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# Barrambie JORC 2012 Mineral Resource Estimate

## HIGHLIGHTS

- **Total Indicated and Inferred Mineral Resources of 47.2Mt at 22% $TiO_2$.**


**Figure 1** Location Plan

Reed Resources Ltd (ASX: RDR) ("Reed") is pleased to report the Mineral Resource estimate for its Barrambie deposit under the new JORC Code (2012) guidelines.

The Mineral Resource estimate contains total Indicated and Inferred Mineral Resources of 47.2Mt at 22.2% TiO2, 0.63% V2O5, and 46.7% Fe2O3, at a cut-off grade of 15% TiO2 (Table 1 and Appendix A).

Snowden Mining Industry Consultants Pty Ltd ("Snowden") had previously reported the Mineral Resource estimate using a $TiO_2$ cut-off in September 2013 in accordance with JORC Code (2004) guidelines.

**Table 1** Barrambie Resource Table for 15% $TiO_2$ cut-off

| Category (JORC, 2012) | Tonnage (Mt) | $TiO_2$ (%) | $V_2O_5$ (%) | $Fe_2O_3$ (%) | $Al_2O_3$ (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|
| Indicated | 34.7 | 22.25 | 0.64 | 46.77 | 9.48 | 14.95 |
| Inferred | 12.5 | 21.99 | 0.58 | 46.51 | 9.32 | 15.40 |
| Total | 47.2 | 22.18 | 0.63 | 46.70 | 9.44 | 15.07 |

All tonnage and grade figures have been rounded down to two or three significant figures, respectively; slight errors may occur due to rounding of values.

