



26 November 2018

## Corporate Details

### Ordinary Shares:

792,144,996

### Market Capitalisation:

~\$150 million

### Cash and bullion at 30 September 2018:

\$17.8 million

### Debt:

\$10 million

ASX Code: MOY

## Board of Directors

Greg Bittar

Non-Executive Chairman

Bruno Lorenzon

Non-Executive Director

Tim Kennedy

Non-Executive Director

Peter Lester

Non-Executive Director

## Management

Peter Cash

Chief Executive Officer

Dean Will

Chief Operating Officer

Ray Parry

Chief Financial Officer and  
Company Secretary

## Contact Details

Unit 7, 140 Abernethy Road  
BELMONT WA 6104

### Telephone:

+ 61 (08) 9216 9011

### Facsimile:

+ 61 (08) 9481 0288

Email: [info@mmltd.com.au](mailto:info@mmltd.com.au)

### Website:

[millenniumminerals.com.au](http://millenniumminerals.com.au)

# Extensional drilling underway at Bartons Underground mine

## Program designed to upgrade Mineral Resources 100m below current workings, allow conversion to Ore Reserves and test high-grade depth extensions

- Major new drilling program has commenced from underground drilling platforms at the Bartons Underground mine.
- Drilling designed to upgrade the Mineral Resources and allow conversion to Ore Reserves.
- Deep exploration drill holes to be completed to test depth extensions 200m below the currently-defined mineralisation.
- Previously-reported deep intercepts from below the current Resource area include:
  - **41m @ 6.02g/t Au from 129m, incl. 2m @ 87.47g/t Au (BARD0285)**
- Drilling will also test a coincident electromagnetic and gravity anomaly representing a potential VMS base metal target located to the north-west of the current underground mine development.
- This base metals drilling is being co-funded by the Western Australian Department of Mines, Industry Regulation and Safety (DMIRS).
- Gravity survey over four key mining centres at Nullagine shows significant accumulations of gold mineralisation at the edges of gravity anomalies. This provides an important new exploration targeting tool for the Company.

Millennium Minerals Limited (ASX: MOY) ("**Millennium**" or the "**Company**") is pleased to advise that a major new round of resource in-fill and extensional drilling has commenced from newly-established underground drilling platforms at the Bartons deposit, part of its 100%-owned Nullagine Gold Project in Western Australia.

The Bartons Underground development has now been completed to the 225m level, with the drilling program designed to in-fill deeper portions of the Mineral Resources and allow conversion of the next five development levels into Ore Reserves.

With the underground resource remaining open at depth, the drilling will also test for extensions of the deposit to a depth of 200m below the currently-defined mineralisation.

Previously-reported deep intercepts below the current Mineral Resource include (see ASX Announcement 24 July 2017):

- 41m grading 6.02g/t Au from 129m, including 2m @ 87.47g/t Au (BARD0285)

An updated Mineral Resource and Ore Reserve estimate for Bartons Underground is expected to be included in the Company's December 2018 Mineral Resource and Ore Reserve statement, scheduled to be released in Q1 2019.

### **Potential VMS Target**

In addition to the resource in-fill and extensional drilling program at Bartons, Millennium will also undertake exploration drilling to target a prominent coincident electromagnetic (EM) and gravity anomaly located 350m to the north-west of the Bartons Underground mine (see Figures 1 - 3).

This EM conductor is highly anomalous within the broader Nullagine Project area, and could be associated with the stratigraphic or structural position of potential Volcanogenic Massive Sulphide (VMS) mineralisation.

While the Nullagine Project has never previously been thought to host volcanic rock units, recent mine development at Bartons Underground has confirmed the presence of bedding-parallel igneous rocks within the footwall. Confirmation of the presence of igneous rock units in close proximity to a coincident EM/gravity anomaly makes this a compelling exploration target for Millennium.

In August 2017, Millennium reported that drill hole BARD0233 at Bartons unexpectedly intersected a 3 metre down-hole zone of high-grade copper-lead-zinc-gold-silver mineralisation in association with elevated levels of other elements (see ASX Announcement 23 August 2017).

