Orion Minerals

ASX/JSE RELEASE: 24 October 2018

Third Diamond Hole Intersects Massive Sulphide Stringer Veins at Rok Optel Nickel-Copper Target, Northern Cape, South Africa

- **10m-thick zone of vein, stringer and massive sulphides hosted in magmatic breccia intersected from 397m to 407m down-hole in new diamond hole OROD003.**
- **Five stacked intrusive-hosted mineralised zones now identified in drilling at Rok Optel.**
- **New intercept can be correlated with recently drilled zones over a 1.25km strike extent of the intrusion, which remains open both to the north and south.**
- **Rok Optel is a focus point for repeated ultramafic intrusions with massive sulphide vein injections and therefore has excellent potential for the discovery of bulk massive sulphide mineralisation.**

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

"The Rok Optel target – which forms part of our regional exploration program in the Areachap Belt outside of our flagship Prieska development project – is continuing to emerge as a very promising Ni-sulphide project.

The vein, stringer and massive sulphides intersected in recently-completed diamond hole OROD003 can be correlated with the mineralisation intersected previously in drill holes OROD001 and OROD002, confirming the potential scale and significance of the target, which we now recognise as having an extensive and complex multi-phase intrusive history.

The identification of magmatic sulphide veins injected into the country rock is also particularly encouraging as it highlights the potential to discover bulk massive sulphide mineralisation. We are eagerly awaiting the assay results so that modelling can be refined and drilling can continue."

Orion Minerals Limited (**ASX/JSE: ORN**) (**Orion**) is pleased to provide an update on its ongoing regional exploration program at the Rok Optel Ni-Cu-Co-PGE target, located on the Namaqua and Disawell prospecting rights (**Disawell**) in the Areachap Belt, South Africa (Figure 1). Rok Optel is located ~80km north-west of the flagship Prieska Zinc-Copper Project.

Diamond drill hole OROD003, which was designed to target a 10,500S down-hole, electro-magnetic (**DHEM**) conductor (also tested by hole OROD001), has been completed to a depth of 532.73m (Figure 2). The hole intersected three significant zones of magmatic sulphide mineralisation, all of which are characterised by the presence of sulphide veins injected into both the host country rock (Appendix 1, A1) and the intrusion.

Magmatic sulphide mineralisation is present within the lower two intrusions. The uppermost intrusion hosts sulphide mineralisation from 361.98m to 415.78m, including a well-mineralised zone from 397.29m to

407.73m with injected stringers, veins and massive sulphide zones that locally brecciate and host autoliths of the intrusion silicates. The massive sulphide veinlets account for approximately 12% of the intersection.

The lowermost intrusion is less mineralised, but importantly also hosts a zone with stringer and vein mineralisation from 457.98m to 471.33m.

The upper mineralised zones visually correlate to those intersected in drill holes OROD001 and OROD002 (previously reported, refer ASX release 10 September 2018) while the lowest zone is a newly identified additional zone.

Assay data have also been received from drill hole OROD002 (Table 1). The geochemical data correlate the three mineralised zones with those intersected by OROD001. The metal tenors and individual ratios are consistent between these holes.

The ubiquitous occurrence of transgressive vein and stringer-style mineralisation over the currently known extent of the intrusion is considered to be genetically very significant. Most massive sulphide ore deposits are characterised by magma chamber dynamics that cause repeated mineralising events within a constrained locality.

At Rok Optel, there are five horizons with stringer-style sulphide mineralisation of moderate to high tenor that have been injected into non- or poorly mineralised silicates. This indicates a magma conduit within which the sulphide liquid was being actively injected into lithified or partially lithified host stratigraphy over a distance of some 1.25km (between the current and the historical drill holes – see Figure 2).

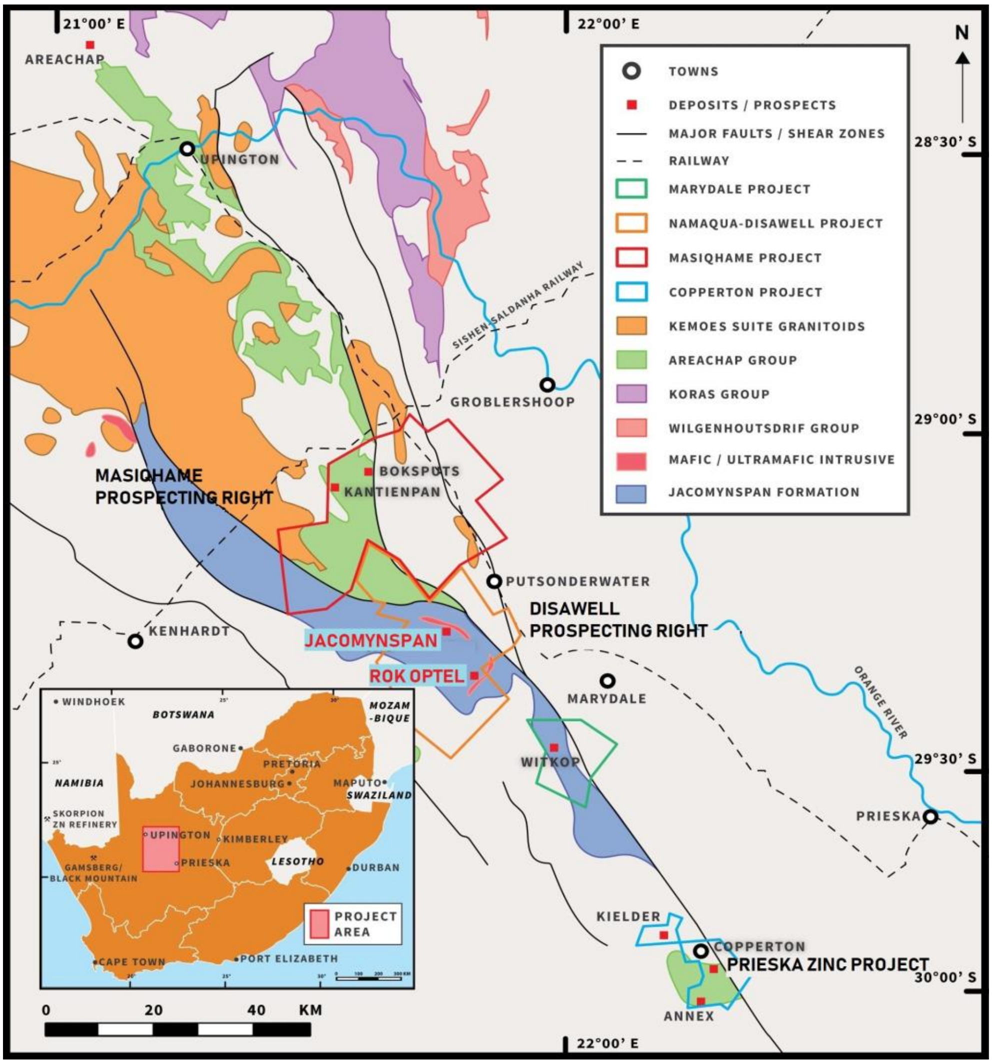

Figure 1: Areachap Project summary geology map showing the Masiqhame and Disawell prospecting right.

The central zone of the prospect area is becoming increasingly of interest as new intrusive outcrops have been identified by mapping, indicating that Jacomynspan Suite intrusions occur within a large area between the Area 4 outcrop in the east and the Jacomynspan norite occurrence to the west (Figure 4). All Rok Optel and Jacomynspan intrusions are shown to be genetically related using whole rock geochemistry (refer Appendix 1- Figure A6).

