

Review of rehabilitation strategy for Rix's Creek Mine – Continuation of Mining project for the Environmental Impact statement (EIS) for the IPCN

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1 Introduction

This document provides a high-level review of two documents for the Independent Planning Commission of NSW (IPCN) for the purpose of supporting the evaluation process for the Commission review of the project:

- EIS Appendix Q Rehabilitation Strategy (19 August 2015 by AECOM) 55pages (hereafter referred to as AECOM, 2015), and
- Continuation of Mining project EIS, Response to Submissions (20 October 2016 by AECOM) 135 pages (hereafter referred to as AECOM, 2016)

While related documents have been referred to in this review, a detailed review of those other documents is outside the scope of this review.

2 Summary

The Rehabilitation Strategy for Rix's Creek Continuation of Mining project should be a roadmap for the company and its external stakeholders that integrates mine rehabilitation and closure (MR&C) throughout the life of mine. The Strategy and the process of its development must instil confidence and trust in those external stakeholders that the company has a rigorous and timely understanding of its MR&C risks and opportunities. It must also provide assurance that the company is systematically working toward the reduction of uncertainty and creation of value during mining in order to create beneficial post-mining uses.

The Bloomfield Group have been mining at Rix's Creek and undertaking rehabilitation for many decades, yet no evidence is provided in the Rehabilitation Strategy (AECOM, 2015) that demonstrates that the two primary rehabilitation land uses of grasses for grazing and trees over grasses for native ecosystems meet any standard. External stakeholder engagement clearly occurs but very limited information is provided on how MR&C aspects are integrated into engagement and how continual engagement will build the dialogue on MR&C over time which assures eventual agreement and sign-off of the site.

Despite specific instructions from the Director General of the Department of Planning and Environment (now Secretary) for the Rehabilitation Strategy to include specific closure aspects, several Mine Rehabilitation and Closure (MR&C) domains are omitted from key aspects of the Rehabilitation Strategy (eg., water filled and/or tailings-filled voids). The strategy document appears to be an adaptation of a Mining Operations Plan (MOP) (AECOM, 2013) and does not adequately integrate all closure requirements which are explicit (in the existing Development Consent) or perhaps less explicit but likely to be needed to address environmental protection (EPL-related) matters for closure (eg., surface and groundwater quality).

There is no evidence of a MR&C-specific risk register so it is possible that a systematic MR&C risk and opportunity assessment process has not been undertaken by the company. In the absence of such a MR&C risk and opportunity register it is possible that insufficient attention has been given to some aspects of the Rehabilitation Strategy. For example, one aspect that can pose significant mining legacy risks is the long term geomorphic stability of the mine landforms. An understanding of long term landform stability risks is required to justify the drainage and slope design presented. Also, legacy risks of voids, backfilled with wastes or left as pit lakes are inadequately identified. The opportunities associated with a) heritage values and b) ensuring productive and environmentally biodiverse rehabilitation are under-developed.

Finally, commitments to future work, studies and standards are embedded in both documents, however they are not brought together in a single table or work program that gives the reader confidence that these commitments have been: a) scoped with clear objectives and outcomes, and b) scheduled with duration and sequencing with other timely milestones identified. This should form part an integrated life of mine plan for MR&C so that key knowledge gaps do not persist until too late in the mine's life to take effective action. The MR&C strategy document should use 'references' rather than a 'bibliography' (as has been used in the Rehabilitation Strategy) to ensure all claims about what is known, and what the company can and will do, are backed up with evidence. In this way, the MR&C knowledge base (and gaps) will be transparently revealed within the strategy.

In summary the Rehabilitation and Closure Strategy should provide a 'roadmap' as an orientation document with direct reference to site specific investigations and other evidence of MR&C, of:

- mine design for closure,
- a growing knowledge base that is accessible and enhanced over time,
- objectives and performance standards for all domains,
- a complete set of completion criteria that are able to be evaluated independently,
- integration of all government guidance and legislative requirements of relevance,
- what is currently known and proven,
- where the risks and uncertainties lie,
- how uncertainty is systematically being addressed,
- how leading practice guidance is being applied, and
- the intent and progressive outcomes of external engagement (not general engagement but specific for MR&C).

3 Mine Rehabilitation and Closure

The Director General's Requirements (Table 1 in AECOM, 2015) require the rehabilitation strategy to address rehabilitation and closure (R&C) so throughout this review the term Mine Rehabilitation and Closure (MR&C) will be used to reflect the required integration of the two processes and outcomes. On reading the Rehabilitation Strategy, it appears that the company aims to use the term 'rehabilitation' to include some aspects of mine closure however, mostly rehabilitation describes landform development and revegetation only. The notion that the 'Mining Operation Plan will substitute for the Rehabilitation Management Plan' (AECOM, 2016, p94) and that the 'Mine Closure Plan to be updated following MOD 8 and submitted

for approval as component of Landscape Management Plan'¹ indicates possible confusion about the purpose of each plan and the differences between *rehabilitation* and *closure* as outlined in leading practice guidance (Australian Government, 2016a, 2016b). The terminology below is included from the ANZMEC and MCA Strategic Framework for Mine Closure (Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia, 2000). A more recent publication of which Australia was a contributor, elaborates on the life cycle nature of mine closure planning to encompass: identifying and engaging stakeholders, factoring in climate change, physical and chemical stability, socio-economic aspects of closure, financing of closure, temporary and sudden closure and managing expectations (Asia-Pacific Economic Cooperation, 2018).