Optical mineralogy assessment of samples from the drill-hole revealed that the predominantly massive chalcopyrite and pyrite had textural similarities to VMS mineralisation.

Assay results from BARD0233 included:

- 3m @ 5.45% Cu, 8.52g/t Au, 141.4g/t Ag, 4.3% Zn and 0.6% Pb from 270m (down-hole) and 230m (vertical depth) including:
  - 1m @ 11.75% Cu, 15.70g/t Au, 238g/t Ag, 6.1% Zn and 0.6% Pb from 270m

Limited follow-up drilling and down-hole electromagnetic surveys at Bartons, failed to explain this highly anomalous intercept.

Millennium is currently undertaking geological work to identify and assess the favourable stratigraphic horizon for the development of VMS mineralisation at Bartons.

The VMS exploration program is being supported by specialist base metals consultant, Jon Hronsky, and is being co-funded by a West Australian Department of Mines, Industry Regulation and Safety (DMIRS) Exploration Incentive Scheme grant of up to \$150,000.

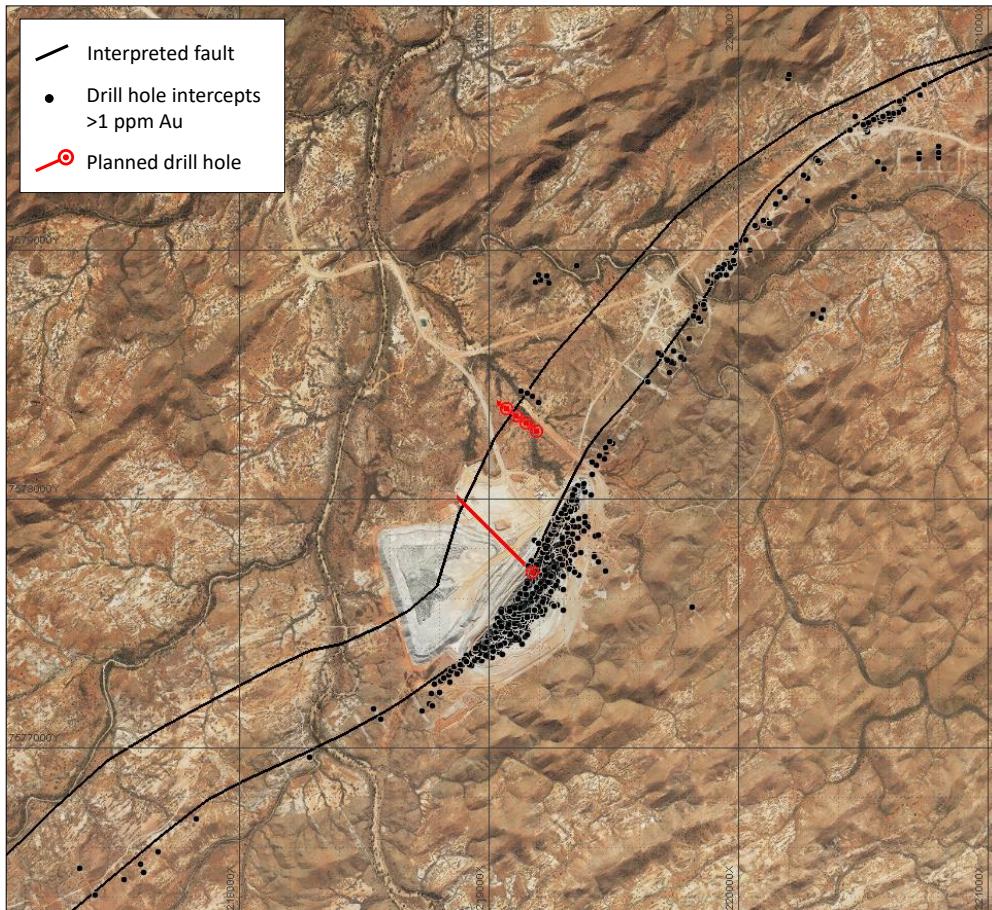


Figure 1: Bartons plan view showing planned exploration drill hole (in pink).