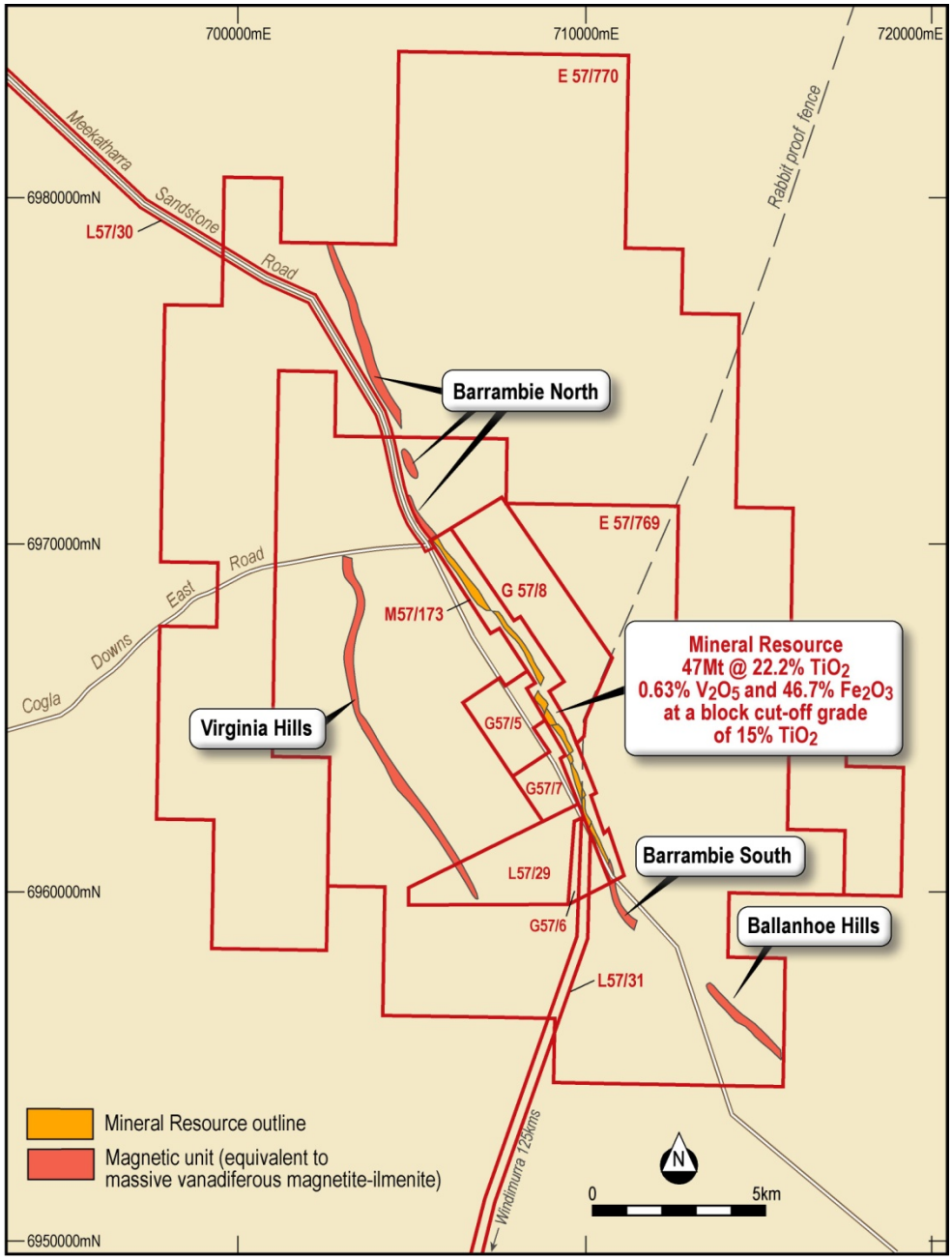


**Figure 2** Plan of the Barrambie Titanium project showing an outline of the Mineral Resource within M57/173. Distribution of titanomagnetite mineralisation along strike and to the west of Barrambie is based on interpretation of aeromagnetic survey data.

**ENDS**

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**Competent Persons Statement**

*Information in this report that relates to Mineral Resources is based on information compiled by Mr Andrew Ross, a Fellow of the Australasian Institute of Mining and Metallurgy (AusIMM), and Dr Bryan Smith a Member of the Australian Institute of Geoscientists (AIG).*

*Mr Andrew Ross, Senior Principal Consultant, is employed by Snowden and compiled the resource estimate report. Mr Ross has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results Mineral Resources and Ore Reserves". Mr Ross consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.*

*Dr Bryan Smith, Director, is employed by Bryan Smith Geosciences Pty Ltd and has compiled and provided drilling results and geological interpretations for Mineral Resource estimates. Dr Smith has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity, which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results Mineral Resources and Ore Reserves". Dr Smith consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.*

**Appendix A**

The following sections are provided to ensure compliance with the JORC (2012) requirements for the reporting of the Mineral Resource estimate for the Barrambie deposit.

**Mineral Resource estimates for the Barrambie Ti-V deposit, as at September 2013, for a block cut-off grade of 15% $TiO_2$**

