Alphamin Announces Updated Mineral Resource and Mineral Reserve Estimates and Life of Mine Schedule for Mpama North Tin Mine

written by Raj Shah | August 2, 2022

August 2, 2022 ([Source](#)) – Alphamin Resources Corp. (AFM:TSXV, APH:JSE AltX, "Alphamin" or the "Company"), a producer of 4% of the world's mined tin[1] from its high-grade operation in the Democratic Republic of Congo, is pleased to announce updated Mineral Resource and Mineral Reserve estimates along with an updated life of mine schedule (LoM) for the Mpama North Mine.

HIGHLIGHTS

- **The updated LoM schedule shows:-**
  - replacement of contained tin depleted over the past 2.5 years
  - contained tin inventory over LoM of 154.5kt at 30 June 2022 (31 Dec 2019: 154.2kt);
- **The updated Resource shows:-**
  - 155.7kt (30 June 2019: 199kt) and 41.2kt (30 June 2019: 21.8kt) tin contained (which includes mineral reserves) at 30 April 2022 in Measured/Indicated and Inferred Resources, respectively, with an 8.0% and a 65.4% increase in grade, respectively.

- **The updated Reserve shows:-**
  - 121.4kt tin contained at 30 June 2022 (31 Dec 2019: 133.4kt) in the Proven and Probable mineral reserve

categories with 15.7% increase in grade to 4.64% Sn .

Updated Mpama North Life of Mine Plan

An updated Mineral Resource Estimate (MRE) and Mineral Reserve estimation have been developed for the Mpama North Mine. These updates replace those announced in the Technical Report of 22 April 2022 which, for Mpama North, were not updated and remained the same as those contained in the Technical Report effective 31 December 2019. The culmination of these Resource and Reserve updates is the re-design and scheduling of the Mpama North Mine into an updated Life of Mine (LoM) schedule. A comparative summary of the previous and updated LoM schedules is presented in Table 1.

Table 1: Mpama North LoM Schedule Comparison

Description	Units	31 December 2019 LoM Schedule	30 June 2022 LoM Schedule
RoM tonnes	Mt	3.85	3.23
Grade delivered to process plant	% Sn	4.00	4.78
Tin content	kt Sn	154.2	154.5
Cut-off grade	% Sn	1.60	1.00

*Note: Rounding may result in computational discrepancies

Mining has progressed steadily at Mpama North since the 2019 estimation of the Reserves and LoM schedule with 990,821 tonnes of ore having been extracted in the 30 months Dec 2019 – Jun 2022. A number of operational improvements and changes resulted in actual mine performance surpassing the 2019 LoM schedule. Run of Mine (RoM) tonnes mined for the financial years 2020 and 2021 exceeded the 2019 LoM schedule by 18.5% and 8.1%, respectively.

In addition, the Reserve cut-off grade calculated in the 31 December 2019 LoM schedule of 1.6% Sn, has at an operational level consistently been reduced due to the improved RoM output, optimised mine planning, out-performance versus dilution assumptions, improvements in the process plant recoveries and an increase in the tin price. These actual results have now been captured in the updated Reserve cut-off grade and LoM schedule which are declared at 1.0% Sn. Exploration success in the form of strike extension of the high-grade chute in the Mpama North deeps target plus the reduced cut-off grade valorises previously excluded lower grade Resource Blocks, converting them into Reserve blocks, which has further added valuable additions to the LoM schedule.

The result of these positive factors is that all contained tin depleted since 31 December 2019 has been replaced in the new LoM schedule. The 154.5kt contained tin in the updated LoM versus the previous 154.2kt has also been accompanied by a valuable grade increase of 19.6% to 4.78% Sn from 4.00% Sn previously scheduled.

As with the previous LoM schedule of 31 December 2019, the updated LoM schedule contains a small portion of Inferred Resources. The Inferred Resource constitutes 18.9% of all RoM tonnes delivered to the plant. 50% of these planned Inferred Resources are scheduled in the final three years of mining in the deep portion of the mine and will be the subject of infill Resource drilling to increase confidence before they are included in any shorter term mine plans or budgets.

The annual contained tin mined target remains ~15,000 tonnes per year which, after expected processing recoveries of 78%, results in ~12,000 tonnes per year of contained tin in concentrate production at the Mpama North Mine.

Mpama North Mineral Resource Estimate

The updated Mineral Resource Estimate (MRE) at Mpama North is illustrated in Figure 1. It is based on new resource exploration drilling on the northern deeps high-grade extensions as well as partial mine depletions (area shaded grey) since the last estimate effective 30 June 2019.

All resource additions have resulted from the renewed Mpama North Mine resource exploration drilling commenced in 2021. The drilling targeted and successfully extended the known dimensions of the highly mineralised linear plunging high-grade chute, returning some of the best project intercepts to date (see Appendix 2). On-going drilling continues at Mpama North with mineralisation intercepted outside the mineral resource boundaries declared in this update.

The updated MRE includes 9 NQ size additional core intersections from the recent exploration drilling at the Mpama North Mine which were completed from August 2021 to March 2022. These new intersections in addition to the original 122 NQ size and 21 PQ size drillholes completed pre-mining between July 2012 to November 2015, form the basis for the updated MRE. The updated MRE and previous MRE for comparison are presented in Table 2.