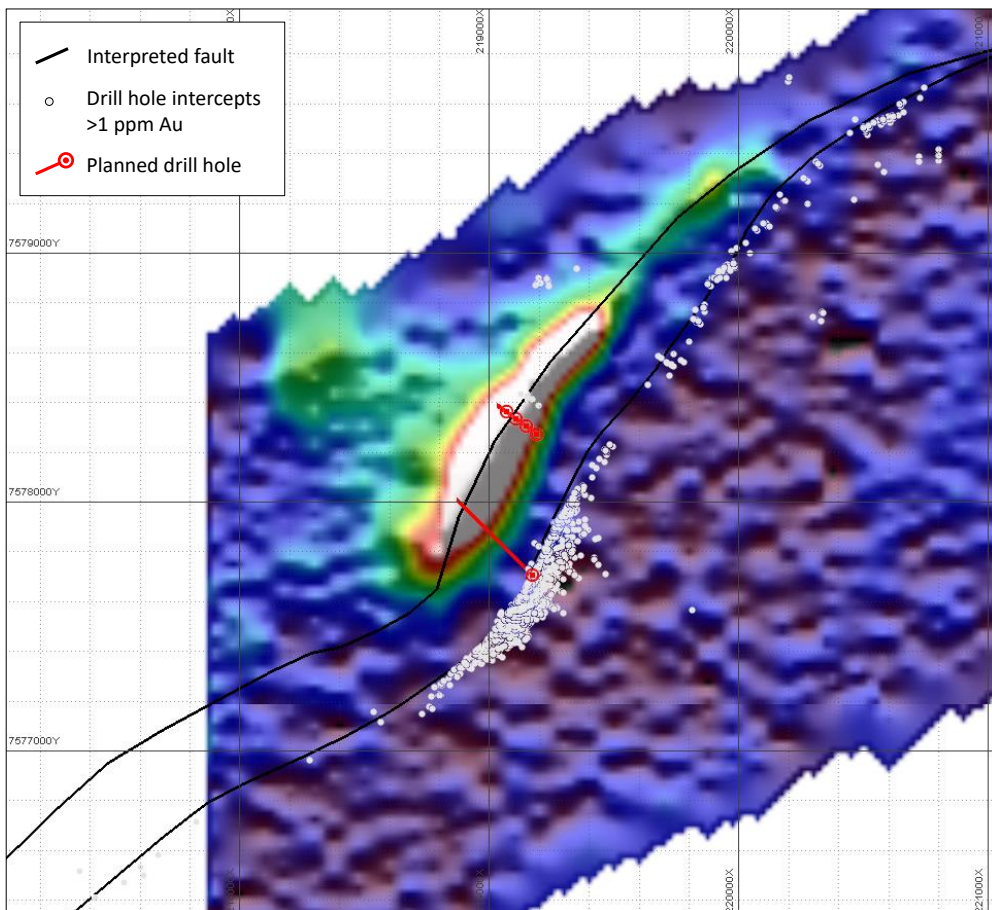
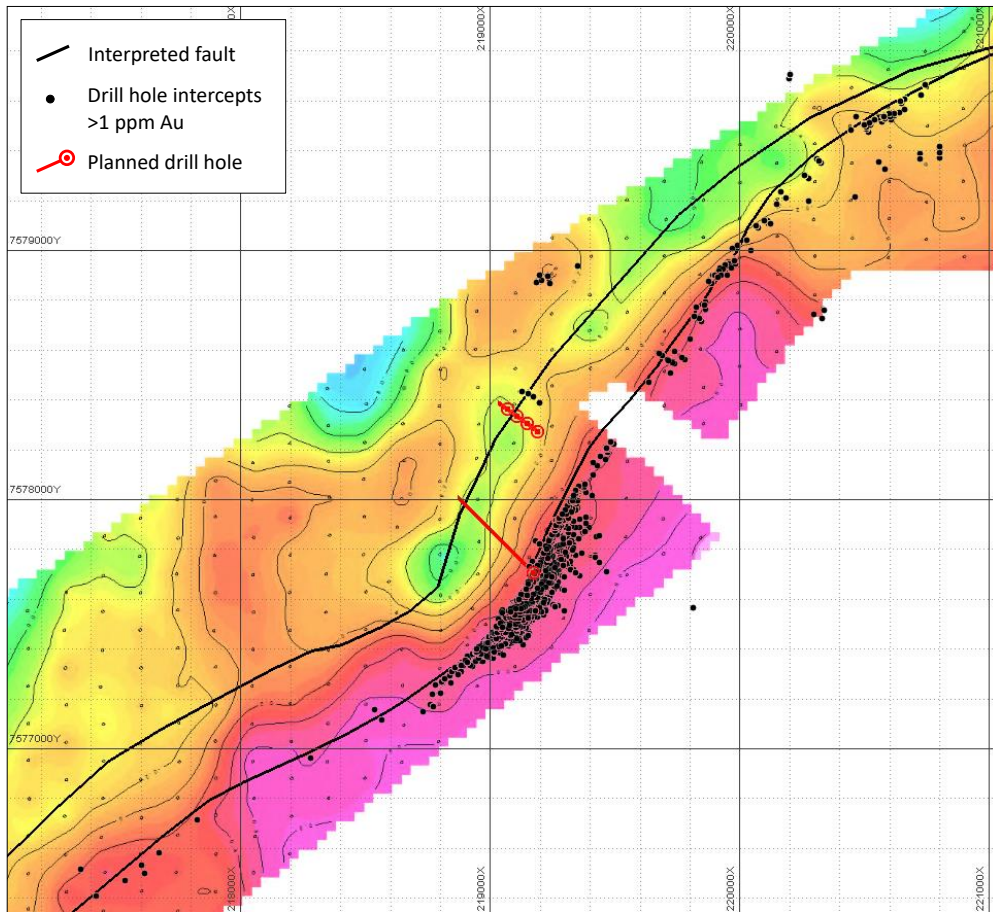


