TENTH ANNUAL REPORT OF THE INDEPENDENT MONITORING PANEL FOR THE COWAL GOLD PROJECT – OCTOBER 2014

INTRODUCTION

The Independent Monitoring Panel (IMP) was established in accordance with condition 8.8(b) of the Development Consent for the Cowal Gold Project. The members of the IMP are:

- Emeritus Professor L Clive Bell, University of Queensland; former Executive Director, Australian Centre for Minerals Extension and Research (ACMER)
- Dr Craig Miller, Environmental Scientist, CTM Consulting (Qld)
- a NSW Department of Planning and Infrastructure representative

The IMP was established under the Development Consent to:

- provide an overview of the independent audits required under condition 8.8(a) of the Development Consent;
- regularly review all environmental monitoring procedures undertaken by the Applicant and monitoring results; and
- provide an Annual Statement of the Environment Report for Lake Cowal with particular reference to the ongoing interaction between the mine and the lake and any requirements of the Director-General.

The Director-General (Planning & Infrastructure) has not specified any requirements under condition 8.8(b)(ii) for the preparation of this report. This report covers site activities and environmental monitoring information provided to the IMP in the 2013 Annual Environmental Management Report (AEMR). The latter report was sent to the IMP on 12 August 2014 and covers the period 23 December 2012 to 22 December 2013.

This 2014 IMP Report includes the review of the Independent Environmental Audit Report (May 2014), prepared by Trevor Brown and Associates, for the 1-year period from April 2013 to April 2014 (Appendix 1), the most recent year being the eighth 12 months of operation. This audit was undertaken over the period from 28 April to 2 May 2014. The IMP also assessed additional material provided by Barrick Australia Ltd in the reports listed in Appendix 2.

The independent environmental auditors reviewed the available documentation covering (1) the implementation of the requirements of the development consent conditions (2) licenses and (3) approvals granted by Government for the project, as well as the environmental monitoring documentation held by Barrick at the mine site office in order to verify compliance with the conditions of approval.

As mentioned in previous IMP reports, the independent environmental auditors established a logical framework for verifying compliance by setting out the entire list of requirements, in the separate management plans that have been prepared by Barrick, that cover environmental management under the Minister's Conditions of Approval. These separate plans include:

- Indigenous Archaeology and Cultural Heritage Management Plan

- Heritage Management Plan
- Flora and Fauna Management Plan
- Erosion and Sediment Control Management Plan
- Soil Stripping Management Plan
- Rehabilitation and Offset Management Plan (submitted 2010 but not yet approved)
- Bushfire Management Plan
- Land Management Plan
- Compensatory Wetland Management Plan
- Site Water Management Plan
- Cyanide Management Plan
- Hazardous Waste and Chemical Management Plan
- Dust Management Plan
- Blast Management Plan
- Noise Management Plan
- Traffic Management Plan

The compliance by Barrick against the requirements of the above-listed plans was assessed by the Independent Environmental Auditors, and comments were made against those approval conditions that had been activated. The scope of the Independent Environmental Audit dated May 2014 included the following components:

- review of the implementation of the requirements of the development consent conditions, licences and approvals for the project for the operation of the mine and process plant;
- conduct of site inspections and review of on-site documentation and monitoring data relevant to the compliance audit;
- hold discussions with project staff in relation to the development consent conditions;
- assessment of compliance of the project with the development consent conditions; and
- preparation of an Independent Environmental Audit Report providing assessment of compliance against each consent condition.

The IMP has reviewed the reporting process used in the Independent Environmental Audit Report of May 2014. The IMP was easily able to assess and verify the status of environmental management information at the site and the general compliance with development consent conditions, licences and approvals granted to Barrick, as reported by the independent environmental auditors. Overall, it is a well-structured and informative report prepared in accordance with the NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS (DRE)) Guidelines and Format for the Preparation of an Annual Environmental Management Report (DTIRIS 2006) and in consultation with relevant stakeholders.