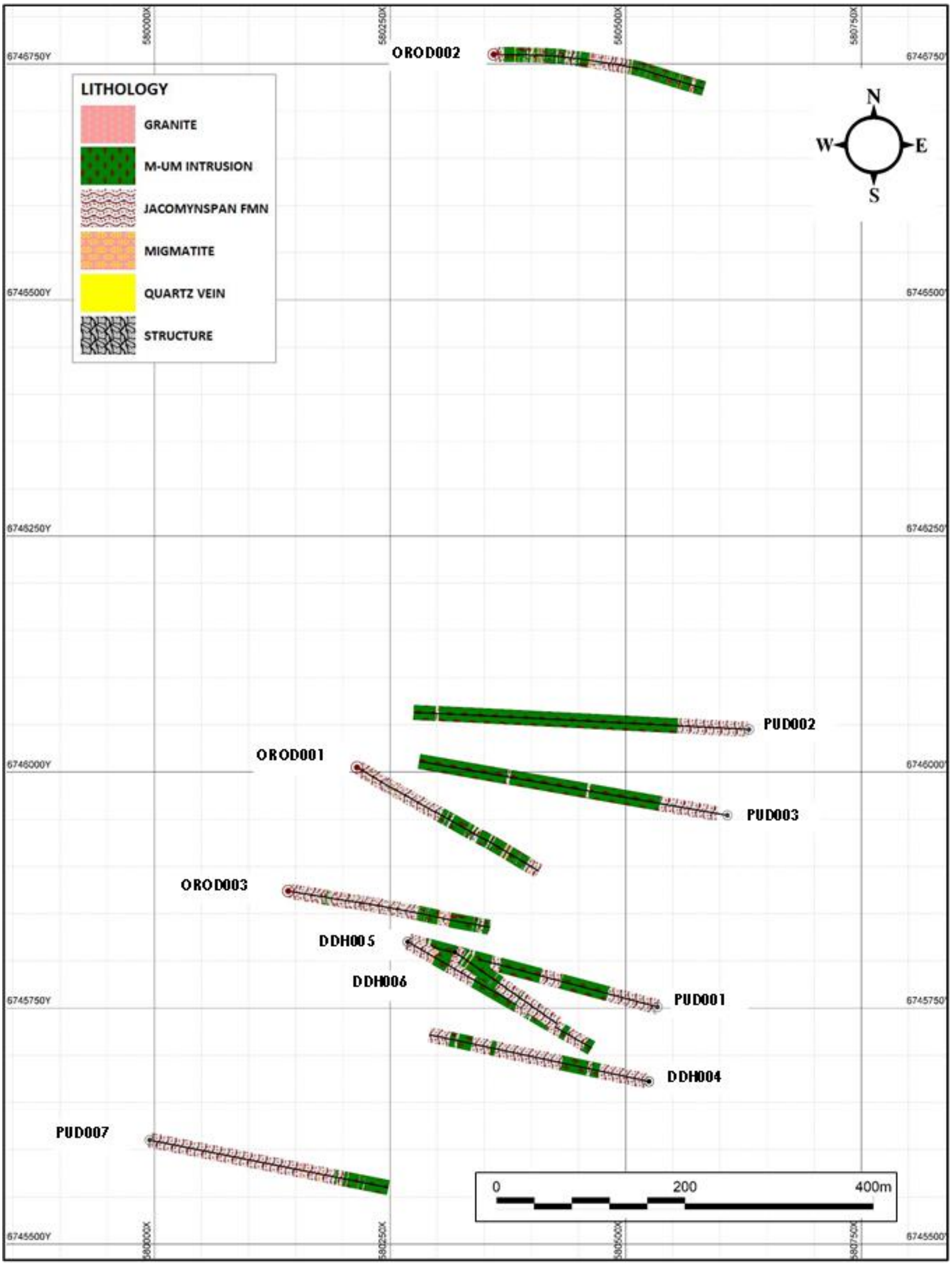

Figure 2: Rok Optel Prospect - diamond drill plan indicating all new and historical drill holes.

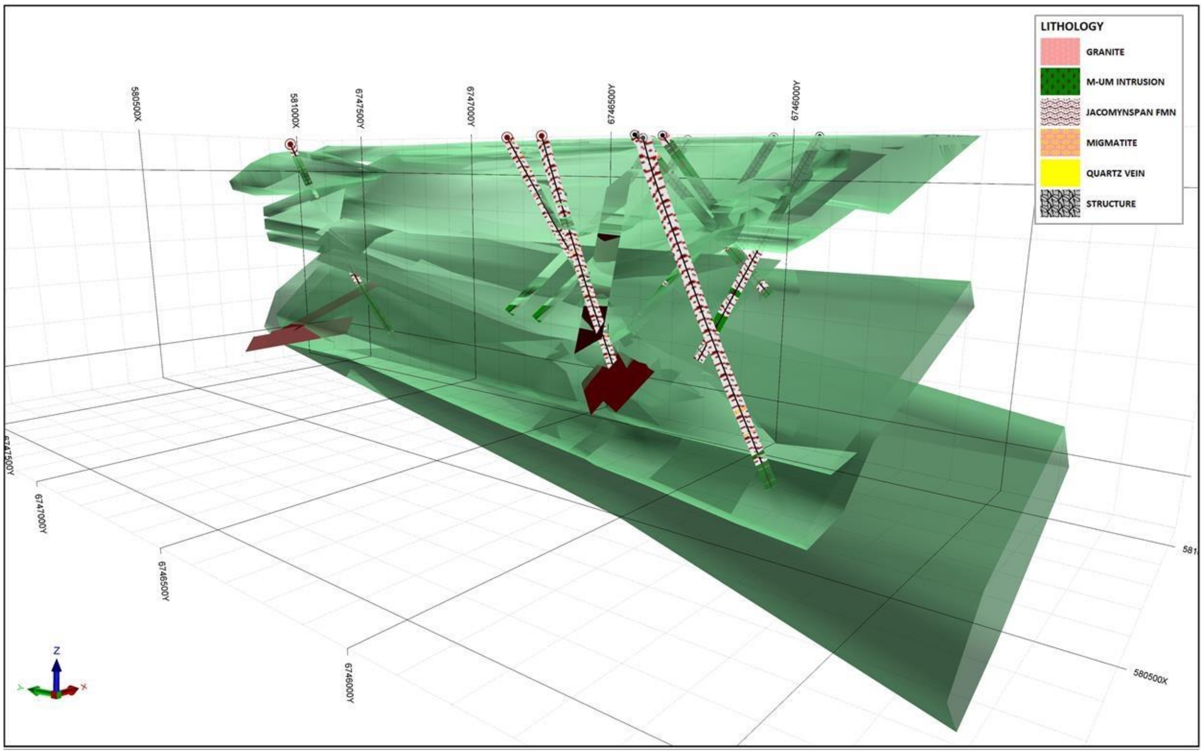

Figure 3: Orthogonal view showing the drill holes, interpreted stacked intrusions and DHEM plates at Rok Optel.