Figure 2: Bartons plan view showing planned exploration drill hole targeting the EM anomaly.





**Figure 3: Bartons plan view showing planned exploration drill hole targeting gravity low coincident with EM anomaly.**

## Gravity Survey

The Company is also pleased to report preliminary results from a recently completed gravity survey over the Golden Eagle, Five Mile, Middle Creek and Camel Creek Mining Centres at Nullagine.

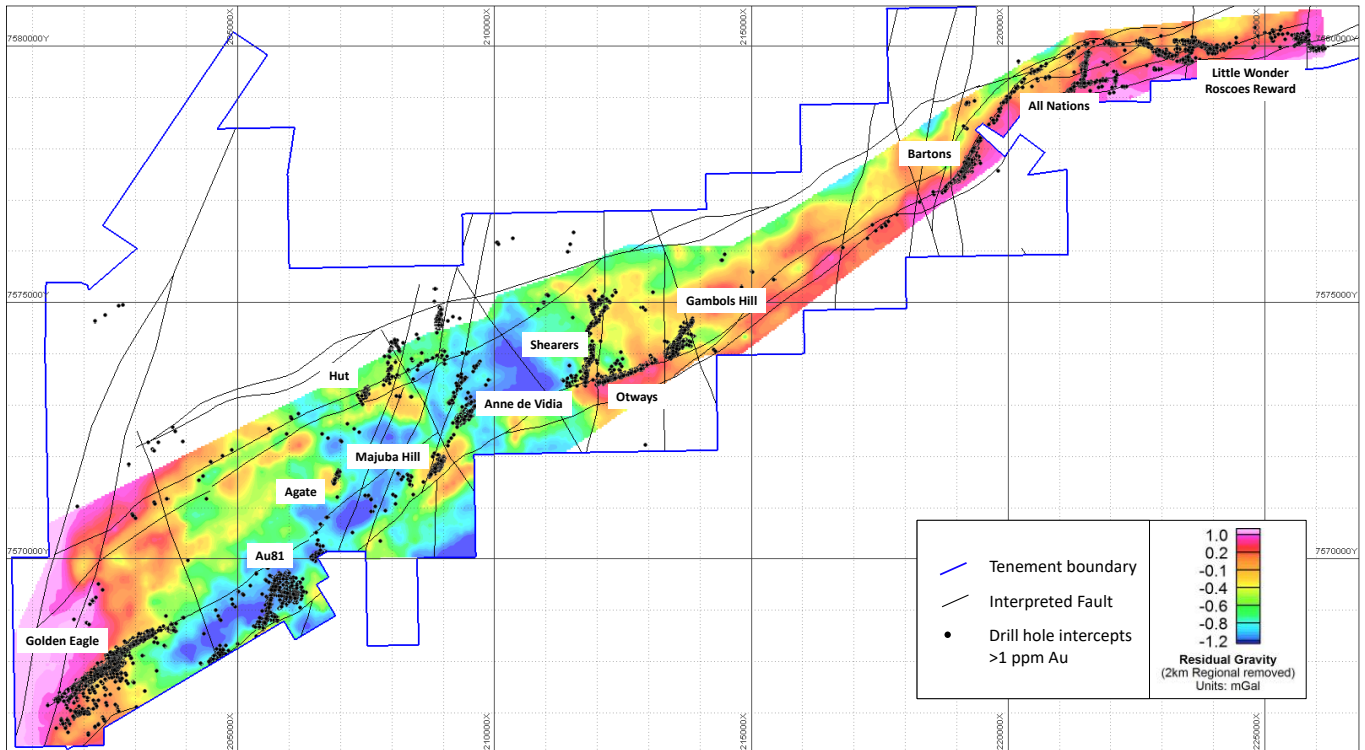
The gravity survey has significantly enhanced Millennium’s understanding of the controls over gold mineralisation in the district, showing that mineralisation across the project area is strongly coincident with the edges of gravity anomalies (see Figure 4 below).