Figure 1: Updated Mpama North Resource Grade Block model (0.5% Sn cut-off)

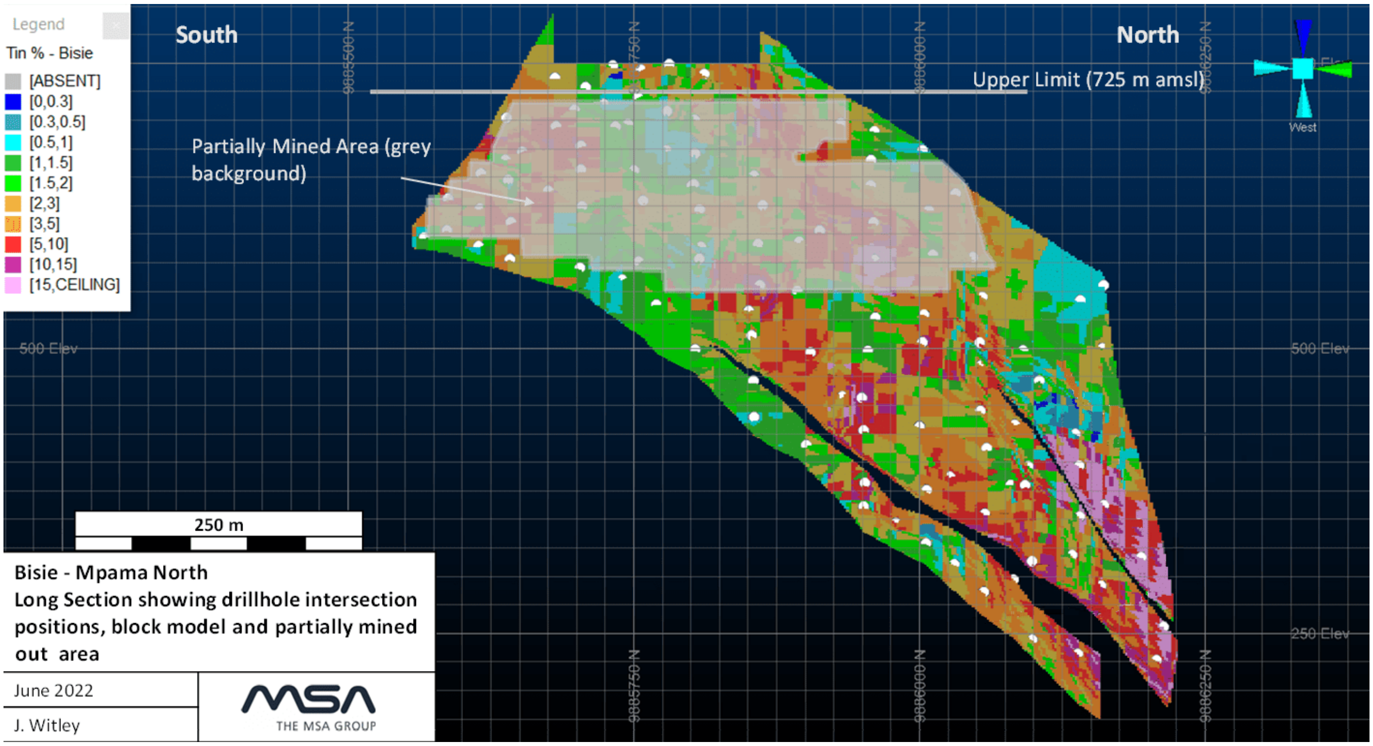

Table 2: Bisie Mpama North Mineral Resource at 0.50% Sn Cut-Off Grade (30 June 2022)

Category	Quantity Mt		Grade % Sn		Tin Content kt	
	06/2019	**04/2022**	**06/2019**	**04/2022**	**06/2019**	**04/2022**
Measured	0.33	0.04	4.75	2.16	15.6	0.9
Indicated	3.99	3.09	4.59	5.02	183.4	154.9
Total Measured and Indicated	**4.32**	**3.13**	**4.61**	**4.98**	**199.0**	**155.7**
Total Inferred	**0.48**	**0.55**	**4.57**	**7.56**	**21.8**	**41.2**

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources which are not Mineral Reserves and have no demonstrated economic viability.*
3. *Mineral Resources are reported inclusive of Mineral*

Reserves.

4. *Alphamin has an 84.1 percent interest in ABM. The Government of the Democratic Republic of Congo (GDRC) has a non-dilutive, 5% share in ABM. The Gross Mineral Resource for the Project is reported.*
5. *The 2022 MRE is effective 30 April 2022 and has been depleted by mining from mine surveys as at 30 April 2022 and an estimate of the extent of artisanal mining to 725 mamsl.*
6. *The 2019 MRE is effective 30 June 2019 and is depleted by mining from mine surveys as at 30 June 2019 and an estimate of the extent of artisanal mining to 725 mamsl.*

Differences between the previous MRE and updated MRE are a decrease in Measured and Indicated Resources contained tin content of 43.3kt Sn with an increase in grade of 8.0% to 4.98% Sn. An increase in Inferred Resources contained tin content of 19.4kt and an increase in grade of 65.4% to 7.56% Sn is also observed for Inferred Resources.

