

**INCREASING CONFIDENCE IN FOUR QUEENSLAND VANADIUM PROJECTS****HIGHLIGHTS**

- Incremental due diligence on four highly prospective vanadium projects in Queensland, which are owned by Vanadium Mining (VanMin) that HDY intends to acquire, has increased confidence to geologically model, estimate and report under the JORC (2012) Code
- The geology team have uncovered further historic evidence there are actually 383 air-core drill-holes targeting the Toolebuc Formation (>170 reported in ASX Release 13 August 2018) along the 150km north-south trending strike running through the Spike, Cera and Petrie projects and within the Sharptooth prospect
- Encouragingly, the average drill-hole depth remains shallow at 30m, while elevated vanadium pentoxide ( $V_2O_5$ ) assay results verify heightened mineral prospectivity across the projects, including:
  - 3m @ 0.31%  $V_2O_5$  from 4m (including 0.5m @ 0.39%) within the Sharptooth prospect<sup>1</sup>
  - 5m @ 0.48%  $V_2O_5$  from 10m and 3m @ 0.47m from 2m within the Cera prospect<sup>2</sup>
- The geology team have conducted a thorough review of the historic air-core drill-holes and believe any future exploration, utilising a large diameter conventional bore-core at the same locations, may result in higher  $V_2O_5$  assay values in line with peers<sup>2</sup>
  - This clearly highlights the potential exploration upside across the four projects
- Overall, with high-grade  $V_2O_5$  mineralisation confirmed near surface within weathered units, there is potentially a solid case that open pit mining methods can be employed
- The Board's strategic objective with the vanadium projects over the longer-term is to develop viable operations in Australia and Argentina – the results to date are clearly on the right trajectory

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**Hardey Resources Executive Chairman, Terence Clee commented:** "The geology team have done a superb job uncovering incremental data points which enhances the prospect of generating a JORC compliant resource across the four Queensland projects and de-risks them further. Moving forward, the Board is increasingly optimistic that Hardey Resources can develop future vanadium supply chains from Australia and Argentina judging by the encouraging results already evidenced."

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Hardey Resources Limited's (ASX: HDY) ("HDY" or "the Company") Board is pleased to present an update on due diligence work being undertaken on the four highly prospective Queensland vanadium owned by VanMin.

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**QUEENSLAND ASSETS FURTHER DE-RISKED**

The geology team have undertaken a thorough review of the geological data available across VanMin’s four Queensland projects – Sharptooth, Spike, Cera and Petrie – and believe there is sufficient information to geologically model, estimate and report under the JORC (2012) Code for vanadium mineralisation. A key finding was discovering there are 383 air-core drill-holes available, which is nearly double the circa 170 initially reported on 13 August 2018. In short, this is a positive development as it further de-risks the prospectivity for Queensland projects.

Within the four projects, the Toolebuc Formation has been correlated across all the bore-holes and high-grade V<sub>2</sub>O<sub>5</sub> mineralisation constrained by horizon. The Sharptooth project<sup>1</sup> includes 3m @ 0.31% V<sub>2</sub>O<sub>5</sub> from 4m (including 0.5m @ 0.39%) and the Cera prospect<sup>2</sup> contains 5m @ 0.48% V<sub>2</sub>O<sub>5</sub> from 10m and 3m @ 0.47m from 2m. The V<sub>2</sub>O<sub>5</sub> mineralisation distribution is displayed in Figure 1, with locations displayed in Figure 2.

