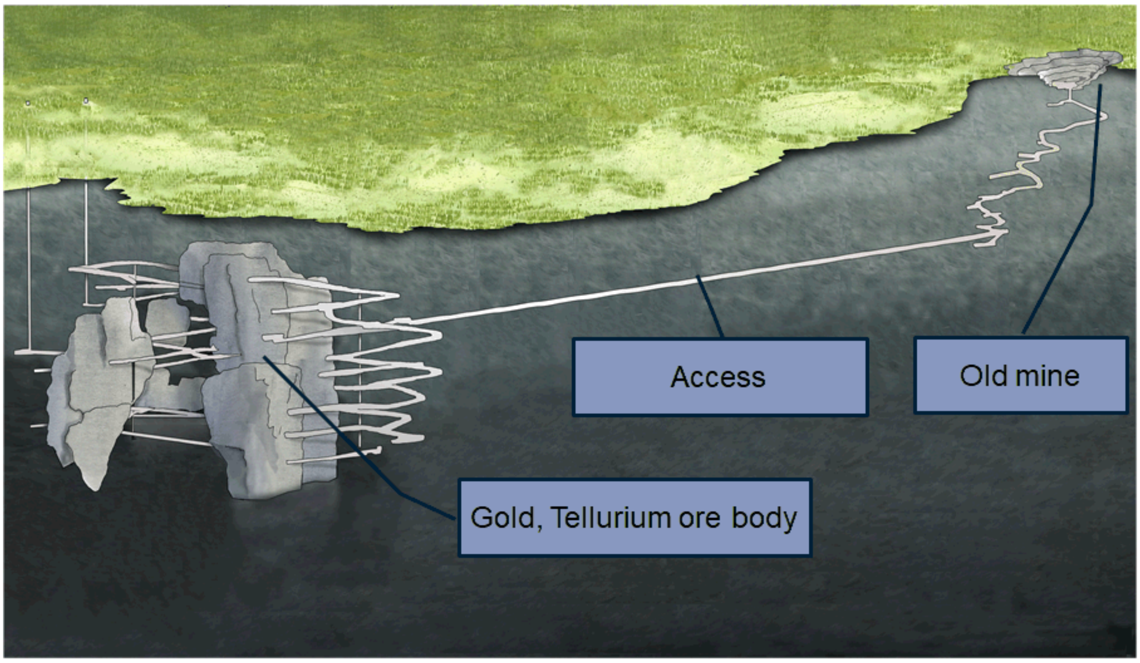
Boliden Summary Report

Mineral Resources and Mineral Reserves | 2021

Kankberg



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1 SUMMARY

This annual summary report concerns Boliden's wholly owned Kankberg mine (Sweden) and is a summary of underlying technical reports which have been prepared in accordance with the guidelines set out in the Pan-European Reserves and Resources Reporting Committee (PERC) "PERC Reporting Standard 2017". The report is updated and issued annually to provide the public (stakeholders, shareholders, potential investors and their advisers) with:

- An overview of the Kankberg mine and Boliden Area Operations; and
- Mineral Resource and Mineral Reserve statements for the mine and an overview of methods used to estimate these.

A summary of Mineral Reserves and additional Mineral Resources is presented in Table 1. The block model used as a basis for estimation of Mineral Resources was prepared in November 2021. The block model used as a basis for estimation of Mineral Reserves was prepared in November 2020.

The effective date of this report is 31 December, 2021.

Table 1: Mineral Reserves and additional Mineral Resources from the Kankberg Mine 31-12-2021 and comparison against previously reported on 31-12-2020

Classification	**2021** kt	**Au (g/t)**	**Ag (g/t)**	**Te (g/t)**	**Bi (g/t)**	2020 kt	Au (g/t)	Ag (g/t)	Te (g/t)	Bi (g/t)
Mineral Reserves										
Proved	2 320	3.7	11	194	95	2 610	3.2	11	181	87
Probable	1 440	3.9	7	158	100	1 930	3.5	6	135	80
Total	3 760	3.8	10	180	97	4 530	3.4	9	162	84
Mineral Resources										
Measured	220	3.1	7	116	77	200	3.5	8	121	84
Indicated	790	3.4	5	147	95	670	4.0	8	162	100
Total M&I	1 010	3.3	6	141	91	870	3.9	8	152	97
Inferred	1 830	3.2	4	128	87	1 460	3.9	7	161	106

See also Section 3.14, 'Comparison with previous year'.

1.1 Competence

The contributors and Competent Persons responsible for the preparation of this report are presented in Table 2 below.

Table 2. Contributors and responsible competent persons for this report

Report Section	Contributors	Competent Persons
Overall report compilation	Birger Voigt	Johan Bradley
Geology	Birger Voigt, Susanne Holmen	Gunnar Agmalm
Resource Estimation	Suzanna Falshaw	Gunnar Agmalm
Mineral Processing	Lisa Malm	Anders Sand
Mining & Reserve Estimation	Kenneth Nyström, Andreas Markström	Gunnar Agmalm
Environmental and legal permits	Rodrigo Jr. Embile, Viktoria Lindberg	Seth Mueller

2 GENERAL INTRODUCTION

2.1 Introduction

Boliden AB ("Boliden") is a Swedish mining and smelting company focusing on production of copper, zinc, lead, gold and silver. Boliden operates six mining areas and five smelters in Sweden, Norway, Finland, and Ireland. The company primarily processes zinc, copper, nickel, gold, lead, and silver and is engaged in exploration, mining, smelting, and metals recycling.

This annual report is issued to provide the public (stakeholders, shareholders, potential investors and their advisers) with an overview of Boliden's Kankberg mine, including the data and assumptions used to support the latest Mineral Resource and Mineral Reserve statements.

The annual report is a summary of internal technical reports, which provide a full evaluation of supporting information for the Mineral Reserves and additional Mineral Resources, having been prepared in accordance with the guidelines set out in the Pan-European Reserves and Resources Reporting Committee (PERC) "PERC Reporting Standard 2017".

2.2 The PERC Reporting Standard

The PERC Reporting Standard 2017 (see www.percstandard.eu) is one of the world-wide CRIRSCO (see www.crirsco.com) group of standards for reporting of Mineral Resources and Mineral Reserves, along with JORC, CIM, SAMREC etc.

The PERC Reporting Standard was adopted by Boliden in 2019.

3 KANKBERG

3.1 Project Outline

The Kankberg mine is located 41 km northwest of Skellefteå in Västerbotten county, northern Sweden. Ore is hosted by an alteration zone in a suite of felsic volcanic and volcaniclastic rocks.

In 2021 (01 January to 28 December) Kankberg mined 468 kt of ore, with an average grade of 3.41 g/t Au, 9.9 g/t Ag and 156 g/t Te. The mine has produced continuously since 2012 through underground, cut and fill methods, between depths of -530 m and -320 m level, via a ramp-drive system from the historic Kankberg open pit mine to the north.

