Boliden Summary Report

Resources and Reserves | 2020

Garpenberg

Prepared by Morvan Derrien

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1 SUMMARY

In 2020 the total mineral reserves in Garpenberg increased by 14.7 Mt (million metric tonnes) to 89.5 Mt. Measured and indicated resource in Garpenberg decreased by 7.7 Mt to 36.6 Mt. Inferred resource increased by 1.4 Mt to 25.5 Mt.

Table 1-1 Mineral Resources and Mineral Reserves in Garpenberg 2020-12-31

	2020						2019					
	kton	Au	Ag	Cu	Zn	Pb	kton	Au	Ag	Cu	Zn	Pb
Classification		(g/t)	(g/t)	(%)	(%)	(%)		(g/t)	(g/t)	(%)	(%)	(%)
Mineral Reserves												
Proved	**23 500**	**0.23**	**97**	**0.03**	**3.1**	**1.2**	21 000	0.2	101	0.03	3.60	1.41
Probable	**66 000**	**0.35**	**93**	**0.05**	**2.7**	**1.3**	53 800	0.3	94	0.05	2.89	1.39
Total	***89 500***	*0.3*	*94*	*0.04*	*2.8*	*1.3*	*74 800*	*0.3*	*96*	*0.05*	*3.10*	*1.40*
Mineral Resources												
Measured	**3 900**	**0.33**	**94**	**0.06**	**3.4**	**1.7**	4 300	0.3	100	0.06	3.32	1.57
Indicated	**32 600**	**0.35**	**89**	**0.05**	**2.7**	**1.3**	40 000	0.3	88	0.05	2.76	1.33
Total M&I	***36 600***	*0.35*	***90***	***0.06***	***2.8***	***1.4***	*44 300*	*0.3*	*90*	*0.05*	*2.82*	*1.36*
Inferred	**25 500**	**0.42**	**57**	**0.07**	**2.5**	**1.4**	24 100	0.5	56	0.08	2.84	1.68

1.1 Competence

Multiple participants have been involved and contributed to this summary report. Roles and responsibilities are listed in Table 1-2.

Table 1-2. Contributors and responsible competent persons for this report

Description	Contributors	Responsible CP
Compilation of this report	Morvan Derrien	Thomas Hedberg
Geology	Morvan Derrien	Gunnar Agmalm
Resource estimation	Sofia Höglund	Gunnar Agmalm
Metallurgy	Anders Sand	Anders Sand
Mining	Catarina Barreira	Thomas Hedberg
Environmental and legal permits	Lotta Tanse	Nils Eriksson

Thomas Hedberg has a background in numerous Managerial positions in Boliden from Mining Engineering to Mine Manager in Sweden and Canada. He currently holds a position as Senior Project Manager for Boliden Mines. This experience gives the general view and understanding of the whole mining process from exploration to concentrate.
Member in FAMMP[1] since 2018.

[1] Fennoscandian Association for Metals and Minerals Professionals

2 GENERAL INTRODUCTION

This report is issued annually to inform the public (shareholders and potential investors) of the mineral assets in Garpenberg held by Boliden. The report is a summary of internal / Competent Persons' Reports for Garpenberg. Boliden method of reporting Mineral Resources and Mineral Reserves intends to comply with the Pan-European Reserves and Resources Reporting Committee (PERC) "PERC Reporting Standard 2017".

The PERC Reporting Standard is an international reporting standard that has been adopted by the mining associations in Sweden (SveMin), Finland (FinnMin) and Norway (Norsk Bergindustri), to be used for exploration and mining companies within the Nordic countries

2.1 Pan-European Standard for Reporting of Exploration Results, Mineral Resources and Mineral Reserves – The PERC Reporting Standard

PERC is the organisation responsible for setting standards for public reporting of Exploration Results, Mineral Resources and Mineral Reserves by companies listed on markets in Europe. PERC is a member of CRIRSCO, the Committee for Mineral Reserves International Reporting Standards, and the PERC Reporting Standard is fully aligned with the CRIRSCO Reporting Template.

The PERC standard sets out minimum standards, recommendations and guidelines for Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves in Europe.

2.2 Definitions

Public Reports on Exploration Results, Mineral Resources and/or Mineral Reserves must only use terms set out in the PERC standard.

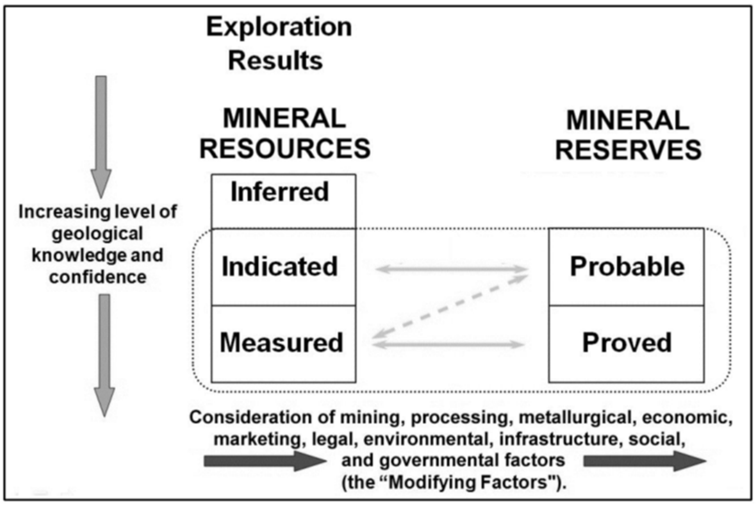


Figure 2-1. General relationship between Exploration Results, Mineral Resources and Mineral Reserves (PERC 2017).

2.2.1 Mineral Resource

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.

2.2.2 Mineral Reserve

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource.

It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

3 GARPENBERG

3.1 Project Outline

Garpenberg is a Zn-Pb-Ag-(Cu-Au) underground mine where the ore is mined from between 500 meters to more than 1 400 meters below surface. The mine encompasses several polymetallic ore bodies. See Figure 3-3, Figure 3-4 and Figure 3-5.

The mined out ore tonnage in 2020 totaled 3000 Kton which is an increase of 135 Kton from previous year. Almost 80 % of the mined tonnage derives from the largest ore body, Lappberget.

Zinc and silver are the most valuable commodities in Garpenberg, each accounting for about 37.5 % of the revenue, followed by lead at 15 % and copper-gold at 10 %.

3.2 Major changes 2020

In 2020 the total mineral reserves in Garpenberg increased by 14.7 Mt (million metric tonnes) to 89.5 Mt. Measured and indicated resource in Garpenberg decreased by 7.7 Mt to 36.6 Mt. Inferred resource increased by 1.4 Mt to 25.5 Mt.

3.2.1 Technical studies

In 2020, a technical report was completed regarding the upgrade of parts of Kvarnberget mineral resource into ore reserve (Derrien 2021). The upgrade from resource to reserve concerns position KVARN 1050-1150Z and KVARN 650-1050Z central pillar.
A technical study was also conducted to consider the technical and economic feasibility of mining 2nd pass stopes in Lappberget (Barreira & Derrien 2020).

3.3 Location

Garpenberg is located in the Hedemora municipality in central Sweden 180 km NW of Stockholm at coordinates (WGS84) latitude 60° 19' 27"N, longitude 16° 13' 38". Figure 3-1 and Figure 3-2 show the geographic location and the mining concessions of Garpenberg.

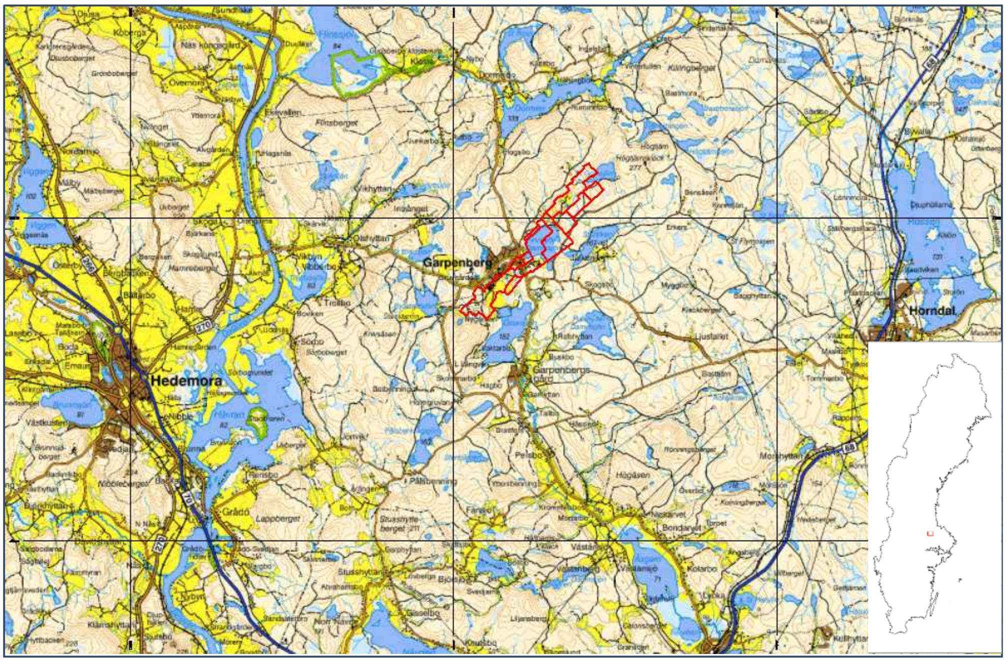


Figure 3-1. Regional map showing Garpenberg mining concession licenses in red colour. Coordinate system in the map is RT90 2.5 gon W.

