Orion Minerals

ASX/JSE RELEASE: 15 January 2019

Prieska Total Mineral Resource Exceeds 30Mt @ 3.7% Zn and 1.2% Cu Following Updated Open Pit Resource

- **Updated total Mineral Resource estimate completed for the Prieska Zinc-Copper Project in South Africa, including an updated Resource for the +105m Level Target (Open Pit), using all 2018 data.**
- **Prieska total Mineral Resource, reported and classified in accordance with the JORC Code (2012), now stands at: 30.49Mt @ 3.7% Zn and 1.2% Cu, including Indicated Mineral Resources of 19.13Mt @ 3.59% Zn and 1.18% Cu.**
- **Updated +105m Level Mineral Resource: 1.76Mt @ 2.0% Zn and 1.5% Cu including an Indicated Resource of 0.62Mt @ 3.05% Zn and 1.54% Cu.**
- **The total Mineral Resource follows the updated Deep Sulphide Resource of 28.73Mt @ 3.8% Zn and 1.2% Cu which underpinned the Phase 1 Scoping Study announced before Christmas. The Bankable Feasibility Study, which will incorporate the total Mineral Resource, is on track for completion in Q2 2019.**

Orion's Managing Director and CEO, Errol Smart, commented:

"The completion of the first 'global' Mineral Resource for Prieska, encompassing all 2018 drilling data, is a great way to start 2019. The total Mineral Resource for the Project now stands at over 30 million tonnes, cementing its position as one of the more significant new VMS development projects globally and highlighting its potential to underpin a substantial, long-life mining operation.

The total Mineral Resource includes an updated Mineral Resource for the +105m Level Open Pit Target, which was not included in the robust Scoping Study on the Phase 1, 10-year project announced just before Christmas. While the +105m Level Mineral Resource will be included in the Bankable Feasibility Study which is due for completion in Q2 this year, it is important to note that this deposit will only be scheduled for mining as part of our Phase 2 operations later in the life of the project.

Our focus remains squarely on the Deep Sulphide Mineral Resource, which will underpin the first decade of operations at Prieska and play a pivotal role in the Company's imminent transformation into a significant base metals developer this year. Near-mine exploration of the extensions to the Deep Sulphide Resource and satellite discoveries, such as those announced before Christmas, provides potential to extend life of mine or increase annual production in the future."

Orion Minerals Limited (**ASX/JSE: ORN**) (**Orion** or **Company**) is pleased to announce an updated total Mineral Resource comprising Indicated and Inferred Resources of **30.49Mt grading 3.7% Zn and 1.2% Cu** at its Prieska Zinc-Copper Project (**Prieska Project**) in the Northern Cape, South Africa, following the completion of an updated Mineral Resource estimate for the +105m Level Target (Open Pit) (Figure 1).

The new total Mineral Resource follows the landmark upgrade to the Deep Sulphide Mineral Resource announced just before Christmas (refer ASX release 18 December 2018)[1] and the subsequent Scoping Study which confirmed a robust Phase 1 development for the Prieska Project (refer ASX release 19 December 2018). The total Mineral Resource will be incorporated in the Bankable Feasibility Study (**BFS**) due for completion in Q2 2019.

Updated +105m Level Mineral Resource

Since the first +105m Level Mineral Resource announcement (refer ASX release 8 February 2018), the geological wireframe and resource estimate have been updated to include additional drill data and refinements to modelling of metallurgical zonation to re-evaluate the model (Figure 2).

The changes to the Mineral Resource estimate have successfully increased the total +105m Level Mineral Resource to **1.76Mt grading 2.0% Zn and 1.5% Cu**, with **0.62Mt grading 3.05% Zn and 1.54% Cu** of the Mineral Resource classified in the higher-confidence Indicated category.

The +105m Level Mineral Resources shown in Table 1 are based on drilling data available for the Repli Prospecting Right. The Mineral Resources are reported in accordance with the JORC Code (2012), with supporting information provided in Appendix 1:

Classification	Mineralised Zone	Tonnes	Zn (tonnes)	Zn (%)	Cu (tonnes)	Cu (%)
Indicated	Supergene	624,000	19,000	3.05	10,000	1.54
	Total	624,000	19,000	3.05	10,000	1.54
Inferred	Oxide	511,000	4,000	0.9	3,000	0.6
	Supergene	627,000	11,000	1.8	14,000	2.2
	Total	1,138,000	16,000	1.4	17,000	1.5
+105m Level Mineral Resource Total		**1,762,000**	**35,000**	**2.0**	**27,000**	**1.5**

Note: +105m Level Mineral Resource bottom cut-off = 0.3% Cu. Mineral Resources stated at *zero % cut*-off. Tonnes are rounded to thousands, which may result in rounding errors.