Production from Kankberg is stockpiled on surface before being trucked to the Boliden Area Operations Processing Plant (BAOPP), a distance of 10 km from the mine. Processing is carried out in campaigns or batches, each of which may take a few weeks. Tailings from Kankberg is deposited at the Hötjärn tailings management facility close to the BAOPP.

Concentrates and precious metal sludge containing gold and silver from the BAOPP are transported roughly 50 km to Boliden's Rönnskär smelter at the port of Skelleftehamn, from where the refined metals are marketed. Tellurium is sold as a concentrate mainly to China.

3.2 Major changes during the year

3.2.1 General

The bullet point list below summarizes changes to the operation during the year:

- Density formula: Ore density is now estimated by regression formula based on mineralogical rock classification (see Section '3.8.6 Density');
- The Kankberg Mineral Resource statement includes Inferred material from a satellite deposit situated north of Västra Åkulla (NOVA);
- Process test work has been undertaken on high sulphide material (see below)
- Mercury is now estimated into the block model;
- A new heat exchanger has been installed in the ventilation system, reducing carbon emissions for heating of incoming air by 80 percent;
- Precious metal sludge from electrowinning, which was previously cast into doré bars at the BAOPP, is now instead transported to Rönnskär for further processing.

3.2.2 Technical studies

Table 3 below presents a summary of technical studies carried out during the year for the conversion of Mineral Resources to Mineral Reserves. Material from this area has relatively high sulphur grades, but process test work has confirmed amenability to the existing Kankberg process route, with similar recoveries and costs.

Table 3: Technical studies of new positions

Position	Tonnages converted from resources	Reference (DMS#)
S274 (between levels z 282 & z 252)	155kt @ 6.7 g/t Au	1841251

3.3 Location

The Kankberg mine is located at latitude 64°55'20" N longitude 20°16'00" E in the north of Sweden, the province and county of Västerbotten and in the Skellefteå Municipality.

Figure 1 shows a road and topography map of the Kankberg - Boliden area. The coordinate system used here is the Svenska Rikssystemet RT 90 2.5 gon väst, and is the older national standard, but is similar to the present national cadastral standard SWEREF99 TM. The location of the 'New' i.e. present Kankberg Mine is shown as a blue mine symbol, while the 'Old' Kankberg Mine, which provides access, is shown as an exhausted (upside-down) mine symbol. Ore from the mine is transported 10 km southeast to the Boliden Area Operations Processing Plant (BAOPP), shown as a blue square near the small town of Boliden.

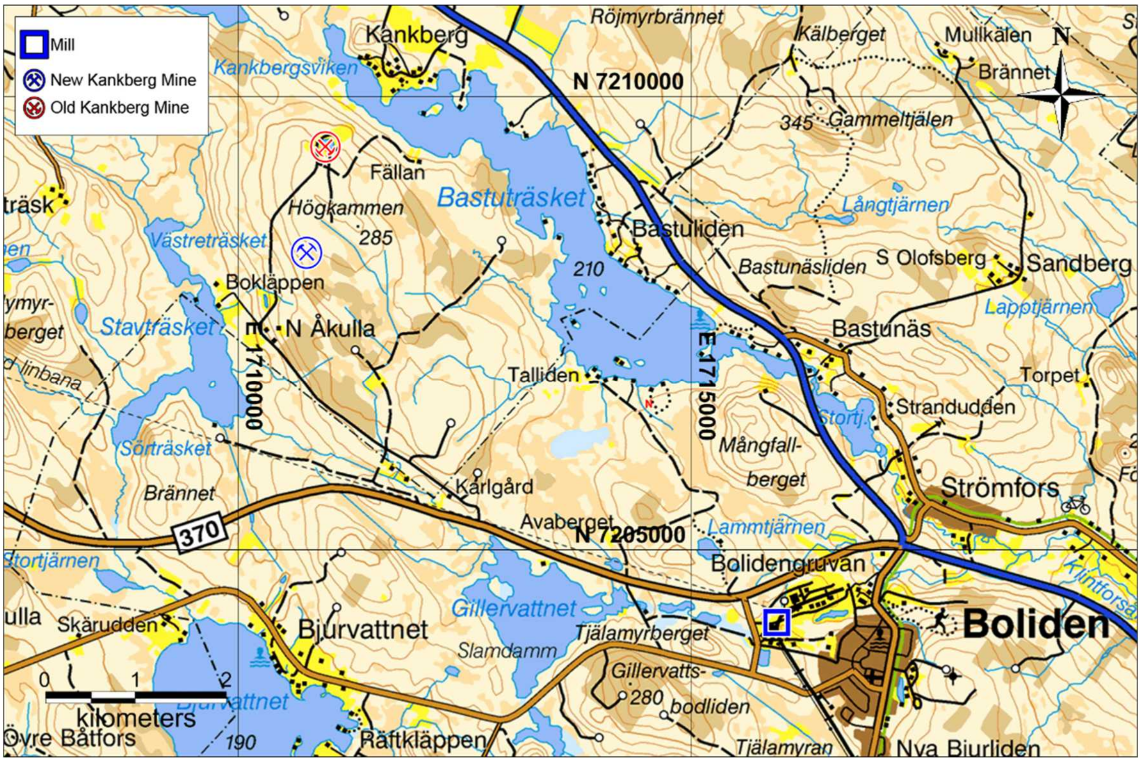

Figure 1: Index Map of the "Kankberg - Boliden" area

3.4 History

Sulfide-hosted copper, gold, silver and zinc were mined from the three historic open pits; Åkulla Östra, Åkulla Västra and Kankberg gruvan, which is now also called 'The Old Kankberg Mine'. Respectively, their ore tonnages were 197 kt, 967 kt and 1.17 Mt. The former two open pits were mined during 1997 to 1998 and 1947 to 1956 respectively. These open pits have been filled and reclaimed. The Old Kankberg Mine was mined in two periods, from 1966 to 1969 and 1988 to 1998. This pit now provides access to the (New) Kankberg Mine, via a decline ramp from the base of the pit to the underground orebody.

Mineralization characteristic of the Kankberg gold mine was first intersected by drilling in 1995 and was followed by exploration development in 1997. Systematic drilling and metallurgical testwork culminated in a feasibility study, which was completed in January 2011. Production from Kankberg commenced in January 2012.

3.5 Ownership and Royalties

Boliden owns the land and has full surface rights surrounding and immediately adjacent to the mine. The main relevant plots are Kankberg 1:35 and Akulla 1:9, Boliden also owns surrounding plots. Since Boliden owns all relevant surface and mineral and mining rights, only an annual royalty of 0.05% is payable to the State, based on contained metal in run of mine ore and average commodity price over the year. No landowner royalties are payable.

3.6 Permits

3.6.1 Introduction

Boliden Mineral AB is in possession of all required permits to mine at the Kankberg Mine and the necessary land use designation from the Mining Inspectorate. Mining concessions and exploration permits are issued by the Mining Inspectorate of Sweden (Bergsstaten) which is part of the Geological Survey of Sweden (SGU). Summary details of these permits and concessions are presented below and can be found at https://www.sgu.se/en/mining-inspectorate/.