3.1 Terminology

Rehabilitation - the return of disturbed land to a stable, productive and self-sustaining condition, after taking into account beneficial uses of the site and surrounding land.

Closure – a whole of mine life process which typically culminates in tenement relinquishment. It includes decommissioning and rehabilitation

Completion Criteria - an agreed standard or level of performance which demonstrates successful closure of a site.

Stakeholder - a person, group or organisation with the potential to be affected by the process of, or outcome of, mine closure (see also Section 4).

The commission may like to consider changing the title of the rehabilitation strategy document to “Mine Rehabilitation and Closure Strategy” in keeping with the closure content required by the Director General. Restructuring of the title and content may ensure adequate attention to closure (as well as rehabilitation), as key closure domains and associated content are absent or under-developed in the Rehabilitation Strategy.

4 Stakeholder expectations for mine rehabilitation and closure

Stakeholder engagement is included up front in leading practice guidance, because of its importance in effective MR&C (ANZMEC & MCA, 2000; International Council on Mining & Metals, 2008). The rehabilitation strategy document (AECOM, 2015) gives only cursory attention to stakeholder engagement for MR&C planning in Section 3. ‘Stakeholder consultation’ lists various external stakeholders and describes a sample of forms of communication used. What is missing is a summary of what stakeholders expect of the MR&C at Rix’s Creek in the context of this Continuation of mining plan. While MOP consultation may have been undertaken in 2013 it is not clear what relevance this has to current MR&C plans.

Section 3 (AECOM, 2015) indicates that the company engages in one way distribution of information which is at the lowest end of the engagement spectrum according to the Quality Assurance Standard for Public Participation (IAP2, 2015). The categories of public participation goals in this Standard range from low to high influence on outcomes: inform,

¹ Rix’s Creek Mine Independent Environmental Audit 2016 Action, 19 January 2017, Planhttp://www.bloomcoll.com.au/Portals/5/Files/RixsCreek/Environmental%20Reports/2016_RCS_IEA_RAR.pdf

consult, involve, collaborate or empower. The one-way communication implied in Section 3 may not reflect what is actually undertaken as it is apparent that Rix's Creek maintains a good relationship with the local community. However, there is no evidence provided to demonstrate that a two-way process is occurring (AECOM, 2015, 2016).

Stakeholders are any group or individual who can affect or are affected by the achievement of the organisation's objectives (Freeman, 1984). This shows the two-way nature of stakeholder relationships, therefore, the stakeholder consultation component of the Rehabilitation Strategy must address both aspects. It should be clearly explained how stakeholders are being/will be affected by a MR&C process or outcome, as well as how they are affecting the MR&C process and outcome. Such evidence will require the stakeholder engagement objectives for MR&C and how they will be achieved. The process for identifying stakeholders (and how this may change over time) as well as register of MR&C stakeholder feedback should be maintained so that input can be tracked over time and the company's responses are able to be transparently accessed. The company's understanding of the role of external stakeholders (including regulators and other stakeholders) in MR&C planning, implementation and post-closure management should be clarified. Figure 6 shows where stakeholders are included in the process of rehabilitation. It would be valuable to know how this has worked so far with rehabilitation which is considered completed and identified as such, in the MOP (AECOM, 2013). For example, have these areas of rehabilitation (400+ ha of rehabilitation) been approved in accordance with Figure 6 before the company removes them from the estimate of rehabilitation costs for Security Deposit calculations?

The EIS has a wider scope than just MR&C and the MOP also has a wider scope than just MR&C as it includes environmental management generally. Neither process appears to address stakeholder engagement for MR&C as a specifically tailored activity to meet the objectives of this function. If areas are progressively agreed to as being completed, then any problems with the evidence or process (between company, regulator and other stakeholders) can then be resolved during mining, rather than left until the end.

The commission may like to consider requiring the company to develop and implement a MR&C stakeholder engagement strategy that ensures the specific issues of MR&C are addressed appropriately. A communication strategy may be part of this document but it must highlight where two-way communication on the range of MR&C issues is required.

5 Social aspects of MR&C

“The assessment of the full range of social impacts associated with a potential Bloomfield Mine closure, are outside the scope of the current study” (UMWELT, 2015, p3). In light of this exclusion at the EIS stage, there is a need for the company to identify when the social study for MR&C will be undertaken. Because there are potential opportunities not yet realised, there may be a need to undertake an evaluation of opportunities early which can support proactive dialogues with external stakeholders. This evaluation of social risks and opportunities of MR&C should also identify where significant uncertainties exist (see also Section 10 – Risk and Opportunity Assessment).

The commission may like to consider asking the company to identify in their work program when a social impacts and opportunity evaluation will be undertaken with the

goal of identifying these aspects early to bring about opportunity realisation and risk reduction integral to MR&C planning, implementation and engagement.