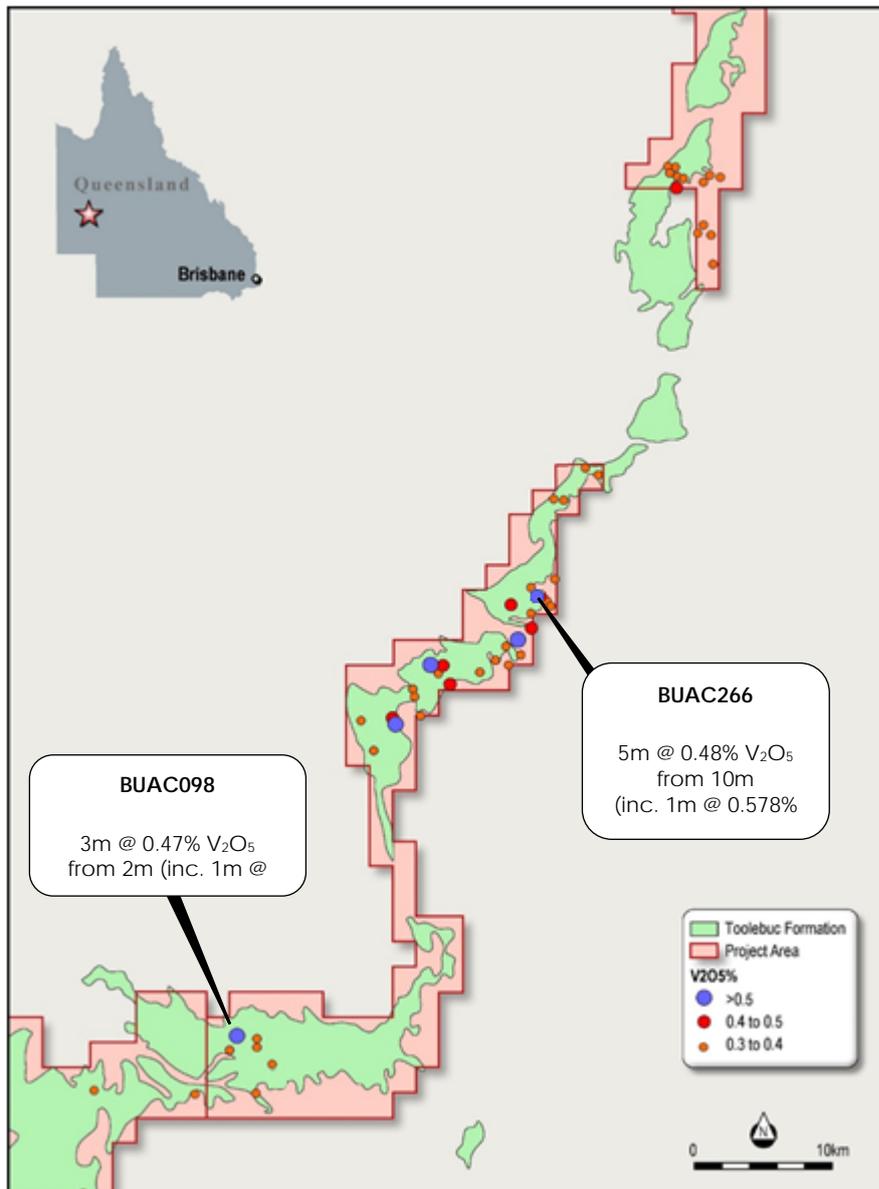
**FIGURE 1: VANADIUM PENTOXIDE MINERALISATION CONCENTRATIONS BY SAMPLE DEPTH**

Hole_ID BUAC266				Hole_ID BUAC098			
Depth_to	Unit	Average of V2O5%		Depth_to	Unit	Average of V2O5%	
1	Lime_00		0.066	1	Lime_01		0.122
2	Lime_00		0.052	2	Lime_02		0.473
3	Lime_01		0.097	3	Lime_02		0.550
4	Lime_01		0.117	4	Lime_02		0.388
5	Lime_01		0.140	5	Lime_02		0.122
6	Lime_01		0.235	6	Mlimst_03		0.099
7	Lime_01		0.074	7	Calnud_02		0.043
8	Lime_01		0.095	8	Calnud_02		0.049
9	Lime_01		0.163	9	Calnud_02		0.043
10	Lime_02		0.369	10	Calnud_02		0.046
11	Lime_02		0.578	11	Calnud_02		0.047
12	Lime_02		0.436	12	Calnud_02		0.044
13	Lime_02		0.545	13	Calnud_02		0.041
14	Lime_02		0.491	14	Calnud_02		0.045
15	Mlimst_03		0.079	15	Calnud_02		0.045
16	Calnud_02		0.061	16	Calnud_02		0.047
17	Calnud_02		0.048	17	Calnud_02		0.041
18	Calnud_02		0.041	18	Calnud_02		0.044
19	Calnud_02		0.044	19	Calnud_02		0.043
20	Calnud_02		0.048	20	Calnud_02		0.042
21	Base_mud		0.000	21	Base_mud	NA	
22	Base_mud		0.000	22	Base_mud	NA	
23	Base_mud		0.000	23	Base_mud	NA	
24	Base_mud		0.000	24	Base_mud	NA	
25	Base_mud		0.000	25	Base_mud	NA	
26	Base_mud		0.000	26	Base_mud	NA	
27	Base_mud		0.000	27	Base_mud	NA	
28	Base_mud		0.000	28	Base_mud	NA	
29	Base_mud		0.000	29	Base_mud	NA	
30	Base_mud		0.000	30	Base_mud	NA	