The capacity of the tailings management facility at BOAPP is sufficient to include material from the Kankberg life of mine plan (LoMP) up to and including 2028. The final two to three years of production are expected to exceed the existing tailings dam capacity. It is not certain at this stage how the balance of this tailings material will be accommodated. Studies are however on-going, a suitable capital provision has been made and it is reasonable to assume that an appropriate solution will be selected in good time for necessary permitting, design and construction to take place.

3.6.2 Exploitation Concessions

Exploitation concessions at Kankberg held by Boliden Mineral AB are presented in Table 4 below.

Table 4: Mining concessions at Kankberg held by Boliden Mineral AB

Name	Diary No.	Area (ha)	Valid from	Valid to
Östra Åkulla nr 1	2000000066:R	45.1598	2001-02-05	2026-02-05
Östra Åkulla nr 2	2009000945	2.8158	2009-11-10	2034-11-10
Kankberg K nr 1	1998000694:R	95.384	2000-01-01	2025-01-01
Åkulla K nr 1	2000000064:R	33.7698	2001-02-05	2026-02-05

It is notable that three of these concessions are due to expire prior in 2025-26, some five years prior to the end of forecast production, according to the current life of mine plan (LoMP). Boliden intend to apply for a ten-year extension to this license in good time and in accordance with standard operating procedure. Whilst the detailed terms of any extension are uncertain at this stage, Boliden is not aware of any current or impending material impediments that would negatively influence a decision from the relevant permitting authorities and would reasonably expect an application for extension to be granted.

3.6.3 Exploration Permits

Table 5 presents the exploration permits held by Boliden in the Kankberg area.

Table 5: Exploration permits held by Boliden Mineral AB in the nearby area of the Kankberg Mine

Name	Diary No.	Area (ha)	Mineral	Valid from	Valid to
Kankberg nr 1006	2017000666	358.20	Au, Cu	2017-11-07	2024-11-07
Kankberg nr 1007	2018000745	222.62	Au, Cu, Zn	2018-11-14	2022-11-14
Gillervattnet nr 1007	2016000088	293.83	Au	2016-04-14	2023-04-14
Gillervattnet nr 1006	2016000067	266.73	Au	2016-03-10	2023-03-10

3.6.4 Environmental Permits

In accordance with the Environmental Law, a main permit as a partial decision: 2011-04-06, mål (case) nr. M739-09 was issued in April 2011 and updated in 2015 with final conditions for discharges as: 2015-01-23, mål (case) nr. M 739-09. These permits cover matters including:

- Maximum production rate 500 ktpa:
- Maximum total concentrations of elements in discharged water (there is no limitation on quantity);
- Maximum noise levels;
- Dust;
- Requirement to run operations as stated in the technical description;
- Acquisition and importation of additional waste rock and/or tailings sand, also temporary storage, for use as fill underground;
- Environmental monitoring;
- Explosives – spillage etc.;
- Remediation plans, to be submitted at least 1 year before closure; and
- As of 2019-11-27 a new financial bank guarantee of 19,2 MSEK was approved by the Environmental Court in case nr M2723-17. The guarantee shall cover all environmental liabilities in case of bankruptcy.

Boliden are in the process of drafting an environmental permit application to include the areas between levels -50 m to -300 m and levels -600 m to -1000. These zones currently lie outside the existing environmental permit boundaries and contain a minor part of the LoMP. The authors are not aware of any material issues currently affect the on-going permit application and consider it reasonable to include this material in the LoMP.

3.7 Geology

3.7.1 Regional

The Kankberg Mine lies within the eastern part of the Skellefte mining field, one of the most important mining regions in Sweden, where Boliden has been active since the 1920s. It's significance in relation to 52 other known deposits in the field is shown in Figure 2 from a paper by Allen et al (1996) that describes the marine volcanic arc setting of these Zn-Cu-Au-Ag polymetallic massive sulfide deposits, vein Au deposits and porphyry Cu-Au-Mo deposits.

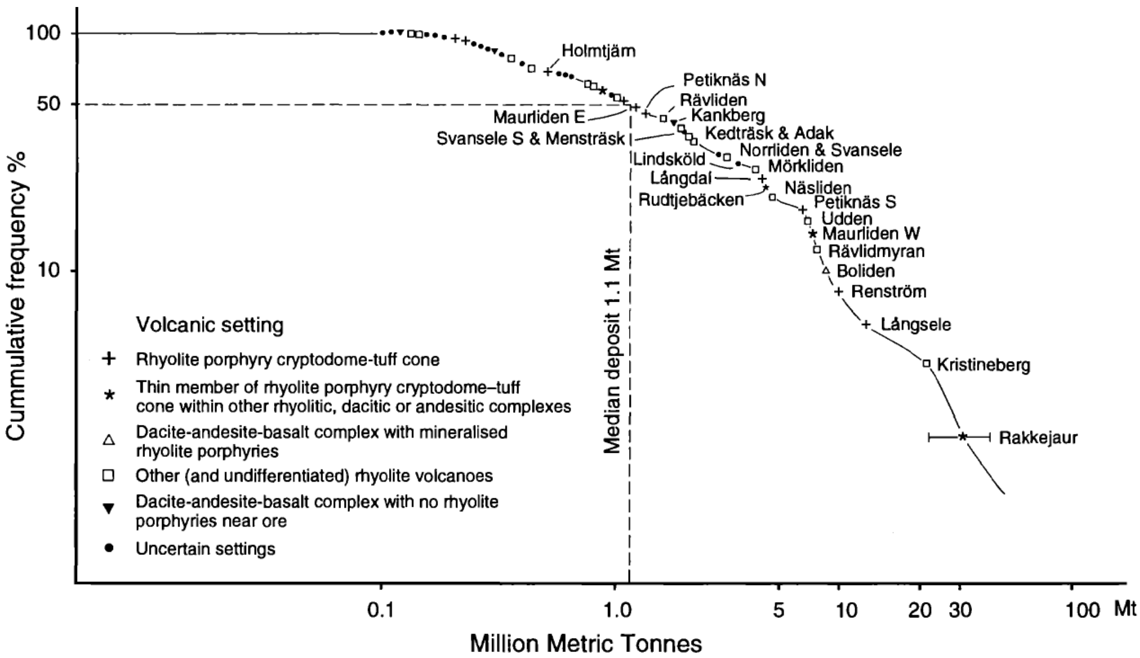

Figure 2: Tonnage-frequency distribution and volcanic setting of the 52 known massive sulphide deposits of 0.1 Mt or more in the Skellefte district (modified from Allen et al (1996)).

The majority of known ore deposits in the Skellefte field occur within the upper parts of the Skellefte group, which is a regionally dominant sequence of volcanic rocks that were formed during a period of intense, extensional, continental margin arc volcanism about 1.89 Ga ago.