In addition to any resource growth in the northern depths high-grade zone, promising additional resource growth potential is likely at Mpama North Mine in the shallow northern strike extension as well as in the down-dip eastern dip extension, both of which are currently undergoing exploration drilling.

The full Mineral Resource checklist of assessment and reporting criteria are presented in Appendix 3. The Mineral Resource estimate has been completed by Mr. J.C. Witley (BSc Hons, MSc (Eng.)) who is a geologist with 33 years' experience in base and precious metals exploration and mining as well as Mineral Resource evaluation and reporting. He is a Principal Resource Consultant for The MSA Group (an independent consulting company), is registered with the South African Council for Natural Scientific Professions (SACNASP) and is a Fellow of the

Geological Society of South Africa (GSSA). Mr. Witley has the appropriate relevant qualifications and experience to be considered a "Qualified Person" for the style and type of mineralisation and activity being undertaken as defined in National Instrument 43-101 Standards of Disclosure of Mineral Projects.

Mpama North Mineral Reserve Estimate

An updated Mineral Reserve estimation was completed subsequent to the updated MRE. Modifying factors in the updated Reserve estimate are largely based on:-

- Actual performance statistics and site-specific experience and reconciliation data to support revised modifying factors (mining recovery, dilution, pillar loss etc.),
- More detailed geotechnical data from mining allowing the mine to be divided into geotechnical domains with different stope design parameters per domain,
- Increased mining levels per mining echelon for stoping, resulting in a reduction in the pillar losses and an increased extraction ratio,
- A reduced cut-off grade based on updated calculations from actual operating costs, increased tin prices and the impact from higher processing recoveries, and
- Recent additions to Mineral Resources from 2021/2022 exploration activities.

The updated Reserve estimate and previous estimate for comparison are presented in Table 3.

Table 3: Bisie Mpama North Mineral Reserve at 1.0% Sn Cut-Off Grade (30 June 2022)

Category	Quantity Mt		Grade % Sn		Tin Content kt	
	2019	2022	2019	2022	2019	2022
Proven Mineral Reserve	0.05	0.00	3.77	1.38	1.9	0.0
Probable Mineral Reserve	3.28	2.62	4.01	4.64	131.5	121.3
Total Proven and Probable Mineral Reserves	**3.33**	**2.62**	**4.01**	**4.64**	**133.4**	**121.4**

Notes:

1. *The Mineral Reserve has been reported in accordance with the requirements and guidelines of NI43-101 and are 100% attributable to ABM.*
2. *Apparent computational errors due to rounding and are not considered significant.*
3. *The Mineral Reserves are reported with appropriate modifying factors of dilution and recovery.*
4. *The Mineral Reserves are reported at the head grade and at delivery to Plant.*
5. *Although stated separately, the Mineral Resources are inclusive of the Mineral Reserves.*
6. *No Inferred Mineral Resources have been included in the Mineral Reserve estimate.*
7. *Quantities are reported in metric tonnes.*
8. *The input studies are to the prescribed level of accuracy.*
9. *The Mineral Reserve estimates contained herein may be subject to legal, political, environmental or other risks that could materially affect the potential exploitation of such Mineral Reserves*

The Mineral Reserve assessment and reporting criteria are presented in Appendix 4. The Mineral Reserve estimate has been prepared by Mr. Clive Brown, Pr. Eng., B.Sc. Engineering (Mining), is a qualified person (QP) as defined in National Instrument 43-101 and has reviewed and approved the scientific and technical information contained in this news release. He is a Principal Consultant and Director of Bara Consulting Pty Limited, an independent technical consultant to the Company.

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CAUTION REGARDING FORWARD LOOKING STATEMENTS

Information in this news release that is not a statement of historical fact constitutes forward-looking information. Forward-looking statements contained herein include, without limitation, statements relating to the updated LoM schedule for Mpama North, and planned future exploration activities and anticipated outcomes. Forward-looking statements are based on assumptions management believes to be reasonable at the time such statements are made. There can be no assurance that such statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. Accordingly, readers should not place undue reliance on forward-looking statements. Although Alphamin has attempted to identify important factors that could cause actual results to differ materially from those contained in forward-looking statements, there may be other factors that cause results not to be as anticipated, estimated or intended. Factors that may cause actual results to differ materially from expected results described in forward-looking *statements include, but are not limited to: uncertainty of future exploration and assay results and consistency with past results and expectations;; uncertainties inherent in estimates of Mineral Resources and Mineral Reserves; global geopolitical and economic uncertainties; volatility of metal prices; uncertainties with respect to social, community and environmental impacts; uninterrupted access to required infrastructure; adverse political events; impacts of the global Covid-19 pandemic as well as those risk factors set out in the Company's Management Discussion and Analysis and other disclosure documents available under the Company's profile at www.sedar.com. Forward-looking statements contained herein are made as of the date of this news release and Alphamin disclaims any obligation to update any forward-looking statements, whether as a result of new information, future events or results or otherwise, except as required by applicable securities laws.*