Table 1: Global Indicated and Inferred Mineral Resource Statement for the +105m Level Target of the Prieska Project.

[1] Mineral Resource reported in ASX release of 18 December 2018: "Landmark Resource Upgrade Sets Strong Foundation" available to the public on www.orionminerals.com.au/investors/market-news. Competent Person Orion's exploration: Mr. Errol Smart. Competent Person: Orion's Mineral Resource: Mr. Sean Duggan. Orion confirms it is not aware of any new information or data that materially affects the information included above. For the Mineral Resources, the company confirms that all material assumptions and technical parameters underpinning the estimates in the ASX release of 18 December 2018 continue to apply and have not materially changed. Orion confirms that the form and context in which the Competent Person's findings are presented here have not materially changed.

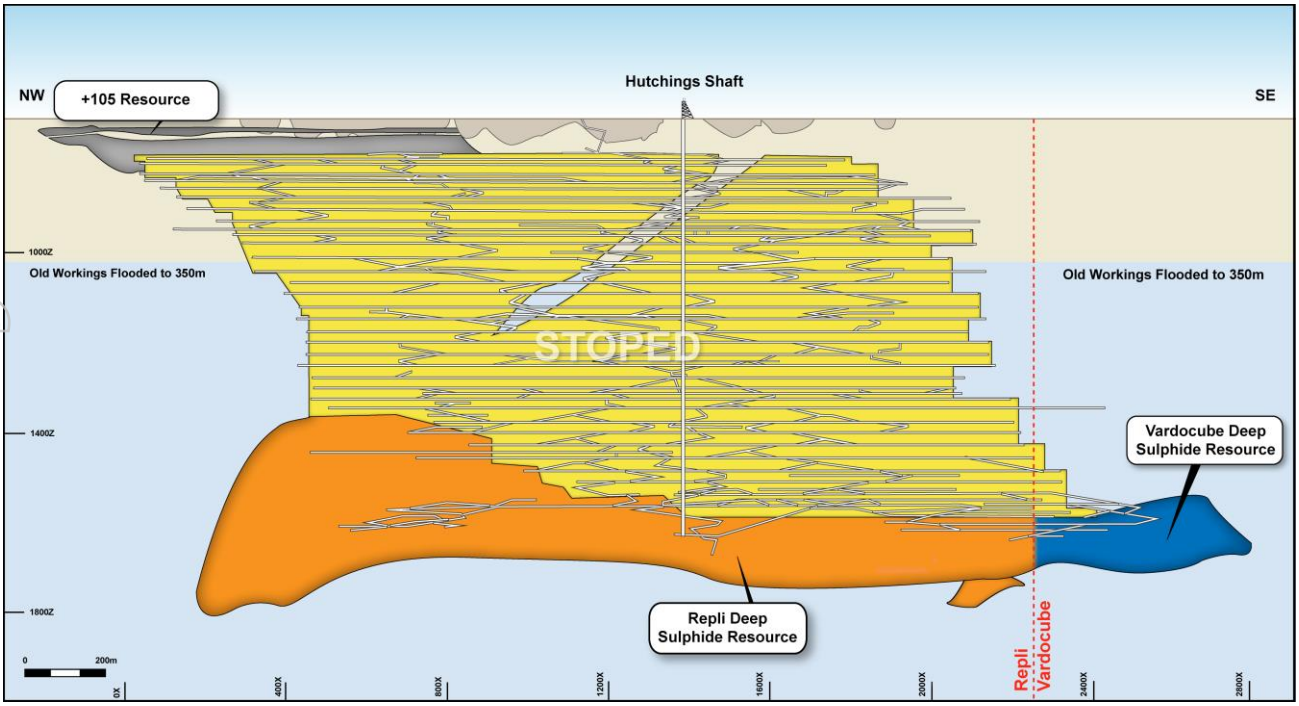


Figure 1: Longitudinal schematic section showing the historically-mined area and the +105m Level and Deep Sulphide Mineral Resources at the Prieska Project, with the Deep Sulphide Resource sub-divided into the Repli and Vardocube Mineral Resource areas.