| Classification | Zone | Oxidation | MTonnes | Density ($t/m^3$) | $TiO_2$ (%) | $V_2O_5$ (%) | $Fe_2O_3$ (%) | $Al_2O_3$ (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|---|---|
| Indicated | Eastern | Oxide | 18.7 | 2.82 | 23.29 | 0.59 | 42.93 | 10.70 | 16.36 |
| | | Transition | 8.7 | 3.52 | 23.11 | 0.61 | 50.80 | 7.34 | 12.99 |
| | | Fresh | 2.4 | 3.85 | 21.77 | 0.56 | 52.90 | 5.99 | 12.84 |
| | | *Sub-total* | *29.8* | *3.10* | *23.11* | *0.60* | *46.02* | *9.35* | *15.10* |
| | Central | Oxide | 3.5 | 2.95 | 16.84 | 0.92 | 49.82 | 11.06 | 14.91 |
| | | Transition | 1.3 | 3.50 | 17.39 | 0.89 | 54.76 | 8.49 | 12.15 |
| | | Fresh | 0.1 | 4.04 | 15.59 | 0.88 | 59.93 | 7.22 | 10.96 |
| | | *Sub-total* | *4.9* | *3.12* | *16.95* | *0.91* | *51.40* | *10.28* | *14.08* |
| | | **Total** | **34.7** | **3.11** | **22.25** | **0.64** | **46.77** | **9.48** | **14.95** |
| Inferred | Eastern | Oxide | 2.6 | 2.71 | 20.88 | 0.48 | 40.00 | 12.20 | 19.42 |
| | | Transition | 3.3 | 3.29 | 23.04 | 0.59 | 47.51 | 8.62 | 14.45 |
| | | Fresh | 5.5 | 3.71 | 22.82 | 0.57 | 47.50 | 8.39 | 14.57 |
| | | *Sub-total* | *11.4* | *3.36* | *22.44* | *0.55* | *45.78* | *9.33* | *15.65* |
| | Central | Oxide | 0.1 | 3.07 | 16.64 | 0.98 | 53.63 | 9.96 | 13.33 |
| | | Transition | 0.4 | 3.47 | 18.36 | 0.86 | 54.15 | 8.79 | 12.43 |
| | | Fresh | 0.7 | 3.86 | 17.30 | 0.91 | 53.48 | 9.44 | 13.17 |
| | | *Sub-total* | *1.2* | *3.64* | *17.55* | *0.90* | *53.71* | *9.30* | *12.96* |
| | | **Total** | **12.5** | **3.38** | **21.99** | **0.58** | **46.51** | **9.32** | **15.40** |
| | | **Grand Total** | **47.2** | **3.18** | **22.18** | **0.63** | **46.70** | **9.44** | **15.07** |

| Zone | MTonnes | Density ($t/m^3$) | $TiO_2$ (%) | $V_2O_5$ (%) | $Fe_2O_3$ (%) | $Al_2O_3$ (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| Oxide (Indicated +Inferred) | 24.9 | 2.83 | 22.11 | 0.63 | 43.64 | 10.90 | 16.46 |
| Transition (Indicated +Inferred) | 13.6 | 3.46 | 22.44 | 0.64 | 50.46 | 7.80 | 13.25 |
| Fresh (Indicated + Inferred) | 8.7 | 3.76 | 21.99 | 0.60 | 49.65 | 7.78 | 13.93 |

All tonnage and grade figures have been rounded down to two or three significant figures, respectively; slight errors may occur due to rounding of values.