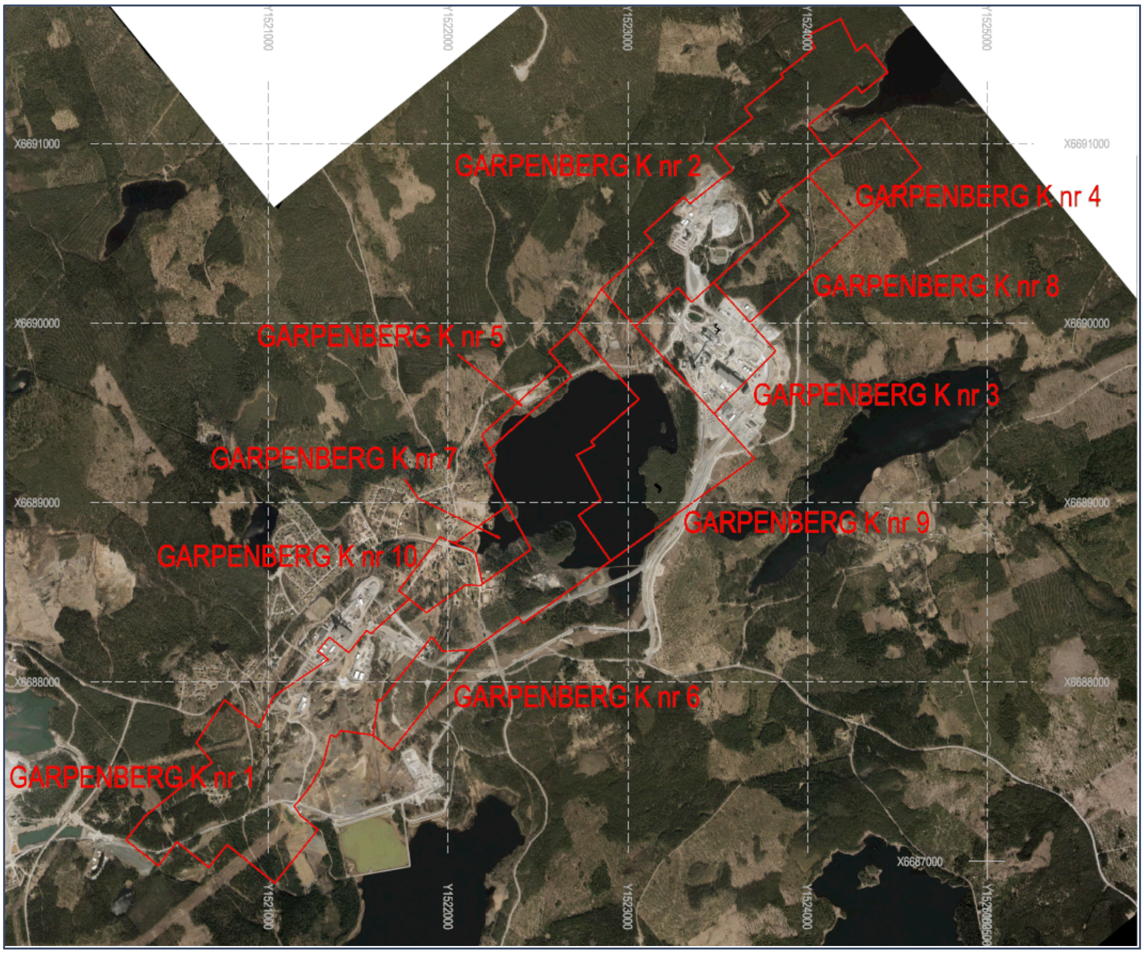


Figure 3-2. Detailed map of Garpenberg mining concessions.

3.4 History

Historical documents show that systematic mining has been conducted in Garpenberg since the 13th century. Recent studies from lake sediments 2017 however push back the evidence for early ore mining in Garpenberg even further, from the Middle Ages to the pre-Roman Iron Age around 400 BC (Bindler et al., 2017).

In 1957 Boliden acquired the Garpenberg mine from AB Zinkgruvor. A total of 54.4 Mt of ore has been processed since Boliden took over the operations (Table 3-1).

A chronological list of historically significant events is presented in appendix 1.

Table 3-1. Annual production numbers 1957-2019. Between 1957 and 1995 the processed ore tonnes and grades are presented with 5-year intervals, while figures for mined ore are missing. From 2005 to 2014 ore from the Lovisagruvan mine was also processed in Garpenberg. A total of 54.4 Mt of ore has been processed since Boliden acquired the mine from AB Zinkgruvor in 1957.

Year	Mined Ore	Processed Ore	Grades				Lovisa
	Kton	Kton	Au g/t	Ag g/t	Zn %	Pb %	Kton
1957		260	1.2	69	2.84	2.34	
1960		306	0.7	81	4.3	3.0	
1965		297	0.9	116	4.9	3.3	
1970		307	0.9	110	4.2	2.7	
1975		349	0.6	114	3.2	1.9	
1980		427	0.5	112	3.0	1.8	
1985		534	0.4	138	3.0	1.9	
1990		747	0.5	135	3.6	2.0	
1995		750	0.4	133	4.3	2.2	
2000	1003	976	0.5	141	3.9	1.9	
2001	1018	984	0.4	136	3.9	1.8	
2002	997	1058	0.4	153	4.0	1.8	
2003	1067	1062	0.4	151	4.6	1.9	
2004	1087	1074	0.3	124	5.6	2.2	
2005	1115	1102	0.3	117	5.8	2.3	13.3
2006	1167	1182	0.4	123	5.7	2.2	17.1
2007	1218	1255	0.3	126	6.3	2.5	17.1
2008	1341	1365	0.3	130	6.9	2.6	27.7
2009	1425	1394	0.3	139	7.3	2.8	31.7
2010	1369	1443	0.3	133	6.6	2.5	28.9
2011	1441	1456	0.3	134	6.1	2.4	37.5
2012	1602	1484	0.27	130	5.6	2.1	39.0
2013	1600	1495	0.3	153	5.2	2.1	39.8
2014	1891	2224	0.31	136	5.1	2.1	38.7
2015	2304	2367	0.32	156	5.0	2.1	

2016	2610	2622	0.31	150	4.4	1.8
2017	2630	2634	0.30	134	4.3	1.8
2018	2625	2622	0.29	135	4.1	1.6
2019	2865	2861	0.26	118	4.1	1.5
2020	3000	3000	0.30	109	3.8	1.5

Resource estimates for new ore bodies are produced by the exploration department by drilling the mineralized rock body in a 50 x 50 m grid, producing an inferred of indicated resource. This is typically followed up by denser drilling carried out by the mine department resulting in a measured resource and eventually a mineral reserve. More on mineral resources and mineral reserves in chapters 3.12 and 3.13, respectively.

The mineral reserve estimates are constantly being revised against the metal grades of the actual mined tonnage through the reconciliation process, see chapter 3.15.

3.5 Ownership

Boliden Mineral AB owns 100 % of the Garpenberg mine.

3.6 Permits

Boliden is the owner of all land where the mining operations are currently developed. Boliden has 10 mining concessions covering the mine area. The concessions are presented in Table 3-2, Figure 3-1 and Figure 3-2.

Table 3-2. Mining concessions in Garpenberg.

Name	Active from	Expires	Minerals
Garpenberg K nr 1	2000-01-01	2025-01-01	Zinc, lead, silver, copper, gold
Garpenberg K nr 2	2000-01-01	2025-01-01	Zinc, lead, silver, copper, gold
Garpenberg K nr 3	2001-06-18	2026-06-18	Zinc, lead, silver, copper, gold
Garpenberg K nr 4	2001-06-18	2026-06-18	Zinc, lead, silver, copper, gold
Garpenberg K nr 5	2002-12-13	2027-12-13	Zinc, lead, silver, copper, gold
Garpenberg K nr 6	2002-12-13	2027-12-13	Zinc, lead, silver, copper, gold
Garpenberg K nr 7	2002-12-13	2027-12-13	Zinc, lead, silver, copper, gold
Garpenberg K nr 8	2003-01-07	2028-01-07	Zinc, lead, silver, copper, gold
Garpenberg K nr 9	2003-04-17	2028-04-17	Zinc, lead, silver, copper, gold
Garpenberg K nr 10	2004-03-19	2029-03-19	Zinc, lead, silver, copper, gold

Boliden has the necessary environmental permits in place to operate the mine. The main permit, in accordance to the Swedish Environmental Act, was issued by the Swedish Environmental Court in 2012 (M461-11 2012-01-31) and the final discharge limits to water were set in 2016 (M461-11 2016-04-15). In 2018 Boliden applied for some changes in the permit which were approved in December 2018 (M467-18, 2018-12-20). These changes allow Boliden to deposit waste-rock according to life-of-mine plan and tailings for 10 years (the longest building period allowed for activities under chapter 11 in the Swedish Environmental Act) in the existing tailings management facility. The permit allows Boliden to operate the mine as described in the application and in particular to (chapter 9 Environmental Act):

- extract and process up to 3 Mtpa of ore in Garpenberg,
- deposit tailings in the Ryllshyttan tailings management facility (TMF), and backfill the mine.

In addition, the permit allows Boliden to (chapter 11 Environmental Act):

- raise the dams at Ryllshyttan TMF to the level of +256m with the maximum water level of +254 m and to construct a new outlet,
- extend the waste-rock dumps,
- set the financial guarantee for closure to 490 MSek,
- raise the water level in the clarification pond to the level of +227,9 m,
- extract mine water, and
- extract up to 1,9 Mm3/yr fresh water from the lakes Gruvsjön och Finnhytte-Dammsjön, of which a maximum of 0,95 Mm3 from Finnhytte-Dammsjön.

The permit is associated with a series of conditions and limit values regarding e.g., discharge water quality and noise levels in neighboring houses.

In November 2020 Boliden applied to the Swedish Environmental Court for an extension of the permit to extract and process up to 3,5 Mtpa of ore in Garpenberg, without changing anything else in the conditions of the environmental permit Boliden have today.

Boliden is studying and evaluating different options for tailings management beyond year 2028. It is Boliden's assessment that it is reasonable to believe that a permit will be granted for future tailings management well in time for having a solution in place before 2028.

The long history of mining in Garpenberg has resulted in a complex environmental situation with numerous historical objects on and around Boliden's land holdings in Garpenberg. Due to the age of these objects, Boliden is assessed to have very limited liability for any future remedial works to limit the environmental impact of these objects; however, Boliden has the responsibility as landowner to conduct investigations in order to determine the impact of these historical objects. These investigations are ongoing, as well as a dialogue with the competent authority regarding the extent of the liability for any future remedial actions on these objects. A process has been initiated by the Water Authority to assess if it necessary to modify the environmental quality standards (EQS) for lake Gruvsjön and downstream lying water bodies as it has been shown that it is not a realistic to reach current EQS, even in a long-term perspective.