3.7.2 Local

The host rock in the Kankberg area is dominated by volcanic rocks of primarily dacitic and rhyolitic compositions forming quartz-feldspar porphyritic, rhyolitic and dacitic rock types. The felsic magmas forming these volcanics intruded as shallow (subvolcanic) dykes and sills and extruded as lavas at the surface where they mixed with sediments and mass flows derived from volcanic slopes. The volcanism initiated a convection of solutions through the rocks. These solutions dissolved and transported minerals and metals to sites of deposition.

After the major volcanic period had ended the area was subsequently deformed and folded. This resulted in a dominantly vertical trend of the rocks and structures. At a later stage, brittle deformation took place. Fractures and fissures were intruded by mafic magma forming basaltic and andesitic dykes, which are common in the Kankberg area.

3.7.3 Mineralization

Gold mineralization is hosted in a complex mix of volcanic rocks consisting primarily of quartz-feldspar porphyry, volcaniclastics and breccias. The host rocks are strongly altered by silicification, andalusite ± topaz alteration and to a varying degree sericitization. The strong alterations form a highly competent body, which is surrounded by dacites. The contact zone is characterized by sericite ± chlorite alteration associated with pyrite ± pyrrhotite.

The economic mineralization is contained in 'metallic' minerals primarily located within the quartz-andalusite ± topaz alteration. It includes fine-grained native gold alloyed with silver at proportions of between 0 to 20%. More commonly, gold occurs as gold-tellurides including petzite (Ag_3AuTe_2), calaverite ($AuTe_2$) and sylvanite ($AuAgTe_4$). Another common telluride is tellurobismuthite (Bi_2Te_3). Several more telluride minerals have been identified through microscopy. Sulfides, pyrite with less pyrrhotite, sphalerite and chalcopyrite, are of minor significance but generally increase upwards through the deposit.

3.8 Drilling procedures and data

3.8.1 Introduction

The present orebody has no surface expression and has been explored entirely by drilling, at first from the surface but predominantly by underground drilling as described below. There is no other sampling of in-situ rock.

3.8.2 Drilling techniques

Exploration and infill drilling are carried out by wireline double-tube diamond core drilling. At present, this is almost exclusively from underground using four rigs equipped with the Wireline 56 system that produces 39 mm diameter core. Four exploration holes have been drilled from the surface. The Near Mine Exploration Department (UGN) use contracted drilling company Protek AB for exploration drilling. Protek AB use two Diamec U4 drill rigs. The mine uses two in-house drill rigs (Diamec U6 and Diamec S6) for infill drilling.

No special measures other than good drilling practice and equipment have been needed to maximize core recovery, which is of the order of 99.5% for all holes.

3.8.3 Downhole surveying

Hole collars are surveyed before drilling and again afterwards. For exploration drilling, downhole deviation surveying is carried out by Protek AB personnel using gyro instruments from Inertial Sensing, Reflex and Devico. For infill drilling, deviation surveying is carried out by Kankberg personnel using a Devico DeviFlex instrument.

3.8.4 Sampling

Apart from by drilling, there are no other samples routinely taken of in-situ rock. Selection of samples from drilling for assaying is as follows.

Exploration holes are generally sampled (and assayed) to about 65% of their total length. Infill drill-holes are generally drilled from either side of, and outside the alteration that characterises the ore envelope. The start of the hole is generally not sampled. When the logging geologist identifies alteration that indicates proximity to the ore envelope, sampling starts two core boxes up-hole from the contact. It will continue until the end of the hole, even if it seems that the drill hole has emerged from the other side of the ore envelope into unmineralized rock.

Exploration holes are sampled as half-cores, where core is split length-ways by diamond saw and one half is sent for assaying. The other half is stored for reference. From infill drilling, of those intersections that are sampled, the whole core is submitted as samples. Un-sampled core is stored for a year, after which it is discarded.

Primary samples and QAQC samples (inserted as described below), are bagged and sent by contracted courier service to the ALS geochemistry laboratory in the town of Piteå, about

100 km to the north, where sample preparation – drying, crushing and pulverising - is carried out using procedure PREP – 22. Sample pulps are returned to Boliden where they are stored.

Because the gold and other economic mineralization is so fine grained, the excellent core recovery and drill spacing of 10m x 10m, it is considered that the sampling is representative of the in-situ material collected.

3.8.5 Logging

Drill core is logged at Boliden Mineral AB's core logging facilities in Boliden. Logging data is captured in WellCAD™ software and data is uploaded to an acQuire™ database.

The following fields are logged:

- Rock type acronym. There are 57 standardized rock types, of which the following 14 are most frequent: quartz-feldspar-porphyry, volcanoclastic, sericite-quartzite, sericite-schist, chlorite-quartzite, dacite, andesite, andalusite-quartzite, topaz fragment rock, breccia, basalt (outside mineralization) and clastic sedimentary.
- Alteration types – andalusite, topaz, sericite, chlorite, silicic
- Mineral proportions of talc and muscovite on a scale of 1 to 5 these affect rock stability and, but of less concern, flotation.
- Other minerals – garnet, tourmaline, sphalerite, galena, chalcopyrite, arsenopyrite, pyrrhotite, pyrite, gold.
- Sulfosalts – tellurides
- Rock Mechanics structures – gouge, disking, crushed drill core – on a 1 to 5 scale: rare, moderate, common, abundant, pervasive.
- Comments. May include small amounts of e.g. gouge, where too small for above logging.
- The start and ends of samples are assigned and length is adjusted to fit with lithological contacts. Length of samples are aimed at 2 m and usually vary between 0.5 and 2 m. Locally, typically where alteration is weak, the length of samples can approach 3 m.

All core is photographed and the photos are available on-line to Boliden staff.

3.8.6 Density

The Kankberg mine applies a three-stage approach for determining sample density, as outlined in priority order below:

1. Measured density (pychnometer);
2. Regression formula (based on mineralogical rock classification); and
3. Default densities of 2.9 for material within the block model* and 2.8 for material outside the block model.

** In practice the number of default densities applied to mineralized material is negligible.*

3.8.7 Analysis and QAQC

Sample preparation, chemical assaying and measurements of specific gravity are carried out by ALS Piteå – Geochemistry, Hammarvagen 22, SE-943 36 Ojebyn, Piteå Norrbotten, Sweden. These procedures are identical for the mine infill drilling and exploration group drill holes.

All ALS geochemical hub laboratories are accredited to ISO/IEC 17025:2017. As part of the QAQC processes, pulp duplicates are sent from ALS to Hazen Research (Colorado, USA) for Te analysis. Table 6 shows an overview of the methods used. The "Over-range method" applies to samples where assay result reached upper detection limit of the primary method.

Table 6. Overview of ALS's designation of analytical methods.