The results provide Millennium with an important new dataset to assist with exploration targeting.

Exploration at Nullagine has historically focused on geochemical anomalies. However, the gravity data shows a compelling correlation with the gold mineralisation discovered at Nullagine to date.

A number of distinct gravity features have been identified in areas that have not previously been tested by drilling. Several of these features are located beneath cover, in areas where surface geochemical anomalism may not be present.

In light of these compelling results, drill programs are now being planned to test the most prospective gravity targets for gold mineralisation.



**Figure 4: Gravity survey data overlaid with >1g/t Au drill intercepts**

## Management Comment

Millennium Chief Executive Peter Cash said that both the deep drilling at Bartons and the gravity survey results represented exciting new growth opportunities for the Company.

“We have been eagerly awaiting the opportunity to get the underground drill rigs underway at Bartons to really test the depth potential of this deposit,” he said.

“All the results to date indicate the high-grade mineralisation extends well below the current Mineral Resources, and the underground drill platforms we now have in place will allow us to cost-effectively test the deeper underground mining potential.

“Results from this drilling will underpin an updated Mineral Resource and Ore Reserve estimate for Bartons, which we expect to announce early next year.

“In addition, we also have a unique opportunity to use the underground platforms at Bartons to test a highly anomalous EM target that could possibly represent a base metals accumulation. This is a genuine wildcat target – we haven’t seen anything else like it at Nullagine – so we are very keen to see what the results show. All going well, we expect to have assays from this hole early in the New Year.

“Outside of our drilling programs, results from the recent gravity survey have given us a new insight into the structural architecture at Nullagine, indicating that gradients in the gravity data may be important targeting for gold mineralisation,” he continued.

“We are now working through these targets – a number of which are in areas that have never previously been tested – to determine priority targets for future drilling.”