6 Integration of regulatory requirements for mine rehabilitation and closure (MR&C)

The Rehabilitation Strategy document should provide an orientation point that integrates all relevant regulatory requirements, not just lists of approvals and licenses and lists of studies as in the MOP (AECOM, 2013). This means that not only must landform design and vegetation related objectives be addressed, but also environmental protection such as surface and groundwater water quality and contamination, final voids and land use, as well as heritage values, aesthetics and stakeholder acceptance. Currently there is no central orientation point which brings together all relevant regulatory requirements and guidance in an integrated manner. Nor is there sufficient attention to the closure and post-closure processes for all relevant aspects of MR&C. The company must be able to explain in the strategy document how the MR&C-relevant requirements of the Development Consent, MOP guidance and conditions of the EPL now and later for closure, are integrated into the strategy, as well as leading practice understandings that fill any gaps that may appear for that site from the existing pieces of legislation.

There are other aspects of relevance to MR&C in the DG's requirements (Director-General, 2014) that are not included in Table 1 (AECOM, 2015) eg., heritage management aspects that require planning for closure. There appears to be a narrower than ideal interpretation of 'rehabilitation' applied to the Strategy document.

The commission may like to consider requiring the company to show that it understands how to integrate the regulatory and other requirements for good MR&C in one high level overview that addresses all MR&C domains, activities and planning processes including internal and external stakeholder engagement.

7 MR&C domains

Important for MR&C planning is to have MR&C domains clearly defined spatially and conceptually. There is no overall map that explains all MR&C domains in a clear manner, understandable to readers not familiar with the site. There is a domain table (Table 2 in AECOM, 2015) however some of these domains are not included in Table 6. The final void domain is excluded from Table 6 and the reasoning is not well justified. Water management domains are not addressed (including groundwater aspects of tailings emplacement areas), nor are heritage domains (Table 5 and Table 6 where vegetation may not be required but other processes are required for closure). In places there is confusion between operational requirements and those needed for MR&C eg. water management areas (Section 4.4) and the associated Figure 3 where the reader is expected to decipher the post-closure water management system from a confusing conceptual map that lacks contour intervals and perhaps aims to include too much information in one figure. Section 4.4 should explain how 'best water management practices' (p15) will be applied to closure.

7.1 Tailings domains

Figure 2 (AECOM, 2015, p. 8) shows North Pit as Tailings Emplacement 4, and Pit 2 as Tailings Emplacement 3. Figure 5-1 (AECOM, 2016, p. 19) includes these tailings

emplacement areas but in Figure 5-2 (year 2020), they are no longer identified as tailings despite there being a new colour in the key for tailings. These domains should also be spatially mapped in the post mining landform so tailings areas, even if rehabilitated are clearly identified, however North Pit is shown as a water management area (Figure 3, AECOM, 2015). Does this mean it is tailings with a lake over the tailings? Also, Pit 2 (Tailings Emplacement 3) is not marked in Figure 3 at all (AECOM 2015). Where the figures on their own do not explain the changes over time of mine domains, then text is needed. Tailings have different legacy risk properties than waste rock so their position within the mine landscape and implications for closure and post-mining land use must be clearly articulated. Often tailings contain significant amounts of water which drain slowly over time. This can require covers to be designed to accommodate these changes – are they water shedding covers or water holding covers? What will be the water quality draining away from these tailings emplacements and how does this influence local groundwater (and surface water) quality and water levels? These domains require more attention in the risk and opportunity assessment.

7.2 Final void domains

Final void is referred to as a domain in Section 4.8 (p. 21) but it has no clear MR&C objectives, performance standards or completion criteria (Table 6). The main final void domain is shown as a dry void not a water management area (Figure 3, in AECOM 2015) and described as a ‘final depression’ in Figure 5-5 (AECOM, 2016). The final void as part of the final mine landscape should have a water balance undertaken. It should also show the likely final water level in the void once groundwater dewatering ceases and rebound of the water table has occurred yet maps cease at year 2037 of groundwater drawdown (AECOM, 2016, Figure 5-5, p. 23). The evidence required for closure planning is incomplete. Further design options are referred to as needing to be undertaken. If modelling and research are required then that should be acknowledged and included in the work program. Table 5 (AECOM, 2015, p. 24) refers to vegetation aspects of the final void but no reference is given to water management nor water quality implications of water filled voids or water over tailings in voids or water from tailings draining from voids. Table 6 requires objectives, performance standards or completion criteria for final voids (AECOM, 2015, p. 37)

7.3 Heritage domains

Heritage domains although mentioned in text (p14), appear to have been omitted from the post-mining landform (Figure 3 in AECOM, 2015). This domain poses opportunities for beneficial post-mining land use. The Rehabilitation Strategy includes in the bibliography reference to ‘Rix’s Creek Colliery Coke Ovens Conservation Plan (2007)’ however it is not made clear in the Strategy how this domain will be addressed in the MR&C process. The Burra Charter and appropriate expertise (Australia ICOMOS, 2013) can provide guidance on how cultural heritage values can be incorporated into closure planning so that objectives and the process for handover, if this is intended, can be defined.

7.4 Aesthetic domain(s)

Because there are specific requirements for aesthetics, it should also be possible for the company to overlay the primary visual/aesthetic domains on the landscape (eg., from Singleton) (overlapping other domains but with specific aesthetic objectives) to facilitate

objective setting, management and completion. There is a need to ensure all domains are clearly delineated, mapped and explained so that no objectives, features or areas are omitted.