Appendix 1: SAMPLE PREPARATION, ANALYSES AND QUALITY CONTROL AND QUALITY ASSURANCE (QAQC)

For sample preparation, analyses and quality control and quality assurance, see the Company's news release dated 07 March 2022 entitled "ALPHAMIN ANNOUNCES MAIDEN MINERAL RESOURCE ESTIMATE AND POSITIVE PRELIMINARY ECONOMIC ASSESSMENT FOR MPAMA SOUTH"

Appendix 2: SIGNIFICANT INTERCEPTS FROM RECENT DRILLING AT MPAMA NORTH. EARLIER DRILLING INTERCEPTS ARE REPORTED IN THE TECHNICAL REPORT DATED 22 APRIL 2022 FILED ON SEDAR.COM (0.5% Sn lower threshold)

Hole	Easting	Northing	RLm	Azi (°)	Dip (°)	From	To	Sn %	Width	Sample Position		
	GPS	GPS							(m)[1]	mid_x	mid_y	mid_z
MND001	No significant intercepts											
MND002	No significant intercepts											
MND003	No significant intercepts											
MND004	583392	9886283	682	270	-52	524.8	525.1	0.67	0.30	582,994	9,886,250	347.0
MND005	No significant intercepts											
MND006	No significant intercepts											
MND007	583100	9886210	726	270	-75	402.0	402.5	0.58	0.45	582,987	9,886,211	340.5
MND009	582881	9886200	752	270	-65	96.4	96.8	2.28	0.40	582,842	9,886,200	667.3
MND010	No significant intercepts											
MND011	583103	9886211	726	270	-83	419.3	428.0	21.85	8.74	583,021	9,886,194	312.7
						430.6	438.9	17.52	8.30	583,018	9,886,193	302.0
MND012	582950	9886140	765	270	-60	64.7	65.4	12.20	0.65	582,916	9,886,142	699.8
MND013	582945	9886142	759	270	-50	142.7	143.0	10.05	0.28	582,852	9,886,146	651.2
						177.0	178.0	1.02	1.00	582,829	9,886,146	625.5
MND014	No significant intercepts											
MND015a	582950	9886140	755	270	-70	172.3	172.7	6.34	0.36	582,887	9,886,144	594.8
MND016	583063	9886162	741	270	-50	249.4	253.0	0.62	3.58	582,895	9,886,161	554.1
MND017	583195	9886171	744	270	-50	385.0	386.0	1.02	1.00	582,947	9,886,165	450.1
MND018	583063	9886162	740	270	-60	284.7	285.0	11.70	0.30	582,912	9,886,160	498.4
MND019	583196	9886171	744	270	-64	432.2	444.0	25.94	11.76	582,992	9,886,162	357.3
						445.0	445.6	15.30	0.55	582,988	9,886,162	351.2
MND020	583196	9886171	744	270	-72	484.9	492.3	7.08	7.36	583,024	9,886,160	288.3
						495.0	499.3	7.50	4.25	583,020	9,886,159	280.6
MND021	583195	9886171	744	270	-57	425.3	425.6	10.50	0.30	582,962	9,886,178	388.9
MND022a	583244	9886211	741	270	-73	547.0	558.3	7.62	11.30	583,060	9,886,205	220.5
						559.0	565.9	16.37	6.85	583,056	9,886,205	211.4
						567.7	569.5	1.31	1.83	583,054	9,886,205	205.7
MND023	583204	9886236	738	270	-75	511.6	524.7	21.27	13.10	583,038	9,886,208	249.3
						527.0	528.4	2.35	1.42	583,033	9,886,207	240.8
1. Apparent widths, not true thickness												

Appendix 3: Mineral Resource Checklist of Assessment and Reporting Criteria

Drilling techniques	A total of 195 exploration drillholes have been completed at Mpama North. All drillholes were diamond drill cored and drilled from surface (mostly NQ) at angles of between -60° and -75°. The drillholes were drilled from east to west along section lines spaced between approximately 25 m and 50 m apart. 21 PQ sized holes from a metallurgical drilling campaign were also included that were drilled in three clusters approximately 25 m apart.
Logging	All of the drillholes were geologically logged by qualified geologists. The logging is of an appropriate standard for grade estimation.
Drill sample recovery	Core recovery in the mineralised zones was observed to be very good and is on average greater than 95%. Five of the shallow drillholes intersected artisanal workings and so recovery of the high-grade mineralisation was poor and therefore the data from these holes were not used for grade estimation.
Sampling methods	Half core samples were collected continuously through the mineralised zones after being cut longitudinally in half using a diamond saw. Drillhole samples were taken at nominal 1 m intervals, which were adjusted to smaller intervals in order to target the vein zones. Lithological contacts were honoured during the sampling. MSA’s observations indicated that the routine sampling was performed to a reasonable standard and is suitable for evaluation purposes.

