



Rasp Mine

Zinc – Lead – Silver Project

Project Approval No. 07-0018

Submissions Report (MOD6)

Kintore Pit TSF3

December 2021

Broken Hill Operations Pty Ltd

BROKEN HILL

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30 November 2021

Mr. Steve O'Donoghue
Director Resource Assessments
Department of Planning Industry and Environment
GPO Box 39
Sydney NSW 2001

Dear Steve,

Re: 07_0018 Mod 6 Rasp Mine Modification 6 - Submissions Response

1. Introduction

I refer to your letter to CBH Resources (Broken Hill Operations – or BHOP), dated 21 September 2021, asking for responses to issues raised in advice from NSW Government agencies and issues raised in a community submission in relation to Rasp Mine MOD 6 (07_0018 MOD 6).

This report summarises the issues raised and provides a commensurate response and has been prepared in accordance with *State significant development guidelines – preparing a submissions report* (DPIE 2021).

2. Summary of Mod 6 proposal

In August 2021 BHOP submitted modification application 07_0018 MOD 6 under Section 4.55(2) of the Environmental Planning & Assessment Act 1979. The application was publicly exhibited between 8 September to 21 September 2021.

The proposed modification involves:

- establishing Kintore Pit as TSF3 for naturally dried tailings to be co-placed with excess waste rock from underground development;
- relocating the mine portal and access decline with associated infrastructure to a boxcut;
- utilising TSF2 for harvesting naturally dried (solar and air) tailings for transfer to TSF3;
- conducting periodical crushing of non-ore material in Kintore Pit Tipple and/or BHP Pit;
- utilising waste rock (containing on average <0.5% lead(Pb)) for rehabilitation capping; and
- administrative amendments for site noise criteria and annual environmental reporting.

These activities would be undertaken on land already disturbed for mining activities.

The environmental impacts of the above activities have been comprehensively assessed and the assessments are included in full in *Rasp Mine Modification Report (Mod 6) Kintore Pit TSF3 August 2021* (BHOP 2021).

3. Submissions analysis

3.1 Exhibition details

The Mod 6 Modification Report was publicly exhibited from 8 September to 21 September 2021, at the DPIE Major Projects portal.

3.2 Submissions received

During the exhibition period advice was received from nine NSW Government agencies, one local government authority, and one submission was received from a community member. Following the exhibition period, advice was received from two further NSW Government agencies and the same community member provided a supplementary submission.

The advice and submissions received have been placed on the DPIE Major Projects Portal at:

<https://www.planningportal.nsw.gov.au/major-projects/project/20956>

3.3 Summary of submissions

3.3.1 NSW Government agency advice

None of the NSW Government agencies objected to the proposed modification. However they variously made recommendations to manage and mitigate the potential environmental impacts associated with the proposal. The agencies' advice is summarised as follows.

Environment Protection Authority

EPA remarked that there are minor predicted changes to existing environmental impacts from the proposed modification activities it recommended conditions of approval to be incorporated for the project, including:

- a cap on ore production and processing of 0.5 million tonnes per annum;
- prior to the commencement of construction operations, the preparation of a Construction Air Quality Management Plan (AQMP), to include proactive and reactive mitigation strategies, details of monitoring methods, trigger actions response plans; and
- an update to the existing Air Quality Management Plan.

Biodiversity & Conservation Division

DPIE's Biodiversity and Conservation Division (BCD) considered that the proposed modification would not likely cause harm to threatened species. It also considered that the likelihood of bats occupying the shafts is low. BCD however recommended that BHOP assess the old mine workings for bat occupancy.

Resources Regulator

The Resources Regulator commented that BHOP should provide:

- an identification and assessment of post-mining land use options in consideration of constraints and opportunities associated with the site, incorporating the outcomes of the Rasp Mine Dust Management Options Assessment;
- rehabilitation objectives and completion criteria are Kintore Pit TSF3 and Blackwood Pit TSF2 and should be considered upfront; and
- a clear statement is required that surface water management, including spillways in the final landform will be designed to meet hydrological projections associated with industry accepted guidelines for tailings storage facility closure – specifically ANCOLD Guidelines on Tailings Dams (2019) and the ICMM Global Tailings Standard.

Crown Land

Crown Land commented on blasting impacts for construction of the underground access portal, and asked for:

- An agreement that regulates and monitors vibration and dust levels is requested. It also asked for 14 days notice of blasting events;
- that vibration levels, and compliance with the relevant guidelines, are required at the time of construction of the portal, as per the *Protection of the Environment Operations Act 1997* and CBH Resources Limited's Mining Operations Plan; and
- Crown land also reminded BHOP that, Crown reserves and roads within a Mining Lease (with surface rights), or mining related activity, must be subject to a Compensation Agreement issued under section 265 of the *Mining Act 1992*. They may also be subject to a Section 81 Consent under the *Mining Act 1992*, where surface activities are proposed. The Compensation Agreement and/or Consent must be agreed and executed prior to any mining activity taking place.