7.5 Underground mining domain

The domain of underground mining (past and future) must be included in the domain maps as well as having clear post-closure objectives, performance standards and completion criteria. Domains are not just those features visible from above and defined by vegetation and water bodies, but all aspects that interact with MR&C objectives above and below ground.

7.6 Summary

Those domains currently omitted or under-represented in the Strategy include: final voids, those already backfilled as well as the proposed final pit lake void(s), heritage areas and underground mining. There could be more domains of relevance. Mine domains should be mapped at a suitable scale, perhaps as a series of maps to enable easy interpretation by laypersons and technical experts of: a) all current domains, b) all current domains plus the future changes proposed through continuation of mining, and c) the post-closure domain land uses with transparency to what lies below. Each domain requires a unique identifier that will be used to cross-reference it throughout the rest of the strategy and all MR&C planning documentation. These identifiers can be used to ensure alignment of domains with objectives and completion criteria. This must include domains not previously included such as voids, tailings dams and all backfilled voids, heritage domains, underground mining and so on.

The commission may like to consider requiring the company to: a) identify all MR&C domains on maps from present to post-closure, b) label and describe all domains, c) ensure objectives, performance standards and completion criteria exist for all domains, and d) identify stakeholders that need to be consulted to explore post-closure domain risks and opportunities further.

8 Management of knowledge and identification of knowledge gaps

Considering the rehabilitation program at the mine is supported by over 75 years of company experience and 25 years in land management (AECOM, 2015, p5) it is expected that a 'Continuation of mining' proposal would present the successful rehabilitation evidence from past work as a basis for going forward. Yet this is absent. There is very little evidence of past performance presented as a basis for future MR&C. Apart from government issued standards and guidance, there is very little evidence of company derived MR&C knowledge in the Bibliography (p57). There is some soil and land impact assessment work (2015) and there is evidence of the company having a conservation plan for the Colliery Coking Ovens (2007). For such a strategic point in time for the company planning continuation of mining a 'MR&C Knowledge Base' should be cross-referenced in this strategy document to provide the necessary evidence for proposed approaches going forward. The knowledge base will also identify the knowledge gaps for each domain and ensure that knowledge needed is aligned with MR&C objectives, performance standards and completion criteria as well as stakeholder expectations for involvement in the MR&C planning process and outcomes.

Currently the land use capability information as presented as pre-existing land capability classes over current mine landforms. It is not easy for the reader to see how land capability has been preserved by rehabilitation (Table 4 and Figure 4). The purpose for separation of

Class 4 land into two categories is not explained. It is also not clear if land capability classes of current mine landforms that have been rehabilitated has been independently determined. This evidence is required. If the pre-existing land use capability was overlaid on an aerial photo from a pre-mining point in time with a second image showing post-mining land use capability over mine landforms then it would be easier for readers to see and understand the spatial distribution of mining land capability changes.

The Strategy document should address which performance standards and completion criteria for each objective and domain exist, and those that require development. There are many domains that still require performance standards and completion criteria – these must be included (eg. for heritage areas, final voids, water management system, groundwater, contamination etc) as well as whole MR&C planning process ‘acceptance by stakeholders’ indicators and performance evaluation measures.

If the knowledge base does not already exist, it must be a synthesised document that draws out key knowledge of relevance to each of the domain and objective including surface and groundwater management for final voids and final surface water management design of landforms, heritage aspects, native ecosystem trials, pasture trials, drawing upon independent assessment of revegetation against objectives and land uses. The manner in which responses are given to the EIS submissions, does not always clarify how the company will act. While they may have addressed the issues raised, the direct MR&C implications are not always presented (p18 for example (AECOM, 2016)).

The commission may like to consider requesting the company to develop a MR&C knowledge base for Rix’s Creek (and Integra) and cross-reference this in the MR&C Strategy, as well as making it available as a standalone document (updated regularly).

The commission may like to consider asking the company to provide an independent evaluation of land capability of rehabilitated mine landforms identified in the MOP (AECOM, 2013).

9 Rehabilitation objectives, performance standards and proposed completion criteria

The rehabilitation strategy should show clear alignment between rehabilitation objectives, performance standards and completion criteria. Each domain must be included, currently several domains are absent. These omissions pose ‘blindspots’ and therefore potential risks in the planning process. The discrete identification of domains and their labelling will help to facilitate the clarification of objectives, performance standards and proposed completion criteria. The strategy includes reference to objectives (Section 1.3.2 and 2.2), aims (Section 2.0, 5.6), and goals (Section 2.1) which is very confusing. Clarification of the differences or the use of one terminology will simplify the planning process. In some sections objectives include specific completion criteria (Section 1.3.2 in AECOM, 2015). This section which is supposed to outline the objectives of the strategy includes the aim of the revegetation program whereas the heading implies that this section gives the objectives for the document. Rehabilitation goals and objectives currently sit under the main heading of ‘history of land management at Rix’s Creek Mine’ which does not seem appropriate. Rehabilitation Objectives in 2.2 are actions ‘land will be topsoiled’, not objectives. This terminology and section content misalignment does not present a logical flow throughout the document making the document difficult to follow and therefore difficult to implement or regulate.