The Independent Environmental Auditors (aemc) drew the following conclusion in their April 2014 report (p.86) :

The audit findings confirm an overall high standard of general compliance with the Minister's Conditions of Approval, Environmental Protection Licence and requirements of the environmental conditions attached to the Mining Lease 1535.

Overall the IMP concurs with this assessment based upon its review of all available documents, and the site visit on 10 and 11 September 2014. Specific areas for possible improvement are considered below.

REVIEW OF CGM'S RESPONSE TO THE 2013 IMP REPORT

The IMP made four recommendations in the 2013 IMP Report concerning environmental monitoring procedures sent to the Department of Planning and Infrastructure on 9 October 2013. The department forwarded this report to the Cowal Gold Mine (CGM), and this was received on 2 June 2014. These recommendations are assessed below in terms of adequacy of the response by CGM on 4 September 2014 to the department, and new recommendations are made where required.

> **2013 IMP Recommendation 1:** *CGM should complete the layout and planting of the Northern Waste Emplacement Trials as soon as possible and ensure that appropriate native species are included as direct seeded, tube stock, or fascine treatments.*

In response to the above recommendation, CGM replied -

"Barrick, with DnA Environmental, has finalised the design for the Northern Waste Rock Emplacement Trial and implementation of the trial (growth medium placement and planting) has now been completed. The design/layout of the trial is shown in Enclosure 1. The current draft of DnA Environmental's report, *Northern Waste Rock Emplacement Rehabilitation Trials (February 2014)*, details the specific native tree and shrub species recommended to be tested in the trial (and provides a list of species recommended as suitable for revegetation of the CGM waste rock emplacements).

Barrick sourced the recommended tubestock species for the trial from Jayfields Nursery (a nursery recommended by Greening Australia representatives). However it should be noted that given *Senna artemisiodes subsp*. was unavailable, DnA Environmental recommended *Acacia decora* (Western Golden Wattle) as a suitable replacement species for inclusion in the trial.

To minimise complexity of the trial, the revised trial design proposes to assess the performance of selected tubestock species only (i.e. the trial will no longer involve direct seeded plots) (DnA Environmental, 2014). Monitoring of the Northern Waste Rock Emplacement Trial will be conducted in accordance with the methodology detailed in DnA Environmental's (2014) draft report. A copy of DnA Environmental's draft report is provided in Enclosure 2.

Following planting of the Northern Waste Rock Emplacement Trial, approximately 12 hectares of the inner batters of the Perimeter Waste Rock Emplacement is proposed to be direct seeded in late 2014/early 2015 (subject to suitable conditions prevailing) using a seed mix developed from DnA Environmental's recommended revegetation species list for the waste rock emplacements. Monitoring of the direct seeded area will be conducted in accordance with the CGM's existing rehabilitation monitoring programme methodology to assess germination performance and plant growth development.
Regarding the use of fascine treatments at the CGM to assist with erosion control on final landform slopes. Based on the results of numerous rehabilitation trials conducted to date, the most successful method in stabilising the slope and the surface cover materials was to apply a layer of rock mulch (approximately 300 millimetres [mm] deep) and topsoil on the waste rock surface which is cross-ripped along the contour of the slope to create a series of troughs and banks followed by the placement of hay and establishment of a cover crop. Other methods trialled, such as rock ribbons and belts or clumps of straw hay (which are similar concepts to fascine treatments), resulted in sedimentation above the rock ribbon and increased erosion downslope from the rock

ribbon and suppressed vegetation growth on slopes including the straw hay treatment. Based on these results, these treatments were not pursued further at the CGM."

2014 IMP Assessment 1:
The IMP noted that CGM had moved forward with the design and planting of the Northern Waste Rock Emplacement Trials, and it was able to view the trials during the site visit. It was noted that, to reduce the complexity of the trial, direct-seeded plots were deleted. While this was of concern, the IMP believes the commitment to direct seed (and monitor) approximately 12 ha of the inner batters of the Perimeter Waste Rock Emplacement in late 2014/early 2015 should provide a good test of the efficacy of this revegetation technique.