3.7 Geology

The Garpenberg mine is situated in the mineralized Palaeoproterozoic igneous province of Bergslagen, south central Sweden, which is host to a variety of ore deposits, and especially Fe-oxide and polymetallic sulphide deposits. Garpenberg is the largest sulphide deposit in the region, and comprises several individual ore bodies distributed over a distance of 4 km along a limestone horizon, see Figure 3-3. The main host rock is calcitic marble (limestone) altered to dolomite and Mg +/- Mn-rich skarns. The footwall comprises of strongly phlogopite-biotite-cordierite-sericite-quartz altered felsic volcaniclastic rocks, whereas the hanging-wall comprises relatively unaltered volcaniclastic and sedimentary rocks and dacitic intrusions. The stratigraphic succession is attributed to the volcanic cycle of a felsic caldera complex, and includes rhyolitic to dacitic, juvenile pumiceous, graded mass-flow breccia deposits and rhyolitic to dacitic ash-siltstone and sandstone in the footwall, and polymict conglomerates and juvenile, rhyolitic, pumiceous breccias in the hanging-wall. These pumiceous breccias in the hanging-wall record a climactic eruption that formed a caldera over 500 m deep and over 9 km in diameter in the Garpenberg area. The limestone hosting the ore is interpreted as a stromatolitic carbonate platform, formed in a shallow, marine environment during a hiatus in volcanism.

The ore-host limestone shows a complex geometry due to large scale folding, shearing and faulting. Folding and late faults have locally remobilized the ore into fault- and fracture-hosted sulphide veins, some of which have been thick enough and rich enough to mine. These structural features have resulted in complex synforms and antiforms, and have a major influence on the position, geometry and metal grades of the ore bodies. The Lappberget ore body is interpreted as an over 1.5 km long, subvertical anticlinal tube fold with the top of the antiform just below 200z. The initial main stage of mineralization and alteration at all the known Garpenberg ore bodies is interpreted to be essentially syn-volcanic in timing and to pre-date regional metamorphism and deformation (Jansson & Allen, 2011).

The Garpenberg mine encompasses several ore bodies which follow a limestone-marble horizon occurring in a synform structure. The structure is compressed at the southern end and opens to the north. The horizon is strongly isoclinally folded and the structure tectonic and divided into blocks. The ore bodies occur in the contact zone between the limestone and underlying siltstones. The contact zone is heavily altered to skarn and the limestone to dolomite. The structures are consistently steeply dipping.

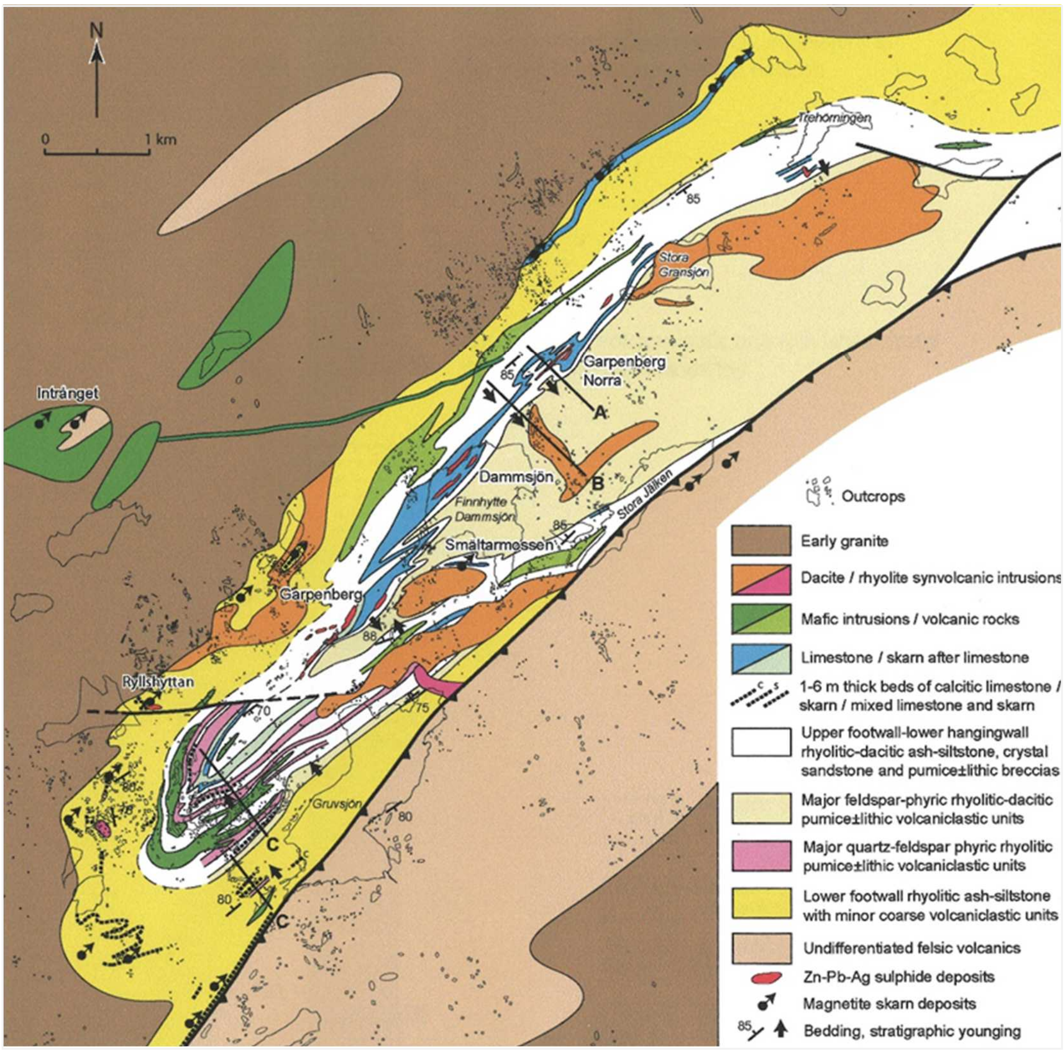


Figure 3-3. Geological map of Garpenberg. From Allen et al., 2003.

Mineralization is mainly of replacement style and is likely to have taken place where metal-bearing fluids penetrated up along synvolcanic, extensional faults and came in contact with reactive limestone to form large, massive sulphide bodies.

The different ores are strongly structurally related and the largest ore bodies linked to antiforms as Lappberget and Kaspersbo. The mineralization comprises pyrite, sphalerite, galena and silver mineral in some places forming semi-compact blisters in the quartzite and skarn-altered contact zones. Also, between the ore bodies, there are occurrences of mineralization controlled by tectonic mica-rich shear zones. In the entire field occurs mineralization also as remobilization along the axial planes. Remobilizations intersect the more or less semi-compact lenses and both expand and extend the ore bodies, especially at depth.

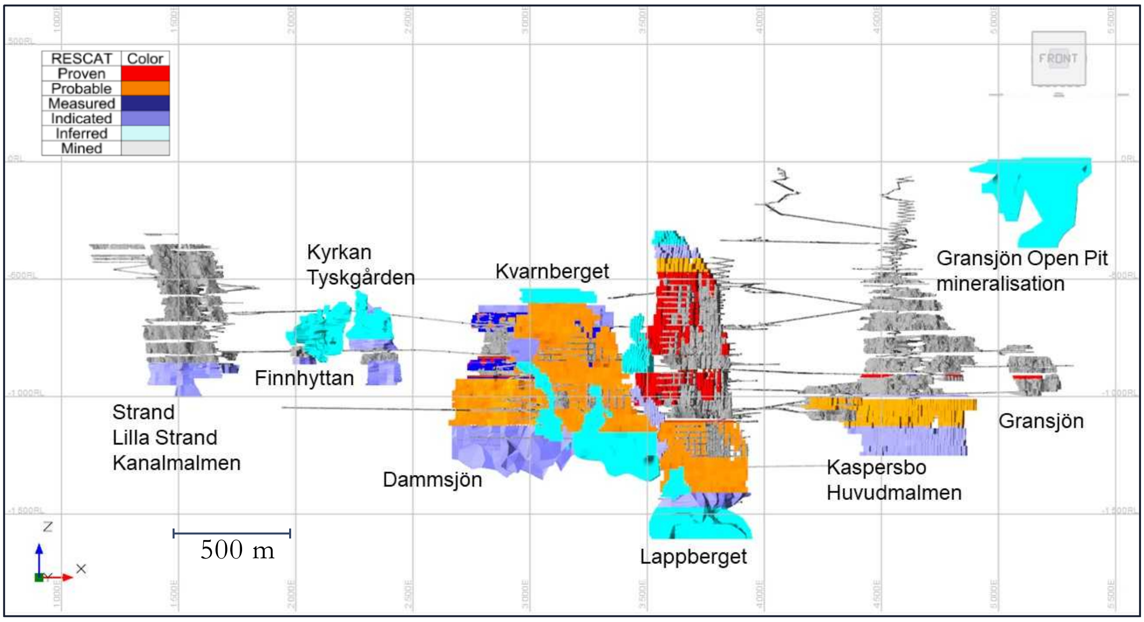


Figure 3-4. Front view of the Garpenberg ore bodies looking north in the local coordinate system. Colors according to resource category.