Source: HDY geology team, refer to Table 1 for a summary of the historical open file tenure pXRF value statistical analysis

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FIGURE 2: HIGH GRADE BOREHOLE LOCATIONS



Source: HDY geology team

### Exploration upside

The historic data review across the Spike, Cera and Petrie projects confirmed a typically thick mineralised zone, with an average 0.23% V<sub>2</sub>O<sub>5</sub> content. However, indicative pXRF values of up to 0.587% V<sub>2</sub>O<sub>5</sub> have been reported in Cera suggesting increased mineralisation potential across the projects, subject to samples being fully assayed.

Moreover, the team believes the drilling methods employed across the projects could be improved by: increasing the depth; and utilising larger diameter drill-cores. Typically, the Toolebuc Formation zones within the projects was not tested below 30m.

As many of the historic boreholes are interpreted to terminate prematurely, not capturing the entire mineralised sequence, the full potential of the project areas is still to be realised. Consequently, there is clearly significant exploration upside from undertaking a more thorough drilling program.

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Lastly, with elevated mineralisation typically occurring in shallow environments, the projects are amenable to shallow, open-pit mining methods.

### **Weathered zones**

The geology team worked to define base weathering – a critical inclusion in the geological model for the projects. Establishing the base for weathering has revealed substantial vanadium enrichment within these zones. The enrichment is in line with published research, and the enriched vanadium zone can be seen within the pXRF values and sampled intervals of Figure 1. Quantification of the enriched vanadium zone across the QLD VanMin projects is not possible, until the creation and validation of a geological model is complete.

VanMin's projects are targeted to map significant areas of Toolebuc Formation which are at surface or interpreted to be shallow and under minimal cover. These significant outcropping areas and regional mapping suggest large subsurface areas of weathered Toolebuc formation, are present in the VanMin projects, based on the shallow dip of the Toolebuc formation.

### **Next steps**

Preliminary review on VanMin's Northern Territory projects.



Terence Clee  
Executive Chairman

### **References**

- 1) QDEX Report No: CR 6421, discussed in the accompanying Table 1.
- 2) QDEX Report No: CR4344, discussed in the accompanying Table 1.

### **COMPETENT PERSON'S STATEMENT:**

The information in this report that relates to Geological Interpretation, Historical Exploration Results, or Historical Mineral Resources is based on information compiled by Nicholas Ryan, a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy. Mr Ryan has been a Member of the Australian Institute of Mining and Metallurgy for 12 years and is a Chartered Professional (Geology). Mr Ryan is employed by Xplore Resources Pty Ltd. Mr Ryan 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 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Ryan consents to the inclusion in the report of the matters based on his information and the form and context in which it appears.

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• JORC Code, 2012 Edition – Table 1 report template

Drilling results summarized in the Table 1 Sections below are associated with the Spike, Cera, and Petrie projects.