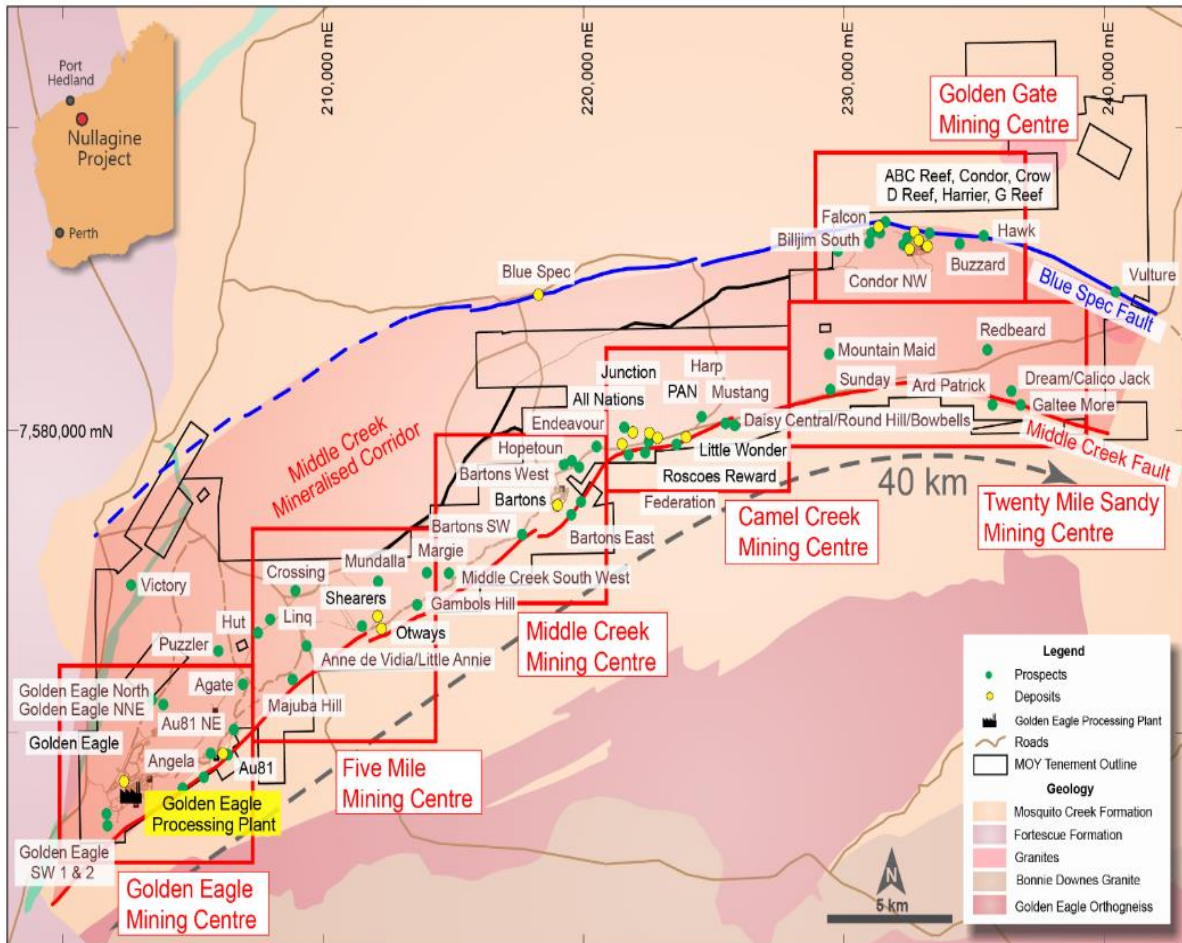


Figure 5: Nullagine Project Location Plan over regional geology

**ENDS**

**For further information:**

**Millennium Minerals Limited:**

**Peter Cash**  
**Chief Executive Officer**  
**+61 8 9216 9011**

**For media inquiries:**

**Kate Bell / Nicholas Read**  
**Read Corporate**  
**+61 8 9388 1474**

### **Competent Persons Statements – Exploration Results**

The information in this report that relates to Exploration Results is based on information compiled by Mr James Farrell (MAusIMM(CP), MAIG), a geologist employed full-time by Millennium Minerals Limited. Mr Farrell is a Member and Chartered Professional of the Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to this style of mineralisation and type of deposit under consideration and to the activity that is being reported on 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 Farrell consents to the inclusion in the report of the matters in the form and context in which it appears.