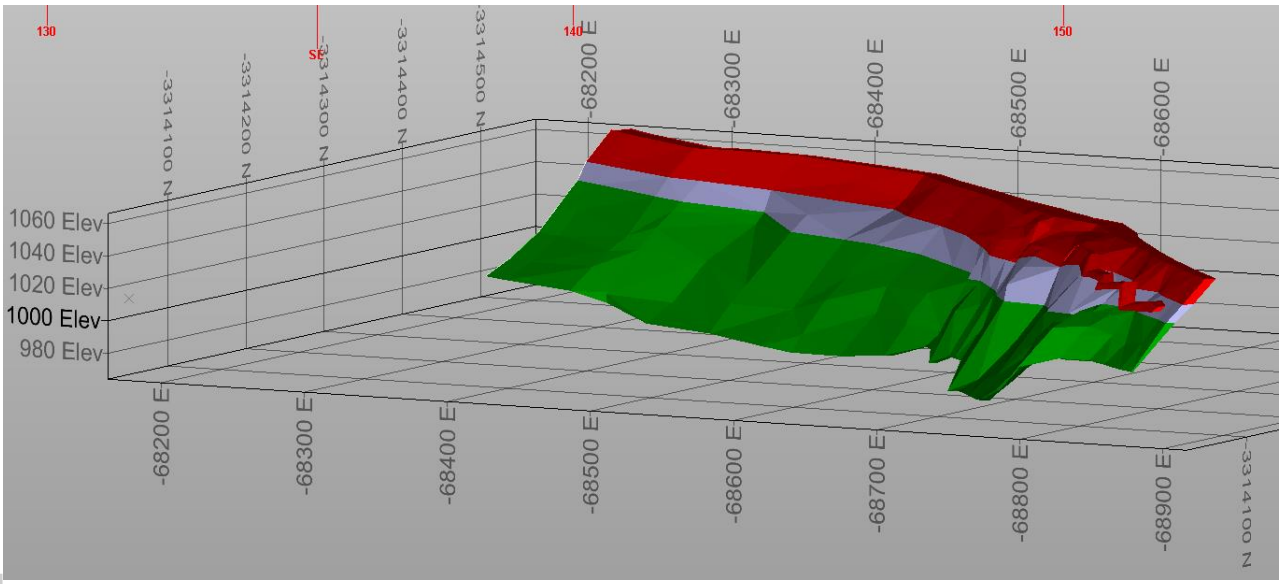


Figure 2: Isometric view showing the +105m Level Mineral Resource with the Supergene Zone in green and Oxide Zone in red. The area between the Oxide and Supergene Zones is a leached (clay) zone with insignificant Zn and Cu values and is excluded from the Mineral Resource.

The updated +105m Level Mineral Resource incorporates the results of 3,981m of drilling from 43 holes. The only new hole drilled since the +105m Level Mineral Resource announcement, OCOD138, intersected 2.18m at 8.61% Zn, 1.43% Cu, 0.33 g/t Au and 10.10 g/t Ag from 93.42m in supergene mineralisation (refer ASX release 5 November 2018)[2].

[2] Exploration Results reported in ASX release of 5 November 2018: "Thick, high-grade zinc-copper intercepts at Prieska Project" available to the public on www.orionminerals.com.au/investors/market-news. Competent Person: Mr JE Potgieter. Orion confirms it is not aware of any new information or data that materially affects the information included in the market announcement. Orion confirms that the form and context in which the Competent Person's findings are presented have not been materially modified.

In compliance with ASX Listing Rule 5.8.1, the following sections present a summary of all information material to understanding the reported Mineral Resource estimates:

Geology & Geological Interpretation

The Prieska Zn-Cu Deposit is a Volcanogenic Massive Sulphide (**VMS**) deposit which is situated in the southernmost exposures of the north-northwest trending Kakamas Terrain, which forms part of the Mid-Proterozoic Namaqualand Metamorphic Complex. The deposit is hosted by the Copperton Formation of the Areachap Group.

The structural sequence at the mine consists of a footwall Smouspan Gneiss Member, Prieska Copper Mines Assemblage, which hosts the sulphide mineralisation, and the hangingwall Vogelstruisbult Gneiss Member.

The +105m Level Target occurs above the upper limit of historically mined Prieska Zn-Cu Deposit at approximately 100m depth below surface, up to surface. It has a strike length of 867m and vary between 1.5m and 23m.