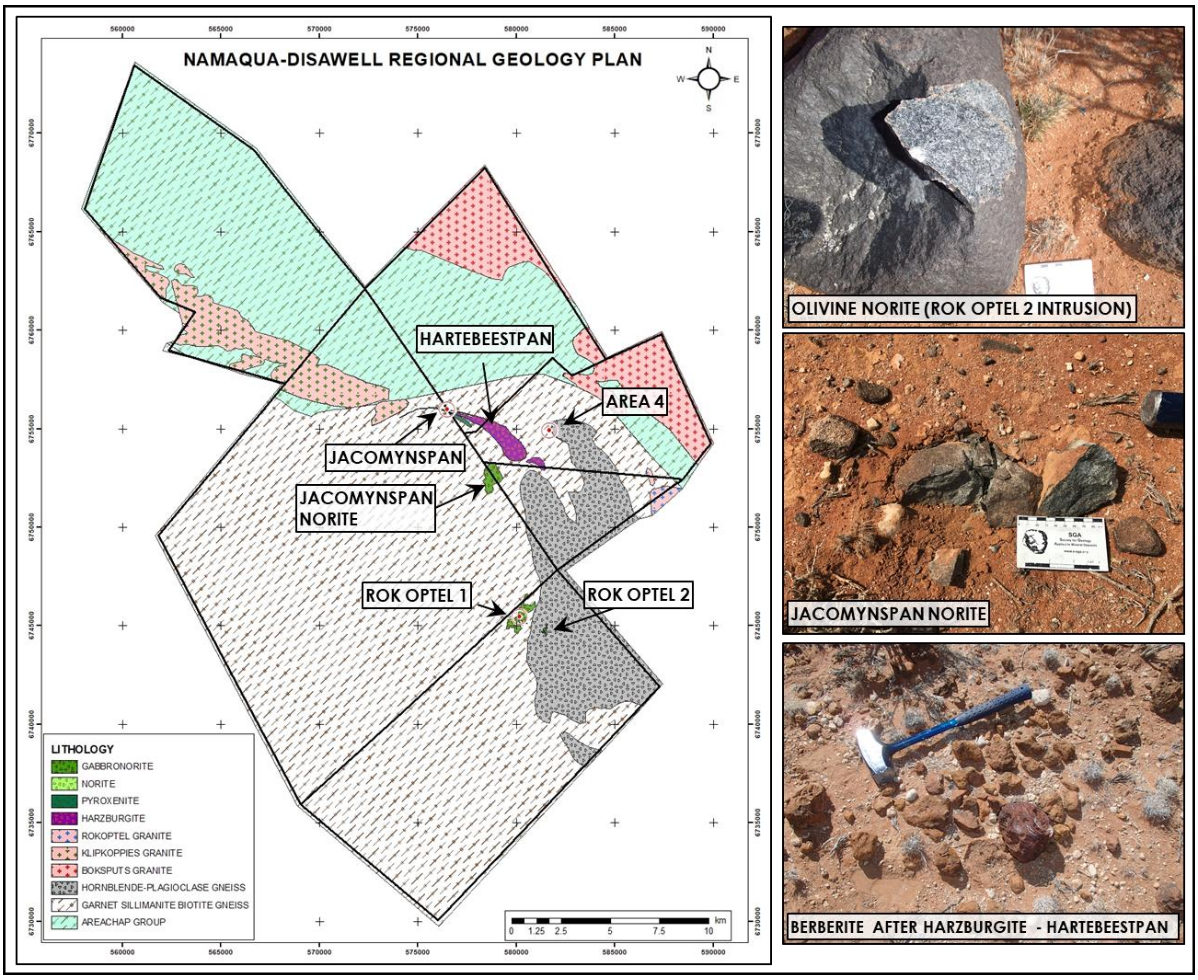

Figure 4: Project Geology Plan indicating the major country rock lithologies and the prospects and intrusions at Rok Optel.

Drill Hole	Cut Off	From m	Width m	Ni wt%	Cu wt%	Co wt%	2PGE + Au g/t
OROD001	0.2% Ni	201.05	8.99	0.24	0.16	0.016	0.22
		292.09	7.29	0.28	0.11	0.013	0.66
	0.3% Ni	297.44	1.94	0.38	0.15	0.015	1.45
	0.5% Ni	201.05	1.22	0.45	0.57	0.047	0.16
OROD002	0.2% Ni	149.16	1.27	0.39	0.10	0.032	0.03
		159.95	0.94	0.22	0.11	0.031	0.05
		174.08	0.66	0.24	0.24	0.035	0.02
		215.49	0.37	0.90	0.18	0.139	0.03
		222.36	1.68	0.22	0.07	0.010	0.33
		338.09	2.37	0.15	0.13	0.014	0.87
		356.08	2.46	0.33	0.20	0.046	0.08
		363.47	2.86	0.17	0.04	0.012	0.21
	0.3% Ni	149.16	1.27	0.39	0.10	0.032	0.03
		215.49	0.37	0.90	0.18	0.139	0.03
		356.08	2.46	0.33	0.20	0.046	0.08
	0.5% Ni	149.16	0.57	0.61	0.14	0.048	0.04
		215.49	0.37	0.90	0.18	0.139	0.03

Table 1: Drill intersections from OROD001 and OROD002 calculated using SG-weighting at various cut-off grades. The widths are intersection widths and have not been corrected to true width.

Drill hole OROD003 has again confirmed the presence of magmatic sulphide mineralisation, accounting for the electromagnetic (**EM**) conductors at Rok Optel. Drill hole OROD003 has been DHEM-surveyed and is currently being modelled to test for better developed mineralisation in off-hole conductors located in close proximity.

Once all outstanding analytical and geophysical results have been received and evaluated, drilling will resume on the Rok Optel Prospect.

Errol Smart
Managing Director and CEO

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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 Richard Hornsey (Pr.Sci.Nat.) Registration No: 400071/96, a Competent Person who is a member of the South African Council for Natural Scientific Professionals, a Recognised Overseas Professional Organisation (**RPO**). Mr Hornsey is a Consultant to Orion. Mr Hornsey 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 Hornsey consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

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Appendix 1 – Technical Update on the Drill Program at Rok Optel

This technical report details the work undertaken and initial technical results of the phase 1 drill program completed at Rok Optel. Analytical data from drill hole OROD003 and infill sampling of drill holes OROD001 and OROD002 are awaited.

Diamond Drilling

The drill hole status is outlined by Table A1. The current drill campaign has now completed 1206.76m of diamond drill core drilling. The majority of the drilling was completed with oriented core to enable determination of the attitude of structural elements of interest.

Drill hole	X UTM34S	Y UTM34S	Elevation (m)	Initial Depth (m)	Final Depth (m)	Dip (degrees)	Azimuth (degrees)
OROD001	580,215	6,746,005	1,059	0	412.06	-60	120
OROD002	580,360	6,746,760	1,559	0	491.95	-65	090
OROD003	580,142	6,745,874	1,057	0	532.73	-70	102

Table A1: Orion Rok Optel Drill hole Information.

Mineralisation

All three of Orion's drill holes at Rok Optel have intersected several intervals of magmatic sulphide mineralisation. This has been examined, characterised and logged in detail as the style of mineralisation provides an important parameter for assessment of intrusion fertility, generation of magmatic sulphide liquid, mode of sulphide liquid transport, and trapping of massive mineralisation.

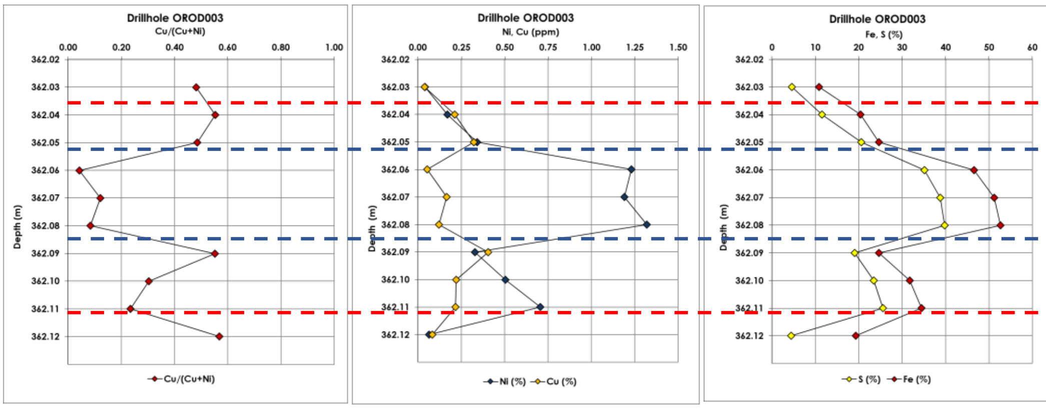
The styles of mineralisation intersected include disseminated and fine blebby to patchy mineralisation present within several zones at Rok Optel. Of greater significance, there are several horizons that host veins both within, and transgressive to the magmatic fabric, grading into zones of thicker sulphide veins and massive sulphide lenses of up to 21cm (OROD003). Drill hole OROD003 intersected a combined total of 1.23m of massive sulphide in ten discrete layers and vein networks. This compares to drill holes OROD001 (0.32m in 4 layers) and OROD002 (0.32m in 7 layers).

The ubiquitous occurrence of transgressive vein and stringer-style mineralisation over the currently known extent of the intrusion is genetically highly significant. Most significant massive sulphide ore deposits are characterised by magma chamber dynamics that cause repeated mineralising events within a constrained locality. At Rok Optel, there are five horizons with stringer-style moderate to high tenor sulphide mineralisation injected into otherwise non-poorly mineralised silicates. This indicates a magma conduit within which sulphide liquid was being actively injected into lithified or partially lithified host stratigraphy over a distance of at least 925m between drill holes OROD002 and OROD003, and 1.25km including all historic drilling.

Metal tenors have been calculated for the elements of interest using the methodology of Kerr (2003). This indicates significant variability in metal endowment within and between the mineralised horizons and provides a parameter for between-hole comparison. The Rok Optel tenors range between 1.41% to 10.22% Ni and 0.75% to 3.86% Cu for the mineralised intervals >0.2% Ni. Generally, the disseminated mineralised zones have higher tenors (up to 15% Ni) than the better mineralised zones. This is related to magma chamber dynamics and is consistent with the majority of intrusions globally.