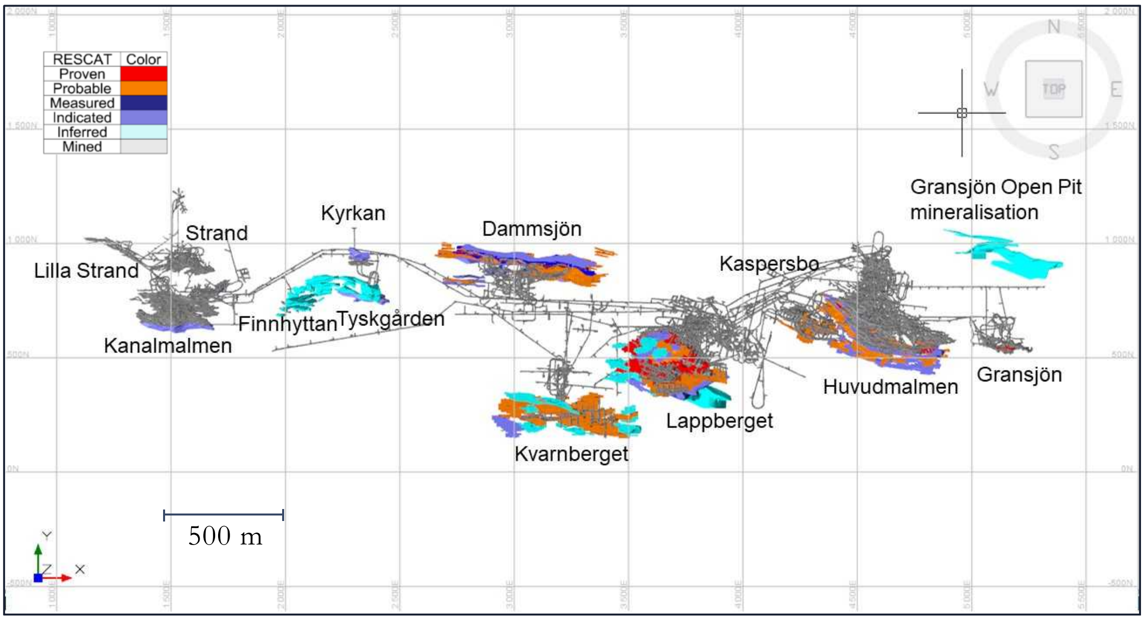


Figure 3-5. Top view of the Garpenberg ore bodies. Colors according to resource category.

3.8 Exploration procedures and data

3.8.1 Drilling techniques and downhole survey

Diamond drilling assay data is used for mineral resource estimation. Diamond drilling is performed by drilling contractor Drillcon and supervised by Boliden personnel. By default drilling dimension in Garpenberg is B-size with a core diameter of 39 mm. The current practice is to measure all drillholes longer than 100 m for deviation with Reflex Maxibor2. Drill holes longer than 400 m are measured with IS Gyro.

3.8.2 Logging and sampling

The drill core is logged by Boliden geologists and sampled by Boliden technical personnel. Different level of logging detail is being applied depending on whether drill holes are exploration or infill drill holes. However, features which are always logged are: lithological units, fractures, level of schistosity and content of talc. For infill drill holes, the whole core is usually sampled, leaving no core left in the core boxes. Exploration drill holes are sawed in half along the drill core axis and one half is sent for analysis while the other half is stored in Boliden's core archive.

3.8.3 Density

Density data has been collected from bulk samples from each ore lens. This data has been used to produce individual density formulas for each ore body based on metal content. As an example, the density formula for Lappberget is 2.8 +0.004Cu + 0.004Zn + 0.02Pb + 0.0365S. Average bulk densities for the different ore bodies vary between 2.71 (Garpenberg south) and 3.15 (Gransjön).

3.8.4 Analysis and QAQC

Drill core analyses are carried out by ALS laboratories. Sample preparation is done in Piteå, Sweden and assays are carried out in ALS's hub-lab in Loughrea, Ireland. ALS laboratories are accredited according to ISO/IEC 17025. Umpire lab check assays are done by MS Analytical. An overview of the different analytical methods is presented in table Table 3-3

Table 3-3. Overview of ALS's designation of analytical methods. Over-range method applies to samples where assay result reached upper detection limit of primary method.

	Method	Over-range method
Preparation	PREP-31B	
Assay Au	Au-ICP21	Au-AA25/Au-GRA21
Assay Ag, Cu, Pb, Zn	ME-OG46	Ag - GRA21 Pb - AAORE Zn - ME-ICPORE
Assay S	IR08	
Assay other (48 elements)	ME-MS61	
Specific gravity (core)	OA-GRA08	
Specific gravity (pulp)	OA-GRA08b	

Preparation of the samples, coded PREP-31B, comprises crushing the rock to 70% less than 2mm, riffle splitting off 1 kg and pulverizing the split to better than 85% passing 75 microns.

Au-ICP21 is a package of fire assay with an ICP-AES analysis. In ME-OG46, Aqua Regia is used to dissolve base metals and silver while assay is done with ICP-AES. IR08 is used for total sulphur analysis using a Leco Sulphur analyzer. ME-MS61 is a package of a 4-acid digestion process with an ICP-MS analysis. Specific gravity is measured either directly on drill core (OA-GRA08), or on pulps using a pycnometer (OA-GRA08b).

All samples are prepared and analyzed with Au-ICP21, ME-OG46 and IR08 while selected drillholes are analyzed with ME-MS61 and Specific Gravity as well. For the latter, analysis on pulp is the preferred method. Table 3-4 shows which elements are analyzed with lab codes ME-OG46 and ME-MS61.

Table 3-4. Elements analyzed with ME-OG46 and ME-MS61.

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

ME-OG46 ME-MS61

Quality assessment and quality control is continuously monitored using QAQC samples such as in-house standards, blanks and umpire lab checks (pulp duplicates). It is required that each sample batch is submitted with at least one blank sample and one standard sample. Batches with more than 16 samples also require a pulp duplicate sample. As the number of samples in a batch increases so does the required QAQC samples, for example a batch with 100 samples requires two blanks samples, three standard samples and one pulp duplicate sample.

A review of all yearly QAQC samples utilized shows that the results fall within the predetermined acceptable limits. The results have been summarized in Boliden's internal QAQC report (Derrien 2020).

3.9 Exploration activities and infill drilling

In 2020, near mine exploration focused on two key objectives. Firstly, resource drilling targeted the Lappberget deposit, primarily from the recently completed exploration drifts at 1432 and 1450 levels with drill programme DP200003 (ca. 9500 metres drilled). In addition to delineation drilling at depth, work was also performed on the western extent of the deposit between 600 – 800 z with drill programme DP200052 (1324 metres drilled). Drilling results from DP200052 were utilized in the 2020 resource update of Lappberget LC west between 642 – 904z (see chapter 3.14).

Drilling at depth (DP200003) is part of an extensive programme which started in 2020 and will finish in 2021. Therefore no resource estimate for this work was undertaken in 2020.

In addition to resource drilling, near mine exploration has also pursued exploration objectives at the southern depth extent of the mine from the southern limit of the 1075 drift with drill programme DP 200001 (2584 metres drilled). In the north, drilling from the surface has tested the northern depth extent of the Gransjö deposit with two holes totaling 1589 metres (DP200006). These programmes delivered prospective intercepts however exploration remains at an early stage and is therefore not covered in this report.

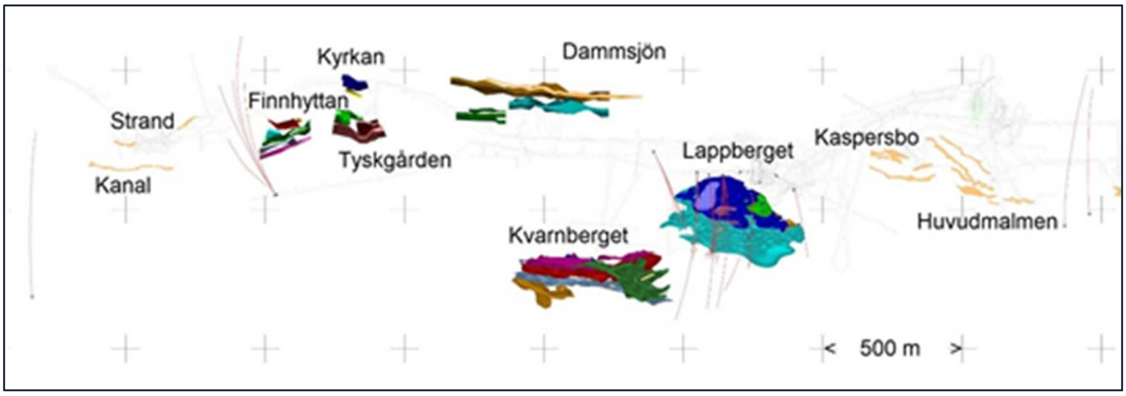


Figure 3-6. Distribution of near mine exploration resource drilling (red traces) in 2020.

The Ore Reserve Department has carried out resource estimation work on areas drilled by near mine exploration in 2019, primarily Lappberget above 390 z and Kvarnberget above 600 z. These calculations are presented in chapter 3.12 and 3.14 in this report and will not be repeated here, they were performed in 2020 as drilling was completed late in 2019.

The mine department conducted several infill drilling programs in 2020. Drilling from Kvarnberget 1050z, initiated in 2019, was completed in order to delineate with more precision the lower part of Kvarnberget ore body between 1050 –1150z. Infill drilling was also conducted in different positions in Lappberget between 800-1300z, targeting in particular the western extent of Lappberget (ca. 7600 meters drilled).

In Dammsjön, an extensive infill program was started in 2017 for the area below 1050z, and will be finalized in early 2021. This drilling is not included in the current resource estimation. A complete update of the Dammsjön mineral resource will be completed in 2021.

3.10 Mining methods, processing and infrastructure

Almost 90% of the mined ore in Garpenberg is extracted by sublevel stoping (also called longhole stoping), where the ore is mined in layers between two drifts vertically 25 m apart. Most areas are mined with transversal longhole stoping, where the development and stope axis are perpendicular to the strike of the orebody. In some more narrow areas, longitudinal longhole stoping is used. The orientation of this method is along or parallel to the strike of the orebody. The ore body is split into primary and secondary stopes, which are mined in a predefined order and pyramid shape sequence. The standard stope dimensions are 24 - 25m high, 10 m wide for primary stopes and 15 m wide for secondary stopes. In Lappberget, the ore body is divided in mining blocks with 6 levels of stopes in each block.

The last level of each mining block is the sill pillar, which separates the different mining blocks. This division allows the mine to have several production areas being scheduled and mined at the same time.