**JORC 2012 Edition - Table 1**

Section 1 Sampling Techniques and Data

Criteria	JORC Code Explanation	Commentary
<b>Sampling techniques</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Include reference to measures taken to ensure sample representatively and the appropriate calibration of any measurement tools or systems used.</li> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• No drilling and sampling results are included in this report.</li> </ul>
<b>Drilling techniques</b>	<ul style="list-style-type: none"> <li>• 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).</li> </ul>	<ul style="list-style-type: none"> <li>• No drilling and sampling results are included in this report.</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>• No drilling and sampling results are included in this report.</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>• No drilling and sampling results are included in this report.</li> </ul>



Criteria	JORC Code Explanation	Commentary
<b>Sub-sampling techniques and sample preparation</b>	<ul style="list-style-type: none"> <li>• <i>If core, whether cut or sawn and whether quarter, half or all core taken.</i></li> <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>	<ul style="list-style-type: none"> <li>• <i>No drilling and sampling results are included in this report.</i></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 (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>The ground gravity survey was completed using a Scintrex CG-5 digital automated gravity meter on a staggered 150m by 150m grid.</i></li> <li>• <i>The gravity meter was calibrated both pre and post survey using the Geoscience Australia calibration range at Helena Valley, Western Australia.</i></li> <li>• <i>A minimum of two readings were taken at each station location and the results compared to mitigate any potential impact of environmental conditions.</i></li> <li>• <i>3% of all readings were repeats.</i></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> <li>• <i>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</i></li> <li>• <i>Discuss any adjustment to assay data.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>No drilling and sampling results are included in this report.</i></li> </ul>
<b>Location of data points</b>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> <li>• <i>Specification of the grid system used.</i></li> <li>• <i>Quality and adequacy of topographic control.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Gravity stations locations were surveyed with a Real Time Kinematic (RTK) DGPS to a <math>\pm 10</math> mm positional precision.</i></li> </ul>
<b>Data spacing and distribution</b>	<ul style="list-style-type: none"> <li>• <i>Data spacing for reporting of Exploration Results.</i></li> <li>• <i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>No drilling and sampling results are included in this report.</i></li> </ul>



Criteria	JORC Code Explanation	Commentary
	<ul style="list-style-type: none"> <li>Whether sample compositing has been applied.</li> </ul>	
<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 and sampling results are included in this report.</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>No sampling results are included in this report.</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 reviews.</li> </ul>	<ul style="list-style-type: none"> <li>No new drilling and sampling results are included in this report. Internal lab audits conducted by Millennium have shown no material issues with results previously reported.</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 settings.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>All the deposits and prospects lie within fully granted Mining Leases within the Pilbara Gold Field (46), as detailed below. All the tenements are in good standing with no known impediments.</li> <li>Agate<sup>^+</sup> - M46/265 (100% Millennium)</li> <li>All Nations* -M46/98<sup>+</sup>, M46/199<sup>+</sup>, &amp; M46/442<sup>@</sup> (100% Millennium);</li> <li>Anne de Vidia<sup>^+</sup>- M46/262 (100% Millennium);</li> <li>Angela<sup>^+</sup> - M46/186 (100% Millennium);</li> <li>Au81<sup>^</sup> -M46/138<sup>#</sup> (100% Millennium);</li> <li>Au81 West<sup>^</sup> -M46/443<sup>+</sup> (100% Millennium);</li> <li>Bartons* -M46/3, M46/164 &amp; M46/441 (100% Millennium);</li> <li>Bow Bells*<sup>@</sup> - M46/166 (100% Millennium);</li> <li>Crossing<sup>^**</sup> - M46/266 (100% Millennium);</li> <li>Gambols Hill<sup>**</sup> - M46/261 (100% Millennium);</li> <li>Golden Eagle<sup>^+</sup> - M46/186, M46/267 &amp; M46/300 (100% Millennium);</li> <li>Hopetoun – Endeavour*<sup>@</sup> - M46/57 &amp; M46/442 (100% Millennium);</li> <li>Hut<sup>^+</sup> - M46/265 &amp; M46/266 (100% Millennium);</li> <li>Junction*<sup>@</sup> - M46/442 (100% Millennium);</li> <li>Little Annie*<sup>^+</sup> - M46/265 &amp; M46/266 (100% Millennium)</li> <li>Little Wonder* -M46/146<sup>+</sup>, M46/198<sup>+</sup> &amp; M46/166<sup>@</sup> (100% Millennium);</li> <li>Majuba Hill<sup>^+</sup> - M46/192 &amp; M46/445 (100% Millennium);</li> <li>Mundalla* - M46/50 &amp; M46/445<sup>+</sup> (100% Millennium);</li> <li>Mustang*<sup>@</sup> - M46/166 (100% Millennium);</li> <li>Otways*<sup>+</sup> - M46/262 (100% Millennium);</li> <li>Roscoes Reward*<sup>@</sup> - M46/166 and M46/442(100% Millennium);</li> <li>Round Hill*<sup>@</sup> - M46/166 (100% Millennium)</li> <li>Shearers*<sup>+</sup> - M46/261 &amp; M46/262 (100% Millennium);</li> <li>Shearers North* - M46/50 &amp; M46/262<sup>+</sup> (100% Millennium).</li> </ul> <p><sup>^</sup> These tenements are located within the Palyku title claim (WC99/16).  <sup>*</sup>These tenements are located within the Njamal title claim (WC99/8).  <sup>+</sup> A \$10/oz royalty payable to Tyson Resources Pty Ltd.</p>