Section 1 Sampling Techniques and Data

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

Criteria	JORC Code explanation	Commentary
<b>Sampling techniques</b>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</i></li> <li>• <i>Aspects of the determination of mineralisation that are Material to the Public Report.</i></li> <li>• <i>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 pulverized 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.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>• Spike, Cera &amp; Petrie projects – Hancock Exploration Management Services, on behalf of Jacaranda Alliance JV, from May to August 2010: drilled 413 aircore drillholes for a total of 12,400m of drilling, with at least 383 aircore drillholes accumulating to 11,542 of drilling that potentially can be used in a geological model, with a total depth range from 25 to 30m within the Vanadium Mining project areas.</li> <li>• “Check samples were analysed by ALS Chemex in Mt Isa to provide calibration factors for correcting the Niton XRF readings”. No further sampling techniques details were accessible from the QDEX publicly available reports.</li> <li>• Sample intervals were obtained on a 1m basis from down hole depths from aircore drilling, samples were only taken on an integer depth basis. Samples were analysed at 1m intervals using a hand-held Niton XRF spectrometer for elements U, Cu, Pb, Zn and V.</li> <li>• The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project.</li> <li>• No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Drilling techniques</b>	<ul style="list-style-type: none"> <li>• <i>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).</i></li> </ul>	<ul style="list-style-type: none"> <li>• Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>• Spike, Cera &amp; Petrie projects – Aircore Drilling was the drilling method that Jacaranda Alliance JV used for the exploration campaign. No further drilling technique details were provided.</li> </ul>

Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"> <li>The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project, additional drilling would be required to estimate and report an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Drill sample recovery</b>	<ul style="list-style-type: none"> <li>Method of recording and assessing core and chip sample recoveries and results assessed.</li> <li>Measures taken to maximise sample recovery and ensure representative nature of the samples.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Aircore Drilling was the drilling method that the Jacaranda Alliance JV used, no further information had been reported on the drilling process and sample recovery in their tenure reporting.</li> <li>The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Logging</b>	<ul style="list-style-type: none"> <li>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.</li> <li>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.</li> <li>The total length and percentage of the relevant intersections logged.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – In annual reporting Jacaranda Alliance JV states it compiled all lithological data for the aircore holes. The lithology for each 1m interval was recorded in the analyses text files attached to the annual reports. The lithology of each 1m interval was categorised into either soil, mudstone, limestone, muddy limestone, calcareous limestone or coquinite.</li> <li>The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Sub-</b>	<ul style="list-style-type: none"> <li>If core, whether cut or sawn and whether quarter, half or all core</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX</li> </ul>

Criteria	JORC Code explanation	Commentary
<b>sampling techniques and sample preparation</b>	<p>taken.</p> <ul style="list-style-type: none"> <li>• <i>If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.</i></li> <li>• <i>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</i></li> <li>• <i>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</i></li> <li>• <i>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.</i></li> <li>• <i>Whether sample sizes are appropriate to the grain size of the material being sampled.</i></li> </ul>	<p>Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</p> <ul style="list-style-type: none"> <li>• Spike, Cera &amp; Petrie projects – Aircore Drilling samples were obtained at 1m intervals and tested by hand-held Niton XRF spectrometer. Check samples were analysed by ALS Chemex in Mt Isa to provide calibration factors and analytical data was compiled and was re-calculated using check samples analysed by ALS. No further information had been reported on the drilling and sampling process.</li> <li>• The Competent Person considers that the drilling, sampling, handheld XRF spectrometer results are appropriate for consideration of the mineralisation potential of the project, additional drilling would be required to estimate and report an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>• No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Quality of assay data and laboratory tests</b>	<ul style="list-style-type: none"> <li>• <i>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.</i></li> <li>• <i>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.</i></li> <li>• <i>Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>• Spike, Cera &amp; Petrie projects - Annual reports by the Jacaranda Alliance JV states all samples were analysed using a hand-held Niton XRF spectrometer for at least U, Cu, Pb, Zn and V.</li> <li>• Vanadium assay data or hand-held Niton XRF spectrometer readings were in part of the dataset reported to zero decimal places in the original historical tenure reports. The original data was sourced from the original tenement holder through a government appointed intermediary and validated against the available original data and found to match.</li> <li>• Historical tenure report CR67931 stated “Check samples were analysed by ALS Chemex in Mt Isa to provide calibration factors for correcting the Niton XRF readings” for elements U, Cu, Pb, Zn and V – the outcome of the calibration process is not publicly available.</li> <li>• A subset of holes were logged where possible using an Auslog gamma probe and assessed for Uranium mineralization potential.</li> <li>• No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Verification of sampling and assaying</b>	<ul style="list-style-type: none"> <li>• <i>The verification of significant intersections by either independent or alternative company personnel.</i></li> <li>• <i>The use of twinned holes.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>• Spike, Cera &amp; Petrie projects - All samples were analysed using a hand-held Niton XRF spectrometer. Check samples were analysed by ALS Chemex in Mt</li> </ul>