> **2013 IMP Recommendation 2:** *CGM will need to plan well ahead for collection of native pasture hay and native shrub and tree seed or fascines sufficient to meet the needs of large-scale rehabilitation.*

In response to this recommendation, CGM replied -

"In May 2014, Barrick engaged Greening Australia to assist with the development of a long-term seed and tubestock supply strategy for the CGM's on-site rehabilitation programme and for the CGM's offset revegetation and enhancement programme. Greening Australia's strategy would address propagation methods, site preparation and planting procedures and post-planting maintenance measures. Greening Australia's draft strategy is expected to be available for Barrick review by November 2014.

Barrick will continue to work with specialist local contractors for the long-term supply of locally produced native pasture hay for use in the CGM's rehabilitation programme."

2014 IMP Assessment 2:
Enlistment of Greening Australia's input in this area is to be commended and should provide complementary support to that available from local contractors.

> **2013 IMP Recommendation 3:** *CGM should continue to monitor existing rehabilitation trials (and those planned for 2013) with a view to better define its approach to achieving sustainable, post-mining landscapes. Sampling and monitoring should be such as to provide more information on the benefits or otherwise of subsoil as a component of the root zone.*

In response to this recommendation, CGM replied -

"Barrick will continue to monitor existing rehabilitation trials (and future rehabilitation trials) to determine appropriate depths of cover/plant growth media that assist to achieve CGM rehabilitation objectives.

With regard to the measures being undertaken to determine the benefits or otherwise of subsoil as a component of the plant root zone, Barrick has undertaken the following:

- engaged DnA Environmental to design a 'substrate profile' trial which aims to replicate the proposed cover systems for the top surfaces of the CGM waste rock emplacement and tailings storage facilities (of which subsoil is component);

- engaged DnA Environmental to undertake additional plant root growth assessments of tubestock planted directly in substrates including oxide waste, subsoil and topsoil in the Southern Waste Rock Emplacement Trial area to increase the sampling size and data set from the assessment conducted in November 2012; and
- engaged McKenzie Soil Management to characterise all soil resources (subsoil and topsoil) stockpiled at the CGM and develop measures to improve the suitability of the soil resources for re-use in the rehabilitation programme.

A summary of these measures is provided below.

Substrate Profile Trial

Given the CGM tailings storage facilities and waste rock emplacements are operational and dynamic landforms, the opportunity to implement rehabilitation trials on the top surfaces of these landforms is currently unavailable. The proposed substrate profile trial will involve placing large boxes (approximately 1 m x 1 m wide and 2 m high) proximal to the waste rock emplacements and tailings storage facilities which include various depths of substrate materials including tailings, waste rock, subsoil and topsoil. Select native tree and shrub species would be planted in the substrate treatments and the trial monitored to assess plant growth, with root system development analysed at the completion of the trial.

Barrick is currently finalising the trial design with DnA Environmental and it is anticipated the waste rock emplacement component of the trial will commence (i.e. trial boxes filled and planted) in October 2014 (subject to suitable conditions). The current draft of the Substrate Profile Trial Design report is provided in Enclosure 3.

Plant Root Growth Assessment

In November 2012, DnA Environmental excavated the soil around four (2 year old) tubestock planted in the Southern Waste Rock Emplacement Trial area to assess plant root growth. To increase the data set and confirm the results from the November 2012 assessment, additional plant root growth assessments of tubestock in the Southern

Waste Rock Emplacement Trial area are proposed.

The additional assessments are proposed to be conducted in November 2014 (consistent with the timing of the previous assessments).