Another consideration that was recently introduced concerning the mine design of Lappberget is the division into a main and a second pass sequence (2pass). The main sequence contains more of the high grade areas and is scheduled prior to the second pass sequence, which in general contain lower grade ore (Figure 3-7).

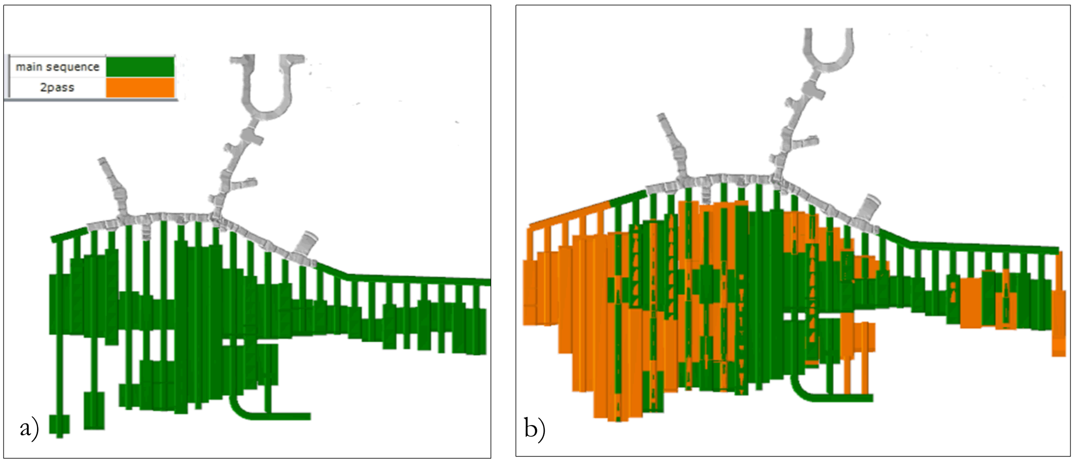


Figure 3-7. Example of mine design in Lappberget
a) High grades layout – main sequence; b) Main sequence (high grades) and 2pass (low grades).

Other mining methods include cut and fill and avoca (rill) (Table 3-5). With the cut and fill method, mining is carried out in slices along the steeply dipping, narrow ore body. The bottom slice is mined first. The excavated area is then backfilled, so mining can continue with the slice above. The rill method used in Garpenberg is in fact similar to longitudinal stopping, but the stopes are split in 20 m long slices. After being blasted and mucked, the stopes are backfilled before the next slice is blasted. This process repeats until the full size of the stope is done.

Table 3-5. Mining method for Garpenberg ore bodies.

Mining method	Ore body	Min width (m)
Sublevel stoping	Lapp, Kvarn, Kasp, Damm, Huvudmalmen	10 alt 15
Cut and fill	Damm	7
Avoca (rill)	Damm	7

Mine reconciliation is the comparison of the planned stopes against the actual outcome. Table 3-6 shows the reconciliation for the large scale mining methods in 2019.

Table 3-6. Reconciliation for sublevel stoping and rill in 2019.

Stopes	Average Recovery (t)	Average OverBreak (%)	Edges Dilution (m)
Primary	87,71%	17,14	0,40
RILL	88,36%	14,10	0,48
Secondary	82,39%	17,41	0,55
Total average	**86,35%**	**17,17**	**0,48**

The expansion project to 2.5 Mt which was completed in 2014 increased the capacity of the mine with the construction of new crushers, shafts, ore hoists, etc. Today there are two underground crushing plants at 700 z and 1087 z. Transport to the crushers is done by trucks from the active mining areas. The crushed ore is hoisted to surface in a shaft, unloaded into a bin in the headframe and then transported by conveyor belts to an intermediate ore storage, which can hold approximately a week of production.

In the concentrator, the ore is ground in two stages with autogenous grinding in the primary stage and pebble mill grinding in the second. After grinding, the ore is screened, with the coarse fraction being returned to the primary mill and the fine fraction undergoing gravimetric separation (Knelson) in order to separate coarse gold out at an early stage of the process. Knelson concentrate is collected in big bags. After gravity separation, material is classified using hydrocyclones. The overflow constitutes the main flotation feed, while the underflow undergoes flash flotation in the grinding circuit, from which the concentrate is sent directly to CuPb separation in the flotation plant and the tailings back to the mills.

Flotation is carried out in a three-stage process flotation circuits: CuPb flotation, CuPb separation and Zn flotation. Regrind mills are installed both in the CuPb and Zn circuits. The mineral concentrates are dewatered using thickeners and pressure filters. Three mineral concentrates are produced in flotation: zinc, lead and copper concentrates. The precious metals report primarily to the copper and lead products. Of the flotation tailings, approximately 1/3 is utilized in the paste plant for producing backfill material for the mine and 2/3 is deposited at the tailings management facility.

The zinc and lead concentrates are transported by truck to Gävle port and from there by ship to Boliden's smelters in Finland, Sweden and Norway. The copper and Knelson concentrates are trucked, the copper concentrate later being reloaded to rail, for onward transport to the Boliden Rönnskär smelter in Skelleftehamn.

3.11 Prices, terms and costs

Mineral Resources and Mineral Reserves are the basis for the company's long-term planning and will be mined for many years to come. Planning prices, which are an expression of the anticipated future average prices for metals and currencies, are, therefore, primarily utilized in the estimations. The planning prices are used to calculate the NSR (Net Smelter Return), expressed in SEK/t, in the geological block models. Boliden currently uses the prices shown in Table 3-7.

Table 3-7.Long term planning prices currently used in Boliden.

Commodity / Currency	Planning prices 2020
Copper	USD 6,600/tonne
Zinc	USD 2,400/tonne
Lead	USD 2,100/tonne
Gold	USD 1,300/tr.oz
Silver	USD 17/tr.oz
USD/SEK	8.00
EUR/SEK	9.35
EUR/USD	1.17

The direct costs for mining and processing a tonne of ore is defined as the variable costs. Included in the variable costs are for example consumables, transportation costs and mine sustaining investments. The variable costs are summarized to around 270 SEK/t.

The site operational costs include not only the variable costs, as defined above, but also fixed costs, such as personnel costs and facility maintenance, and costs for future strategic mine development. Depreciations and capital investments are not included in the site operational costs. The site operational costs are around 530 SEK/t.

The variable and site operational cut-offs respectively are based on the cost levels explained above.

A table of the costs distributions and the cut-offs are summarized in Table 3-8.

Table 3-8.The different cut-offs considered for Garpenberg.

	Total											
	Operational											
Costs distribution	Mine - fixed costs (F)	Mine - variable costs (V)	Mill plant - F	Mill plant - V	Structure services - F	Structure services - V	Reclamation fund	Investment (sustaining)	Investment (capital)	Costs for development	Depreciation	**Cut-off value (SEK/t)**
Variable costs		**X**		**X**		**X**		**X**				**270 SEK/t**
Site operational costs	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**		**530 SEK/t**

3.12 Mineral resources

Several criteria are used to classify mineral resources. As a rule of thumb a drilling grid of 100 x 100 m is required for inferred resource, 50 x 50 m for indicated and 25 x 25 m for measured resource. However, Tyskgården-Finnhyttan is an exception, because complex geological conditions demand a denser drilling pattern. The final classification depends on drilling pattern in combination with a number of other criteria listed below.

- Geological complexity
- Quality and quantity of informing data
    - Confidence in analytical results
    - Confidence in borehole surveying
    - Analytical data
    - Results of the geostatistical analysis, variography, and QKNA
- Metallurgical factors or assumptions
- Confidence in the block estimates

All mineral resources are reported according to the PERC standard (See Figure 2-1).

Bench scale processing tests are systematically done on ore from new mineral resources in order to confirm that the ore is technically extractable and economically mineable. In 2020 tests were carried out on ore from Kvarnberget above 600z and Lappberget above 400z as well as at 800z.

Mineralization is interpreted according to NSR (Net Smelter Return) and geological assumptions. Traditionally the mineral resources were calculated directly from mineralization wireframes. However, in recently estimated areas a RPEEE (Reasonable Prospect of Eventual Economic Extraction) has been created in Deswik Stope Optimizer employing existing geological interpretation and block model (more information on the Deswik Stope Optimizer in chapter 3.13). The latter case stands for more realistic mineable tonnage and grades, which signifies less adjustments when eventually converting mineral resources into mineral reserves.

All reserve and resource tonnes and grades are interrogated from the seven active block models in Garpenberg (See Table 3-9).

Table 3-9. Block models in Garpenberg.

Block model	Ore bodies
BLGAR	Garpenberg South*
BLTYS	Finnhyttan and Kyrkan-Tyskgården
BLDAM	Dammsjön
BLKVB	Kvarnberget
BLLPB	Lappberget
BLNOR	Kaspersbo, Huvudmalmen and Gransjön UG
BLGRN	Gransjön Open Pit

* Including Kanal, Strand, Finnhyttan and Kyrkan-Tyskgården

In Garpenberg, two different estimation methods are used. Ordinary Kriging is usually used in areas where there is sufficient drillhole data and Inverse Distance is usually used in areas with less data. Mineralization models are created in Leapfrog Geo, and then resource estimation is calculated in Datamine. There are still some older mineralization models and block models in use that were created in Propack, which is an add-on to the CAD program MicroStation. Table 3-10 shows estimation methods and software used for each of the ore bodies in Garpenberg and Table 3-11 shows block sizes for each model. The block sizes are selected from spacing in supporting data in combination with complexity in ore geometry and scale of mining.

Table 3-10.Estimation methods for the Garpenberg ore bodies.

Block model	Ore body code	Name	Method	Software
BLGAR		Garpenberg south	Inv Dist	Datamine
BLTYS	FI1-6, TY1-3, KY1-2	Finnhyttan, Kyrkan-Tyskgården	Inv Dist	Datamine
BLDAM	DAM	Dammsjön	Inv Dist	Propack
BLKVB	KVA, KVB, KVC, KVD	Kvarnberget	Kriging	Datamine
BLLBP	LA, LB, LC	Lappberget	Kriging	Datamine
BLNOR	D, E, F, G	Huvudmalmen 881-918 Z	Inv Dist	Propack
BLNOR	HU1-HU6	Huvudmalmen 990-1250 Z	Kriging	Datamine
BLNOR	KA	Kaspersbo	Kriging	Propack
BLGRN	AAA, BBB, CCC, DDD	Gransjön Open Pit	Inv Dist	Propack

Table 3-11. Block sizes and subdivision for Garpenberg block models.