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</li> <li>Discuss any adjustment to assay data.</li> </ul>	<p>Isa to provide calibration factors for correcting the handheld Niton XRF spectrometer readings. Analytical data was compiled and was re-calculated using check samples analysed by ALS. No further details relating to verification were provided in the publicly available historical tenure reports on QDEX.</p> <ul style="list-style-type: none"> <li>The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Location of data points</b>	<ul style="list-style-type: none"> <li>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.</li> <li>Specification of the grid system used.</li> <li>Quality and adequacy of topographic control.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Drillholes were surveyed by handheld GPS. Hancock Exploration Management Services, on behalf of Jacaranda Alliance JV, from May to August 2010: drilled 413 aircore drillholes for a total of 12,400m of drilling, with at least 383 aircore drillholes accumulating to 11,542 of drilling that potentially can be used in a geological model, with a total depth range from 25 to 30m within the Vanadium Mining project areas.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Data spacing and distribution</b>	<ul style="list-style-type: none"> <li>Data spacing for reporting of Exploration Results.</li> <li>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.</li> <li>Whether sample compositing has been applied.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Drillhole spacing of traverses varies from approximately 200m to 1km based on targets distribution throughout the projects.</li> <li>Drilling spacing reported in this announcement is indicative of the local geological structures, intercept width, and handheld Niton XRF spectrometer values.</li> <li>The Competent Person considers that the drilling, sampling, handheld XRF spectrometer results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> </ul>

Criteria	JORC Code explanation	Commentary
<b>Orientation of data in relation to geological structure</b>	<ul style="list-style-type: none"> <li>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Drilling occurred perpendicular / vertical into the ground surface, the mineralisation targeted is the Toolebuc Oil Shale that contains Vanadium mineralisation, dipping at approximately 1-2 degrees from horizontal, occasionally up to 5 degrees within the project areas.</li> <li>Given the drilling orientation as near perpendicular, with shallow drilling (Total Depth =&lt; 100m), the drilling intercepts approximate true thickness of the vanadium mineralisation in assayed samples or hand-held Niton XRF spectrometer analysed samples that show high grades. The drilling can provide confidence in laterally continuity of the drilling data, based on appropriately determined appropriate drillhole spacing and geological interpretation.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Sample security</b>	<ul style="list-style-type: none"> <li>The measures taken to ensure sample security.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – It is assumed that the sample security measures in place at the time of the historical drilling, sampling, and ALS sample dispatch were assumed to be comparable to the contemporary sample security measures.</li> </ul>
<b>Audits or reviews</b>	<ul style="list-style-type: none"> <li>The results of any audits or reviews of sampling techniques and data.</li> </ul>	<ul style="list-style-type: none"> <li>No formal audits or reviews of the Central Coast Exploration N.L. sampling techniques and data have taken place.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>

## Section 2 Reporting of Exploration Results

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

Criteria	JORC Code explanation	Commentary
<b>Mineral tenement and land tenure status</b>	<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Vanadium Mining Pty Ltd holds 100% of the following mineral tenure applications: <ul style="list-style-type: none"> <li>Sharptooth Project, Queensland (“QLD”), Australia – Tenure Identifier EPM26801 [Exploration Permit Mineral Application], 100</li> </ul> </li> </ul>