Spot point analysis using a NITON portable XRF instrument has been used to assess the internal metal grade variability of massive sulphide veinlets intersected in drill hole OROD003 to identify whether processes typical of magmatic fractionation are evident. Figure A1 shows a graph of selected results over an injected massive sulphide vein hosted by country rock gneiss at 362m. The Cu and Ni distribution (Cu-dominant at the sidewalls) is typical of injected sulphide that has then fractionated during cooling. This indicates that the sulphides have been injected into the country rock and that primary magmatic processes were operating during emplacement. Note that NITON values are not considered as quantitative assays and are only of qualitative geo-scientific interest.

Drillhole	Depth (m)	COMMENTS	Ni (%)	Cu (%)	S (%)	Fe (%)	Cu/(Cu+Ni)	Fe/S
OROD003	362.03	Gneiss	0.04	0.04	4.55	10.81	0.48	2.38
OROD003	362.04	Gneiss with sulphide	0.17	0.21	11.52	20.39	0.55	1.77
OROD003	362.05	Massive sulphide	0.34	0.32	20.53	24.60	0.49	1.20
OROD003	362.06	Massive sulphide	1.23	0.05	35.17	46.57	0.04	1.32
OROD003	362.07	Massive sulphide	1.19	0.17	38.79	51.21	0.12	1.32
OROD003	362.08	Massive sulphide	1.32	0.12	39.81	52.63	0.08	1.32
OROD003	362.09	Massive sulphide	0.33	0.41	19.01	24.66	0.55	1.30
OROD003	362.10	Massive sulphide	0.50	0.22	23.44	31.74	0.30	1.35
OROD003	362.11	Massive sulphide	0.71	0.22	25.57	34.44	0.23	1.35
OROD003	362.12	Gneiss	0.06	0.08	4.40	19.29	0.57	4.38



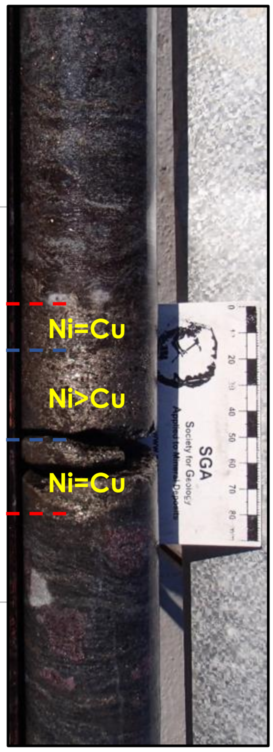
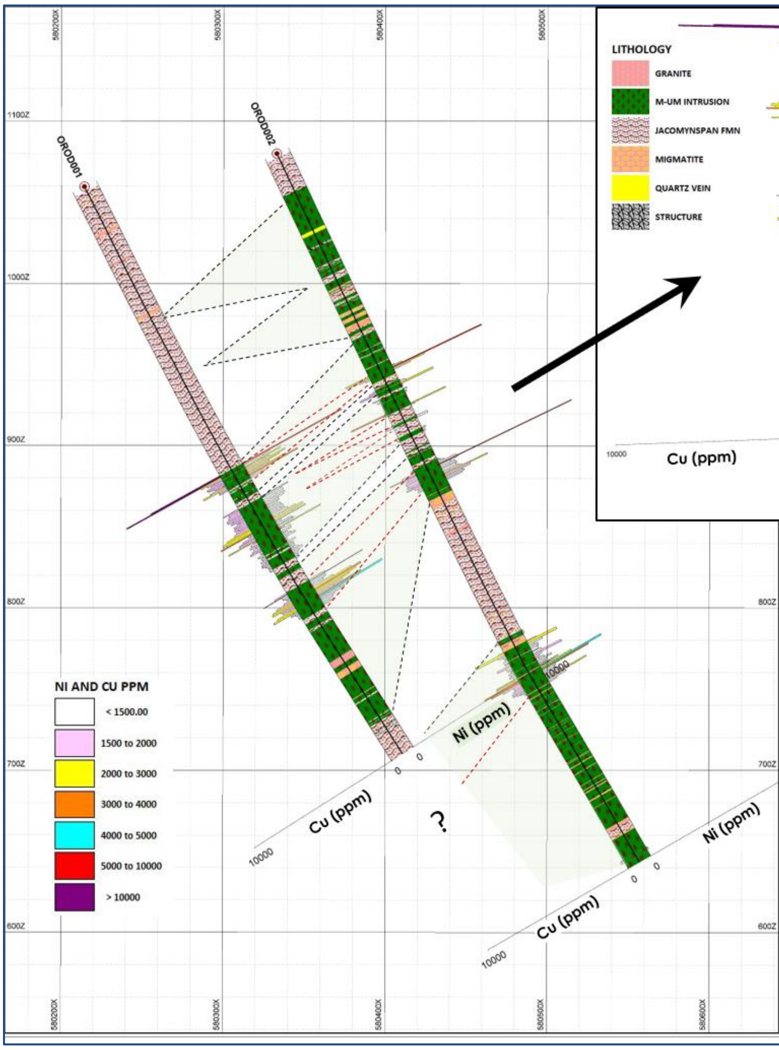


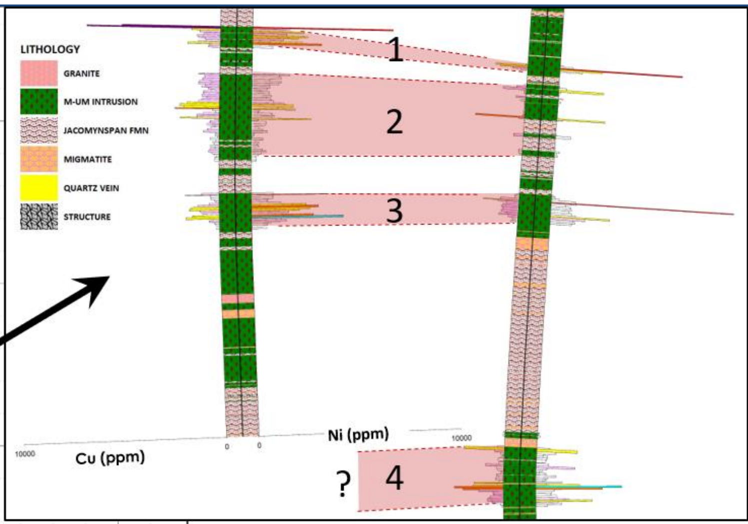
Figure A1: NITON portable XRF analysis of a profile through a massive sulphide vein hosted by country host rock gneiss. The relative metal profiles indicate fractionation between Ni and Cu to form Cu enrichment at the vein margins. This indicates that this vein is derived from the intrusion and has been injected into the gneiss.

Note: The results are derived from portable hand-held XRF instrument spot readings and should not be construed to be absolute qualitative assays. These are purely qualitative readings using an imprecise instrument but can be instructive when considering relative values of elements measured.

Lithogeochemical Correlation of Drill Holes OROD001 and OROD002

The litho-stratigraphy and geochemistry of drill holes OROD001 and OROD002 have been compared to assess whether the mineralised zones share chemical characteristics and assess the continuity between the holes. The parameters used are the individual metals, Ni, Cu, Co, PGE and Au, and S. Metal ratios Cu/(Cu+Ni) and Pt/(Pt+Pd), metal tenors, and the major element oxides MgO and CaO have also been compared. The results, illustrated by Figures A1 to A7 indicate that four mineralised zones are present, of which OROD001 intersected the upper three. A fifth mineralised zone was intersected by drill hole OROD003. These zones are primarily distinguishable based upon their metal ratio, and major element oxide characteristics. Importantly, the metal tenor information indicates that the lower zones of mineralisation have the best metal endowment. This now provides a target zone for ongoing exploration and a control parameter for drill hole management using the NITON portable XRF to analyse sulphide veins and blebs as the drill hole progresses.