Model	Xsize	Ysize	Zsize	Subdivision
BLDAM	4	6	6	2
BLGAR	3	10	5	2
BLGRN	5	10	10	2
BLKVB	4	6	12.5	1
BLLPB	6	10	6	1
BLNOR	10	20	6	2

3.13 Mineral reserves

When converting mineral resources to mineral reserves, a number of parameters have to be considered, the most important ones being economic feasibility and rock mechanics. The rock mechanic conditions determine the amount and size of pillars and sill pillars as well as the length and width of mined stopes. Weak or unstable rock volumes might be discarded completely from the mineral reserves. The volume and geometry of the mineralization will likely determine which mining method to apply. The choice of mining method should also optimize the NPV (net present value) of the ore volume.

With the sublevel stoping method, the mineral reserves are defined by designed stopes whereas the corresponding mineral resources are defined either by designed stopes or by the mineralized envelope above cut-off. Since designed rooms mostly are formed as cubes with 90 degree corners and the mineralized envelope is irregular some of the ore at the edge of

the mineralization might get left out when converting resources to reserves. Likewise, some waste rock might be included at the edges of the mineralization.
Boliden Garpenberg utilizes the mine planning tool Deswik Stope Optimizer (SO) for designing of stopes. SO automates the design process and allows for a number of stope properties including general shape and orientation, cut-off grade, dilution and pillar size. Table 3-12 summarizes the criteria used by SO in different areas in Garpenberg.

Table 3-12. Design properties used by SO to generate stopes in different ore bodies in Garpenberg.

SO criteria	Allow up	min	max
Waste material	20%		
Dilution	25%		
Stope length Lappberget/ Huvudmalmen/Dammsjön	-	7 m	80 m
Stope length Kvarnberget/ Södra malm	-	7 m	40 m
Stope height	-	24-25 m	40 m

The cut-off grade used is based on the cost distribution presented in chapter 3.11. Each stope needs the NSR to be higher than the variable costs, and the average NSR for each time period needs to be higher than the site operational costs. Moreover, the cut-off is adjusted for each ore body and mining method.

For Lappberget the separation into a main and a second pass sequence, as mentioned in chapter 3.10, is done based on different cut-offs for different mining etages. The cut-off is chosen in such a way that both mining sequences are mineable and a favorable NPV is achieved. The different cut-off used for design with SO are presented in Table 3-13.

Table 3-13. Different cut-off values used for design of the stopes with SO in the different areas in Garpenberg.

Orebody	Mining block	Cut-off (SEK/t)	Cut-off for main sequence (SEK/t)
Lappberget	E1100	300	-
	E530	270	520
	E700/880/1250/1400/1550	270	760
Kvarnberget	all	300	-
Kaspersbo	all	300	-
Dammsjön	all	520	-
Huvudmalmen	all	520	-

Table 3-14 shows the Mineral Resources and Mineral Reserves Garpenberg Area as per 2020-12-31.

Table 3-14. Mineral Resources and Mineral Reserves in Garpenberg 2020-12-31

Classification	2020 kton	Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)	2019 kton	Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
Mineral Reserves												
Proved	**23 500**	**0.23**	**97**	**0.03**	**3.1**	**1.2**	21 000	0.2	101	0.03	3.60	1.41
Probable	**66 000**	**0.35**	**93**	**0.05**	**2.7**	**1.3**	53 800	0.3	94	0.05	2.89	1.39
Total	***89 500***	*0.3*	*94*	*0.04*	*2.8*	*1.3*	*74 800*	*0.3*	*96*	*0.05*	*3.10*	*1.40*
Mineral Resources												
Measured	**3 900**	**0.33**	**94**	**0.06**	**3.4**	**1.7**	4 300	0.3	100	0.06	3.32	1.57
Indicated	**32 600**	**0.35**	**89**	**0.05**	**2.7**	**1.3**	40 000	0.3	88	0.05	2.76	1.33
Total M&I	***36 600***	*0.35*	***90***	***0.06***	***2.8***	***1.4***	*44 300*	*0.3*	*90*	*0.05*	*2.82*	*1.36*
Inferred	**25 500**	**0.42**	**57**	**0.07**	**2.5**	**1.4**	24 100	0.5	56	0.08	2.84	1.68

3.14 Comparison with previous year

In 2020 mineral reserves increased by 14.7 Mt to 89.5 Mt. As a result of upgrading resources to reserves, measured and indicated resource decreased by 7.7 Mt to 36.6 Mt. Inferred resource increased by 1.4 Mt to 25.5 Mt. Table 3-15 shows the changes in detail, including changes in metal grades.

There are several factors that explain the large increase in mineral reserve in 2020. A new design was completed for Lappberget, Kvarnberget, Huvudmalmen and Kaspersbo, using Deswik Stope Optimizer (SO).

In Kvarnberget, in the new design for levels 600-1050z, SO used a cut-off of 300 SEK/t. A number of stopes were shortened or even suppressed when the stopes were too small, or the grades were considered too low (Figure 3-8). The central pillar of Kvarnberget between -600z and -1050z, previously classified as indicated resource, was included in the mineral reserve. The new tonnage of level 600-1050z is 14.5 Mt with average metal grades of 0.33 g/t Au, 117 ppm Ag, 2.87% Zn and 1.31% Pb, which is slightly higher than the previous grades reported for that position. The position between -1050z and -1150z was upgraded from indicated resource to probable reserve, resulting in the addition of 3.9 Mt to the mineral reserve. A technical and economical assessment was completed for the new reserve positions in Kvarnberget (Derrien 2021).

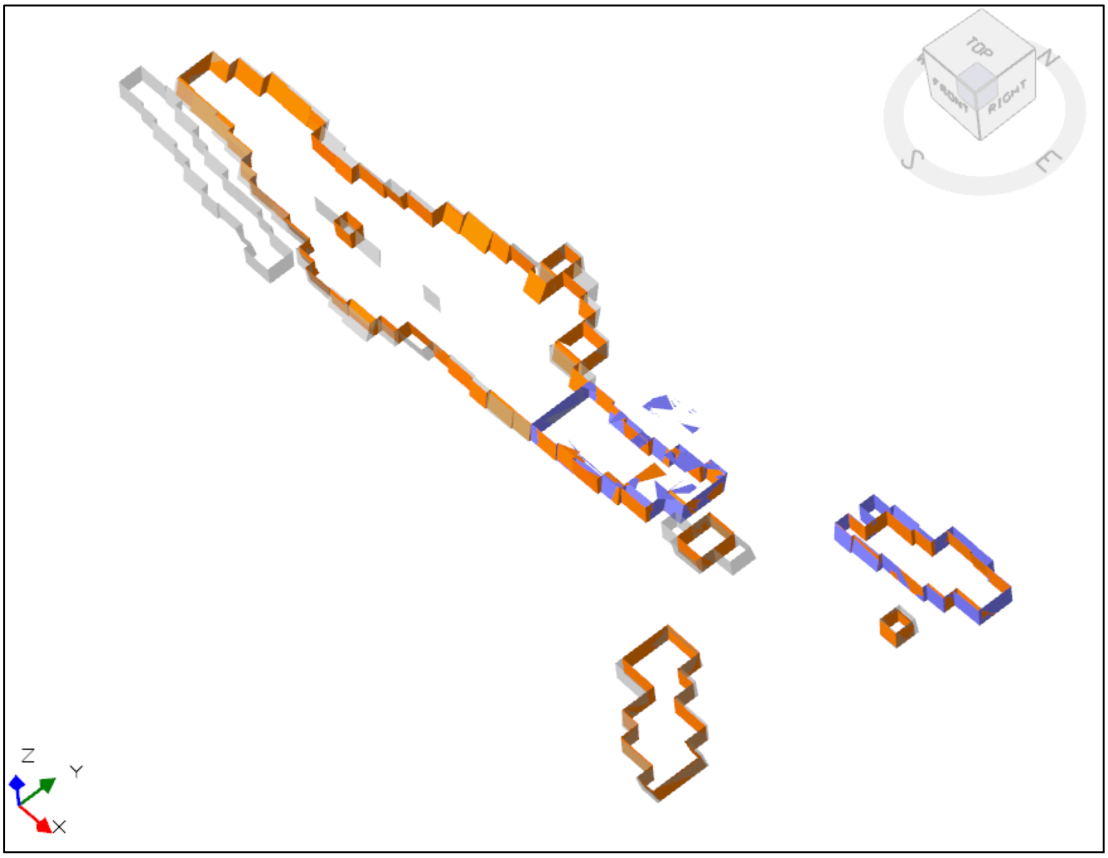


Figure 3-8. Oblique view of Kvarnberget level -730z.The outline of 2019 reserve is in grey, and the 2020 reserve is in orange. Several of the stopes were either shortened or discarded in the new design. The blue shape is the central pillar of Kvarnberget which was included in the reserve in 2020.

In Lappberget, the new design is based on a new block model completed in November 2019. The new block model includes more low grade mineralization than previously, especially in the western area where mineralization style is of remobilized character and is less massive than the eastern and central areas. Most of the added tonnage in Lappberget comes from western area, as well as on the edges (Figure 3-9 shows an example of changes of the reserve at level 1340z). The cut-off used for the stope design with SO is variable between the different etages (Table 3-13). For 2nd pass stopes, a cut-off of 270 kr/t was used, but all stopes with an average NSR below 400 SEK/t were discarded from the reserve. The new design resulted in the addition of 6.2 Mt to the mineral reserve.

Two areas previously classified as resource were also included in the mineral reserve. The completion of flotation tests for the different ore lenses between -400z and -800z allowed to upgrade the area between -408z and -466z, adding 2.6 Mt to the mineral reserve. Completion of infill drilling and subsequent update of the mineralization model and of the block model allowed to upgrade 1.5 Mt indicated resource to probable reserve between -1102z and -1257z.