Characterisation of CGM Soil Resources

As described in the 2012 Annual Environmental Management Report (AEMR) and discussed with the IMP during their site visit in September 2013, Barrick engaged McKenzie Soil Management in 2012 to characterise the CGM's soil resources and assess their suitability as a plant growth medium. Given some subsoil and topsoil stockpiles were unable to be accessed during the 2012/2013 soil stockpile characterisation programme, McKenzie Soil Management will be engaged to sample and assess these remaining stocks and any new soil stocks stripped from disturbance areas associated with the CGM Extension Modification Project (once approved by the NSW Department of Planning and Environment). Characterisation of these soil stocks

will inform the measures (if required) to improve the soil for plant growth and for use in the CGM's rehabilitation programme (e.g. rates of gypsum application).

Further to the above, Barrick will continue to liaise with McKenzie Soil Management regarding the detailed design of a soil amelioration farm to treat strongly sodic and dispersive soil stocks with gypsum."

2014 IMP Assessment 3:
The IMP notes that CGM has taken three specific actions to better define the benefits or otherwise of saved subsoil as a component of the root zone, viz. (1) additional root growth assessments of tubestock previously planted into plots of the Southern Waste Rock Emplacement Trial, (2) design of a substrate trial in large boxes and (3) engagement of a soil science consultant to characterise all topsoil and subsoil resources stockpiled at the mine. The first two actions should give a clearer indication of the plant growth properties of the subsoil.

CGM is to be commended for commissioning the report on Soil Stockpile Characterisation Assessment by McKenzie Soil Management (in conjunction with Carnegie Natives Pty Ltd). The report is comprehensive and now fulfils Recommendation 1 made by the IMP in its 2011 report. Information in the soil report will allow CGM to more accurately (1) assess its usable soil resources and (2) determine the gypsum requirements for each of the different soil resources.

> **2013 IMP Recommendation 4:** *CGM should continue with its efforts to improve the process of dust sample preparation and metal analysis (including liaising with the University of Sydney where necessary) to ensure valid results.*

In response to this recommendation, CGM replied -

"Barrick will continue to the conduct additional dust sampling and analysis procedures (as described in the 2012 AEMR and in Barrick's response to the IMP's 2012 Report) to improve the process of dust sample preparation and metals analysis. These measures will involve:

- continuing to collect depositional dust samples at three monthly intervals from five replicate dust gauges located immediately adjacent to existing dust gauges DG1, DG3, DG4, DG5 and DG13 for comparison to results from depositional dust samples collected monthly from the existing dust gauges;
- continuing to dispatch duplicate dust samples at random to two independent laboratories (ALS and NMI) for metals analysis to review/compare the procedures, sensitivities, sample size thresholds and results provided by each laboratory;
- continuing to engage Dr Cattle from the University of Sydney to analyse the results from the CGM's existing dust monitoring programme and the replicate dust gauge samples; and
- reporting all dust monitoring programme results in the CGM's AEMR."

2014 IMP Assessment 4:

The IPM is satisfied with these measures.

Relevant Additional Issue Identified by the IMP from the 2012 AEMR and Mine Site Visit

The IMP noted the following regarding localised erosion:

> *The IMP observed localised areas of deep tunnel erosion due to incorrect placement and management of dispersive subsoils. The IMP notes the need to ensure that mine planners are trained to allocate and manage dispersive soil material appropriately. The IMP also notes that MineStar should always be used to guide soil placement.*
>
> In response, CGM replied -

"Barrick notes that the areas of localised deep tunnel erosion referred to by the IMP predominantly occurred on the inner batters of the Perimeter Waste Rock Emplacement and on the lower outer batters of the Southern Waste Rock Emplacement (at its southern and eastern extent). Erosion of these areas is considered to be a result of using dispersive soils during early preliminary rehabilitation activities at the CGM when optimal gypsum treatment rates used in rehabilitation works had not yet been determined. Furthermore, at that point in time, it was not yet standard practice to apply rock mulch to landform slopes to assist stabilisation of the slope and the rehabilitation cover materials.