DPIE Water/NRAR

The Department's Water Group (DPIE Water) and Natural Resources Access Regulator (NRAR) commented that the Site Water Management Plan should be updated to reflect relocated and additional water management infrastructure and include monitoring, metering and management measures to report on water take (exempt and licensable), and to address potential impacts to water sources due to the development.

NSW Health

NSW Health replicated the EPA recommendations in its advice. It also commented on the issue of lead in the community, stating that mitigation measures need to be in place to prevent any impact on the community. No mitigation measures are proposed to manage the modelled increase in soil Pb. Lead burden in the community from the development should be reduced to no effect.

Heritage Council of NSW

Heritage Council commented that there are two State listed heritage items near the site which would not be affected by the proposed modification, and the local heritage items would continue to be fenced off.

Heritage NSW

Heritage NSW acknowledged that there are no reported Aboriginal cultural heritage objects or cultural significance associated with MOD 6 activities.

Mining Exploration and Geoscience

Mining Exploration and Geoscience supports the proposal based on production optimisation, resource recovery and the security of regional jobs and state mineral royalties. It noted that the proposal will not sterilise resources near surface and will aid in effective resource recovery and extraction. There will be no substantial change to the production rate or total metals produced. It noted that a deficit in available tailings storage would inhibit mine production by around mid-2022.

Transport for NSW

As the proposal does not affect the classified road network, Transport for NSW did not object to the proposed modification.

Dams Safety NSW

Dams Safety NSW commented that it regulates mining within the Blackwood Notification Area and the dam is heavily monitored. Impacts on the dam from the development will need to be monitored and kept within the limitations already placed on the dam by DSNSW, to ensure no additional threat to the structure results from the proposal.

3.4 Local government authority submission

Broken Hill City Council's submission supports the ongoing operation of the Rasp Mine. In particular, Council stated:

- the continued mining at Rasp Mine important to the economic stability and future of Broken Hill;
- the modification would allow a number of benefits, including in particular mining at Rasp being able to continue past 2022, continued employment of local workers also reduction noise and dust impacts; and
- BHCC asked for daytime only construction activities other than Kintore Pit activities, and the implementation of lead dust mitigation measures through the conditions of approvals.

3.5 Community submission

One submission was received from a resident in the local community. The submitter made a supplementary submission following the completion of the public exhibition period. The submissions raised the following matters:

- Waste disposal locations and the potential for contamination.
- reporting requirements and parameters for blood lead levels;
- air quality impacts in relation to site activities; and
- human health impacts.

3.6 Actions taken since exhibition

BHOP has undertaken a range of actions since MOD 6 was placed on exhibition. This has included:

- Undertaking further assessment of human health risks (SLR 2021), which clarifies that:
 - the Human Health Risk Assessment in the MOD 6 Modification Report used air dispersion modelling predictions for a range of metals in dust;
 - these predictions are reported as total concentrations for each metal (soluble and insoluble concentrations);
 - the modelling inputs are conservative and consequently more likely to overpredict than underpredict modelled blood lead; and
 - there are a range of mitigation measures that would be implemented to minimise dust lift-off at the site.
- a meeting with Resources Regulator on 13 October 2021 to clarify the scope of responses required to its submission, in which agreement was made to provide information on rehabilitation relevant to MOD 6 and a schedule for the preparation of the Rehabilitation Strategy and Rehabilitation Management Plan; and
- undertaking an assessment of rehabilitation domains relative to MOD 6 and outlining the pathway to preparation of the Rehabilitation Strategy and Rehabilitation Management Plan (EMM 2021).

The SLR and EMM supplementary assessments are included as Appendix A and Appendix B, respectively.

4 Response to submissions

Responses to the issues raised by the NSW Government agencies, local government authority and the community member are provided in Table 4.1.