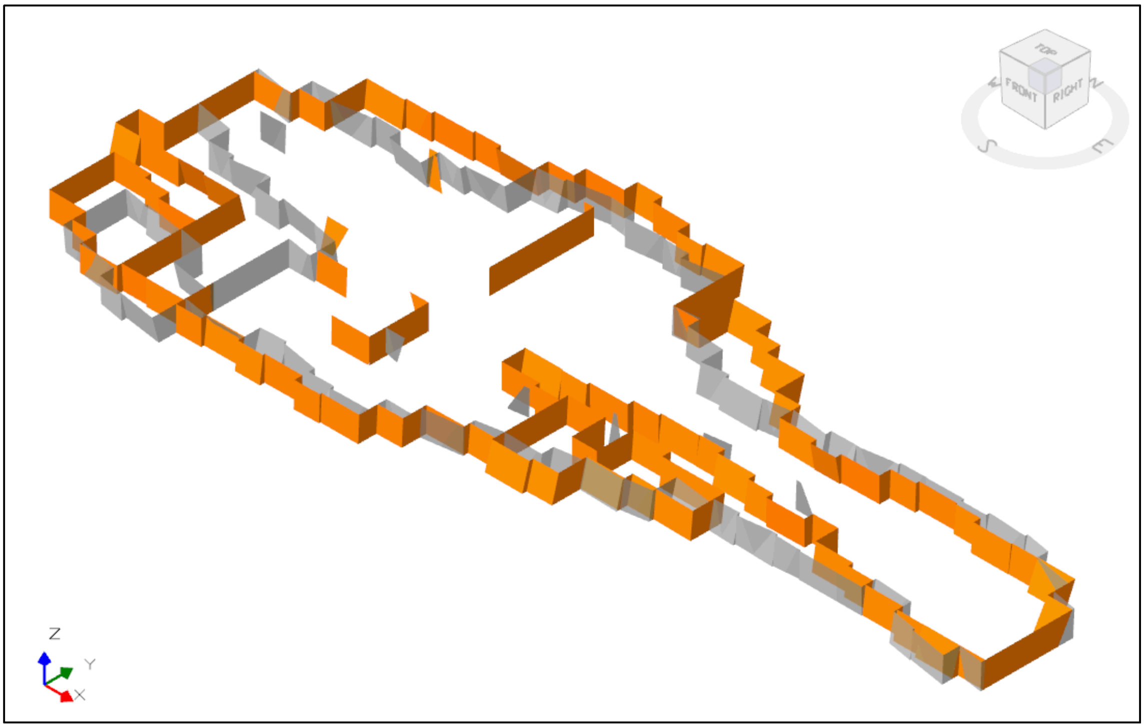


Figure 3-9. Oblique view of Lappberget level -1340z.The outline of 2019 reserve is in grey, and the 2020 reserve is in orange. In the new design, some of the stopes are wider on the edges, some new stopes were included on the western side of Lappberget.

In Huvudmalmen and Kaspersbo, the new design now includes areas previously classified as indicated or measured resource. Moreover, most of the stopes are bigger than in the previous design (Figure 3-10).The total increase in tonnage in mineral reserve for Huvudmalmen and Kaspersbo is 1.8 Mt.

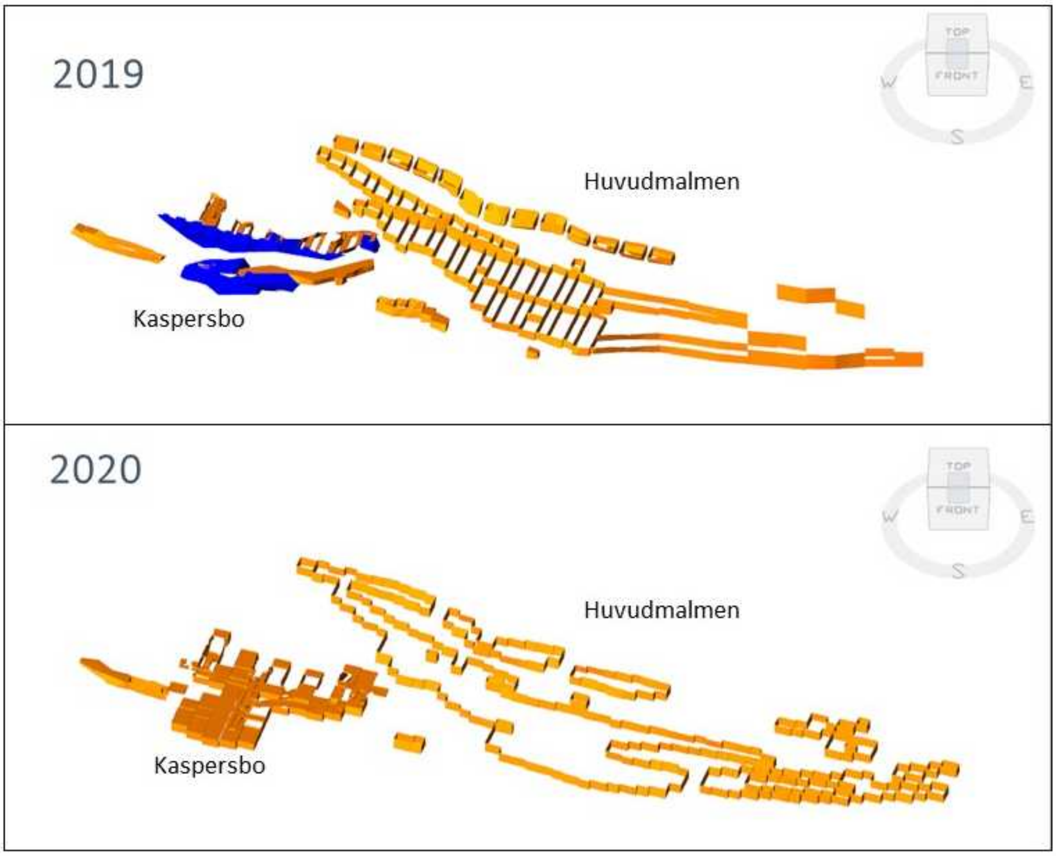
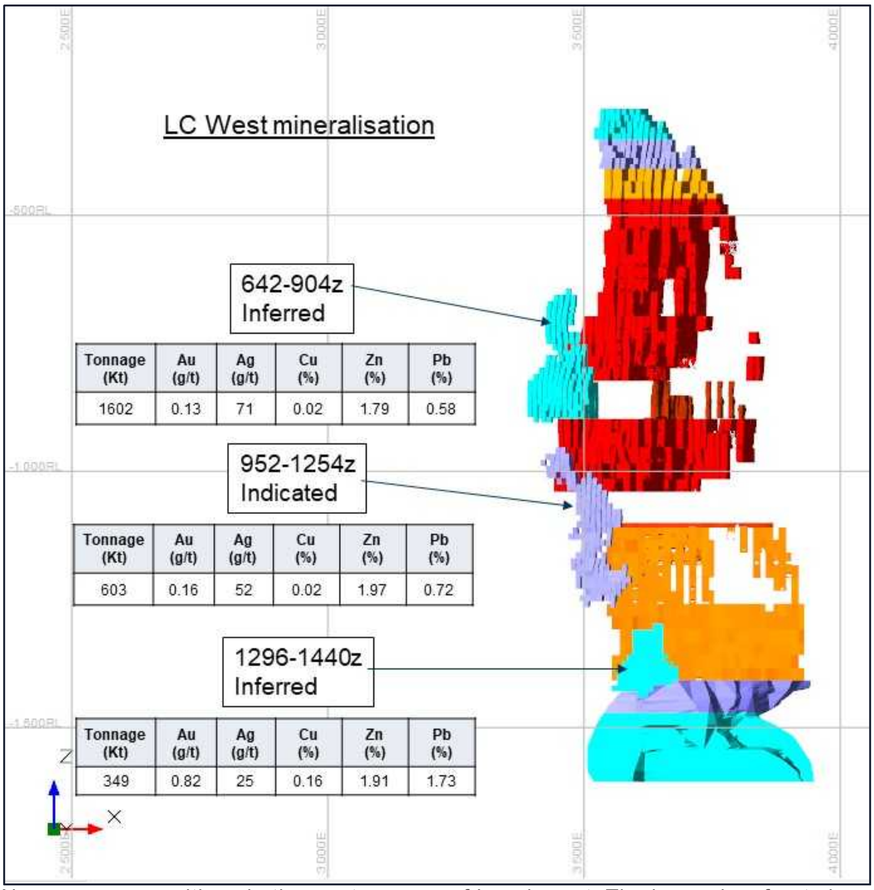


Figure 3-10. Example of changes in resource and reserve in Kaspersbo and Huvudmalmen at level -1040z.

Exploration drilling was also carried out in the upper parts of Lappberget and Kvarnberget, which resulted in the addition of 1.4 Mt of indicated resource and 0.7 Mt of inferred resource at level 291-390z in Lappberget, and 1.0 Mt of inferred resource at level 520-600z in Kvarnberget.

Exploration and infill drilling targeting the western part of Lappberget and the area between Lappberget and Kvarnberget was also completed in 2020. This drilling, coupled with new interpretation of historical data allowed to define three new resource positions between -642 and -1440z (Figure 3-11).



Tonnage (Kt)	Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
1602	0.13	71	0.02	1.79	0.58

Tonnage (Kt)	Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
603	0.16	52	0.02	1.97	0.72

Tonnage (Kt)	Au (g/t)	Ag (g/t)	Cu (%)	Zn (%)	Pb (%)
349	0.82	25	0.16	1.91	1.73

Figure 3-11. New resource positions in the western area of Lappberget. The image is a front view of Lappberget ore body, looking north.

Mined out tonnage in 2020 totals 3 000 kton, which is an increase of 135 kton from previous year. Metal grades of the mined out tonnage is as follows: 3.8% Zn, 1.5% Pb and 109 ppm Ag. Almost 80% of all mined out ore derives from Lappberget.