Once all domains are spatially identified then Table 6 must include them all. The phases current included in Table 6 may be consistent with MOP guidance (New South Wales Government, 2013) however they do not provide the direct link between all domains, their MR&C objectives, their performance standards and completion criteria. In many domain categories there is no performance standard, just a general statement and sometimes specific completion criteria and other times a general statement (eg., ‘all completion criteria regarding landform stability and vegetation cover met’ p. 40 Table 6). This is not a completion criteria. Nor are ‘third party audits’ (p37) completion criteria but means to evaluate them. Also, the justification/source given is ‘Mine Operations Plan’ with no date or details. These vague statements, inadequately referenced, do not provide clarity over what is known and not known, and needs to be understood during the life of the mine in order to achieve successful MR&C. The Strategy document must clearly provide links to evidence of what is known, and also what is not known explaining how that knowledge will be gained. The work schedule for that evidence and knowledge gathering should be included showing the timing and interconnectedness of each part of the MR&C strategy. This would show when consultation will be undertaken on specific elements so that eventual agreement will be reached with external stakeholders and successful endpoints achieved. Where those standards and criteria are not yet developed then this should be clearly identified and a process for developing them explained, and included in the work program.

The commission may like to consider requesting the company to use consistent language to describe objectives, performance standards and completion criteria throughout, then they should clearly articulate the MR&C Strategy objectives, performance standards and completion criteria for all domains (as the inclusion of closure is sought by the DG in Table 1).

10 Risk and opportunity evaluation for MR&C strategy

This section highlights the need for MR&C risk and opportunity assessment as the Rehabilitation Strategy (AECOM, 2015) did not reference a MR&C risk assessment or risk register. Nor are the key MR&C risks identified in the Strategy. This section draws attention to specific aspects as examples, that would benefit from risk and opportunity assessment.

10.1 Risk and opportunity assessment

A MR&C-specific risk and opportunity assessment is critical to MR&C planning. While there is reference in the MOP (AECOM, 2013) to a Risk Rating Matrix (Table 6, p.13) and ‘Environmental Risk Assessment’ this does not address many MR&C risks nor does it address opportunities for beneficial post-mining land use. The risk rating matrix appears to be geared toward safety and environmental incidents. This approach may not detect slow incubating environmental risks or social risks.

The MR&C risk and opportunity assessment should identify the most significant issues so that the company (and regulatory agencies) apply appropriate attention to them. Not all issues are equal in importance for MR&C and the current form of the rehabilitation strategy does not reveal the key risks and opportunities in a transparent manner (nor does the MOP give due attention to legacy risks). Once a MR&C risk and opportunity assessment is undertaken it becomes a living document/process that would involve both internal and external stakeholders through consultation to keep it current (reviewed annually or whenever there is a

significant change). The process involves applying control measures to significant risks and opportunities. These control measures (and initiatives) provide mechanisms for risk reduction to an acceptable level and exploration of opportunities. This process enables the company to progressively reduce its MR&C uncertainty and may encourage the company to become increasingly sensitive to residual risk and how mine plans can influence this risk.

Residual risk is the component of any risk which we do not eliminate or control (Handmer & Williams, 2001). For MR&C this means risks that persist after the mine is closed that must be managed by someone (eg., the company in perpetuity for the government or community for legacy sites). When considering residual risks, value created by opportunities to integrate new or alternative land uses after mining can help to offset residual risk. Further, in the EIS social impact and opportunity assessment there is very limited attention to social opportunity (UMWELT, 2015). The MR&C strategy would benefit from a social opportunity assessment for MR&C in order for some of these opportunities to be identified and followed up. Despite the relative absence of MR&C social opportunity attention, stakeholders showed a high level of interest in vegetation clearance, habitat loss, landscape and drainage change (UMWELT, 2015, p 47). Neither the risks nor the opportunities from MR&C are articulated in the rehabilitation strategy (AECOM, 2015). The risk register in the MOP (Appendix A in AECOM, 2013) is superficial for rehabilitation and doesn't address many critical aspects of mine closure. For example, odour is a concern from spontaneous combustion but not the rehabilitation catching on fire. The risks of premature closure are not addressed, nor a lack of external stakeholder agreement on the MR&C end point. Despite the potential salinity aspects of the final pit lake there is no mention of the final void in the risk register. These are examples only and are not an exhaustive list of risk considerations.

The use of a TARP (Trigger Action Response Plan) as the mechanism to respond to adverse outcomes appears to be an 'operational' phase mechanism (AECOM, 2013; New South Wales Government, 2013). There is little a TARP can do when a MR&C problem emerges close to, during or after closure. So, unless MR&C risks and impacts are well understood in advance and mitigated by design and other measures early in the mine's life such problems may go unseen. How does the company plan to apply TARP's after closure? The continuing use of the term 'rehabilitation' appears to constrain the perceptions of closure to only those aspects that involve vegetation (thereby creating blind-spots for surface and ground water (quality and flows), underground mining (except for portals), voids in the landscape, heritage and MR&C-specific stakeholder engagement processes, to name a few). This illustrates how the Rehabilitation Strategy (AECOM, 2015) and MOP (AECOM, 2013) have inadequate sensitivity to MR&C risks. The MOP cannot, therefore, be considered a suitable substitute for the rehabilitation plan.