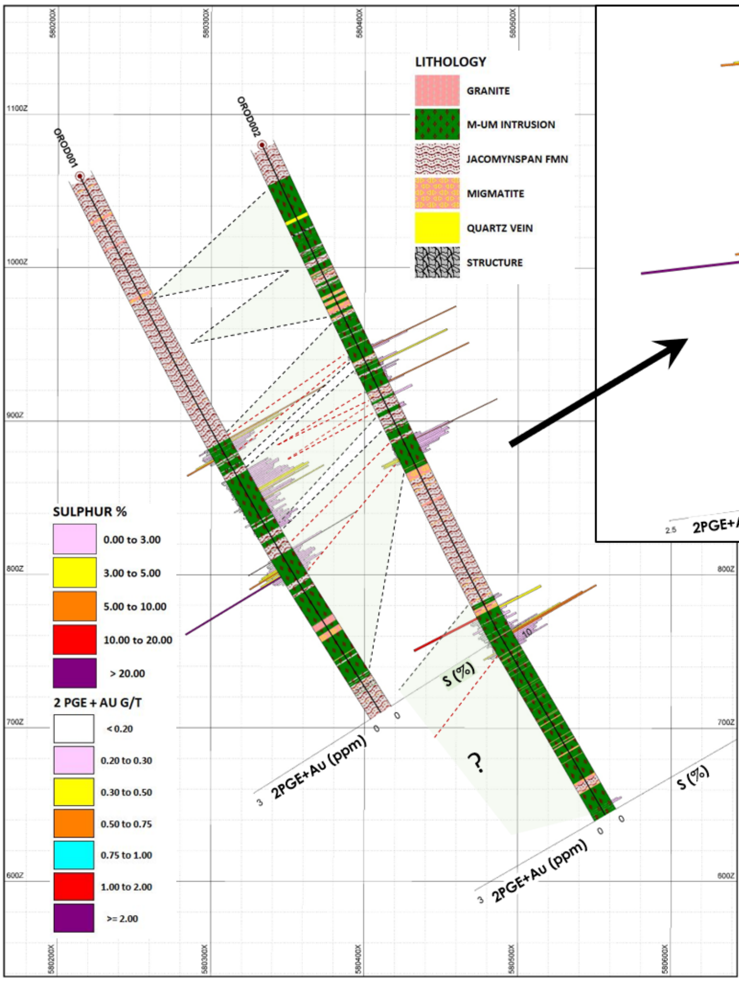


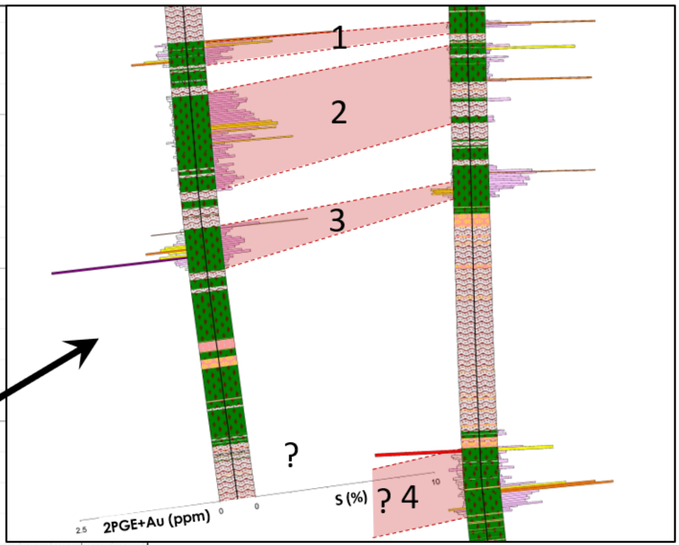


Ni (ppm) vs Cu (ppm)

- The intrusion is a tubular sill complex that pinches out laterally between the holes (upper part of OROD002 is present as thin apophyses in OROD001; lower part of OROD001 is thicker than OROD002).
- The lowest OROD002 sill has not been intersected in hole OROD001.
- It is difficult to make definitive correlations between mineralised zones using base metals alone.
- Zones 1 – 4 are indicated above. This correlation is tested using other geochemical parameters in the following sections.

Figure A2: Ni and Cu (ppm) comparison between drill holes OROD001 and OROD002.





2PGE + Au (ppm) vs S (ppm)

- This plot provides an indication of the metal endowment (tenor) of the mineralised zones and the relationships between different influxes of magma into the conduit.
- Zones 1, 3, and 4 have intervals with >1ppm PGE, whereas zone 2 is PGE depleted.
- The S and PGE profiles for zone 3 are the most consistent between the holes, providing strong support for this correlation.
- Zone 4, intersected by OROD002 is a complex zone with several sub-units and variable PGE endowment.

Figure A3: 2PGE + Au (ppm) and S (%) comparison between drill holes OROD001 and OROD002.

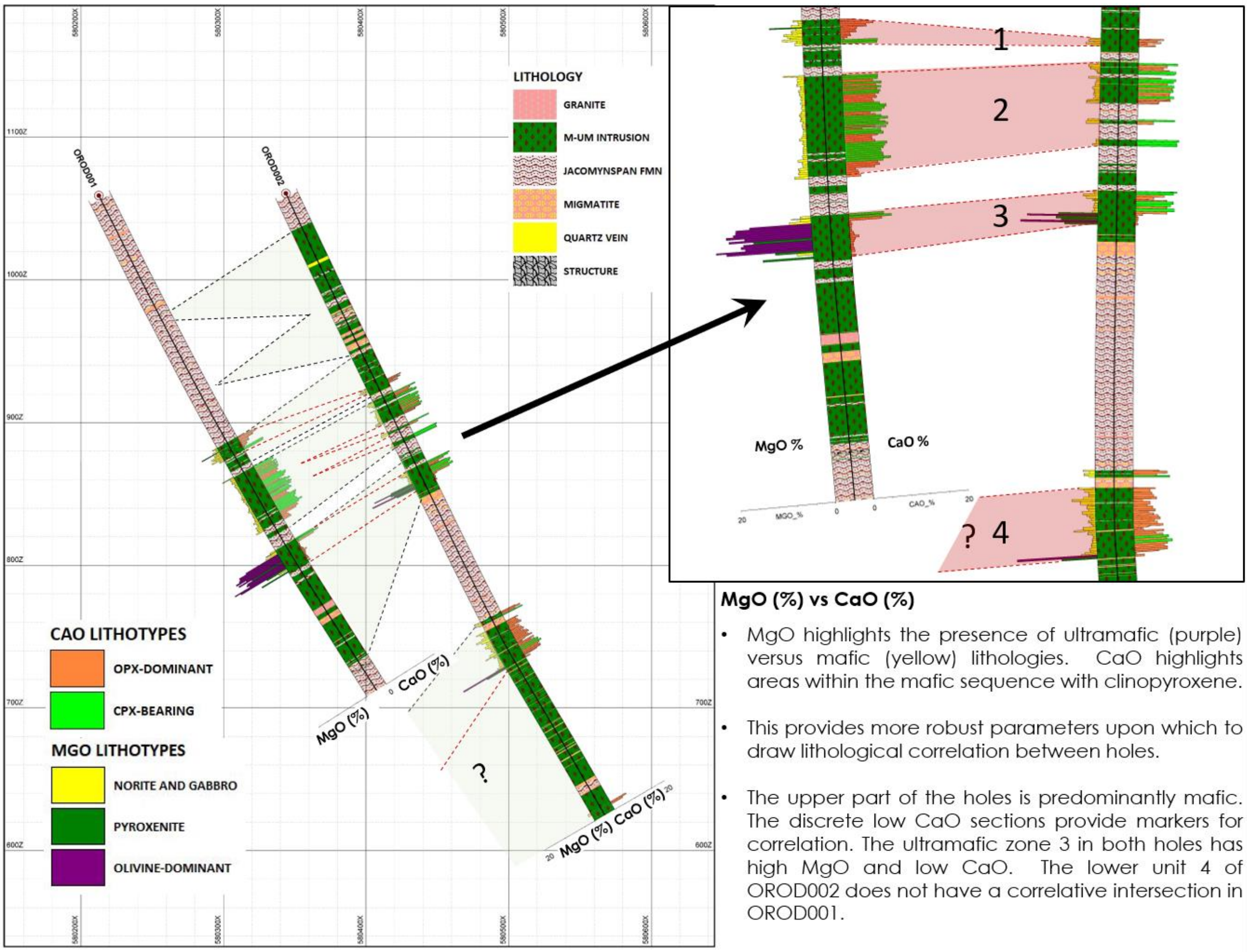
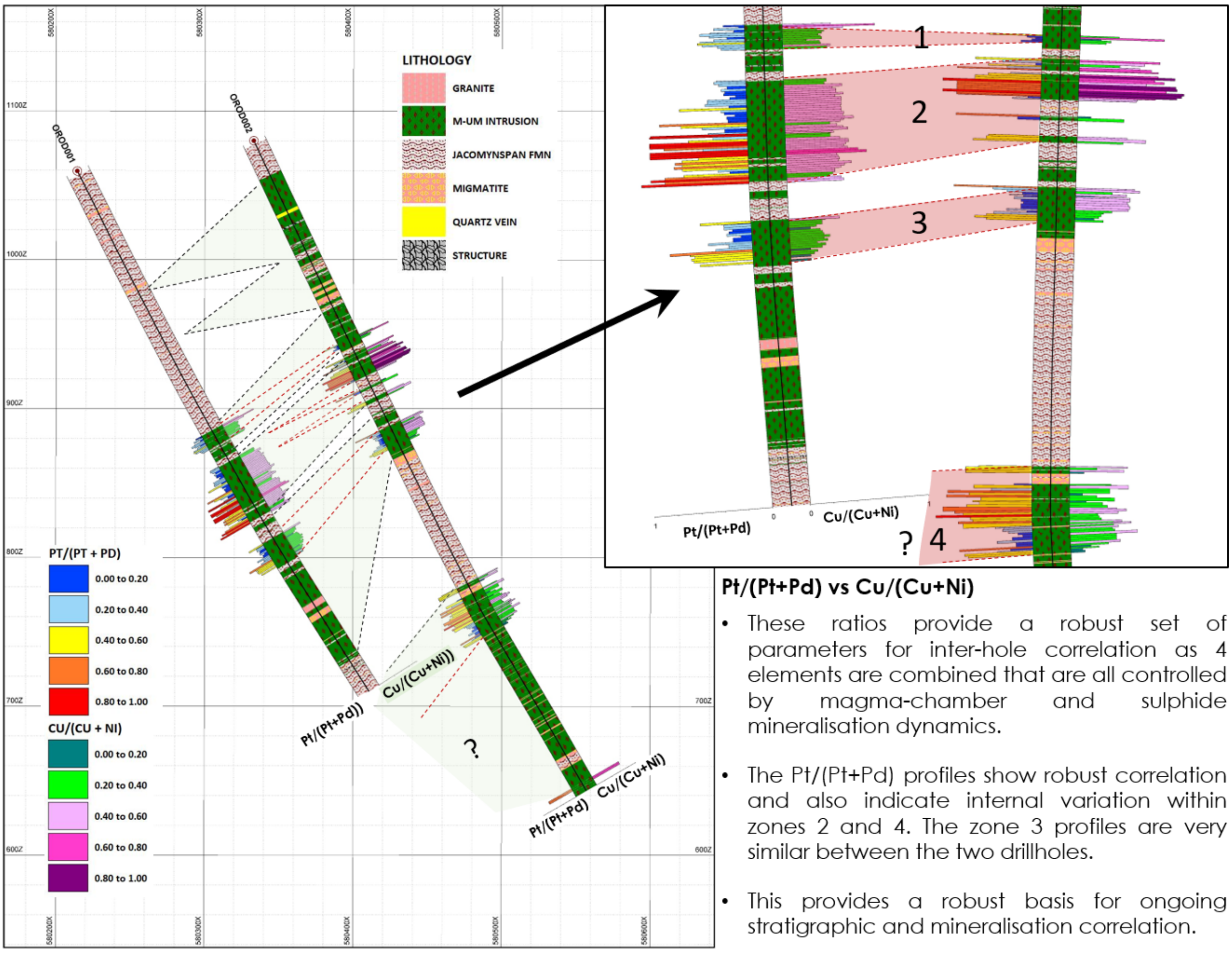