	Method	Over-range method
Preparation	PREP – 22	
Assay Au	Au-ICP21	Au-GRA21, Au-AA25, Au-SCR21
Assay other	ME-MS61m	Ag-OG62/Ag-GRA21, S-IR08, Te-AA62, (As, Cu, Pb, Zn)-OG62, Hg-ICP42
Specific gravity (core)	OA-GRA08	
Specific gravity (pulp)	OA-GRA08c	

Au-ICP21 is a package of fire assay with an ICP-AES analysis. ME-MS61m is a package of a 4-acid digestion process with an ICP-MS analysis. The Periodic table of elements in Table 7 show which elements (marked in yellow) are assayed for at the Kankberg mine. Results are available in the drilling database, held in acQuire™ software.

Table 7. Periodic Table, highlighted to show assayed elements.

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac¨	Ku	Ha													
	*	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
	¨	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

The aims of the exploration and infill drilling differ slightly and standards/certified reference materials (CRM's) and QAQC procedures that are applied differ to address these aims.

Infill drilling insert QAQC samples according to the following guidelines:

- Blanks: 1st blank as the 5th - 10th sample, rate 1:50, and after visible gold and/or particularly strongly mineralized zones;
- Standards/CRM's: rate 1:50, grade of standard reflecting suspected grade of mineralized zone. Added in proportion; 10% low grade, 80% medium grade and 10% high grade. About 10 different international and in-house standards are or have been used; and

- Check assays: rate 1:50, limited to sample series of more than 50 samples, anywhere in sample series.

This result in an average QAQC usage of approximately 5.4% (standards = 2.7%, blanks = 1.7% and check assays = 1.0%).

Exploration drilling generally follows the QAQC recommendation given by the Exploration department, which is documented in Boliden's internal business management system (BMS), as stated below:

- In-house standards ca. 3%
- CRM (certified reference material) ca. 1.5%
- Blanks 2%
- Check assays 0.5%

An evaluation is underway to assess the merits of preparing standard material from Kankberg mineralization.

QAQC is checked for every sample batch before it is approved in the database. In case of deviations appropriate actions are taken such as re-assay of samples or submission of new samples in case of suspicion of contamination. Issues with long term trends are reviewed.

In total, there were 7 failed batches during the year, which were returned for re-assay.

3.9 Exploration activities and infill drilling

Exploration mainly focused on drilling in both the upper and lower parts of the main mineralization which currently lie outside the LoMP. Minor drilling was also carried out on outlying targets, which in some cases was supported by geophysical surveying.

Infill drilling is focused on increasing the drill hole density within the existing mineralized zones and LoMP. Infill drilling aims at maintaining a lead time of approximately three years ahead of planned production.

3.10 Mining methods, mineral processing and infrastructure

3.10.1 Mining methods

The mining method at Kankberg is a cut-and-fill process that can also be described as room-and-pillar with fill. The ore is mined in 6 m high horizontal rooms or stopes (7 m if it is a bottom room). The rooms are stacked vertically in 4 to 6 levels, which are accessed from the ramp, as shown in Figure 3 (left). The mining starts from a bottom undercut and advances upwards. As shown in Figure 3 (right), the mining cycle is comprised of drilling of the ore, loading of blast holes, blasting, loading of the ore, cleaning of the exposed rock and reinforcing with cemented iron rods and shotcrete.

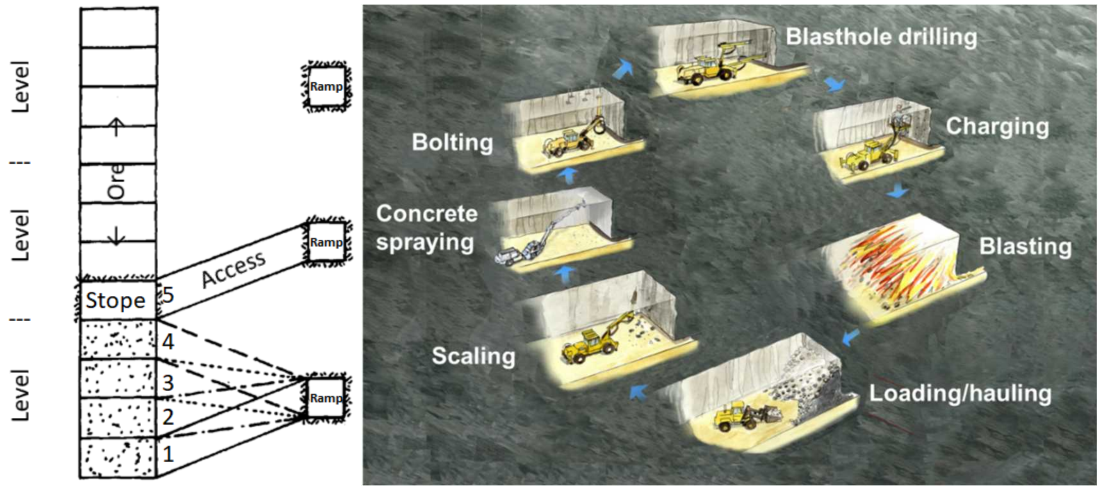

Figure 3: (Left) Sketch profile showing stope access. (Right) Illustration of the mining cycle.

Once the stope is mined, media like water, power supply and ventilation are retreated, as the stope is backfilled with waste material. The fill material serves both as support for the stope walls and as working platform for the next stope. The width of stopes varies between 4.5m to 10m. Where the width of the stope exceeds 10 m, pillars of 6 x 6 m are left at 10 m intervals within the stope. On average 4 to 5 different stopes are in production at any given time with one primary backfill area. Pillars on successive levels are vertically aligned.

Ground support is through rock bolting and shotcreting with fiber-reinforced concrete.

Backfill uses waste rock either from elsewhere in the mine, which comprises around 51% of the total requirement, or waste material which is currently trucked from Rönnskär.

3.10.2 Mineral processing

The ore is delivered by truck to the BOAPP, weighed by truck weigh-bridge and either delivered directly into the plant or stockpiled separately from ore from other mines. Ores from the different mines are processed in batches or campaigns. The feed tonnage to the processing plant is measured using a weighing system with a stationary belt scale. The feed tonnage and the truck weights are used to determine current tonnage in the stockpiles.

As shown in Figure 4 below, there are two stages of grinding. The primary mill is a fully autogenous mill and the secondary mill is a pebble mill fed with pebbles extracted from the primary mill. The ground ore is classified using screens and hydro-cyclones. A gravimetric concentrate containing coarse grained gold bearing minerals is produced in the grinding circuit. The gravimetric concentrate is packed in bags of about 800 kg and delivered to the Rönnskär smelter by truck.