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Criteria	JORC Code explanation	Commentary
	<p><i>settings.</i></p> <ul style="list-style-type: none"> <li><i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>sub-blocks, submitted to the QLD Department of Natural Resources, Mines, and Energy (“DNRM”) on the 23 February 2018; Cera Project, QLD, Australia – Tenure Identifier EPM26802 [Exploration Permit Mineral Application], 100 sub-blocks, submitted to the DNRM on the 26 February 2018;</li> <li>Spike Project, QLD, Australia – Tenure Identifier EPM26803 [Exploration Permit Mineral Application], 100 sub-blocks, submitted to the DNRM on the 26 February 2018;</li> <li>Petrie Project, QLD, Australia – Tenure Identifier EPM26804 [Exploration Permit Mineral Application], 100 sub-blocks, submitted to the DNRM on the 26 February 2018;</li> <li>Wollagalong Project, Northern Territory (“NT”), Australia – Tenure Identifier EL31841 [Exploration Licence Application], submitted to the NT Department of Primary Industries and Resources (“DPIR”) on the 5 March 2018; &amp;</li> <li>Chisholm Project, NT, Australia – Tenure Identifier EL31842 [Exploration Licence Application], submitted to the NT DPIR on the 5 March 2018.</li> <li>Note: No drilling or sample results are reported in this announcement for the Northern Territory Vanadium Mining Pty Ltd projects.</li> </ul>
<p><b>Exploration done by other parties</b></p>	<ul style="list-style-type: none"> <li><i>Acknowledgment and appraisal of exploration by other parties.</i></li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>The announcement contains the following publicly reported exploration activity: <ul style="list-style-type: none"> <li>Hancock Exploration Management Services, on behalf of Jacaranda Alliance JV, from May to August 2010, drilled 413 aircore drillholes for a total of 12,400m of drilling, with at least 383 aircore drillholes accumulating to 11,542 of drilling that potentially can be used in a geological model, with a total depth range from 25 to 30m within the Vanadium Mining project areas.</li> </ul> </li> <li>Upon the completion of comprehensive Desktop Studies are complete, additional Historical Exploration Activity could be publicly reported.</li> </ul>
<p><b>Geology</b></p>	<ul style="list-style-type: none"> <li><i>Deposit type, geological setting and style of mineralisation.</i></li> </ul>	<ul style="list-style-type: none"> <li>For its Queensland projects Vanadium Mining Pty Ltd is targeting the following styles Early Cretaceous Toolebuc Shale: this is an oil-bearing shale that contains vanadium mineralisation occurring in the Eromanga Basin and exposed in outcrop throughout Central and Northern Queensland. The Eromanga Basin is a shallow dipping depression where the Toolebuc Shale occurs at the surface.</li> <li>The Toolebuc Shale contains sediment that predominantly consists of</li> </ul>

Criteria	JORC Code explanation	Commentary
		<p>black carbonaceous shale, bituminous shale, minor siltstone, with limestone lenses and coquinites (mixed limestone and clays). Clays associated with the Toolebuc Shale are vanadium bearing, associated with pyrite, or are chemically bound to the fresh oil kerogens.</p> <ul style="list-style-type: none"> <li>The Toolebuc Shale dips between 1-10 degrees from horizontal, near outcrops of the Vanadium Mining projects is typically 1-2 degrees and can be up to 5 degrees dip.</li> </ul>
<b>Drill hole Information</b>	<ul style="list-style-type: none"> <li>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: <ul style="list-style-type: none"> <li>easting and northing of the drill hole collar</li> <li>elevation or RL (Reduced Level – elevation above sea level in meters) of the drill hole collar</li> <li>dip and azimuth of the hole</li> <li>down hole length and interception depth</li> <li>hole length.</li> </ul> </li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Hancock Exploration Management Services, on behalf of Jacaranda Alliance JV, from May to August 2010, drilled: 413 aircore drillholes for a total of 12,400m of drilling, with at least 383 aircore drillholes accumulating to 11,542 of drilling that potentially can be used in a geological model, with a total depth range from 25 to 30m within the Vanadium Mining project areas.</li> <li>The drillhole dataset with regard to drillhole collar locations/sample locations is incomplete and efforts are being made to source the complete dataset from the original tenement holder: approximately 60 boreholes have been identified as potentially residing in the Spike, Cera, &amp; Petrie project areas in historical tenure maps, however borehole collar co-ordinate information was not tabulated in the body of the historical tenure reports, nor the borehole names clearly legible for all holes on the historical tenure maps.</li> <li>During May-August 2010 Hancock Exploration Management Services completed an air core drilling programme in EPMs 15234, 15235, 15236, 15240, 15241, 15298 and 15299. A total of 413 air core holes were drilled for 12,400 meters – with at least 383 aircore drillholes accumulating to 11,542 of drilling that potentially can be used in a geological model, with a total depth range from 25 to 30m within the Vanadium Mining project areas.</li> <li>The currently available drillhole and subsequent sample/pXRF information were sourced from multiple historical tenure reports that include: 1) CR64271, 2) CR64273 &amp; 3) CR64276, &amp; 4) CR67931. pXRF had been conducted on 3,581 samples for boreholes that are known to be within the Vanadium Mining QLD Spike, Cera, &amp; Petrie project areas.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Data aggregation</b>	<ul style="list-style-type: none"> <li>In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for</li> </ul>