Criteria	JORC Code Explanation	Commentary
		<p>@ Little Wonder (M46/166), Round Hill (M46/166), Junction (M46/442) and Roscoes Reward (M46/166 and M46/442) gross revenue royalty of 6.44% payable to Royalty Stream Investments (WA Gold) Pty Ltd for up to 20koz then it reverts to 1.5% rate for gold mined beyond 20koz ;</p> <ul style="list-style-type: none"> <li># 2.5% of revenue payable to Wakeford Holding Pty Ltd.</li> </ul>
<b>Exploration done by other parties</b>	<ul style="list-style-type: none"> <li>Acknowledgment and appraisal of exploration by other parties.</li> </ul>	<ul style="list-style-type: none"> <li>Millennium has reviewed exploration undertaken by other parties at Nullagine. Previous work has not assessed exploration targets similar to those described in this announcement.</li> </ul>
<b>Geology</b>	<ul style="list-style-type: none"> <li>Deposit type, geological setting and style of mineralisation.</li> </ul>	<ul style="list-style-type: none"> <li>The Nullagine Gold Project deposits are structurally controlled, sediment-hosted, lode gold style deposits. They are all situated in the Mosquito Creek Basin that consists predominantly of Archean aged, turbidite sequences of sandstone, siltstone, shale and minor conglomerate units.</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 metres) 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>No new drilling and sampling results are included in this report.</li> </ul>
<b>Data aggregation methods</b>	<ul style="list-style-type: none"> <li>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.</li> <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>	<ul style="list-style-type: none"> <li>No new drilling and sampling results are included in this report.</li> </ul>



Criteria	JORC Code Explanation	Commentary
<b>Relationship between mineralisation widths and intercept lengths</b>	<ul style="list-style-type: none"> <li>• <i>These relationships are particularly important in the reporting of Exploration Results.</i></li> <li>• <i>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</i></li> <li>• <i>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’).</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>No new drilling and sampling results are included in this report.</i></li> </ul>
<b>Diagrams</b>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Representative maps have been included in the report along with documentation.</i></li> </ul>
<b>Balanced reporting</b>	<ul style="list-style-type: none"> <li>• <i>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.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>All of the drill results have been reported for the project. No new results are included in this report.</i></li> </ul>
<b>Other substantive exploration data</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 method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Outcrops of quartz veins have been previously mapped at Golden Eagle. Mineralisation is primarily associated with a combination of quartz veining, shearing, strong sericite alteration and strong limonite staining or pyrite-arsenopyrite content.</i></li> <li>• <i>The electromagnetic survey was completed in 2004 using the airborne HoistEM system. The survey was completed on nominally 100m spaced north-south oriented flight lines.</i></li> <li>• <i>The ground gravity survey was completed using a Scintrex CG-5 digital automated gravity meter on a staggered 150m by 150m grid.</i></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>• <i>Drilling is currently being planned to test targets identified from the gravity survey.</i></li> <li>• <i>Target generation work for VMS style mineralisation is on-going and includes sampling to assess fertility and mapping of the potential VMS mineralisation stratigraphic position.</i></li> </ul>