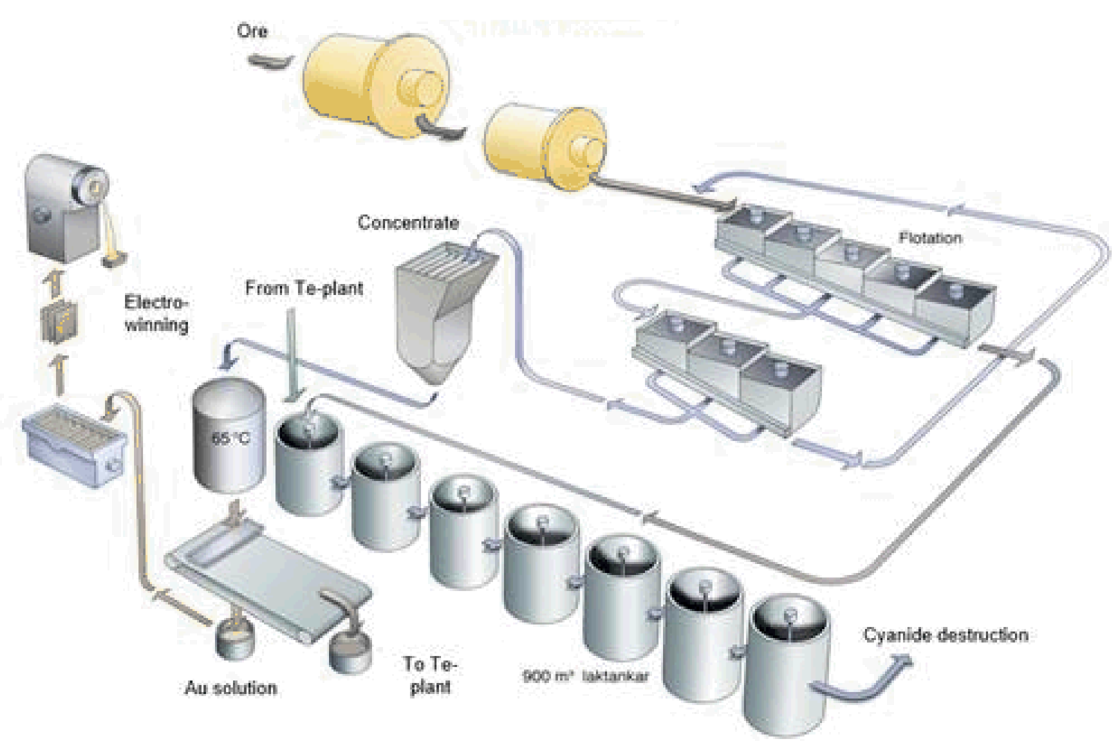

Figure 4: Simplified overview of the different stages of Kankberg ore processing at BAOPP.

Flotation is used to produce a precious metals and tellurium concentrate. The concentrate is accumulated in a leaching tank over a four to five-week campaign. After the completion of a campaign, the concentrate is hot cyanide leached to extract precious metals as a solution. This is done as a batch process. This solution is then separated from the tellurium-rich leach residue using a belt filter. The solution is pumped through a column containing active carbon to recover precious metals. These are then stripped from the carbon as a solution. Electrowinning is used to precipitate the precious metals in the solution to a sludge. In previous years, this sludge was melted and cast into doré bars at the BAOPP. However, since mid-2021, this sludge is transported to the Rönnskär smelter for further processing.

The tellurium-rich leach residue is stored in a tank so that onward processing can proceed continuously. The residue is leached again in a proprietary process to recover the tellurium to a tellurium concentrate 'cement'. This is a grey-black powder containing principally tellurium and bismuth oxides with 10% moisture. It is packed in steel drums for sale.

Also, in a continuous process, the residue from the tellurium process is added to the flotation tailings which are cyanide-leached at ambient temperature in a CIL process using active carbon. The active carbon is stripped to produce a solution containing precious metals. In the same process, but not at the same time as the batch described above, electrowinning is used to precipitate the precious metals in the solution to a sludge that is sent to the Rönnskär smelter for further processing.

Metallurgical accounting where a sum of products calculated using assays from daily composite samples of main process streams and assays and tonnage for delivered products together with feed tonnage is used to determine the head grade of the ore.

Metallurgical recoveries are presented in Table 8 below.

Table 8: Metallurgical Recoveries 2021

Metal	Average Metallurgical Recovery
Au	86%
Ag	36%
Te	51%

3.10.3 Infrastructure

Mine access is via a decline from the historic Kankberg open pit. The run of mine ore is transported by truck to stockpiles at surface before onward transport by truck to the BAOPP.

Air intake to the mine is via a ventilation shaft equipped with two 1800 mm fans on surface. To avoid freezing during winter months, air is heated with a heat exchanger between intake and return air and two propane gas burners as required during the coldest winter temperatures. Current capacity amounts to approximately 600,000 m3/h.
Air is distributed underground via 900 or 1000 mm fans to individual stopes. Active stopes with no activity are ventilated with around 5 m3/s and 16 m3/s during loading.
Return air from the south ramp exits the mine via an exhaust air shaft located in the south ramp area. Return air from the north ramp exits the mine either via the exhaust shaft or the mine ramp system.

The underground facilities for managing water at the mine consist of a system of pump stations and sumps, where mine water is collected and pumped to surface in stages.
Several oil separators are installed adjacent to workshops and filling stations.
Surface water from the industrial areas flow via drainage ditches to collection ponds for subsequent pumping to the mine water treatment plant.

3.11 Prices, terms and costs

3.11.1 Metal prices

Boliden's planning prices, which are an expression of the anticipated future average prices for approximately 10 years, are presented in Table 9 below.

Table 9. Long-term metal prices and currency exchange rates

Metal prices		**LTP 2023->**
Gold	USD/tr.oz	1 300
	SEK/kg	334 368
Silver	USD/tr.oz	17.0
	SEK/kg	4 373
Tellurium	USD/kg	35
	SEK/kg	280

Currency rates		**LTP**

	2023->
USD/SEK	8.00

3.11.2 Costs

Mining, transportation and processing costs are summarized in Table 10.

Table 10: Mining, transport and process operating costs

	Costs (SEK/t)
Mining (excluding transport of ore in mine)	335
Ore transport (within the mine and to BAOPP)	65
Process (without fixed expenditures)	125
Total	**525**

The total of these costs gives the break-even cut-off used for mine planning.

3.11.3 Net Smelter Return

For revenue evaluation, a 'Net Smelter Return' (NSR) value is effectively the value in Swedish Kronor (SEK) for each gram of each contained product or by-product metal attributed to ore arriving at the BOAPP from Kankberg, within Boliden's accounting system. Being a combined product value, it is used as a grade to describe tonnages in terms of SEK/t and is derived from long-term metal prices, metallurgical recoveries (Table 8) and smelter terms.

The long-term NSR Factors are given for 1 gram of each metal below:

- Au = 283 SEK
- Ag = 1.54 SEK
- Te = 0.15 SEK

3.11.4 Cut-off grades

The operational costs and NSR factors provided above together define the cut-off grade, which is expressed as a combined NSR value / tonne. The relative contribution of individual metals to this cut-off grade will vary according to location, but in general Au accounts for around 96% of the revenue for any single block. This is equivalent to:

- Operational cut-off (525 SEK) = 1.78 g/t
- Marginal cut-off (300 SEK) = 1.02 g/t
- Waste material (<300 SEK) = <1.02 g/t

3.12 Mineral Resources

Three-dimensional grade shells are created in Leapfrog Geo and used in Datamine Studio RM as estimation domains for grade interpolations. The grade shells are based on the following Au grades:

- High grade domain = Au >=2 ppm
- Low grade domain = Au >=1 ppm

- Waste grade domain = Au >= 0.5 ppm

These threshold grades roughly reflect historic cut-off grades and are used to reduce smoothing and produce a more local grade estimate. In addition, a high Sulphur domain is also created to provide a more local S estimate within the Au-rich zones. This grade shell is based on a cut-off grade of S >= 5%.