Table 4.1 Responses to agency advice and community submission

Submitter	Comment	Response
EPA	<p>Based on the information provided there are minor predicted changes to existing environmental impacts from the proposed modification activities and we recommend the following conditions are incorporated into any approval of the modification.</p> <p>1. No more than 500 thousand tonnes per annum (500 ktpa) of ore can be extracted and processed at the site.</p> <p>Prior to the commencement of construction operations, the proponent must develop and implement a Construction Air Quality Management Plan (AQMP). As a minimum, the plan must include;</p> <p>i. <i>Proactive and reactive mitigation strategies for all significant, and potentially significant emissions sources;</i></p> <p>ii. <i>Monitoring method(s), including but not limited to:</i></p> <p>a) continuous Particulate Matter monitoring.</p> <p>b) meteorological monitoring</p> <p>c) location, frequency and duration of monitoring.</p> <p><i>Note: All monitoring equipment associated with the monitoring network must be operated, maintained and calibrated to the minimum standard required by the equipment manufacturer or reference method. The number of monitors used must be appropriate for the effective management of dust at the premises.</i></p> <p>iii. <i>Trigger response management protocols to be used in combination with the continuous Particulate Matter and meteorological monitors. The selected trigger levels must be informed by the results and conclusions presented in the Updated Air Quality Impact Assessment, and must be clear, measurable, and auditable.</i></p> <p>iv. <i>Identification of clear and specific reactive mitigation measures to be implemented in accordance with the trigger response management protocol.</i></p> <p>v. <i>Description of specific and measurable watering application rates/ targets</i></p> <p>vi. <i>Record keeping.</i></p>	<ul style="list-style-type: none"> ▪ BHOP has not sought to amend its production rate through the proposed modification. The current conditions of approval and the Environment Protection Licence provide an effective regulatory framework for site operations at the approved production level of 0.75 Mtpa. BHOP discussed this approach with the EPA on 26/11/21. ▪ For the MOD 6 construction scenario, there is anticipated to be a minor and temporary net increase in lead (Pb) concentrations / deposition rates across the sensitive receptors when compared with the levels approved under MOD4. However this will only be for a short construction duration of 6 months, after which time, emissions are expected and modelled to decrease under normal operations. The minor and temporary increase is mainly due to material being handled during construction. ▪ All air quality metrics are predicted to be below their respective NSW EPA criteria for the both the MOD 6 Construction Scenario and the MOD 6 operational scenario. ▪ A net reduction in Pb concentrations / deposition rates is expected for the MOD 6 operational scenario when compared with the PPR scenario and the BAU Scenario. ▪ As the MOD 6 operational scenario as proposed in the MR is considered to be a reasonable worst-case future year scenario, ERM Sydney concluded that all future operational years are anticipated to result in a net reduction in off-site air quality impacts (including Pb) when compared with current operations. ▪ The results for all three scenarios demonstrated compliance with all the NSW EPA impact assessment criteria for all air quality parameters assessed. ▪ Cumulative impacts from the proposed Broken Hill North Mine Recommencement Project have been assessed for the short term and long-term air quality metrics. The results demonstrate no exceedance of the NSW impact assessment criteria at any of the co-located receptors that were assessed.

EPA	<p>2. Prior to the commencement of tailings harvesting, the proponent must update the sites air quality management plan to include proactive and reactive measures specific to managing dust emissions from all activities associated with tailings harvesting. The plan must be updated to include proactive and reactive management measures, including the use of a comprehensive water sprinkling system, portable ambient air monitoring equipment and weather forecasting to inform operational activities.</p> <p>Where the modification is approved a variation to Environment Protection Licence No 12559 issued by the EPA and held by the proponent for activities at the mine will be required and we expect the proponent to submit a licence variation prior to any modification construction works. We have no further comments on the proposed modification.</p>	<ul style="list-style-type: none"> ▪ A detailed AQMP is already in place which includes trigger response protocols and mitigation measures. This plan will be reviewed and adapted as necessary to cover the additional activities. The plan will include the following mitigation strategies for the proposed modification: ▪ Various mitigation measures have been identified to reduce dust emissions which include: <ul style="list-style-type: none"> a) the sealing of the new ore haul road; b) a reduction in truck movements by the use of larger trucks for tailings haulage (from TSF2 to TSF3); and c) the sprinkler system for TSF2 will be optimised to accommodate the change to tailings harvesting operations. ▪ BHOP will implement a Construction Environmental Management Plan to manage environmental issues including dust mitigation during the construction stage of MOD 6. ▪ The conditions of approval already require BHOP to review and update its management plans following the approval of a modification. BHOP will therefore undertake a review and update as necessary the existing AQMP prior to tailing harvesting. The updated plan will detail the operation of the watering system and any monitoring that would apply to the proposed activities. <p>BHOP will discuss the need to vary EPL 12559 with EPA.</p>
Department of Regional NSW - Mining Exploration and Geoscience (MEG)	<ul style="list-style-type: none"> ▪ The Modification is based on a mine plan to the end of 2026, which includes extraction of 500,000 tonnes per annum (tpa) ore, 146,000 tpa of waste (to the surface) and 480,000 tpa of tailings harvested and transferred to the Kintore Pit TSF3 facility. ▪ The proposed surface tailings facility, development of the decline and the new boxcut will not sterilise resources near surface and will aid in effective resource recovery and extraction. There will be no substantial change to the production rate or total metals (concentrates) produced. ▪ Without the Modification, a deficit in available tailings storage would inhibit mine production by around mid-2022. MEG supports the project based on production optimisation, resource recovery and the security of regional jobs and state mineral royalties. 	<ul style="list-style-type: none"> ▪ BHOP notes MEG’s support for the proposed modification given the benefits it would accrue.