The +105m Level Target comprises four defined zones. These are:

- Haematite-goethite-quartz oxide zone (gossan) from surface to approximately 33m;
- Clay (kaolinite) zone developed in places below 33m;
- Chalcocite dominant supergene zone between approximately 42m and 70m; and
- Mixed supergene-sulphide zone between approximately 70m and 90m below surface. This has a relatively sharp contact with the fresh underlying massive sulphides.

Two zones have been defined for inclusion as part of the +105m Level Mineral Resource and these are referred to as the Oxide Zone and Supergene Zone.

Drilling Techniques

The drilling techniques used on which the Mineral Resource estimate is based are surface Reverse Circulation (**RC**) drilling and both surface and underground diamond drilling.

RC holes have been drilled using a 140mm diameter RC hammer bit.

Diamond drilling from surface was done with NQ core size using a triple tube core barrel to improve core recovery in soft formations. No core orientation was done.

Underground drilling was done with a double tube core barrel and BX size reverse flush.

Sampling & Sub-Sampling Techniques

RC samples were collected at 1m intervals via a cyclone and collected in polyweave bags. Each sample was split via a 3-tier splitter, followed by a single splitter to produce two samples of approximately 2.5kg each (an "original" and a "duplicate").

Diamond core was cut at a core yard and half core taken as the sample. In friable ore where core splitting was not possible half of the broken friable material was sampled using a spoon and scraper. Diamond core was sampled on 1m intervals where possible, sample lengths were adjusted to ensure samples do not cross geological boundaries or other features.

All sampling was done under the supervision of a qualified geologist.

Sample Analysis Method

Three laboratories were used. Repli (Agama) drilling used Genalysis South Africa (Pty) Ltd (**Genalysis**) and Orion used ALS Chemex (Pty) Ltd (**ALS**) with SGS Laboratory used as the referee laboratory.

Analyses were by the Inductively Coupled Plasma and Optical Emission Spectroscopy ("ICP-OES") methodology. Initially ALS used a three-acid digest, but it was changed to an Aqua-regia digest in November 2017. Genalysis used a four-acid digest and SGS an Aqua-regia digest.

Estimation Methodology

The wireframe of the +105m Level Target mineralised zone was constructed for Mineral Resource estimation utilising Zn% values greater than or equal to 0.6% and Cu% values greater than or equal to 0.3%.

Samples were composited to 1m. The exceptionally high assay values for all variables were capped to selected thresholds using the Parker methodology.

Following a spatial analysis, the composite data was used to estimate the block grades using ordinary kriging. Estimation runs using more than one neighbourhood were utilised for all variables and the first estimation run in each case had smaller searches.

A block model with cells of 40m X by 40m Y by 5m Z was used for the +105m Level Target with a sub-cell size of 2.5m x 2.5m x 2.5m.

Bulk Densities (t/m^3) were determined using the water displacement method. Due to poor core recoveries the density data in the Oxide Zone is sparse with only 14 samples available. There are 134 density measurements in the Supergene Zone. The entire sample (normally 1m length) was measured. Local block estimates of density were produced using ordinary kriging in areas of close-spaced sampling. A second pass with longer search radii was utilised and the remaining blocks were populated using grid filling.

Datamine™ was utilised to create a block model and measure individual block volumes within each zone and these data were imported into Isatis™ for further analysis.

The Oxide and Supergene zones were analysed independently to ensure that the plane for estimation had an optimal orientation.

The Oxide and Supergene zones were reported independently in the Mineral Resource statement.

Resource Classification

The geology of the two zones making up the +105m Level Mineral Resource is relatively uncomplicated, and the key issues relate to the delineation of the domain boundaries (not geology).

The Oxide Zone is classified as Inferred Mineral Resource. The geological model is defined to a reasonable level and there is sufficiently accurate data to produce local block estimates using ordinary kriging, albeit there is a limited number of samples. There is a high level of uncertainty associated with the zonal estimation of density due to a low number of samples as well as possible inaccuracies associated with core loss. The collapse breccia (part of sinkhole) will also have the largest effect on this zone and this has not been well defined.

The Supergene Zone is classified as both Inferred and Indicated Mineral Resources. The geological model is defined to a reasonable level and there is sufficiently accurate data coverage to produce local block estimates using ordinary kriging. In parts of the Supergene Zone there are sufficient data for reasonably accurate local block estimates of grade (~69% of volume populated by 1st pass kriging). The low number of density samples is a concern but local block estimation with reasonable accuracy was possible. The kriging performance parameters, e.g. slope of regression, were utilised to make a distinction between the Indicated and Inferred levels of confidence.

