate.
- Flotation testwork on the copper flotation tails to reduce the mass pull of the pyrite concentrate and improve cobalt recovery to produce a better cobalt grade concentrate.

Recommendations include drilling three holes in the open pit area of the Ruby Zone and three holes in South Reef totalling 4,000 m. At $500/m, a total of $2 million for metallurgical drilling is estimated. The cost for metallurgical testing is estimated at $300,000.

Additionally, obtaining a market study for a pyrite-cobalt concentrate is recommended at an estimated cost of $35,000.

23.3 Other Recommendations

Additional recommendations are summarized in Table 23-1.

23.4 Summary of Recommendation Costs

Estimated costs for completing the recommended work is summarized Table 23-1.

Table 23-1: Recommended Budget for Further Work

Recommended Program	Description	Estimated Budget ($000s)
Baseline Studies	Maintain environmental baseline studies and permitting activities	50
Acid Base Accounting Study	Implement an initial acid base accounting waste-rock study	50
Exploration	Continue exploration in the vicinity of Bornite looking for satellite deposits through an integrated program, including geologic mapping, relogging of existing drill holes, lithogeochemistry and geophysical surveys.	250
Drilling, Geology, Database and Scoping Study	-	13,658 to 16,685
Metallurgical Testing	-	2,335
Hydrogeological and Geotechnical Assessment	Initiate hydrogeological and geotechnical programs to better understand the groundwater regime and the stability characteristics of the rocks at Bornite, particularly for those areas that would be mined by underground mine methods.	500
Total		**16,843 to 19,870**

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25.0 RELIANCE ON INFORMATION PROVIDED BY REGISTRANTS

The QPs have not independently reviewed and rely on information provide by Trilogy Metals of the following:

- Legal information including ownership of the Bornite Property or any underlying property agreements, mineral tenure, surface rights, royalties
- Environmental matters including permitting.

The QPs have fully relied upon, and disclaim responsibility for information provided by Trilogy Metals through the following:

- Elaine M. Sanders, Chief Financial Officer and Corporate Secretary, Trilogy Metals, 2023, email statement confirming the validity of the contents contained in Chapter 3 of the Report herein, dated 31 January 2023.

This information is used in Chapter 3 for legal and environmental information, and in Chapter 11 to support reasonable prospects for economic extraction.

The QP considers it reasonable to rely on Trilogy Metals since they have an independent title opinion prepared in 2018, and have successfully obtained permits to support their exploration programs since 2011.