Heritage Council of NSW	<ul style="list-style-type: none"> ▪ Two SHR listed items near the site, the <i>Broken Hill Railway Station and yard group</i> (SHR 01101) and <i>BHP Chimney Ruin of First Offices</i> (SHR 01820) are separated from the works and will not be affected by the proposed modification. ▪ There are no local heritage items affected by this modification as they are not located within the Kintore Pit precinct or the area proposed for the new portal. It is noted that the local heritage items, which are located within the BHP pit, continue to be fenced for protection (Section 8.10, RMMR). ▪ Based on the above information, there are no objections to the proposed modification (MOD 6). 	<ul style="list-style-type: none"> ▪ BHOP notes the submission made by Heritage Council of NSW. BHOP will continue to manage heritage on site in accordance with the current conditions of approval and under its existing management plan.
Heritage NSW	<ul style="list-style-type: none"> ▪ Heritage NSW acknowledged that there are no reported Aboriginal cultural heritage objects or cultural significance associated with Mod 6 activities 	<ul style="list-style-type: none"> ▪ Heritage NSW comment is noted.
Biodiversity and Conservation Division	<ul style="list-style-type: none"> ▪ BCD considers that that the proposed modification is not likely to cause harm to threatened species. It is understood that no natural vegetation will need to be cleared. The likelihood of bats occupying the shafts being considered in this proposal is low. We recommend that when accessing the old mine workings the area should be assessed for bat occupancy, preferably using ultrasonic audio recorders. If bats are discovered BCD should be notified. 	<ul style="list-style-type: none"> ▪ BHOP notes BCD's request. BHOP will assess the old mine workings for bat occupancy and will notify BCD for advice if any bats are located.
DPIE Water	<ul style="list-style-type: none"> ▪ The Site Water Management Plan should be updated to reflect relocated and additional water management infrastructure and include monitoring, metering and management measures to report on water take (exempt and licenseable), and to address potential impacts to water sources due to the development. 	<ul style="list-style-type: none"> ▪ BHOP will review and update its Site Water Management Plan as necessary, in accordance with the existing conditions of approval.
Crown Lands	<ul style="list-style-type: none"> ▪ The active mine is overlaid by Crown reserves 103488 and 1029548, which are reserved for the purpose of Café and memorial tourism. ▪ The reserves' infrastructure and its structural integrity, along with the safety of the reserves' visitors, may be impacted by the proposed blasting and associated vibration to establish the new portal. ▪ It should be a condition of consent that vibration levels, and compliance with the relevant guidelines, are required at the time of construction of the portal, as per the <i>Protection of the Environment Operations Act 1997</i> and CBH Resources Limited's Mining Operations Plan. ▪ An agreement that regulates and monitors vibration and dust levels is requested. Crown Lands also requires CBH Resources Limited to provide Crown Lands with 14 days notice of blasting events, before the events are to take place. 	<ul style="list-style-type: none"> ▪ BHOP has strict blasting protocols already in place to manage vibration at nearby structures, including blast notification procedures. The conditions of approval effectively regulate blasting and air quality impacts. ▪ However BHOP agrees with Crown Lands that the blasting activities will need to be closely managed and that this can be undertaken in accordance with an agreement between the two parties. ▪ BHOP will give 14 days' notice of the intention to conduct box cut related blasting to Crown Lands. BHOP will also provide regular updates of this schedule as blasting times draw closer. The current blast monitor at the café will continue to be operated through the blasting activities associated with MOD 6. ▪ BHOP will ensure it complies with relevant sections of the <i>Mining Act 1992</i>.