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<b>methods</b>	<p><i>grades) and cut-off grades are usually Material and should be stated.</i></p> <ul style="list-style-type: none"> <li>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.</li> <li>The assumptions used for any reporting of metal equivalent values should be clearly stated.</li> </ul>	<p>further details.</p> <ul style="list-style-type: none"> <li>Spike, Cera &amp; Petrie projects – Hancock Exploration Management Services, on behalf of Jacaranda Alliance JV, from May to August 2010, drilling sample results were reported on the historical portable Niton XRF spectrometry values obtained on the interval sampled and assayed.</li> <li>Data aggregation occurred in this announcement when values have been reported over an intersection length of more than 1m, using sample length weighting of each individual hand-held Niton XRF spectrometer reading. No ALS assay results have been reported in this announcement.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Relationship between mineralisation widths and intercept lengths</b>	<ul style="list-style-type: none"> <li>These relationships are particularly important in the reporting of Exploration Results.</li> <li>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</li> <li>If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>Spike, Cera &amp; Petrie projects – Drilling occurred perpendicular / vertical into the ground surface, the mineralisation targeted is the Toolebuc Oil Shale that contains Vanadium mineralisation, dipping at approximately 1-5 degrees from horizontal.</li> <li>The Competent Person considers that the drilling, sampling, hand-held Niton XRF spectrometer, or assay results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Diagrams</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>All QLD projects – appropriate plan view diagrams are shown in the announcement to display vanadium mineral prospectivity.</li> <li>The Competent Person considers that the drilling, sampling, assay results are appropriate for consideration of the mineralisation potential of the project. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Balanced</b>	<ul style="list-style-type: none"> <li>Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades</li> </ul>	<ul style="list-style-type: none"> <li>Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for</li> </ul>