Quality of assay data and laboratory tests	<u>2012-2015 Drilling</u> The assays were conducted at ALS Chemex in Johannesburg where samples were analysed for tin using fused disc ME-XRF05 with 10% precision and an upper limit of 10 000 ppm. This was reduced to 5,000 ppm from 2014 onwards. Over limit samples were sent to Vancouver for ME-XRF10 which uses a Lithium Borate 50:50 flux with an upper detection limit of 60% and precision of 5%. ME-ICP61, HF, HNO3, HCL04 and HCL leach with ICP-AES finish was used for 33 elements including base metals. ME-OG62, a four-acid digestion, was used on ore grade samples for Pb, Zn, Cu & Ag. External quality assurance of the laboratory assays for the Alphamin samples was monitored. Blank samples, certified reference materials and duplicate samples were inserted with the field samples accounting for approximately 10% of the total sample set. The QAQC measures used by Alphamin revealed the following: • The high-grade CRM (31.42% Sn) assays by ALS prior to 2015 returned values approximately 8% higher than the certified mean value. 98 pulp rejects from this period of between 1.5% and 60% Sn were re-assayed by ALS in 2016 together with the high-grade CRM. The 2016 assays correlated well with those prior to 2015 and the high-grade CRM returned values within tolerance. Therefore, the pre-2015 assays were accepted for estimation without modification. • The lower grade CRM assays (<2% Sn) indicated that the Sn and Cu assays were accurate and unbiased, consistently returning values within two standard deviations of the accepted CRM value. • The field duplicates confirmed the nuggetty nature of the tin mineralisation. The majority of the duplicate assays were within 20% of the field sample. • Blank samples indicated that no significant contamination occurred. <u>2021-2022 Drilling</u> At the on-site ABM laboratory (overseen by Anchem), samples were first checked off against the submission list supplied and then weighed and oven dried for 2 hours at 105 degrees Celsius. The dried samples were crushed by jaw crusher to 75% passing 2 mm, from which a 250 g riffle split was taken. This 250 g split was pulverised in ring mills to 90% passing 75 µm from which a sample for analysis was taken. Samples were homogenised using a corner-to-corner methodology and two samples were taken from each pulp, one of 10 g for on-site laboratory assaying and another 150 g sample for export and independent accredited 3rd party laboratory assaying. Received samples at ALS Johannesburg were checked off against the list of samples supplied and logged in the system. Quality Control is performed by way of sieve tests every 50 samples and should a sample fail, the preceding 50 samples are ground in a ring mill pulveriser using a carbon steel ring set to 85 % passing 75µm. Samples are analysed for tin using method code ME-XRF05 conducted on a pressed pellet with 10% precision and an upper limit of 5,000ppm. The over-limit tin samples are analysed as fused disks according to method ME-XRF15c, which makes use of pre-oxidation and decomposition by fusion with 12:22 lithium borate flux containing 20% Sodium Nitrate as an oxidizing agent, with an upper detection limit of 79% Sn. ME-ICP61, HF, HNO3, HCL04 and HCL leach with ICP-AES finish was used for 33 elements including base metals. ME-OG62, a four-acid digestion, was used on high-grade samples for Pb, Zn, Cu & Ag. The Mpama North samples were assayed in batches together with the Mpama South samples. External quality assurance of the laboratory assays for the Alphamin samples was monitored. Blank samples (299), certified reference materials (434) and duplicate samples (357) were inserted with the field samples accounting for approximately 11% of the total sample set. The QAQC measures used by Alphamin revealed the following: • Blank samples indicated that no significant contamination occurred overall. Low levels of contamination (mostly <200 ppm Sn) mostly occurred, however 12 values between 229 ppm and 1,285 ppm were returned. Given the high grades at Bisie, the levels of contamination are not significant. • Five different CRMs were used with expected values between 0.18% and 31.42% Sn. The lower grade CRMs were prepared by Ore Research and Exploration (OREAS) and the two high grade CRMs (4.19% and 31.42% Sn) by the Bureau of Analysed Samples Ltd (BCS). In general, ALS returned values within the tolerance limits (three standard deviations) for the OREAS CRMs, although slightly lower than the expected values. Assays of the highest grade BCS CRM were mostly outside of the three standard deviation limits but within ±4%of the expected value. For the 5.07% Sn BCS CRM, assays were consistently lower than the expected value by as much as 7%. Overall, the CRMs results indicate a slight negative bias for the ALS assays. • Coarse duplicates show mostly excellent correlation, indicating minimal error in the process and a high degree of repeatability.