**JORC Table 1, Section 1, Sampling Techniques and Data**

| Criteria | Commentary |
|---|---|
| Sampling techniques | The Barrambie resource estimate is based on the logging and sampling of 796 reverse circulation (RC) and 41 diamond (DD) drillholes (PQ and HQ3 size). Of these holes 782 RC and 36 DD holes were drilled by AVCH.<br>Limited information is available on the sampling methods used for the historic data (pre-2007). Snowden reviewed documents provided by Bryan Smith (Geosciences Pty Ltd) detailing drilling and sampling methods used for the most recent drilling (2007 to present) which are considered to be in line with industry standard.<br>Drillholes have been sampled on 3 m intervals in areas of background mineralisation and 1 m intervals within mineralised zones.<br>For RC holes the drill cuttings were collected in a cyclone, discharged at 1 m intervals into a bucket and then passed through a 3 tiered Jones riffle splitter to produce a split sample of about 3.5 kg. Diamond core was sampled on 1 m intervals with core being sawn in half and sampled as quarter core samples. |
| Drilling techniques | The Barrambie deposit has a 40 year drilling history. Drilling techniques include rotary air blast (RAB), open hole percussion (OHP), RC and DD. Only RC and DD holes have been used for the resource estimation.<br>Core orientation marks were attempted using a spear and crayon at the end of each core run; however, these were only successful on partly oxidised or fresh material. |
| Drill sample recovery | A qualitative logging code was used to record recovery for the recent RC and DD drilling. Recovery of samples is considered to be good with only minor losses within fault zones which are dominated by clay. |
| Logging | Geological logging of core and rock chips was carried out recording oxidation, colour, texture, mineralisation, water and recovery. Magnetic susceptibility readings were taken every 1 m for RC holes and 0.5 m for DD holes.<br>Snowden considers the logging was carried out in sufficient detail to meet the requirements of resource estimation and mining studies. |
| Sub-sampling techniques and sample preparation | AVCH core was wrapped in film and transferred to core trays where the downhole depth was marked on core blocks. Core was cut in half using a core saw.<br>RC samples were collected in a cyclone at the rig. All samples within the mineralised zones were considered to be mostly dry.<br>Initially sample intervals were adjusted so samples did not cross geological boundaries. This was modified to routine 1 m samples, due to the difficulty in identifying the contacts during the second drilling campaign in 2007.<br>Limited information is available on the quality control (QC) methods applied to the historic drillholes. QC procedures to ensure sampling is representative of the in situ material for the most recent drilling include the use of field duplicates and twinned holes. Comparison of the original and duplicate assays show an acceptable level of precision indicating field sampling procedures are reasonable.<br>The samples sizes are considered to be appropriate to correctly represent the mineralisation. |
| Quality of assay data and laboratory tests | Samples have been assayed for 13 attributes using XRF analysis except for 4 historical DD holes which were assayed using AAS.<br>Limited information is available on the QC methods applied to the historic drillholes. Field QC procedures for the most recent drilling include the use of assay standards, field duplicates and umpire laboratory analysis.<br>Results of the QC analysis indicated that acceptable levels of accuracy and precision have been achieved. |
| Verification of sampling and assaying | A total of 13 DD holes were twinned with selected RC holes. The results indicate minimal downhole smearing in RC drillholes. |

| Criteria | Commentary |
|---|---|
| Location of data points | The drilling coordinates are in a local metric grid established by surveyors Hille Tompson and Delfos located in Geraldton, which has a grid north-south baseline at 5500 mE. The historic drillholes were surveyed on the local metric grid. Where the historic hole collars could not be identified the collar locations were converted from the old imperial grid locations.<br>The topographic surface was provided by Southern Geoscience Consultants (SGC) compiled as part of an aeromagnetic survey flown on 25 m spaced lines in 2005. The Digital Elevation Model (DEM) was supplied in GDA, MGA Zone 50 coordinates and transformed to the local metric grid using 4 drillholes as common points. |
| Data spacing and distribution | Drill spacing is predominantly 100 m by 25 m. There is one 100 m area drilled at centres of 25 m by 25 m, and one 25 m area drilled at centres of 12.5 m by 12.5 m.<br>Drill spacing is sufficient to establish the degree of geological and grade continuity necessary to support the resource classification. |
| Orientation of data in relation to geological structure | Drillholes are drilled towards local grid east or west at varying angles to intersect the mineralised zones perpendicularly. The location and orientation of the Barrambie drillholes is appropriate given the strike and morphology of the mineralisation. |
| Sample security | Samples are stored onsite and transported to the laboratory on a regular basis. The laboratory was instructed to dispose of the residual samples by AVCH, the pulps have been retained. Bulk samples required for future metallurgical test work have been retained and are currently stored at Koorda. |
| Audits or reviews | To date there have been no audits or reviews of sampling techniques and data. |