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<b>reporting</b>	<i>and/or widths should be practiced to avoid misleading reporting of Exploration Results.</i>	<p>further details.</p> <ul style="list-style-type: none"> <li>• Spike, Cera &amp; Petrie projects – The currently available drillhole and subsequent sample/pXRF information were sourced from multiple historical tenure reports that include: 1) CR64271, 2) CR64273 &amp; 3) CR64276, 4) CR67931, 5) CR73656, 6) CR73657, 7) CR73676, 8) CR73739, 9) CR73746, 10) CR73748, &amp; 11) CR73758 Appropriate plan view diagrams are shown in the announcement to display vanadium mineral prospectivity. The geological data can be geologically modelled, the historical drillhole data &amp; any subsequent developed geological model &amp; would need to be thoroughly evaluated/interrogated, before consideration of any reporting of an exploration target or a mineral resource to the JORC (2012) Code.</li> <li>• Statistical Analysis of the lithology recorded for the approximately 1,890 pXRF values reveal the following (ignoring the zero value readings): <ul style="list-style-type: none"> <li>➢ Calcareous Mudstone V<sub>2</sub>O<sub>5</sub> pXRF values: 0.01 to 0.22%, average 0.04%</li> <li>➢ Coquinite V<sub>2</sub>O<sub>5</sub> pXRF values: 0.03 to 0.58%, average 0.17%</li> <li>➢ Limestone V<sub>2</sub>O<sub>5</sub> pXRF values: 0.02 to 0.58%, average 0.04%</li> <li>➢ Muddy Limestone V<sub>2</sub>O<sub>5</sub> pXRF values: 0.01 to 0.22%, average 0.40%</li> <li>➢ Mudstone V<sub>2</sub>O<sub>5</sub> pXRF values: 0.02 to 0.49%, average 0.06%</li> <li>➢ Soil V<sub>2</sub>O<sub>5</sub> pXRF values: 0.03 to 0.17%, average 0.06%</li> <li>➢ All Samples V<sub>2</sub>O<sub>5</sub> pXRF values: 0.01 to 0.58%, average 0.09%</li> </ul> </li> <li>• Statistical Analysis of the individual pXRF values that make up the two possible working sections in the aircore drilling: <ul style="list-style-type: none"> <li>➢ High grade V<sub>2</sub>O<sub>5</sub> pXRF 1,070 values: thickness of the working section in the aircore drilling ranges from 4 to 6m, with a weighted pXRF minimum of 0.10%, maximum of 0.49%, average of 0.25%</li> <li>➢ Lower grade V<sub>2</sub>O<sub>5</sub> pXRF values, in a coherent block immediately about the high grade working section, 823 pXRF values: thickness of the lower grade working section in the aircore drilling ranges from 0 to 3m, with a weighted pXRF minimum of 0.00% (for zero thickness), maximum of 0.31%, average of 0.11%</li> </ul> </li> <li>• No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Other substantive exploration</b>	<ul style="list-style-type: none"> <li>• <i>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</i></li> </ul>	<ul style="list-style-type: none"> <li>• Sharptooth project – historical drilling reported previously in the HDY ASX Release dated 19/07/2018, refer to that Announcement and Table 1 for further details.</li> <li>• Spike, Cera &amp; Petrie projects – Further lithological descriptions were</li> </ul>

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<b>data</b>	<i>method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.</i>	<p>provided during the geological mapping of the earlier reconnaissance stage.</p> <ul style="list-style-type: none"> <li>• The current announcement used two other forms of substantive exploration data:</li> <li>• 1) QLD – the Vanadium Mining Pty Ltd Geology Team generated an interpretation of the outcrop-subcrop zone and extents of Toolebuc formation at the edges of the Eromanga Basin, based on the following datasets: <ul style="list-style-type: none"> <li>➤ 1a) Ozimic, S. and Saxby, J.D., 1983. Oil Shale Methodology: An examination of the Toolebuc Formation and the laterally contiguous time equivalent units, Eromanga and Carpentaria Basins. Bureau of Mineral Resources and CSIRO research project;</li> <li>➤ 1b) Lewis, S.E., Henderson, R.A., Dickens, G.R., Shields, G.A., &amp; Coxhell, S., 2010. The geochemistry of primary and weathered oil shale and coquina across the Julia Creek vanadium deposit (Queensland, Australia). Miner Deposita 45: 599–620;</li> <li>➤ 1c) Smart, J., Grimes, K.G., Douth, H.F., &amp; Pinchin, J., 1980. The Mesozoic Carpentaria Basin and the Cainozoic Karumba Basin, North Queensland. Bulletin 202, Department of Natural Resources &amp; Energy, Bureau of Mineral Resources, Geology &amp; Geophysics. Australian Government Publishing Service, Canberra;</li> <li>➤ 1d) Coxhell, S., &amp; Fehlberg, B., 2000. Julia Creek Vanadium and Oil Shale Deposit. AIG Journal – Applied geoscientific research and practice in Australia; &amp;</li> <li>➤ 1e) MinesOnlineMap information publicly available from the QLD Department of Natural Resources and Mines, and the Geological Survey of Queensland.</li> </ul> </li> <li>• No drilling or sample results are reported in this announcement for the other Vanadium Mining Pty Ltd projects.</li> </ul>
<b>Further work</b>	<ul style="list-style-type: none"> <li>• <i>The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).</i></li> <li>• <i>Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.</i></li> </ul>	<ul style="list-style-type: none"> <li>• All Vanadium Mining Pty Ltd projects require technical evaluation to prioritize areas within the projects to focus mineral exploration efforts, to systematically explore for vanadium mineralisation.</li> <li>• Geological modelling of the QLD Vanadium Mining Pty Ltd projects.</li> </ul>

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