As a part of planned rehabilitation works which commenced in late 2013, Barrick has since re-worked the southern and eastern lower outer batters of the Southern Waste Rock Emplacement and the lower batters of the Lake Protection Bund including backfilling and remediating the areas of erosion. Re-working/re-shaping of approximately 12 ha of the inner batters of the Perimeter Waste Rock Emplacement commenced in August 2014, with completion of rehabilitation activities (e.g. placement of cover materials and seeding) proposed to occur during late 2014 to early 2015 (subject to suitable conditions).

Consistent with Barrick's current cover system concept for the CGM's final landform slopes (which has been based on the results of various rehabilitation trials conducted to date) (Barrick, 2013), the following rehabilitation works have or will be completed for the areas described above:

- backfilling eroded areas with waste rock and re-shaping the area (using MineStar equipped fleet);
- applying gypsum at a rate of 10 tonne per hectare (t/ha) to oxide waste rock surfaces (prior to the application of surface cover materials);
- applying a layer of primary waste rock mulch approximately 300 millimetres (mm) deep;
- applying a layer of topsoil over the primary rock mulch approximately 250 mm deep;

- cross-ripping the materials along the contour of the slope (to create troughs and banks) with application of a further 10 t/ha of gypsum to the topsoil layer; and
- placing a layer of native pasture hay approximately 5 cm deep on the northern and western aspects of the landform slopes.

In addition to these rehabilitation works, Barrick staff will continue to use McKenzie Soil Management's (2013) *Cowal Gold Mine Soil Stockpile Characterisation Assessment* report (and any future addenda) to guide management and amelioration of the CGM's subsoil and topsoil resources."

2014 IMP Assessment 5:
During the site visit by members of the IMP, it was noted that, since the 2013 site visit, considerable reworking and reseeding of eroded areas had been undertaken using appropriate techniques including rock mulch.

The IMP notes the details of the current preferred rehabilitation approach which has evolved from assessment of the various trials across the mine site and which includes higher rates of gypsum to reduce dispersion of oxide and replaced soil.

The IMP also notes that care must be taken when planting tubestock to ensure that the root mass is planted into substrate. We observed instances where the root mass was suspended in the hay mulch, possibly due to the speed of planting; these seedlings will die. More care is required in the balance between speed of planting and effectiveness of planting.

> **2014 IMP Recommendation 1:** CGM should continue to monitor all existing rehabilitation trials and those to be established in 2014/2015 (direct- seeded native species areas) with a view to continually refine its approach to achieving large-scale sustainable rehabilitation. Particular attention should be paid to the landform design, rehabilitation materials, rehabilitation cover system and revegetation concepts defined in the 2014 CGM Rehabilitation Risk Assessment (draft of May 2014).

ADDITIONAL ISSUES IDENTIFIED BY THE IMP IN THE 2013 AEMR AND 2014 INDEPENDENT ENVIRONMENTAL AUDIT AND SITE VISIT

Dust Monitoring Results
In Appendix B of the 2013 AEMR, some of the maximum and minimum values listed in the tables are incorrect. This issue should be checked in the 2014 AEMR.

Rehabilitation Risk – El Nino

The Bureau of Meteorology's ENSO Tracker indicates there is at least a 50% chance of El Niño developing over the coming months, and this is double the long-term likelihood for the southern summer (2014/15).

El Niño is associated with below-average rainfall and above-average daytime temperatures in the CGM region. Rehabilitation plantings are likely to be subject to significant water stress and there may be increased mortality

Deep watering of tubestock will be required to ensure that the seedlings establish their roots into the substrate after planting and that they can survive through the projected hot dry summer. Monitoring of plant available water in the root zone may be required in the following growing season/s to determine whether supplementary watering is

required to ensure survival and growth until seedlings and saplings have become self-sustaining.