Figure A4: MgO and CaO (%) comparison between drill holes OROD001 and OROD002.



Pt/(Pt+Pd) vs Cu/(Cu+Ni)

- These ratios provide a robust set of parameters for inter-hole correlation as 4 elements are combined that are all controlled by magma-chamber and sulphide mineralisation dynamics.
- The Pt/(Pt+Pd) profiles show robust correlation and also indicate internal variation within zones 2 and 4. The zone 3 profiles are very similar between the two drillholes.
- This provides a robust basis for ongoing stratigraphic and mineralisation correlation.

Figure A5: Pt/(Pt+Pd) and Cu/(Cu+Ni) ratio comparison between drill holes OROD001 and OROD002.

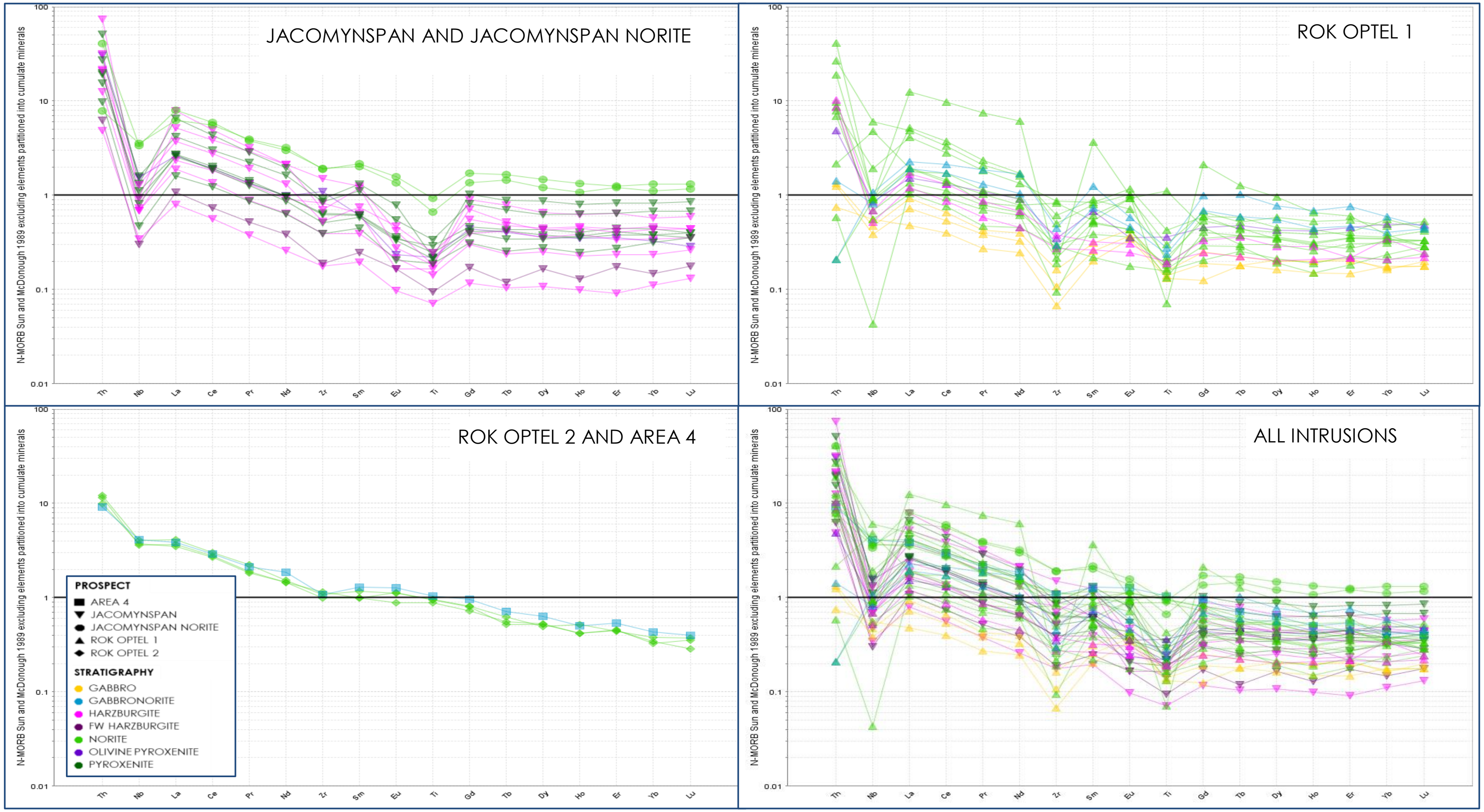


Figure A6: Geochemical spider plots of the Jacomynspan Suite of intrusions indicating the similarities between the individual intrusions, and the group at Rok Optel.

Appendix 2: The following tables are provided in accordance with the JORC Code (2012) for the reporting of Exploration Results for the Jacomynspan Project.