The results conform to the view of the Competent Person.

Metallurgy

Metallurgical test work indicated that a separate zinc and copper concentrate of the supergene mineralisation is achievable, test work of the oxide mineralisation however was unsuccessful.

The oxide mineralisation has a reasonable prospect for eventual economic extraction as it occurs close to the surface and treatment of this type of ore by means of leaching is well known in the industry.

Cut-off Grades & Mining Methods

A Cu% cut-off of 0.3% was used for the Mineral Resource Statement that corresponds with the wireframe modelling. This cut-off is similar to that used in many open cast mining deposits worldwide.

Open cast mining methods are planned. Whittle pit optimisation study and detail pit design, as part of a Bankable Feasibility Study, is in progress.

Future Work

No additional drilling is planned before the completion of the BFS. Grade control drilling on a closely spaced grid will be executed during the operational phase of the open pit.

Total Prieska Project Mineral Resource

The Deep Sulphide Mineral Resource of the Prieska Deposit located on both Repli and Vardocube Prospecting Rights, which was announced in December 2018 (refer ASX release 18 December 2018), combined with the +105m Level Mineral Resource is summarised in Table 2 below.

Resource	Classification	Tonnes	Zn (tonnes)	Zn (%)	Cu (tonnes)	Cu (%)
Deep Sulphide Resource	Indicated	18,507,000	667,000	3.60	217,000	1.17
	Inferred	10,219,000	417,000	4.1	117,000	1.1
+ 105m Level Resource	Indicated	624,000	19,000	3.05	10,000	1.54
	Inferred	1,138,000	16,000	1.4	17,000	1.4
Total	Indicated	19,131,000	686,000	3.59	227,000	1.18
Total	Inferred	11,357,000	433,000	3.8	134,000	1.2
Grand Total		**30,488,000**	**1,119,000**	**3.7**	**361,000**	**1.2**

Note: Deep Sulphide Resource bottom cut-off = 4% Equivalent Zn; +105m Level Mineral Resource bottom cut-off = 0.3% Cu. Mineral Resources stated at *zero % cut*-off. Tonnes are rounded to thousands, which may result in rounding errors.

Table 2: Global Mineral Resource for the combined +105m Level and Deep Sulphide Targets of the Prieska Project.

As part of the BFS, Orion now looks forward to the completion of detailed scheduling and mine design for the +105m Level and Deep Sulphide Mineral Resources. With engineering studies progressing well (refer ASX release 2 February 2018) and metallurgical optimisation completed (refer ASX releases 1 March 2018 and 22 October 2017), Orion is confident of a positive outcome for the BFS.

Project Background

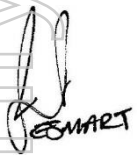
The Prieska Project is located in the Northern Cape Province of South Africa, approximately 290km south-west of the city of Kimberley. The project area encompasses the historical Prieska Copper Mine (**PCM**). PCM was profitably operated by Anglovaal as an underground zinc and copper mine, exploiting the Copperton deposit between 1971 and 1991, processing on average 3Mt per year to produce 1.01Mt of zinc and 0.42Mt of copper in concentrates (refer ASX release 15 November 2017). Run-of-mine ore was treated by froth flotation to produce separate concentrates of copper and zinc.

Orion is now investigating the establishment of new mining operations targeting the extraction of the remaining zinc-copper mineralisation at the Prieska VMS deposit.

Orion has delineated a Mineral Resource for the +105m Level and Deep Sulphide Targets, classified by a Competent Person and reported in accordance with the JORC Code, amounting to 30.49Mt grading 3.7% Zn and 1.2% Cu of which, 19.13Mt is in the Indicated Category grading at 3.59% Zn and 1.18% Cu.

Mine-development studies are scheduled for completion in the first half of 2019. DRA Projects South Africa Pty Ltd is the lead consultant appointed to consolidate the BFS, part of which includes the design of the mineral processing plant. Metallurgical test work was conducted at the Mintek laboratories in Johannesburg, South Africa. ABS Africa Pty Ltd is supervising the environmental permitting.

An application for a Mining Permit was submitted in April 2018 and granting of the permit is expected in Q2 2019, with project construction planned to start in Q4 2019.