**Table 2.1 JORC Table 1, Section 2, Reporting of Exploration Results**

| Criteria | Commentary |
|---|---|
| Mineral tenement and land tenure status | The Barrambie mineralisation is within granted mining lease M57/173 in the Eastern Murchison Goldfields. In April 2003, Reed Resources Ltd (RDR) through its subsidiary AVCH acquired 100% ownership of M57/173. The tenure was secure at the time of resource estimation and reporting. No known impediments exist to operate in the area. |
| Exploration done by other parties | There is no exploration done by other parties to acknowledge or appraise at this time. |
| Geology | The ferrovanadium titanium (Ti-V-Fe) deposit occurs within the Archaean Barrambie Greenstone Belt, which is a narrow, NNW-SSE trending greenstone belt in the northern Yilgarn Craton. The linear greenstone belt is about 60 km long and attains a maximum width of about 4 km. It is flanked by banded gneiss and granitoids. The mineralisation is hosted within a large layered, mafic intrusive complex (the Barrambie Igneous Complex), which has intruded into and is conformable with the general trend of the enclosing Greenstone Belt. From aeromagnetic data and regional geological mapping, it appears that this layered sill complex extends over a distance of at least 25 km into tenements to the north and south of M57/173 that have been acquired by RDR. The layered sill varies in width from 500 m to 1700 m.<br><br>The sill is comprised of anorthositic magnetite-bearing gabbros that intrude a sequence of metasediments, banded iron formation, metabasalts and metamorphosed felsic volcanics of the Barrambie Greenstone Belt. The metasediment unit forms the hanging-wall to the layered sill complex.<br><br>Exposure is poor due to deep weathering, masking by laterite, widespread cover of transported regolith (wind-blown and water-borne sandy and silty clay), laterite scree and colluvium. Where remnant laterite profiles occur on low hills, there is ferricrete capping over a strongly weathered material that extends down to depths of 70 m.<br><br>Ti-V-Fe mineralisation occurs as bands of cumulate aggregations of vanadiferous magnetite (martite)-ilmenite (leucoxene) in massive and disseminated layers and lenses.<br><br>Within the tenement the layered deposit has been divided into five sections established at major fault offsets. Cross faults have displacements that range from a few metres to 400 m. The water table occurs at about 35 m below the surface (when measured where the laterite profile has been stripped). |
| Drill hole Information | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Data aggregation methods | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Relationship between mineralisation widths and intercept lengths | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Diagrams | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Balanced reporting | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Other substantive exploration data | There are no exploration results reported for the immediate Barrambie area that have not been reported previously |
| Further work | Further exploration work is not planned for the immediate Barrambie area |