Verification of sampling and assaying	A selection of cores representative of the 2012-2015 drilling programme at Mpama North were visually verified during three site visits by the QP (July 2013, May 2014 and August 2015). The QP observed the mineralisation in the cores and compared it with the assay results. It was found that the assays generally agreed with the observations made on the core The QP took ten quarter core field duplicates for independent check assay in 2013, which confirmed the original sample assays within reasonable limits for this style of mineralisation 150 pulp duplicates were sent to SGS (Johannesburg) in 2013 for confirmation assay and a further 173 were assayed in 2015. In 2015, 99 pulp duplicates were sent to Setpoint (Johannesburg) for confirmation assays. • The pulp duplicates assayed by SGS in 2013 showed excellent correlation with the ALS assays at both high- and low-grade ranges. • SGS assays were lower than ALS for grades above 20% for the 2014 data checked in 2015. SGS under-reported the grade of all the CRMs that were inserted. The high-grade CRM was under assayed by approximately 5%. • Setpoint assays were lower than ALS for grades above 10% for the 2014 data checked in 2015. ALS tended to under-report the grades of the CRMs. Since the 2012 to 2015 drilling took place, the QP has visited the Bisie site on two occasions. From 10 to 12 March 2020 the Mpama North underground workings were visited, and the on-site laboratory was inspected. From 11 to 18 August 2021 the available Mpama South cores, current Mpama North sites and drilling were inspected as well as upgrades to the on-site laboratory. Core photos from the drilling programme have regularly been provided to the QP for inspection.
Location of data points	All except two of the Bisie surface drillhole collars used in the Mineral Resource estimate were surveyed by D.GPS. All collar elevations were validated against a LiDAR topographic survey. Down-hole surveys were completed for all the holes drilled at Mpama North. From 2012 to 2015 these were mostly by standard multishot techniques and therefore the accuracy of the survey was impacted by natural magnetism. The latest drillhole surveys have been competed using a north seeking gyro.
Tonnage factors (in situ bulk densities)	For the 2012-2015 drilling, specific gravity determinations were made for 2,698 drillhole samples using a laboratory gas pycnometer. A regression formula of tin grade against specific gravity was developed that was applied to the samples that did not have direct SG measurements. The assigned specific gravity was interpolated into the block model using ordinary kriging. The laboratory pycnometry readings compared well with a number of SG measurements completed using the Archimedes principle of weight in air versus weight in water. For the 2021-2022 drilling, 1,154 relative density measurements were made on mineralised and unmineralised samples using the weight in air versus weight in water method.
Data density and distribution	The holes were drilled from east to west along section lines spaced approximately 50 m to 60 m apart with infill drilling on 25 m to 30 m spaced sections in a portion of the shallower area. Along the section lines, the drillholes intersected the mineralisation between approximately 25 m and 50 m apart in most of the Mineral Resource area. 21 PQ sized holes from a metallurgical drilling campaign were included that were drilled in three clusters approximately 25 m apart. Within the clusters, the PQ holes were drilled approximately 5 m apart. In the Mineral Resource area, 131 NQ drillholes were used for the grade estimate. Several holes did not intersect the mineralised zone or intersected low-grade mineralisation outside of the area currently defined as a Mineral Resource, and five of the shallow drillholes intersected artisanal workings. The data from these holes were not used for grade estimation.
Database integrity	Data are stored in an Access database. MSA completed spot checks on the database and is confident that the Alphamin database is a reasonably accurate representation of the original data collected.
Dimensions	The area defined as a Mineral Resource extends approximately 750 m in the down plunge direction. It extends for a width of approximately 300 m in the plane of mineralisation perpendicular to the plunge. The main zone of the Mineral Resource, which accounts for 97% of the Mineral Resource, is on average approximately 9 m thick, although is narrower (less than 1 m) at the margins and up to 20 m thick in the central areas. The minor zones that occur several metres above and below the main zone are considerably narrower than the main zone and cover areas of between 100 m and 200 m in the dip and strike directions.

Geological interpretation	The mineralised intersections in drill core are clearly discernible. The Mineral Resource is interpreted to occur as irregular tabular mineralised zones, dipping 65° to the east, containing several narrow veins, blocks and disseminations of cassiterite. The mineralised zones are hosted in chlorite schist that is the result of intense alteration and may originally have been a distinct stratigraphic interval or structure. The main zone of the Mineral Resource is almost continuous for approximately 750 m although it has been affected by a number of faults causing local displacement. Several faults with throws in excess of 10 m have been modelled. • The Main Vein mineralisation consists of a number of uncorrelated cassiterite veins within pervasively chloritised schist. This zone generally occurs over thicknesses of between 2 m and 22 m with an average thickness of approximately 9 m. The Main Vein zone is generally the highest grade and most consistent overall. • Hanging Wall Vein mineralisation occurs within partly chloritised schist and micaceous schist between 4 m and 20 m above the Main Vein. This zone of mineralisation is generally between 0.5 m and 4 m wide and occurs in the central area of the deposit and tapers out northwards. The middling between the Hanging Wall Vein and the Main Vein decreases in areas and it is possible that this vein merges into the Main Vein in some parts of the deposit. • Footwall Vein (FW Vein) mineralisation occurs within the micaceous schist and amphibolite schist between 2 m and 12 m below the Main Vein. This zone is restricted to the southern areas, is very narrow (<50 cm) and high-grade in its most northern occurrences but thickens to the south to several metres. It is possible that this vein merges into the Main Vein in some parts of the deposit. A three-dimensional wireframe model was created for the three zones of mineralisation based on a grade threshold of 0.35% Sn. The main zone is the most consistent zone and occurs within a persistent chlorite schist. Narrower less continuous zones occur above and below the main zone within chlorite-mica schists.
Domains	The mineralisation was modelled as three tabular zones containing irregular vein style mineralisation. A hard boundary was used to select data for estimation in order to honour the sharp nature of vein boundaries.
Compositing	Sample lengths were composited to 1 m. Composites of less than 1 m occurred in the narrow vein areas, which were retained. Accumulations of Sn%-density-composite length were calculated for grade estimation so that narrow high-grade composites did not excessively influence the estimate.
Statistics and variography	Two populations of Sn mineralisation occur, a high-grade population of cassiterite veins and a lower grade population containing disseminated cassiterite as vein fragments and blebs. The data were separated into the two statistical populations, which resulted in the coefficient of variation for the Sn accumulation composites in the high-grade population being 0.5 and for the lower grade population being 1.6. The histograms are positively skewed. Normal Scores variograms were calculated in the plane of the mineralisation, down-hole and across strike. Variogram ranges for the Sn accumulation in the main zone were modelled with ranges in the order of 75 m in the longest direction of continuity and 60 m in the second direction. Reliable variograms could not be produced for either the hangingwall or footwall zones and the main zone variogram was used to estimate these areas.
Top or bottom cuts for grades	Top caps were applied to outlier values by examination of histograms and cumulative probability plots. Top caps were applied to the accumulation value for tin, which affected 2.5% of the data.
Data clustering	21 PQ sized holes from a metallurgical drilling campaign were included that were drilled in three close clusters approximately 25 m apart. Within the clusters the PQ holes were drilled approximately 5 m apart. Outside of the metallurgical sampling area the grid is approximately regular.
Block size	20 mN by 2 mE by 10 mRL three-dimensional block models were used. The blocks were divided into sub-cells to better represent the interpreted mineralisation extents. The blocks were rotated into the plane of mineralisation prior to estimation.