Errol Smart
Managing Director and CEO

ENQUIRIES

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Competent Person's Statement

The information in this report that relates to Exploration Results is based on information compiled by Mr Errol Smart (Pr.Sci.Nat.), a Competent Person who is a member of the South African Council for Natural Scientific Professionals, a Recognised Professional Organisation (**RPO**). Mr Smart is a full-time employee of Orion. Mr Smart has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the JORC Code. Mr Smart consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

The information in this report that relates to Mineral Resources is based on information compiled by Mr Sean Duggan, a Competent Person who is a Director and Principal Analyst at Z Star Mineral Resource Consultants (Pty) Ltd. Mr Duggan (PrSciNat) is registered with the South African Council for Natural Scientific Professionals (Registration No. 400035/01), an RPO. Mr Duggan has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the JORC Code. Mr Duggan consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears and detailed in Appendix 1.

Disclaimer

This release may include forward-looking statements. Such forward-looking statements may include, among other things, statements regarding targets, estimates and assumptions in respect of metal production and prices, operating costs and results, capital expenditures, mineral reserves and mineral resources and anticipated grades and recovery rates, and are or may be based on assumptions and estimates related to future technical, economic, market, political, social and other conditions. These forward-looking statements are based on management's expectations and beliefs concerning future events. Forward-looking statements inherently involve subjective judgement and analysis and are necessarily subject to risks, uncertainties and other factors, many of which are outside the control of Orion. Actual results and developments may vary materially from those expressed in this release. Given these uncertainties, readers are cautioned not to place undue reliance on such forward-looking statements. Orion makes no undertaking to subsequently update or revise the forward-looking statements made in this release to reflect events or circumstances after the date of this release. All information in respect of Exploration Results and other technical information should be read in conjunction with Competent Person Statements in this release (where applicable). To the maximum extent permitted by law, Orion and any of its related bodies corporate and affiliates and their officers, employees, agents, associates and advisers:

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Appendix 1: The following table is provided in accordance with the JORC Code (2012) requirements for the reporting of Mineral Resources for the Prieska +105m Level Target.

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section. Refer to ASX releases 5 November 2018 and 18 December 2018 for matters related to sections 1 and 2)

Criteria	JORC Code explanation	Commentary

Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.*
	• *Data validation procedures used.*
		• All drill hole and sample data are stored by Orion in a robust Geobank™ database.
		• Validation includes the following:
		  ○ Ensuring that all drill holes have appropriate XYZ coordinates.
		  ○ Comparing the maximum depth of the hole against the final depth indicated in the collar file.
		  ○ Comparing the final depth in the survey file against final depth in the collar file.
		  ○ Comparing the final depths of all geology, assay, core recovery against the final depth in the collar file.
		  ○ Checking for duplicate drill holes.
		  ○ Checking that each depth interval has a main lithology.
		  ○ Checking that all fields that were set up as mandatory fields contain entries.
		  ○ The core recoveries were checked for unrealistic percentages.
		  ○ Density results are checked for unrealistic values.
		• Additional validation was undertaken when the drill hole data was imported into the Geovia SurpacTM (**Surpac**) modelling software. The data was checked for duplicates, gaps, overlaps, impossible intervals in down-hole sequence for assay, collar coordinates, geology data and survey data. The drill holes were also visually checked in plan and section in Surpac.
		• Additional validation was also undertaken when the data was imported into Datamine™ and then when the de-surveyed data was imported to Isatis™ for the EDA and the estimation.

Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Z* Star Mineral Resource Consultants (Pty) Ltd were requested by Orion Services South Africa (Pty) Ltd to estimate and classify a mineral resource for the Deep Sulphide and +105m Level Target deposits. They visited the site from 17 to 19 October 2017 and during February 2018. The visits included a review of the drilling and sampling operations, discussion on the geology and associated mineralisation, review of the planned drill holes and examination of the assay data and a high level spatial

Criteria	JORC Code explanation	Commentary
		analysis.

Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.*
	• *Nature of the data used and of any assumptions made.*
	• *The effect, if any, of alternative interpretations on Mineral Resource estimation. The use of geology in guiding and controlling Mineral Resource estimation.*
	• *The factors affecting continuity both of grade and geology.*
		• The +105m Level Mineral Resource comprises four defined geological zones above the primary sulphides. These are:
		  ○ Haematite-goethite-quartz oxide zone (gossan) from surface to approximately 33m.
		  ○ Clay (kaolinite) zone developed in places below 33m.
		  ○ Chalcocite dominant supergene zone between approximately 42m and 70m.
		  ○ Mixed Supergene-sulphide zone between approximately 70 and 90m below surface. This has a relatively sharp contact with the fresh underlying massive sulphides.
		• Of the above four zones, the first and the third are considered as being suitable for inclusion as part of the Mineral Resource. These two are referred to as the Oxide and Supergene zones, respectively.
		• The boundaries of the mineralisation are relatively sharp irrespective of the geology. Therefore, wireframes for the Oxide and Supergene zones were created by interpretation of the Zn% and Cu% values along 31 sections across the deposit. The wireframes were constructed utilising Zn% values greater than or equal to 0.6% and Cu% values greater than or equal to 0.3%. Where possible both values were utilised during modelling, but greater emphasis was placed on the copper values as the zinc was leached out towards surface. In places, this resulted in the inclusion of mineralised areas based only on high Cu% values.
		• In the NW part of the deposit, mineralisation occurs in two lenses. It is unclear whether this is stacked mineralisation formed during deposition or a structural duplication due to thrusting or isoclinal folding and will be investigated with detail grade control drilling should open pit mining be approved. The upper lens does not seem to have depth extent and is part of the oxide zone.
		• Geological data and conclusions reached are based on observations in drill core.
		• The oxide and supergene zones are treated separately in the resource estimation.

Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• The strike length is 867m and the depths below surface to the upper limits are from 5m to 20m and to the lower limits from 61m to 104m below surface. • Thickness of the mineralised zone varies from 1.5m to 23m.

Criteria	JORC Code explanation	Commentary
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters, and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulfur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	• Density weighting is standard practice for VMS deposits. However, in the Oxide and Supergene zones the density measurements do not correlate well with the assay values and density weighting was therefore not included. The poor correlation is probably due to the friable nature of the core. • The distribution of composites for each of the variables (Zn%, Cu%, and density) were assessed and a decision was taken to utilise the Parker methodology for capping outliers. The process involved capping the relevant outliers for each variable to a chosen threshold. • No Zn%, Cu% or density values were capped in the Oxide Zone however capping was applied to two Zn% assays and one Cu% assay in the Supergene Zone. • Datamine™ was utilised to create a block model and measure individual block volumes within each zone and these data were imported into Isatis™ for further analysis. • The Oxide and Supergene zones were analysed independently to ensure that the plane for estimation had an optimal orientation. • Variograms for all variables were created from the laboratory assay capped composites only and modelled in two directions, downhole (along the drill hole) and omni-directionally on the plane of the mineralisation. Assessment of the variogram models was preferentially focused on the Zn and Cu spatial structure. • Repli (2014) stated a near-surface Oxide Mineral Resource of 1.2Mt at 1.02% Cu and 1.13% Zn for the north-west oxide and leached zone, based on 12 diamond drill holes. • No mining production took place above the 105 level of the mine. • No assumptions have been made regarding the recovery of by-products. • No deleterious elements or non-grade variables were estimated. • A block model was created to allow estimation into 40m x 40m x 5m blocks with sub-cells of 2.5m x 2.5m x 2.5m. • Ordinary kriging (OK) was undertaken on all variables on a 40m x 40m x 5m block scale, utilising the capped composite input datasets and the modelled variograms. Estimation runs on two different neighbourhoods were utilised for all variables and the first estimation run in each case has smaller searches (equivalent to the variogram ranges), particularly in the Z direction. This ensures that the variography and therefore the nature of the mineralisation is honoured and ensures that negative weights are minimised. The neighbourhood of the second kriging run was expanded to allow population of most of the remaining blocks. The 2nd pass kriging run failed to populate all the blocks in the Oxide and Supergene Zones,