A facilitated MR&C risk and opportunity assessment would include company personnel and consultants with an intimate understanding of the mining operations and MR&C knowledge. The MR&C risk register control measures will assign tasks to the work program to address knowledge gaps, specific consultation and other control measures (eg., scenario modelling).

The commission may like to consider requiring the company to engage an appropriately qualified independent mine closure specialist to facilitate a workshop to undertake a MR&C risk and opportunity assessment, to produce a MR&C risk register that will be

updated from time to time. From this report a summary of key risks and opportunities would then be included in the MR&C strategy document.

The commission may like to consider recommending changes to the MOP guidelines (New South Wales Government, 2013) to support effective MR&C risk and opportunity evaluation methods as operational environmental risk evaluation tools do not adequately address MR&C risks.

10.2 Long term landform sustainability

It is not clear from the rehabilitation strategy what design time frames are being applied to sustainability of water management structures (eg., table 6-1 to 6-3 in AECOM, 2016) or the whole mine landform (or sub-catchments). There also is no evidence of modelling of geomorphic stability of the landforms (Hancock, Loch, & Willgoose, 2003). Such modelling is used to inform design so that unstable elements of the constructed landform including spoil/soil management can be modified during operations when equipment is available and before revegetation works to save reworking areas. This is also relevant to long term water management where sediment traps and other drainage structures are considered in the final landform design, however their design criteria are not clear. Long term water management includes not only surface flows from mine landforms and water filled voids but also groundwater movement and interactions. There are both hydrological as well as water quality considerations to be designed and residual risks understood. Described as the forgotten legacy of mine closure, reviews of mine closure highlight how water management aspects delay mine closure or were found to require long term management very late in the process, (Byrne, 2013; Byrne & Hancock, 2018).

Unclear for those reading the response to submissions report, is the reference to the 'Blue Book' design of water management (AECOM, 2016, p. 69). This section of the response to submissions document is largely focussed on operational water management for the EIS and does not give sufficient attention to MR&C and post-closure water management. If the MOP is the only mechanism to address 'rehabilitation', then much of the work required will be compressed inappropriately into the final MOP which is too late to detect problems that must be addressed earlier. (This also has relevance to Section 11 on final voids). Improved resolution images are required, as are more detailed catchment/sub-catchment designs for mine landforms. Currently Figure 3 (AECOM, 2015, p. 9) is difficult to interpret for water management, with other content included on same image. Consideration must be given to how the sub-catchment flows from the new landform match pre-existing sub-catchment flows from the pre-mining landform in order to mitigate fluvial destabilisation through sedimentation or erosion.

Part of long term stability of final mine landforms requires sensitivity analysis of the landform design to a range of climate change scenarios. Locally relevant climate modelling resources are available ie., NARClim²³. Reference is given to climate change but no commitment made to model scenarios, to identify MR&C implications and options (AECOM, 2015, p. 35).

² <http://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/About-NARClim>

³ <http://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Hunter-Climate-Change-Downloads>

The commission may like to consider requiring the company to undertake geomorphic landform modelling as a means of assessing and modifying or verifying final landform design (and sub-catchment drainage design) for long term stability. This would include climate change scenario sensitivity analyses.

10.3 Premature and temporary closure

The Rehabilitation Strategy implies the company will be there till the end of mining and beyond to ensure rehabilitation and closure meet the regulatory and stakeholder expectations. This implication is inferred by the future commitment to certain management measures in Table 7-1 (AECOM, 2016) and reference to the full mine life as intended at this point in time. However more mines close prematurely - about 75%, in a study of 800 mine closures in Australia over 20 years (Laurence, 2006) - and more recently there are examples of coal mines which have closed with little notice (two out of four brown coal mines in Victoria) and others that have been 'sold' for \$1 (Willacy, 2016). The risks of premature closure also have relevance to Section 12 where studies, trials, independent evaluation of rehabilitation performance as evidence of achievement of completion criteria is needed to close effectively.

The commission may like to consider a requirement for the company to prepare premature mine closure scenarios that show the mine landscape and post mining uses for premature closure in, say, five yearly intervals to address the question: How would the mine be rehabilitated and closed if mining ceased in 2023, 2028, or 2033?

10.4 Value of land (and water) post-closure

Section 6.15.5 (AECOM, 2016) gives details on value of land foregone due to mining however there is limited attention to the residual value of land from rehabilitation. This could be more fully explored by the provision of evidence by the company of the productivity of rehabilitated waste dumps for grazing as well as valuing biodiversity (independent and appropriately qualified assessment would be required). Through this process it may be possible to explore the value of ecosystem re-establishment for biodiversity offset areas. Employment through MR&C may also be undervalued in this response to the EIS. Other values remaining unconsidered are not limited to, but may include heritage tourism connecting multiple sites of heritage value in the area (connecting with heritage values at Rix's Creek mine). There is also a growing interest in Australian Geotourism since 2015⁴.