Grade estimation	The accumulation of tin grade, density and composite length were estimated using ordinary kriging. Copper, lead, zinc, silver, arsenic and sulphur grades were also estimated. The Sn%-density-composite length accumulations were divided into a high-grade population (>80 %t/m) and a lower grade population (<80 %t/m). The probability of a block containing values above and below this threshold was estimated by indicator kriging. Outside of the indicator variogram range, estimates did not use the extreme high grades (>80 %tm) in order to reduce the influence of these values on estimates further away from them. The high- and low-grade populations were estimated separately using ordinary kriging and the block model grade was then assigned based on the estimated grade of the high and low grade and their proportion in each block. A minimum number of 4 and a maximum of 10 one metre composites were required for the high-grade Sn-accumulation population. A minimum number of 8 and a maximum of 24 one metre composites were required for the lower grade Sn-accumulation population and other variables. Search distances and orientations were aligned with the variogram range and mineralised trends. Estimates were extrapolated for a maximum distance of 20 m up- or down-plunge from the nearest drillhole intersection. Extrapolation is minimal over most of the Mineral Resource as the up-and down dip limits have been well defined by the drilling, except in a portion on the down-plunge area that is open at depth.
Resource classification	Measured Mineral Resources were declared where the drillhole spacing is approximately 25 m and where the geological model has low variability. The mineralisation was classified as Indicated Mineral Resources if block estimates occur within the 50 m drilling grid, so that all Indicated estimates are informed by samples within the variogram range. The remainder of the interpreted model within the sparser drilled area was classified as Inferred Mineral Resources with a maximum extrapolation from a drillhole of 20 m along plunge. The up-plunge extremity is separated from the main area by a fault and the structural interpretation in this area is tenuous and it does not contain sufficient data to classify them as Indicated Mineral Resources. Consequently, this area was classified as Inferred Mineral Resources. The high-grade mineralisation of reasonable tonnage leads no doubts as to reasonable potential for economic extraction, it being one of the highest-grade tin deposits in the world. Mpama North is currently a profitable mine.
Mining cuts	The thickness of the mineralisation was honoured in the estimate and as a result some areas will be more sensitive to dilution than others. The thickness, grade and steep dip implies that the Mineral Resource can be extracted using established underground mining methods.
Metallurgical factors or assumptions	The tin mineralisation occurs as cassiterite, an oxide of tin (SnO_2). The Cu, Zn and Pb mineralisation occurs as sulphides. Each of these minerals is amenable to standard processing techniques for each metal. At the Mpama North Mine, gravity separation is used to create a saleable tin concentrate and the sulphide minerals are removed from the tin concentrate as they represent impurities.
Legal aspects and tenure	Alphamin through its wholly owned DRC subsidiary, Alphamin Mining Bisie SA, has a Mining License PE 13155 which includes the Bisie Tin Mine. Alphamin has an 80.75 percent interest in ABM. The Government of the Democratic Republic of Congo (GDRC) has a non-dilutive, 5% share in ABM.
Audits, reviews and site inspection	The following review work was completed by MSA: • Inspection of approximately 25% of the Alphamin cores used in the Mineral Resource estimate • Database spot check • Inspection of drill sites • Independent check sampling • Inspection of the on-site sample preparation laboratory.

Appendix 4: Mineral Reserve and Mine Schedule Modifying factors

Modifying Factors

TABLE 4.1 MODIFYING FACTORS APPLIED		
Modifying factor	**Value**	**Comment**

Mining recovery Development and slyping Long hole stopes Sill pillars (other)	98% 98% 61%	Based on historical performance reported
Dilution Development and slyping Long hole stopes Sill pillars	8% 10% 18%	Based on historical performance reported

A cut-off grade calculation was performed based on the metal price provided by Alphamin of US$32,000 per tonne and costs as per the 2022 mine budget, provided by Alphamin and reviewed by Bara. The breakeven grade calculation is shown in the table below. This breakeven grade of 1.5% Sn was applied to determine the limits of mining while the marginal cut-off grade of 1.0% was applied to select stopes for inclusion in the mine schedule and Mineral Reserve.