Criteria	JORC Code explanation	Commentary
		particularly in areas where the peripheral dip of the deposit was different to the best fit plane. A decision was taken to utilise the "grid filling" option in IsatisTM using a moving average interpolator. • No assumptions were made regarding selective mining methods. • The Oxide and Supergene zones were reported independently in the mineral resource statement.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• No moisture content was calculated, and the core was naturally dried when logged and sampled. The estimated tonnages are therefore based on a natural basis.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• A Cu% cut-off of 0.3% was used for the Mineral Resource Statement that corresponds with the wireframe modelling. • The cut-off was on the recommendation of Orion's Chief Operating Officer (COO) which is based on historical data from the Prieska Mine and a dataset of parameters from similar operations in the region.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• The assumption is to use open cast mining methods with 10m benches. • The major risk is mining between sinkholes and above the partly collapsed crown pillar of the underground mined-out stopes. • Whittle pit optimisation study and detail pit design, as part of a Bankable Feasibility Study, is in progress.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• Metallurgical test work indicated that a separate copper and zinc concentrate of the supergene mineralisation is achievable, test work of the oxide mineralisation however was unsuccessful. • The oxide mineralisation has a reasonable prospect for eventual economic extraction as it occurs close to the surface and treatment of this type of ore by means of leaching is well known in the industry.
Environmental factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the*	• The Deep Sulphide Resource is on the environmental footprint of the historic Prieska Copper Mine site. Environmental impact assessment studies form part of the on-going BFS.

Criteria	JORC Code explanation	Commentary
	determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.	

Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.*
	• *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.*
	• *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*
		• Due to the poor core recoveries the density data in the Oxide Zone is sparse with only 14 samples available. There are 134 density measurements in the Supergene Zone.
		• Bulk Densities were determined using the water displacement method. A representative sample of full core at 15cm length was collected per metre length, taking cognisance of the change in lithology.
		• A total of 33% of the samples lying within the wireframe used for the estimation of the supergene mineralisation were re-done for relative density using the wax relative density method. These results show excellent precision and no obvious bias when comparing with the original relative densities.
		• No moisture content was determined.
		• Core is mostly weathered in the Oxide Zone with obvious core loss. The representative samples selected for density measurement were sprayed with a clear lacquer spray and allowed to dry prior to being weighed.
		• The low number of samples and the lack of a variogram model for density samples in the Oxide Zone resulted in a different approach to estimation. The estimation methodology for density in this zone is as follows:
		  ○ Calculation of a length weighted average BD per drill hole
		  ○ Calculation of the average density per spatial area from the drill holes (declustering).
		  ○ Calculation of the average of the spatial areas (declustered mean). This marginally lower but more representative mean BD value was applied as a zonal estimate for all blocks within the Oxide Zone, i.e. 2.59 t/m^3.
		• The density in the Supergene Zone were estimated using Ordinary Kriging.

Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors, i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data.*	• The geology of the two zones making up the +105m Level Mineral Resource is relatively uncomplicated, and the key issues relate to the delineation of the domain boundaries (not geology). The assay data used for estimation is reliable and has been acquired with good governance associated with all processes. With one exception (BD in the Oxide) the variables were estimated using independent variogram

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	• *Whether the result appropriately reflects the Competent Person(s)' view of the deposit.*	models and Ordinary Kriging. • Oxide Zone: Inferred Mineral Resource - the geological model is defined to a reasonable level and there is sufficiently accurate data to produce local block estimates using Ordinary Kriging, albeit there is a limited number of samples. There is a high level of uncertainty associated with the zonal estimation of density due to a low number of samples (and a possible bias in the methodology) as well as possible inaccuracies associated with core loss. The collapse breccia (part of sinkhole) will also have the largest effect on this zone and this has not been well defined. • Supergene Zone: Inferred and Indicated Mineral Resources - the geological model is defined to a reasonable level and there is sufficiently accurate data coverage to produce local block estimates using Ordinary Kriging. In parts of the Supergene Zone there are sufficient data for reasonably accurate local block estimates of grade (~69% of volume populated by 1st Pass kriging). The low number of density samples is a concern but local block estimation with reasonable accuracy was possible. The kriging performance parameters, e.g. slope of regression, were utilised to make a distinction between the Indicated and Inferred levels of confidence. • The results conform to the view of the Competent Person.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• MSA Consulting reviewed the +105m Level Mineral Resource • A review of the +105m Level Mineral Resource by SRK is planned for the first quarter of 2019.
Discussion of relative accuracy/confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• Final estimates for all variables in both zones were validated by comparing the mean composite grades to the mean estimate grades. The data for Zn and Cu with the 1st Pass and final estimates are within 5% of the composites mean for the Supergene Zone and within 8% for the Oxide Zone. • Composite and estimated final grade and density distributions were compared to ensure that the block estimates represent the original data distribution. These were found to be reasonably compatible. • SwatheTrend plots were created in the Y, X and Z directions and all the estimates followed the trend of the composite data. • All estimates were studied graphically and compared to the composite data in three-dimensional space and they compared reasonably well, given the high variability of the sample data. • No production data is are available.