Histograms and log probability plots were used to identify the presence of outlier grades for Au, Ag, Te and Bi. The Au top-cap was reduced in the 2021 update after initial validation indicated the mean high-grade block estimate was outside a reasonable tolerance. Top-caps were otherwise retained (for Ag, Te, Bi) from the previous update as per the following:

- Au = 50 ppm
- Ag = 200 ppm
- Te = 1500 ppm
- Bi = 1500 ppm

Drill core samples are usually taken at 2 m length within geological domains. Length-weighted composites with a target length of 2 m were calculated for the grade estimation process, as for previous estimations.

Previous variogram parameters were reviewed in Snowden Supervisor and were deemed reasonable to retain in this update. The same structural trend planes used to control the mineralization shells in Leapfrog Geo were retained as inputs to dynamic anisotropy within the Au domain. The search parameters are in line with previous estimates and only a small adjustment was deemed necessary to the first Au search volume to ensure more than one drillhole was used in the estimate. In general, the minimum number of composites required for a block estimate is five, although this is reduced to one for the final search pass.

Ordinary Kriging was used for the grade estimation of Au, Ag, Te, Bi, Cu, S, Al and Fe. Inverse distance weighting (IDW) was used for grade estimation of Sb, Hg, Pb, As, Zn and density. Any Au estimates within the high-grade zone that were estimated with a negative Au grade were re-estimated with IDW however, in practice, this affected an insignificant number of blocks.

A parent block size of 6 x 6 x 6 m is utilized with sub-blocking to 1.5 x 1.5 x 1.5m based on QKNA completed in Snowden Supervisor and an approximate drillhole spacing of 10-20m.

To check the estimation strategy is appropriate, the block model is validated using various techniques:

- Statistical comparison
- Validation plots comparing the block model estimates against input data along different slices through the deposits
- Visual validation of block estimates in 3D against input data

Overall, the global block estimates are slightly conservative however, reasonable correlation exists between the sample data and the block estimate to consider the resource estimate reliable.

Mineral Resources are classified into Measured, Indicated and Inferred categories. The Mineral Resource classification is based upon key indicators including the quality and quantity of informing data, confidence in the block estimates, and assurance in the reasonable continuation of mineralization.

In general, a minimum sample spacing of 60 x 60m is required for Inferred, 20 x 20m for indicated and 10 x 10m for Measured. Classification strings are manually reviewed and updated in Datamine Studio RM according to these key indicators.

The basis for defining Mineral Resources is that:

(a) the material is above the marginal cut-off grade; and
(b) is included within the LG (low grade) and/or HG (high grade) domain and not waste (WG) domain.

Mineral Resources may include sill pillars and Inferred material that lie within the LoMP.

Waste rock dilution and mining recovery are incorporated into Mineral Recourses as outlined in Table 11 below.

The Mineral Resource statement is presented in Table 1 above.

3.13 Mineral Reserves

Mineral Resources are converted into Mineral Reserves when the rooms that will mine them are planned, and that material left in pillars can be excluded. Mineral Reserves are selected and reported from the parts of the block model which fall within mining design volumes (LoMP), which could include Inferred Mineral Resources. Material that falls outside the mine design is defined by wireframes and is reported as Mineral Resources exclusive of Mineral Reserves.

Where mining design volumes include Measured and Indicated Mineral Resources, then these are transferred into Proved and Probable Mineral Reserves, respectively, but excluding material in pillars. It may include small quantities of material that are Inferred Mineral Resources that are not transferred. Vertical pillars are included in the mine design but are not transferred into Mineral Reserves and are not reported.

Mineral Resources are always reported as additional to Mineral Reserves.

The Mineral Resources and Reserves are estimated with waste rock dilution and recovery percentage per category according to Table 11.

Table 11: Waste rock and dilution per category

Waste rock dilution (%)	Recovery (%)	Category

3.5	100	RESCAT=1 (Proved)	Reserve
15	85	RESCAT=2 (Probable)	Reserve
3.5	90	RESCAT=3 (Measured)	Resource
15	75	RESCAT=4 (Indicated)	Resource
20	70 or 80	RESCAT=5 (Inferred)	Resource

In effect, Measured Mineral Resources are similar to Proved Mineral Reserves, except that the pillars are explicitly omitted from the Proved Mineral Reserves, whereas in the Measured Mineral Resources, the pillars have not been planned, but they are implicitly omitted by the Recovery Factor. The same relationship exists between Indicated Mineral Resources and Probable Mineral Reserves.

All other modifying factors, namely processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors, that are required to transfer Mineral Resources to Mineral Reserves are already in place and considered to be favourable. If, for example, potentially economic mineralization was found by drilling at Kankberg that required different processing to that presently used for Kankberg ore, then this material would require a separate Feasibility Study to develop a separate mine with separate mineral asset reporting.

Using NSR as calculated above, a break-even mining cut-off grade of 525 SEK/t is used to guide mining design and in Mineral Reserve and additional Resource Estimation. When rock below this cut-off must be mined, mainly to access higher-grade material, a marginal cut-off of 300 SEK/t is applied and this material is trucked as ore. Rock below 300 SEK/t would be mined as waste and used within the mine as backfilling material.

For production planning and Reserve classification, the entire room must average at least 525 SEK/t to be mined (this could include material which has a grade below 525 SEK/t).

The Mineral Reserve statement is presented in Table 1 above.

3.14 Comparison with previous year

The total Mineral Reserve tonnes for 2021 have been reduced by 780 kt in comparison with the 2020 statement (Figure 5). This reduction is primarily due to depletion through production (“Mined (total)” -468 kt). In addition, an adjustment of -417 kt (“Adjusting”), was made to exclude material with an average grade below marginal cut-off (< 300 SEK/t), which had previously been reported as Mineral Reserve. As a consequence, the average gold grade of the Mineral Reserve has increased from 3.3 g/t Au to 3.8 g/t Au. A total of 115 kt were added through conversion of Mineral Resources.