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling. • Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. • Aspects of the determination of mineralisation that are Material to the Public Report. • In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	• The drill hole is geologically logged, and zones of mineralisation are identified and marked on the core. The core is marked for cutting using the "low point" of the stratigraphy, marking the downhole direction on each core piece to ensure that the cut core is returned to the tray correctly. Half core is sampled. Following cutting, the core returned to the tray. The sampling process is undertaken by a geologist, who checks that all core is returned in the correct order by turning the core to face upward, fitting the core together and marking the metre intervals on the cut face. The core is reviewed, and zones of mineralisation identified. The core sample intervals are marked with due consideration of the percentage of sulphide mineralisation, lithological contacts, and minimum and maximum sample intervals (nominally 30cm to 1.5m). The sampling details are captured onto a paper log sheet that records sample depths, sample number (derived from a standardised sample register) recoveries, mineralisation percentage, sulphide minerals and mineralisation style. A comments field is used to capture ancillary observations or associations. • Samples are despatched by courier to the analytical laboratory. • For point / spot analysis of mineral grains a handheld XRF (Thermo Scientific Niton XL2 Analyser) is used. The instrument is used only for point / spot analysis and not for bulk assays and/or resource estimations.
Drilling techniques	• *Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).*	• Diamond core drilling was undertaken using HQ core size to drill through the weathered zone (approximately 75m) reducing to NQ core in hard rock. All drilling is undertaken using double tube wireline drilling, using 3m or 6m core barrels. • The OROD001core was partially oriented. OROD002 and OROD003 were drilled with oriented core. Core orientation is undertaken using a Reflex gravity face tool that provides a reference point and relative degree reading to the base of the drill hole.

Criteria	JORC Code explanation	Commentary
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Core recoveries are assessed on a routine basis using drill rig and core yard standard procedures. • At the drill rig, core stick-ups are measured at the end of each run. The core is fitted together and placed into the core trays with a plastic block at the end of each run recording the hole depth and advance. • At the core yard, the length of core is measured for each run. The measured length of core is subtracted from the run length recorded from the driller's stick-up measurements and recorded as a core gain or loss. • During the logging and sampling process, core recoveries are considered, and the cause of loss is quantified and described. The locations of 'bottom breaks' relative to the core run markers are observed. • There is no relationship between grade and recovery. This is a hard-rock style of mineralisation that is being evaluated using diamond drilling, generally with 100% core recovery through the mineralised zones.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* ► *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.* • *The total length and percentage of the relevant intersections logged.*	• The drill hole core is geologically logged utilising a standard-format logging template designed specifically for this style of mineralisation. The level of detail is sufficient to support Mineral Resource estimation, mining studies and metallurgical studies. • Both quantitative and qualitative logging is undertaken dependent upon the features being described. Qualitative parameters include lithology, colour, grain size, weathering, structural features, alteration, sulphide and oxide mineralisation, secondary mineralisation, and general contextual comments. Quantitative parameters include intensity of the qualitative parameters, mineralisation percentages, and magnetic properties. • Oriented core has measurements taken relative to an orientation line showing bottom of hole for planar surfaces and results are recorded for structural orientation in 3D space. • The logs are recorded onto pre-designed templates and captured into digital format at the project office. • The drill hole core is photographed according to standard core yard procedure and the photographs are digitally archived.

Criteria	JORC Code explanation	Commentary
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	• The NQ core is saw-cut at the Copperton core yard, and half-core is sampled. • Within the mineralised zones, the entire zone is cut and sampled. Internal waste or non-mineralised zones may not be sampled dependent upon their width. • The duplicate samples are derived from quarter core from previously sampled drill holes. • The sampling methodology is suitable for the style of mineralisation being sampled. The base metals are associated with the sulphide minerals, which are generally reasonably evenly distributed. Although nugget effects are higher for the precious metals, they are fine grained and intimately associated with the base metal sulphides, therefore nugget effect is reduced. • Sample preparation is undertaken at the ISO-accredited ALS Chemex analytical laboratory. The samples are processed according to industry best-practice. This involves a sample check-in procedure during which samples are assigned unique bar codes and entered into the LIMS system. The samples are then dried, crushed to <5mm, and pulverised to >85% <75 microns. • Density determinations are acquired by the technician using an Archimedes Bath. The data are captured and verified by the geologist prior to sample bag sealing. • The samples are sealed and are placed into polyweave bags for shipping to the analytical laboratory. The bagging schedule is recorded, and all bags are weighed. • All hard-copy information pertaining to the above process is filed in the original drill hole log file, and the appropriate data is digitally captured into the MS Excel drill hole log file.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.*	• Following sampling data capture, the core is placed into pre-numbered plastic bags by the responsible geologist. QC samples are assigned empty bags at this point. The sample ticket book is then completed and handed over to the technician. • Duplicate samples derived from previous drill hole core (quarter core), or drill hole being sampled are added to the sample list at the end.

Criteria	JORC Code explanation	Commentary
	• *Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established*	• QC samples (standards and blanks) are inserted into the defined sample bags by the technician. Matrix and mineralisation-matched standards are used. • ALS Chemex also inserts QC samples into each batch, including 5% CRM's, 2.5% blanks, and 2.5% duplicates. • The analyses are undertaken by ALS Chemex. The samples are analysed for base metals, precious metals and sulphur using the following methods: o ME-ICP41 – 35-element analysis specifically designed to analyse the acid-soluble portion of the analyte. The sample is digested using aqua regia, with ICP-AES analysis. For the metals of specific interest, Ni, Cu, and Co, the detection limits are 1 – 10,000ppm. For S, the detection limits are 0.01 – 10%. o PGM-ICP23 – standard Pb-collection fire assay with ICP-MS finish using a nominal 30g sample weight (detection limits of 0.005 (Pt) and 0.001 (Au, Pd) to 10.0g/t). o NI, Cu-OG46 – is applied to samples that assay > detection limit for Ni and Cu using method ME-ICP41. The method uses aqua regia digestion with ICP-AES or AAS analysis. o S-IR08 - total sulphur analysis using the Leco method has been implemented following identification of an issue with the ME-ICP41 sulphur analysis for samples with >10% S. The analytical data below this percentage are statistically comparable between the two methods. • Selected samples are submitted for lithogeochemical analysis to enable comparison of the major and trace element distributions between and within intrusions. This uses the package: o CCP-PKG01 – this provides a complete lithogeochemical characterisation of non-poorly mineralised samples to provide major, trace, and the full suite of REE. • The methods utilised are appropriate to the style and grade of mineralisation being explored for. The aqua regia digest provides the most precise analysis of the acid-soluble sulphide hosted mineralisation, without digesting the non-recoverable silicate hosted base metals. • Following receipt of assay data, QC assessment is undertaken using a standard-format spreadsheet that includes all historic assay data. The

Criteria	JORC Code explanation	Commentary
		external standard, blank and duplicate data are processed as well as the internal ALS Chemex standards, duplicates and blanks. • All Niton data is captured into the drill hole file. • The Niton XL2 runs an internal calibration routine upon start-up. Dependent upon the number of readings being acquired and the purpose of analysis, analytical readings of a manufacturer provided standard reference material may be used for ongoing QA-QC. This requirement depends upon whether quantitative or qualitative measurements are being acquired.
Portable XRF Analysis	• *Instrument used, methodology applied, QC protocols and usage/applicability of the data.*	• A NITON portable XRF (Thermo Scientific Niton XL2) is used on a routine basis to provide a first-pass assessment of the sulphide mineralisation intersected during drilling. • Handheld XRF analysis are acquired using the mining setting, with reading times of 30 or 60 seconds. • The Niton XL2 has internal calibration on start-up and readings on a regular basis of manufacturer provided standard reference material is used for ongoing QA-QC. • Calibration factors were not applied to the NITON data. • The observations of metal tenor variation derived from the laboratory analyses of drill holes OROD001 and OROD002 indicate that systematic variation within and between the mineral zones is present. The NITON is therefore used as the drill hole progresses to provide analyses that are specifically used for characterisation of sulphide mineralisation and to assess which zones are being intersected on a daily "real-time basis". • The NITON readings are acquired by a geologist from drill hole core, marking the sulphide bleb to be analysed prior to taking the measurement. The 'mining mode' instrument setting is used. The element readings are reported as percentages. The instrument is calibrated upon start-up using the manufacturers internal standards. Readings are acquired for intervals of 30 or 60 seconds. A single measurement per sulphide bleb is acquired (this is applicable for the objectives being investigated and has been found to be a robust measurement of mineral zone characteristics). The elements recorded are Ni, Cu, Fe, S, and Ca. All data including a comments field is captured into the drill hole file.