TABLE 4.2 BISIE TIN PROJECT CUT OFF GRADE ESTIMATE – JUNE 2022					
		Breakeven cut-off grade		**Marginal cut-off grade**	
Item	**Unit**	**Value**		**Value**	
Tin price	US$/tonne	32,000		32,000	
Operating costs					
On mine costs	US$/t RoM	196		86	
Off mine costs (fixed)	US$/t RoM	168		168	
Total cost	**US$/t milled**	364		254	
Breakeven recovered grade	%	1.14		0.79	

Plant recovery	%	78	%	78	%
Breakeven RoM grade	%	1.5		1.0	

The stoping and development productivities to be used in the life of mine plan were discussed and agreed with mine management. The scheduling rates included consideration of:

- Performance over the year to date
- Changes to shift arrangements to CONOPS
- Maintenance and services installation requirements
- Equipment availability.

Table 4.3 below summarises the advance rates used in the mine schedule.

TABLE 4.3 SCHEDULING ADVANCE PER MONTH PER END TYPE							
	Unit	**Decline**		**FW Drive**		**Ore Drive**	
Shifts per day	Unit	2		2		2	
Days per month	Unit	26		26		26	
Blast hole length	metres	3.2		3.2		3.2	
Effective advance	metres	2.8		2.8		2.8	
Time to drill and blast (shifts)	Unit	1		1		1	
Time to muck and support (shifts)	Unit	1		1		2	
Blasts per day	Unit	1		1		0.7	
Advance pr day	metres	2.8		2.8		1.9	
Blast efficiency	%	80	%	80	%	80	%
Advance per month	Metres/month	58		58		39	

Advance used in schedule	**Metres/month**	**60**		**40**		**40**	

There are currently three development jumbos available on site and they are planned at a maximum of 240 metres per month. These drill rigs are allocated in the mine schedule as follows:

- One to the ramp (Decline) and ancillary excavations off of the ramp.
- One to lateral waste development
- One to ore development and slyping.

The long hole drilling capacity of the long hole production drill rig limited the long hole stoping production to a maximum of 27,000 tonnes per month.

The mining schedule targets RoM tin content delivered to plant of minimum 15,000 tonnes tin per year. The processing plant has capacity to process a maximum of 40,000 tonnes per month. This processing constraint was used as a constraint in the mining schedule. The Rom tonnage on a monthly basis based on the grade in order to achieve the required tin production within the processing and mining constraints.

The targeted production rate of an average of 1500 t contained Sn per month can be maintained for 99 months (Eight years and three months). The mining schedule includes 18.9% made up of inferred resources which are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves.

Ore reserve statement

Only Measured and Indicated Mineral Resources are converted to Mineral Reserves. The total life of mine schedule included 18.9 % of the scheduled production from Inferred Mineral Resources, which was not included in the Mineral Reserves. This Mineral

Reserve estimate is based on a depletion date of 30 June 2022. It followed an assessment of the economic viability of the Mineral Resources that were scheduled for depletion before confirming them as Mineral Reserves.

Summary of Reserves for Bisie Tin at 30 June 2022						
Classification	**Quantity (Mt)**		**Tin Grade (%)**		**Tin Content (kt)**	
	2022	**2019**	**2022**	**2019**	**2022**	**2019**
Proven Mineral Reserve	0.00	0.05	1.38	3.77	0.0	1.9
Probable Mineral Resource	2.62	3.28	4.64	4.01	121.3	131.5
Total Mineral Reserves	**2.62**	**3.33**	**4.64**	**4.01**	**121.4**	**133.4**

Source: Bara (2022)

Notes:

- *The Mineral Reserve has been reported in accordance with the requirements and guidelines of NI43-101 and are 100% attributable to ABM.*
- *Apparent computational errors due to rounding and are not considered significant.*
- *The Mineral Reserves are reported with appropriate modifying factors of dilution and recovery.*
- *The Mineral Reserves are reported at the head grade and at delivery to Plant.*
- *The Mineral Reserves are stated at a price of US32,000/t Sn as at 30 June 2022.*
- *Although stated separately, the Mineral Resources are inclusive of the Mineral Reserves.*
- *No Inferred Mineral Resources have been included in the Mineral Reserve estimate.*
- *Quantities are reported in metric tonnes.*

- *The input studies are to the prescribed level of accuracy of a minimum pre-feasibility study level.*
- *The Mineral Reserve estimates contained herein may be subject to legal, political, environmental or other risks that could materially affect the potential exploitation of such Mineral Reserves.*

The Qualified Person for Mineral Reserves has satisfied himself that the methodology used for estimating and presenting Mineral Reserves herein conform to the requirements and guidelines of NI 43-101 and therefore supports this Mineral Reserve estimate as stated above.

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[1] Data obtained from International Tin Association Tin Industry Review Update 2021