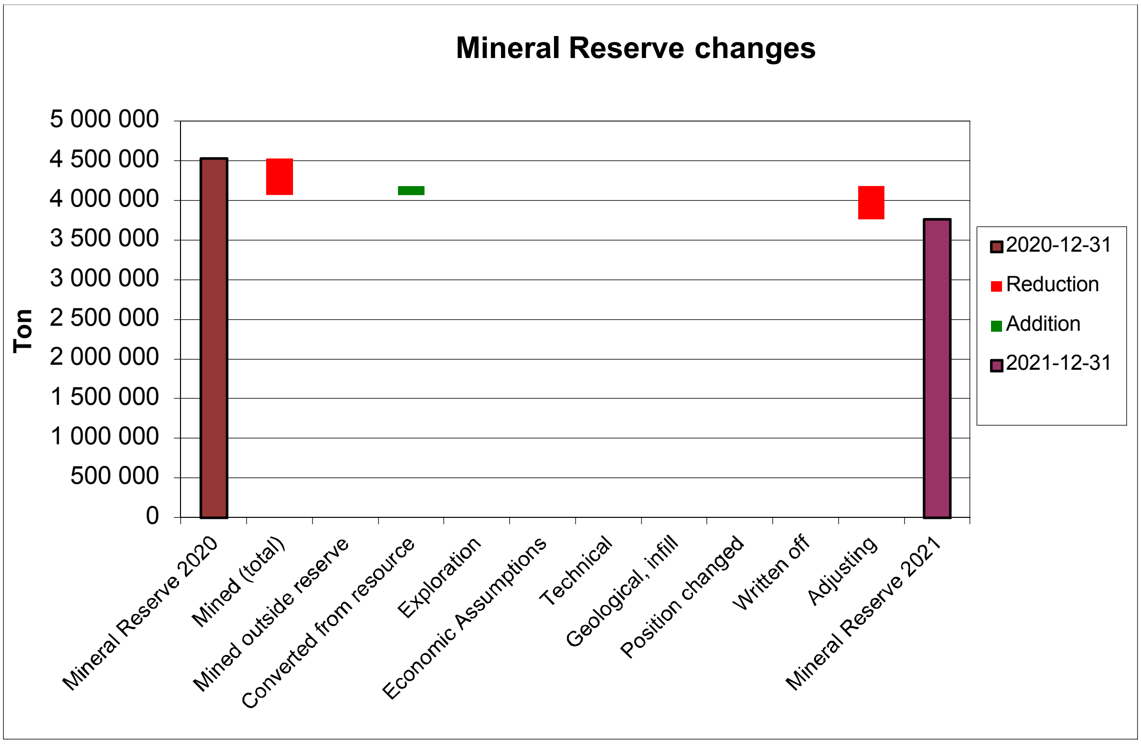

Figure 5: Changes to Mineral Reserves (P+P)

Mineral Resources have increased by 514 kt, with exploration adding a total of 694 kt (Figure 6).

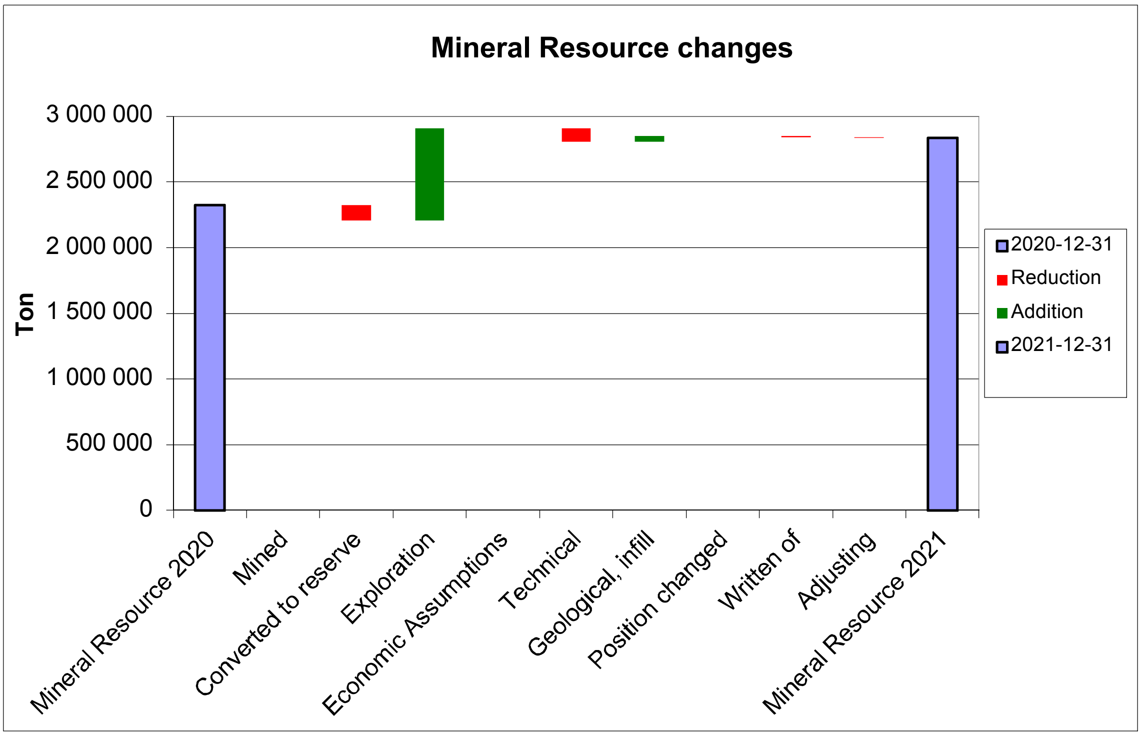

Figure 6: Changes to Mineral Resources (M+I+I)

3.15 Reconciliation

Reconciliation at the Kankberg Mine is completed for every month of production and aggregated for the year. Mined grades and tonnages are read from the block model for every position that has been mined. These predicted grades are then summarized, where the average grade for that month is compared with the average grade and tonnage which has been reported by the BAOPP.

The reconciliation for 2021 is shown in Table 12. Reconciliation data shows that mined tonnages show a small deviation (+2%) from those reported by the BAOPP. Reconciliation of mined grades against process plant reported grades shows good correlation with Au and Te (+2% & +7%). Reconciliation of Ag shows a larger deviation of +18%, which may warrant further investigation, but given Ag accounts for roughly 2% of Kankberg revenue, this is not considered to be a material issue.

Table 12: Kankberg Reconciliation 2021 (DMS #1150727)

2021 Reconciliation - Kankberg				
Category	**Tonnes kt**	**Au g/t**	**Ag g/t**	**Te g/t**
Mined (Kankberg)	467 814	3.4	9.9	156.2
Processed (BAOPP)	476 297	3.5	11.5	165.5
Difference (Mined vs. Processed)	8 483	0.1	1.6	9.4
Difference (Mined vs Processed %)	2%	2%	16%	6%

4 REFERENCES

Internal References

- DMS #1841251, Conversion of Mineral Resources to Mineral Reserves. Position S274.
- DMS #1150727, Kankberg reconciliation file.

External References (public domain):

- Kankberg Annual Summary Report 2020 (https://www.boliden.com/globalassets/operations/exploration/mineral-resources-and-mineral-reserves-pdf/2020/resources-and-reserves-kankberg-2020-12-31.pdf)

- Pan-European Standard for reporting of Exploration results, Mineral Resources and Mineral Reserves (The PERC Reporting standard 2017.) www.percstandard.eu