Criteria	JORC Code explanation	Commentary
		• The NITON data are not used for mineral resource purposes, or for derivation of intersection width calculations. The data are used for qualitative assessment of specific attributes of the mineralisation that are not achievable using a lab assay interval.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• No independent verification has been undertaken by independent persons. • All intersections and their analytical data have been inspected and verified by Orion Minerals Executive: Exploration. • The drill hole data are captured onto paper logs that are kept in specific drill hole log files. The data is captured into a standard-format drill hole MS Excel spreadsheet by the geologist. The drill hole log is regularly appended to the project database as data is captured. • First-pass quality control is undertaken on a regular basis as the log data are imported into Micromine for visualisation purposes. The Micromine file import verification protocols identify any depth or survey issues should they be present. • No adjustments are made to assay data. The assay certificate is not altered in any manner. The data are captured from the certificate into the drill hole file, merged, QC samples removed, and the data are appended to the Micromine project file. The data are compared to the drill hole logs to assess whether any anomalies are present.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• The drill hole collars are field located using a handheld Garmin GPS. The drill hole azimuth and dip are surveyed by the driller using an electronic level and verified using a Brunton compass. • Drill hole downhole surveys are undertaken using a North-seeking Gyro instrument. • The data are recorded using the WGS84 datum, UTM Zone 34S. • GPS elevation calibration is undertaken by recording points at a standard datum point.

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Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• The current drilling is part of the discovery phase targeting massive sulphide mineralisation. Although sulphide mineralisation has been intersected it is not intended at this stage to include this in a mineral resource. Seven drill holes were drilled by previous explorers.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• The mineralisation is primary magmatic sulphide and is not related to any imposed structural control. • The drill holes have intersected the mineralisation at a low to moderate angle to true dip, therefore sampling is representative of the mineralisation. • The drilling orientation is appropriate to the intrusion orientation as currently understood. • Most drilling is undertaken with oriented core in order to determine the 3D orientation of planar features.
Sample security	• *The measures taken to ensure sample security.*	• The samples are managed according to company chain of security protocols, including storage in a locked core yard, and courier of the sealed bags directly to the laboratory.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• No specific audit of this project has been undertaken. The sampling process is governed by well-established industry and company procedures and protocols.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The farm Rok Optel 261 has overlapping rights (in respect of differing minerals) held by two companies. • Namaqua Nickel Mining (Pty) Ltd holds a mining right NC 10032MR (over Die Plaas No. 387: Whole Farm Hartebeest Pan 175: RE, Portion 5 Jacomyns Pan 176: RE, Portion 1, Rok Optel 261: RE, Portion 1, Portion 2, Portion 3) for the mining of Nickel, Copper, Cobalt, PGM, Gold. This right was granted on 19 September 2016 subject to certain conditions, which include local community participation and financial guarantees, but is not yet executed. • Disawell (Pty) Ltd holds two prospecting rights namely NC 30/5/1/1/2/11010 PR (over Jacomyns Pan 176: RE, Portion 1, Portion 2 Rok Optel 261: RE, Portion 1, Portion 2, Portion 3 Rooi Puts 172: Portion 2, Portion 3, Portion 4) and NC 30/5/1/1/2/10938 PR (over Hartebeest Pan 175: RE, Portion 3, Portion 4, Portion 5 Farm 387: RE), each for the exploration of Zinc, Lead, Sulphur. • Disawell and Namaqua entered into an earn-in agreement with Orion Minerals, in terms of which Orion (through its subsidiary, Area Metals Holdings No. 3 (Pty) Ltd) is granted the right to invest in these companies. • No historical or environmental impediments to obtaining an operating licence are known.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• On Rok Optel 261, exploration has been undertaken by several parties, although only limited data are available. Hochmetals SWA undertook exploration during the early 1970's and drilled the drill holes previously reported upon by Orion Minerals. Poor quality standardised and summarised geological logs submitted to government are the only information remaining from this period. • Newmont undertook exploration from 1975 to 1977. The Hochmetals core was re-analysed. The existing drill hole PUD001 was deepened by 70m and a new hole (PUD007) drilled to 522.90m. A report (Gresse 1977) with drill plans and sections is available and has been captured into the database.

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Geology	• *Deposit type, geological setting and style of mineralisation.*	• The Rok Optel mineralisation is contained within portions of a metamorphosed mafic to ultramafic intrusion at least 150m thick containing magmatic nickel-copper sulphides. The intrusion is predominantly norite and gabbro, with lenticular bodies of pyroxenite to harzburgite. The intrusion is enclosed within quartz-feldspar-biotite-garnet (sillimanite) gneiss country rocks.
Drill hole Information	• A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: o easting and northing of the drill hole collar o elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar o dip and azimuth of the hole o down hole length and interception depth o hole length. • If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	• See Table 1.
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• The assay data are captured into a standard-format MS-Excel spreadsheet within which various derived parameters are calculated, including standard metal ratios (Pt/(Pt+Pd) and Cu/(Cu+Ni), major element oxides (using standard conversions), combined Pt, Pd, and Au (2PGE+Au), and base and precious metal tenors (using the methodology of Kerr, A. (2003): Spreadsheets for the calculation and correction of sulphide metal contents. Newfoundland and Labrador Department of Mines and Energy, Geological Survey, Open File NFLD/2805). • The assay data are weighted using the density and interval width to derive a mass factor that is then applied to the metal grade. Composite intervals are calculated using the mass-weighted values, which are then divided by the sum of the mass factors to derive the metal grade in weight percent. • The assay data are attributed and coloured according to the Ni grade

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		to highlight zones of mineralisation for composite calculation. Composite intersection widths are manually calculated for various cut-off grades on a common-sense basis including minor lower grade intervals if present within a thicker zone of mineralisation.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').*	• The drill holes intersected the mineralisation at predominantly moderate to low angles.
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• The prospect plan indicates the drilled and planned drill hole localities. • The intersection data derived from the abovementioned composite calculations are presented in the report.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• In the opinion of the Competent Person, the analytical data have been reported in a responsible and balanced manner.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• The Time Domain Electromagnetic Surveys are undertaken using a best-in-class electromagnetic receiver manufactured by Electromagnetic Technologies. The source is a custom-built Time Domain Electromagnetic transmitter, capable of transmitting 140 Amps into a 1 x 1km aluminium wire loop. The source is coupled with military grade fluxgate sensors for shallow exploration and super-sensitive high-temperature Super Conducting Quantum Interference Devices (SQUIDs) manufactured in Germany, which are state of the art for deeper exploration. The SQUID system was employed at the ROK4 grid and can detect moderate to super-conductors to approximately 1,000m below surface. Readings are taken every 50-100m on 200m-spaced grid lines. • Down-Hole Time Domain Electromagnetic surveys are undertaken using a Digi-Atlantis EM receiver. The source is a custom-built Time Domain Electromagnetic transmitter, capable of transmitting 140 Amps into a 1

Criteria	JORC Code explanation	Commentary
		x 1km aluminium wire loop. The drill holes are cased using plastic pipe prior to survey. The survey is undertaken at station intervals of between 2 and 15m dependent upon the location of the mineralisation. Data are quality controlled then forward to the geophysical consultant.
Further work	1. The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling). 2. Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	• Drill hole OROD001 intersected the base of the Rok Optel intrusion at 387.82m and was completed at 412.06m. The DHTEM survey indicated that although some of the plates were intersected, a conductor is located off-hole. A follow-up hole, OROD003, is underway to test this target. • Drill hole OROD002 intersected a sequence of interlayered intrusive and gneiss rocks from 25.73m to the end of hole at 491.95m. The DHTEM has also indicated the presence of a deeper-seated conductor that will be tested by follow-up drilling. • Drill hole OROD003 initially drilled down the margin of the upper part of the intrusion before intersecting the lower part of the intrusive complex. The drill hole is currently being DHTEM surveyed. • Ongoing work includes systematic further ground and downhole geophysics including fixed and moving loop EM, together with mapping and geochemistry of both surface outcrop and drill holes to map out the entire extent of the intrusive and identify likely bulk massive sulphide accumulations.