> **2014 IMP Recommendation 2:** That watering continue over summer until seedlings have established their roots, and that plant available water in the soil be monitored to guide watering if above average dry conditions continue

ANNUAL STATE OF THE ENVIRONMENT REPORT FOR LAKE COWAL

An unintended but positive consequence of the establishment of a Temporary Isolation Bund (TIB) around the perimeter waste rock emplacement is the natural increase in native species and habitat development. For example, there has been significant recruitment of river red gum (*Eucalyptus camaldulensis*) along the edges of the TIB following the filling and subsequent emptying of Lake Cowal. These trees are a natural feature of the riparian zone of other parts of the lake. When grown they have the potential to provide significant habitat for native biodiversity, as well as ongoing protection for the toe of the perimeter waste rock emplacement. Similarly, an ephemeral wetland has developed behind the TIB and is providing feeding and breeding habitat for a number of native species.

A potential threat to these biodiversity values is the commitment made to increase the height of the bund by 0.5m, following the 2012 flood, and the requirement to breach or deconstruct the bund as part of the mine closure rehabilitation process.

The IMP considers that the current and future biodiversity value of the TIB is high enough to warrant:

- Ensuring that the growing river red gums and the swale habitats are not detrimentally impacted by the equipment or materials used in raising the TIB
- Reconsidering whether the TIB should be breached or deconstructed as part of the mine closure and rehabilitation process.

> **2014 IMP Recommendation 3:** That raising of the TIB is conducted in a manner that ensures protection of the naturally recruited river red gum saplings and swale habitats

> **2014 IMP Recommendation 4:** That the requirement to deconstruct or breach the TIB be reconsidered based on an assessment of the naturally developing habitat and biodiversity values of the structure

SUMMARY OF 2014 IMP RECOMENDATIONS

> **Recommendation 1:** CGM should continue to monitor all existing rehabilitation trials and those to be established in 2014/2015 (direct- seeded native species areas) with a view to continually refine its approach to achieving large-scale sustainable rehabilitation. Particular attention should be paid to the landform design, rehabilitation materials, rehabilitation cover system and revegetation concepts defined in the 2014 CGM Rehabilitation Risk Assessment (draft of May 2014).

> **Recommendation 2:** That watering continue over summer until seedlings have established their roots, and that plant available water in the soil be monitored to guide watering if above average dry conditions continue

Recommendation 3: That raising of the TIB is conducted in a manner that ensures protection of the naturally recruited river red gum saplings and swale habitats

Recommendation 4: That the requirement to deconstruct or breach the TIB be reconsidered based on an assessment of the naturally developing habitat and biodiversity values of the structure

INDEPENDENT MONITORING PANEL

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APPENDIX 1 - OVERVIEW OF THE INDEPENDENT ENVIRONMENTAL AUDIT (IEA)

Under the Minister's Condition of Approval (MCoA) (26 February 1999), an Independent Environmental Audit was to be completed:

- six-monthly during construction;
- 12 months after commencement of ore processing;
- then every three years thereafter until decommissioning of the mine and ore processing operations, respectively, or as otherwise directed by the Director-General.

In its report of August 2007, the IMP recognised that the template-based approach, that had been used by Trevor Brown and Associates applied environmental management consultants (aemc) in the four six-monthly reports leading up to the 2007 IMP reporting period, was well-structured for addressing complex environmental compliance requirements, and was a good example of best practice for easily accessible and updated environmental compliance information. Thus the IMP made the recommendation that "Barrick consider continuing use of the template-based approach established by aemc for environmental auditing of operations in order to regularly and systematically update progress on each of the environmental management and monitoring components. This approach would greatly assist the IMP in its annual review."

APPENDIX 2 – LIST OF REPORTS ASSESSED BY INDEPENDENT MONITORING PANEL

Cowal Gold Project – 2013 Annual Environmental Management Report (12 August 2013). Barrick Australia Limited.

Cowal Gold Project – Independent Environmental Audit (May 2014). Trevor Brown and Associates .

Northern Waste Rock Emplacement Rehabilitation Trials. Prepared for Cowal Gold Mine. February 2014. DnA Environmental.

Cowal Gold Mine Soil Stockpile Characterisation Assessment. August 2013. McKenzie Soil Management Pty Ltd.