Research and other studies on value creation through post-mining land use provide a resource for the company. The concept of regeneration as addressing social and biophysical aspects of 'rehabilitation' have been the subject of research (Whitbread-Abrutat, Kendle, & Coppin, 2013). There is also a body of resource materials on post mining land uses some from abandoned mining regions that provide some insights into value creation (Unger, 2009; Unger, Lechner, Kenway, Glenn, & Walton, 2015). A recent publication that Australian members contributed to, describes a mine closure checklist for governments (Asia-Pacific Economic Cooperation, 2018). The volume, "From start to finish: a life of mine perspective" provides valuable insights for integrating MR&C into operations for effective closure (Australasian Institute of Mining and Metallurgy, 2018).

⁴ <https://www.ausimmbulletin.com/news/geotourism-continues-to-grow-in-australia/>

Insights may also be gained from other mining regions in Australia where multiple mine closures are recognised to have cumulative impacts that need to be managed at a regional scale (Hazelwood Mine Fire Inquiry, 2016). Such initiatives have identified the need for collaboration between companies and regional planning by multiple agencies of government. The concept of ‘social license to close’ reflects the need for companies to engage early and often with external stakeholders on MR&C specifically.

The commission may like to consider a requirement for the company to more comprehensively evaluate value creation through MR&C using independent yet achievable options. This could take the form of a living document used during, and updated after, stakeholder engagement processes with a view to ultimately creating partnerships and agreements for sustainable uses.

10.5 Evidence of agricultural land rehab and native ecosystem

There is no evidence given that demonstrates current rehabilitation undertaken meets the objectives and completion criteria in Section 7.2.7.2, Table 14 (p40) in the MOP (AECOM, 2013) or Rehabilitation strategy (AECOM, 2015). It is also not clear what the completion criteria are (as noted in Section 9 earlier).

Section 7.3 of the MOP shows a change in the areas active and rehabilitated. It is assumed this informs the security deposit estimate. If so, what is the process for signing off on rehabilitation to confirm it meets the standard required by regulators and other stakeholders and therefore can be deducted from areas ‘requiring rehabilitation’? (section 7.5). There is also a statement saying there is no monitoring requirement after 5 years (in the MOP) yet most native ecosystems take 15 years to mature sufficiently well to know they are on an appropriate trajectory. In the absence of any evidence that agricultural land is performing to a standard there is also no certainty that 5 years is adequate for agricultural land (pA13 in the MOP (AECOM, 2013). Each of the documents describe what will be done, but rarely do they provide evidence that what has been done, and is being done, in a manner that gives confidence that current rehabilitation meets an accepted standard.

The commission may like to consider seeking evidence of performance of existing rehabilitation. If this evidence exists in the MR&C knowledge base then this should be cross-referenced to the MR&C Strategy.

The commission may like to consider asking for the measurable completion criteria used for assessment of agricultural land and native ecosystem performance.

11 Final voids

Section 4.8 of the rehabilitation strategy (AECOM, 2015) provides a brief description of a single final void but not the options evaluated. Also, the final void design cannot be easily interpreted from Figure 3 (p9). It appears that a large area of exposed pit wall will exist above the water level covered by dark green rehabilitation – but this may be an incorrect interpretation of the figure. With pseudo-contour lines and drainage lines shown with the same colour blue, it is a difficult image to interpret. The water management system for closure and post-closure (addressing post-groundwater rebound) would best be shown on separate yet consistently-scaled maps. Also, there appears to be a blue line running from the

final void to a downstream creek (north-west of void). Is this intended or an artefact of the figure?

The Rehabilitation Strategy provides no evidence on the salinity levels in the pit lake, ecosystem health, batter revegetation nor fluctuating water levels or how access will be managed. No water balance is apparent for the final void. A more recent memo provides salinity levels from modelling (Janssen & Hall, 2018) however the source of the data is not presented so it is not possible to know the assumptions of the modelling nor the level of accuracy.

Where studies are identified as being needed the Company must assign them to the work schedule. The need for specific studies should align with the objectives, performance standards and completion criteria part of the MR&C planning process, after being subjected to a MR&C risk and opportunity assessment. The studies identified may be required but the justification and clear connection to achievement of the objectives is not provided.

It is also not clear what the implications are for existing backfilled pits as part of MR&C. Absent from the Rehabilitation Strategy (2015) but appearing in a figure in the response to submissions are tailings emplacement areas (Figure 5-1, p19 (AECOM, 2016)). They represent domains not described in the Rehabilitation Strategy (AECOM, 2015). They require identification, objectives, performance standards and completion criteria also. Records on deposition should go into the knowledge base and design for covers be part of MR&C work program. If already capped and covered then it must be possible to identify the design criteria, taking account of consolidation and drainage of tailings water and groundwater implications etc.

Additional information on the final void water level indicates a surface water diversion that will be established on the high-wall (Janssen & Hall, 2018, p 4). It is not clear if this is intended to divert runoff away from the void, or into the void. Reference to 'typical values' does not provide clarity as to whether the data exist to back up the assumptions or if regional values have been used.

Pit lake modelling highlights some assumptions about the void which are simplistic in nature demonstrating the need for more rigorous assessment by a specialist pit lake expert to: a) undertake a water balance for the pit lake long term, including probability of pit overflow and interactions with groundwater, b) predict water quality in the pit lake, c) show likely trends in water levels and quality over time and d) clarify seasonal influences on mixing of waters vertically (overturning).