**Table 2.2 JORC Table 1, Section 3, Reporting of Mineral Resources**

| Criteria | Commentary |
|---|---|
| Database integrity | Snowden completed a basic validation check of the database for potential errors as a preliminary step to compiling the resource estimate. A number of minor issues were identified and corrected. |
| Site visits | The geological and sample database is maintained by AVCH and was validated by Snowden during the last resource update in January 2009 and this included a review of the QC data. Drilling and sampling procedures were documented by Bryan Smith (Geosciences Pty Ltd) who made regular site visits during the drilling campaigns. Snowden considers sufficient information was provided to develop the geological model and resource estimate to the level of an Indicated and Inferred Resource. |
| Geological interpretation | The interpretations for structural, lithological and weathering surfaces have been compiled by Snowden using the drillhole database supplied by AVCH.<br>A topography wireframe surface was generated from RC and DD drillhole collars, combined with the DEM points supplied by SGC. Discrepancies in elevation between drillhole collars and the DEM in the order of 2 m to 3 m were found north of 12600 mN.<br>The interpretations for the mineralisation envelope and domains were based on $V_2O_5$ grade cut-offs determined from statistical analysis of the drillhole data. A mineralisation indicator of 0.6% $V_2O_5$ was used to define the high grade domain within both the Central and Eastern zones. The Eastern zone low grade mineralisation was based on a threshold of 0.3% $V_2O_5$ and 0.1% $V_2O_5$ for the Central and Eastern zone low grade mineralised envelopes surrounding the lodes. Six mineralised domains have been interpreted, four within the Eastern zone and two within the Central zone.<br>Oxide, transition and fresh sub-domains were interpreted. |
| Dimensions | The deposit covers an area of approximately 10.5 km north-south by approximately 250 m east-west and extends to a depth approximately 60 m below surface. The deposit remains open at depth and along strike. |
| Estimation and modelling techniques | Drillhole data was coded using the wireframe interpretations representing oxidation surfaces, fault blocks and mineralised domains. Samples were composited to 1 m downhole, with the composite lengths adjusted to include all intervals and avoid loss of residual samples.<br>Top cuts were applied to $V_2O_5$ and $TiO_2$ in the Central zone to limit the influence of outlier grades. Statistical analysis of the remaining attributes within each domain indicates that there are no extreme outliers and therefore no top cut was applied.<br>Traditional variograms were modelled for the combined Eastern and Central zones and the parameters applied to the six original mineralised domains, with the nuggets and sill values adjusted for those domains. At Snowden's request, AVCH completed a program of closely spacing drilling within a test area which has provided better understanding of the short range continuity of mineralisation.<br>There was insufficient data within the Far Eastern zone high grade domain; therefore the Eastern zone high grade parameters were applied. The Dyke variogram was modelled as an omni-directional variogram as the low number of samples in this domain could not support directional variography.<br>CAE Studio (Datamine) software was used to estimate grades for $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$, CaO and magnetic susceptibility using ordinary block kriging (OK) into 10 mE by 40 mN by 5 mRL parent cell size as determined by a kriging neighbourhood analysis (KNA) carried out in March 2008. Sub-celling to 0.25 m by 10 m by 1.25 m has been allowed. A block discretisation of 2 by 5 by 1 was used in the easting, northing and elevation directions respectively.<br>Boundary conditions used in the estimate are listed below: |

| Domain | Attribute | Boundary conditions |
|---|---|---|
| Mineralised domains | $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$ | Hard boundaries across grouped domains. Soft boundaries over oxidation horizons |
| Mineralised domains | CaO and magnetic susceptibility | Hard boundaries across grouped domains and oxidation horizons |

| Criteria | Commentary | | |
|---|---|---|---|
| | Dyke | $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$, CaO and magnetic susceptibility | Hard boundaries across grouped domains and oxidation horizons |

The orientations of the search ellipses were defined to suit the approximate local dip and strike of the lode wireframes within each fault block. The initial search pass used ranges derived from the variograms. Blocks were estimated using a minimum of 6 and a maximum of 30 samples. If the initial search failed to find the minimum number of samples required, then a second search was conducted using 1.5 times the initial search radii.

After the estimation of $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$ approximately 0.3% of the total number of blocks within the mineralised domains were not estimated due to an insufficient numbers of samples. The majority of these blocks were located within the Dyke and were assigned the mean assay of the Dyke. Uninformed blocks within the mineralised domains were assigned the mean assay of the Central and Eastern zones as appropriate.

The estimates were validated as follows:

- A visual comparison of the block grade estimates to the input drillhole composite data on a section by section basis shows a reasonable correlation, although there is some evidence of smoothing of low and high grades within the low grade mineralised envelopes.
- A comparison of the estimated block grades to the average composite (naïve) grades for $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$ within the mineralised domains show good results, with both sets of results being within 8%.
- Trend plots show a reasonable comparison of the block grades with the samples grades in the easting and northing directions. For the elevation direction the model and sample means sometimes diverge. This is due to the sub-vertical geometry of the lodes; few drillhole intercepts in the vertical direction and the fact that grades have been estimated using a search ellipse that has a significant range in the vertical direction resulting in apparent smoothing of the model.