Table 3-15. Mineral Resources and Mineral Reserves in Garpenberg as per December 31, 2020. Numbers in brackets show changes from last year.

Classification	Kton		Au (g/t)		Ag (g/t)		Cu (%)		Zn (%)		Pb (%)	
Mineral Reserves												
Proved	23 485	(+2 449)	0.23	(-0.01)	97	(-2)	0.03	(-0.01)	3.1	(-0.4)	1.2	(-0.2)
Probable	66 037	(+12 238)	0.35	(+0.01)	93	(-2)	0.05	(-)	2.7	(-0.2)	1.3	(-0.1)
Total Mineral Reserve	*89 522*	*(+14 687)*	*0.32*	*(+0.01)*	*94*	*(-2)*	*0.04*	*(-0.01)*	*2.8*	*(-0.3)*	*1.3*	(-0.1)
Mineral Resourcess												
Measured	3 912	(-411)	0.33	(+0.02)	94	(-6)	0.06	(-)	3.4	(+0.1)	1.7	(+0.1)
Indicated	32 648	(-7 314)	0.35	(-)	89	(-)	0.05	(-)	2.7	(-)	1.3	(-)
Total M&I	*36 560*	*(-7 724)*	*0.35*	*(-)*	*90*	*(-)*	*0.06*	*(-)*	*2.8*	*(-)*	*1.4*	(+0.1)
Inferred	25 466	(+1374)	0.42	(-0.01)	57	(-2)	0.07	(-)	2.5	(-0.1)	1.4	(-0.1)
Total Mineral Resource	*62 026*	*(-6351)*	*0.38*	*(-)*	*76*	*(-3)*	*0.1*	*(-)*	*2.7*	*(-)*	*1.4*	*(-)*

3.15 Reconciliation

In order to confirm the precision of the geological interpretation, modelling, grade interpolation etc. actual mining volumes times block model grades are checked against the measured results from the processing plant. This procedure is called reconciliation and is carried out every month and presented quarterly. Monthly estimates vary dramatically depending on the mine's logistics of stocks in mine and on surface. The turnover of the stocks also varies a lot.

The grades of the mined out ore are calculated from the block model using the tonnage reported as loaded from the stopes and surveyed tonnage from cut and fill and development ore. The ore can either be transported directly to the plant or put in stockpiles underground. Above ground there is an ore storage facility which at the beginning of 2020 contained 33 Kton of ore. During the year the tonnage fluctuated between 8 kton and 63 kton. At the end of the year the storage contained 33 kton of ore.

For the annual report of reserves and resources the reconciliation is compiled from a weighted aggregation of the four quarters (rolling 4 quarters). Table 3-16 shows monthly and quarterly results for 2020 from the mine and the processing plant. The year total is shown on the bottom row. The official grades for Garpenberg are those of the processing plant. The total tonnage reported derives from production reports and differs slightly from the processed tonnage and from tonnage calculated from the block model in Table 3-16.

Table 3-16. Comparing measured results from the processing plant with calculated results from the block model. Note that the numbers from the processing plant for December are preliminary.

	Metal grades of processed ore						**Metal grades of mined ore (from block model)**					
Quarter	kton	Au g/t	Ag g/t	Cu %	Zn %	Pb %	PP kton	Au g/t	Ag g/t	Cu %	Zn %	Pb %
Jan	211.5	0.26	101	0.06	3.57	1.26	243.0	0.30	96	0.04	3.19	1.28
Feb	228.0	0.39	99	0.08	3.91	1.79	224.0	0.61	108	0.09	3.83	1.97
Mar	266.9	0.46	120	0.09	4.31	1.80	235.9	0.45	115	0.06	3.84	1.55
2020 Q 1	**706.4**	**0.38**	**107**	**0.07**	**3.96**	**1.63**	**702.9**	**0.45**	**106**	**0.06**	**3.61**	**1.59**
Apr	225.9	0.34	114	0.05	4.57	1.69	225.8	0.31	97	0.04	4.20	1.69
May	252.1	0.28	82	0.06	2.97	1.32	281.3	0.41	102	0.04	3.17	1.41
Jun	290.9	0.33	101	0.05	3.57	1.33	276.5	0.32	95	0.04	3.36	1.31
2020 Q 2	**769.0**	**0.32**	**99**	**0.05**	**3.67**	**1.43**	**783.6**	**0.35**	**98**	**0.04**	**3.53**	**1.46**
2020 Q 1+2	**1475.4**	**0.35**	**103**	**0.06**	**3.81**	**1.53**	**1486.5**	**0.40**	**102**	**0.05**	**3.57**	**1.52**
Jul	245.3	0.34	102	0.05	4.08	1.44	234.5	0.26	95	0.03	3.63	1.25
Aug	265.2	0.26	92	0.06	3.25	1.27	280.5	0.29	94	0.04	3.49	1.38
Sep	264.9	0.28	124	0.05	3.96	1.55	304.5	0.24	130	0.04	4.34	1.75
2020 Q 3	**775.4**	**0.29**	**106**	**0.05**	**3.75**	**1.42**	**819.5**	**0.26**	**107**	**0.04**	**3.83**	**1.46**
2020 Q 1-3	**2250.8**	**0.33**	**104**	**0.06**	**3.79**	**1.49**	**2306.0**	**0.35**	**104**	**0.05**	**3.67**	**1.51**
Oct	286.7	0.25	147	0.05	4.26	1.79	268.4	0.26	151	0.04	4.36	1.92
Nov	190.5	0.24	100	0.06	3.97	1.23	206.0	0.25	79	0.04	3.54	1.38
Dec	257.8	0.30	116	0.05	3.33	1.29	244.8	0.32	108	0.05	2.87	1.20
2020 Q 4	**735.1**	**0.26**	**124**	**0.05**	**3.86**	**1.47**	**719.2**	**0.28**	**116**	**0.04**	**3.62**	**1.52**
2020 Q 1-4	**2985.9**	**0.31**	**109**	**0.06**	**3.81**	**1.48**	**3025.2**	**0.33**	**107**	**0.04**	**3.65**	**1.50**

The rolling 4-quarter graph for zinc, lead and silver is shown below in Figure 3-12. The graph shows the difference in % in weighted metal grades between processed ore and mined ore and is calculated with the following equation: (Metal Grade Processing Plant/Metal Grade Block Model)-1. Thus a positive number means that the grade is higher in the processing plant than in the block model. The values for Q 1-4 2020 seen at the rightmost side of the graph are: +4.2% Zn, -1.3% Pb and +2,1% Ag.

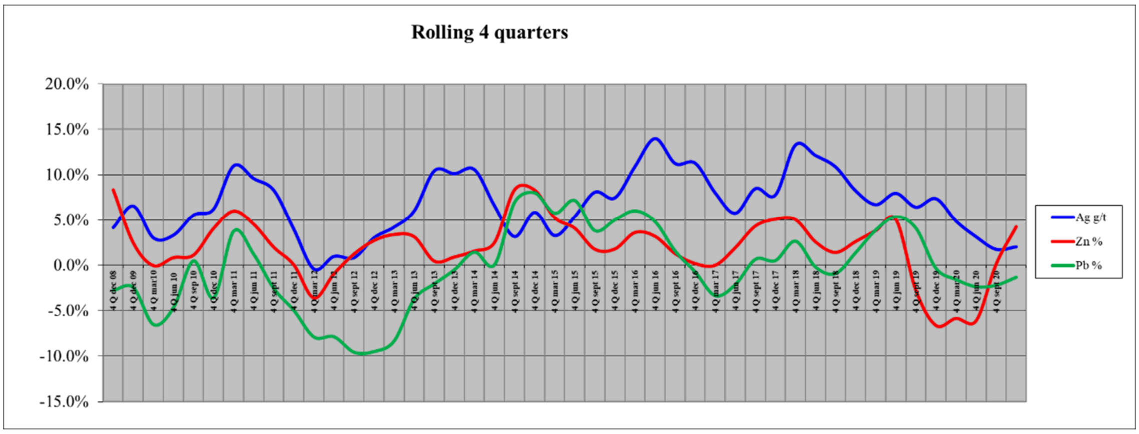


Figure 3-12. Metal grades in processed ore vs metal grades of the mined ore based on the block model, over a ten-year period.

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4.2 Internal references

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APPENDIX 1

A historical overview

~1200	Mining operation commences
1544	Gustav Wasa takes over the mining operation
1840	Discontinuation of mining operation
1906	Mining operation resumed
1908	The first concentrator was built
1923	AB Zinkgruvor, Falun takes over the activity from AB Garpenbergs Odalfält
1928	A new concentrator was built
1950-53	New shaft, head frame and a new concentrator were built
1957	Boliden – new owner
1972	The Garpenberg Norra mine in operation
1989	Increased capacity in the concentrator
1994	Shaft extension to 800 m level in Garpenberg Norra
1996	New hoisting shaft, the Gruvsjö shaft, in the Garpenberg mine
1997	A 1000 m long drill hole was sunk towards the south from the ramp in Garpenberg Norra whereupon Kaspersbo and Lappberget were indicated
2000	Connection drift, development starts
2003	Lappberget diamond core drilling to 800 and 1000 meter level
2003	Lappberget in operation. Kvarnberget was indicated in a drill hole drilled from Lappberget. The connection drift between the two mines was completed – one mine.
2007	Paste plant was built and the mining method sublevel stoping commenced
2008	Pre-project study for extension to 2 Mt
2009	Concept study of Water-inflow in Garpenberg
2010	Pre-project study for extension to 2.5 Mt
2011	The expansion to 2.5 Mt commenced during the year Drainage drilling in 500 level in Lappberget started
2013	Drainage pumping has started. The expansion project 2.5 is nearing completion. Kvarnberget has prepared for mining with the first ore blast in December 2013.
2014	Expansion project to 2.5 Mt completed. New crusher, shafts, ore hoists etc. taken into use. First ore from Kvarnberget delivered to the concentrator. Level 1300 Z passed in Lappberget
2016	Production of 2.6 Mt successfully reached. Ventilation shaft to LAPP 554 ready. Record production of paste, 1005 kTon. First transverse stope mined in KVB.