There is a need to clarify the post-closure use of the void. While this may not be known now, there is a need for the company to specify the process for agreeing upon use and long-term management. The studies needed to address uncertainty for the final voids should be included in the work program.

The commission may like to consider requesting a detailed design of the final void in the context of surface and groundwater systems. Seek also a more rigorous assessment of pit lake water levels and quality over time post-closure, via modelling in order to highlight key design implications early rather than late in the mine's life.

The commission may like to consider seeking the options analysis for the final void from the company to understand the rationale for the preferred option (did external stakeholder engagement inform this process as this is intended as a permanent landscape feature?).

The commission may like to consider requesting the company identify where the other voids and tailings are located in the landscape in MR&C figures. Even after rehabilitation their location should still be clear in spatial data and reports and their R&C described in the knowledge base)

12 Work program for MR&C (action plan)

The use of the term ‘where practical’ is overused. There is no commitment to implementation by this statement ((AECOM, 2015 eg., p. 34 s5.7). All MR&C tasks, studies, research, consultation that flow from regulatory requirements, leading practice and the MR&C risk and opportunity assessment must be included in a work program. This work program will identify when specific studies will be undertaken so that the integrated program can be understood by the company as well as others. Currently there are many commitments embedded within the strategy document in a manner which gives little assurance that the company is tracking these commitments and will address them systematically. A work program/action plan needs to come from this response document (AECOM, 2016), otherwise commitments can be lost. Not all MR&C commitments are in the management measures summary table (AECOM, 2016, Table 7-1). There are commitments scattered throughout various documents. There are also studies referred to in the MOP eg., trial use of biosolids and organics to ameliorate soil for rehabilitation as well as an ACARP Sustainable management of plantations study (AECOM, 2013, p. 47). All studies should be included in the work program, and aligned with domains, their MR&C objectives and the risk/opportunity register.

The following reference indicates a lack of clarity that requires further work, so should be assigned to the work program. *“During the decommissioning phase should contaminated, carbonaceous or material unsuitable for rehabilitation be identified, it will be stripped and buried either in the final stages of capping of the tailings storage facility or disposed of and covered in the floor of the final void. Where possible, the material will be considered for reprocessing before the CHPP is decommissioned”* (AECOM, 2016, p. 93). It is not clear whether the company has evaluated the suitability of the contaminated materials for placement in the void. This is an example of an aspect that should be integrated with the final void pit lake study in the work program. How is the company keeping track of these studies, knowledge gaps and other commitments that require follow up?

Vague, noncommittal statements are frequent in each of the two documents and the MOP. Section 4.7 (AECOM, 2015) states that: *“The final adopted rehabilitation and management options for this domain will largely depend on the prevailing condition in terms of landscape and optimising landuse in terms of current social and economic constraints”*. What certainty does this give the regulator or other stakeholders that any of the plans will be implemented?

The purpose of the Work Program is to identify early the uncertainties that must be addressed (some from the EIS process, others from the MR&C risk and opportunity assessment etc), to ensure completion criteria are aligned with objectives for all domains and activities and to ensure stakeholder engagement involves an ongoing dialogue about what is planned, what is

completed and what is yet to done. These commitments in the Work Program must show time frames for completion directed toward progressive rehabilitation and engagement, and full completion. There should be a review process for checking off completed commitments progressively. Some of these tasks will require independent evaluation if findings are to be robust and trusted.

The commission may like to consider requiring the company to develop and maintain a ‘Commitments register’ for all MR&C actions required. These need to be appropriately scoped (some minor some large) and included in a MR&C Work Program schedule for the operation to ensure discrete studies and other tasks are followed up and records kept.

The commission may like to consider requiring the company to replace vague commitments with firm commitments. If there is a lack of knowledge or certainty then a clear strategy for gathering that knowledge and reducing that uncertainty must be defined with time frames assigned (not left until the end of mining).

13 Utilisation of leading practice guidance

While the Strategy document makes reference to leading practice guidance there is no clear evidence that it has been applied, particularly for closure aspects such as: understanding the role of the knowledge base, the logical sequencing of closure planning (as more than revegetation), the importance of MR&C risk and opportunity assessment and the roles of external stakeholders in the process to ensure acceptance of the MR&C strategy in its entirety. Currently the strategy omits key elements and it is possible that stakeholder engagement for MR&C is not clearly defined, but embedded in other engagement processes where key opportunities for value creation through engagement are overlooked. Long term post-closure concerns raised may not yet be given sufficient attention. Regarding the company’s response to submissions on the EIS it seems to only include supportive feedback (AECOM, 2016). Negative feedback is either absent or not recorded. Perhaps MR&C aspects are embedded within many different sections of the EIS response. One area of risk identified in Table 4.2 from the social impact and opportunity assessment (UMWELT, 2015, p 37) indicates that ‘balancing conflicting land uses, particularly mining agriculture, vineyards and equine industries, and loss of conservation connectivity’ are areas of social risk for natural capital.

The commission may like to consider asking the company to show how they are applying the leading practice mine closure guidance in their Rehabilitation Strategy.

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