The Barrambie Resource was previously estimated by Snowden in March 2008 and January 2009. A comparison between the 2008 and 2009 estimate shows an overall increase in tonnes of 80%. This is due to additional drilling extending the resource approximately 5 km to the north; and infill drilling along the western side of the resource. A revised resource was reported in September 2013 using a $TiO_2$ cut-off rather than $V_2O_5$ following additional hydrometallurgical test work that indicated an alternative processing route that could result in the dominant revenue coming from $TiO_2$.

| | |
|---|---|
| Moisture | Not applicable to this estimate – only dry mass considered. |
| Cut-off parameters | The Mineral Resource is reported at a 15% $TiO_2$ grade cut-off. This threshold was determined by preliminary financial modelling carried out by AVCH and supported by independent cut-off grade analysis by Snowden based upon operating cost estimates, recovery parameters and commodity prices. |
| Mining factors or assumptions | A Scoping Study was completed by Snowden in November 2013 on the basis that the Barrambie deposit will be mined using conventional drill and blast with truck and shovel open pit mining methods. Reasonably small mining equipment would be used to mine the high grade with limited dilution. Ore mined will be placed on a ROM stockpile and transferred to highway haul trucks and transported to a proposed 50 ktpa processing plant to be constructed near Geraldton. |
| Metallurgical factors or assumptions | Metallurgical samples from the oxide and transition zones were provided to Noemet Technologies Inc (Neomet) for laboratory test work. The test work demonstrated that both $V_2O_5$ and $TiO_2$ can be recovered using a 2-stage leaching process. Whilst mineralisation within the primary zone has not been tested this zone constitutes a minor proportion of the defined resource. Test work carried out on similar primary material from Canadian deposits indicates that the Barrambie primary material would be amenable to this processing technique. |
| Environmental factors or | Previous submissions to the Environmental Protection Agency (EPA) are no longer |

| Criteria | Commentary |
|---|---|
| assumptions | relevant given the revised mine plan and production forecast and these will be resubmitted for consideration by the EPA. It is expected that the restrictions could be less severe given the significantly reduced mining rate and the fact that processing will no longer take place at the mine site.<br>A new environmental study focussing on a site near Geraldton as the new processing site will need to be undertaken. |
| Bulk density | Density values were estimated from the mineralised domains in the block model with regression equations using estimated $Fe_2O_3$, $SiO_2$ and $Al_2O_3$ block grades. Limited data was available from the transitional and very little data was available from the fresh. Waste blocks were assigned a default density based on fresh non mineralised gabbro. |
| Classification | The Barrambie resource is classified as Indicated and Inferred for the five major constituents $V_2O_5$, $TiO_2$, $Fe_2O_3$, $Al_2O_3$, $SiO_2$, based on a number of criteria, including the geological confidence, the integrity of the data, the spatial continuity of the mineralisation as demonstrated by variography and the quality of the estimation. The estimates of CaO and magnetic susceptibility have not been classified as they are considered to have low confidence due to poor validation.<br>Mineralised zones where the drill spacing is 100 m by 25 m, 120 m by 25 m or 150 m by 25 m and are within the OK variance envelope (based on a threshold of 0.5) and above the base of drilling have been classified as Indicated. Mineralised zones outside the OK variance envelope and below the base of drilling have been classified as Inferred. Mineralised zones have been extrapolated approximately 20 m beyond the base of drilling.<br>The Mineral Resource estimate appropriately reflects the views of the Competent Person with respect to the deposit. |
| Audits or reviews. | Snowden has completed an internal peer review or the estimate which has concluded that the procedures used to estimate and classify the Mineral Resource are appropriate. There have been no external audits or reviews carried out. |
| Discussion of relative accuracy/ confidence | The relative accuracy and confidence in the Mineral Resource estimate is reflected in the reporting of the Mineral Resource as set out in the JORC code (2012 Edition). |

**About Reed Resources**

Reed Resources Ltd (ASX: RDR, OTC: RDRUY) is a Western Australian resource developer.

Reed Resources' American Depositary Receipts (ADR's) trade under the code RDRUY (CUSIP Number: 758254106). Each Reed Resources ADR is equivalent to 10 ordinary shares of Reed Resources as traded on the ASX. The Bank of New York Mellon is the depository bank.

**Website:** www.reedresources.com