Crown Lands	<ul style="list-style-type: none"> ▪ It is also important to note that all Crown land, reserves and roads within a Mining Lease (with surface rights), or mining related activity, must be subject to a Compensation Agreement issued under section 265 of the <i>Mining Act 1992</i>. They may also be subject to a Section 81 Consent under the <i>Mining Act 1992</i>, where surface activities are proposed. The Compensation Agreement and/or Consent must be agreed and executed prior to any mining activity taking place. 	
Dams Safety NSW	<ul style="list-style-type: none"> ▪ Kintore Pit is an old mining void which has no built embankments. The structure is not a dam and so falls outside of DSNSW's scope for comment, beyond the fact that as an existing mining void it offers a stable repository for tailings deposition and is far superior in this aspect than the current Blackwood TSF. ▪ The Modification proposes the development of a new portal and box cut to access underground mine workings very near to the Blackwood TSF and well within this dam's notification area, subjecting the dam to vibration and possible subsidence impacts. ▪ The impacts on Blackwood TSF from the development of the portal however are expected to be similar to the existing impacts that mining within the notification area is already producing. Mining within the Blackwood Notification Area is currently regulated by DSNSW and the dam is heavily monitored. Impacts on the dam from the development will need to be monitored and kept within the limitations already placed on the dam by DSNSW, to ensure that they pose no additional threat to the structure. ▪ DSNSW has no further comments on the proposal and no recommendations. 	<ul style="list-style-type: none"> ▪ The Blackwoods TSF is a declared dam and is subject to the existing dam notification area and approval from DSNSW. ▪ BHOP will continue to consult with DSNSW throughout the operation of the activities of MOD 6 as required.
Transport for NSW	<ul style="list-style-type: none"> ▪ TfNSW did not object to the proposed modification. 	<ul style="list-style-type: none"> ▪ BHOP notes the TfNSW submission.
NSW Health	<ul style="list-style-type: none"> ▪ The HHRA indicates that modelling shows an increase in soil Pb from the development but are considered small and insignificant. However the burden of lead in the community has been there for many years and presents an ongoing issue and continues to present a risk to vulnerable communities. ▪ Mitigation measures need to be in place to prevent any impact on the community. ▪ No mitigation measures are proposed to manage the modelled increase in soil Pb. Lead burden in the community from the development should be reduced to no effect. 	<ul style="list-style-type: none"> ▪ The HHRA was included as Appendix D1 of the MOD 6 Modification Report. Its findings included: <ul style="list-style-type: none"> d) Predicted incremental increases in soil Pb potentially arising from approximate 12-month MOD6 construction phase were small and insignificant (i.e. 0.005-0.43% of existing soil Pb). e) MOD6 operations were not expected to change absolute geometric mean blood Pb in children living in Broken Hill. f) Blood Pb concentrations in children living in Broken Hill were not anticipated to be affected by activities associated with MOD6. g) The risk of exceeding health-based toxicity reference values for other metals as a result of MOD6 construction or operations was very low.

NSW Health		<ul style="list-style-type: none"> ▪ Throughout the development stage of the proposal, BHOP will continually seek to reduce lead burden in the community through optimising design and minimising material movement. An example of this has already occurred in the boxcut design, where design refinements have resulted in a reduction from ~1 million tonnes to around 0.4 million tonnes of material only requiring to be removed. ▪ BHOP has recently conducted a passive seismic survey of the boxcut area to optimise the current boxcut and with the intent to reduce the amount of material to be excavated. This reduction in material movement will further reduce the predicted minor air quality impacts during the construction phase of MOD 6. ▪ The existing conditions of approval require BHOP to make a reasonable contribution towards the cost of public health monitoring, particularly in relation to child blood lead levels; and public education campaigns about the health risks associated with lead. These contributions will continue to be made during the activities associated with MOD 6, in consultation with the Broken Hill Lead Reference Group. ▪ There are strict lead limits on waste rock that is allowed to be emplaced at the surface. Waste rock with a lead level greater than 0.5% will continue to be placed underground and closely managed under the existing control framework. ▪ It is also noted that BHOP will act to minimise any dust lift off from the Mine site through the following activities: <ul style="list-style-type: none"> h) regular application of chemical dust suppressant to ‘free (undisturbed) areas’; i) continual watering of haul roads and other trafficable areas; j) application of a suitable dust suppressant on unsealed roads; k) additional use of water trucks during approved construction works; and l) an enclosed primary crusher building under negative pressure. ▪ In addition, BHOP is in the process of installing an automated sprinkler system across the Blackwood Pit Tails Storage facility (TSF2).
Resources Regulator	<p>Issue: Post Mining Land Use</p> <ul style="list-style-type: none"> ▪ Comment: The EA should include an identification and assessment of post-mining land use options in consideration of constraints and opportunities associated with the site, regardless of pending guidance on closure objectives from the Inter-agency Panel on the Line of Lode. This should incorporate the outcomes of the Rasp Mine Dust Management Options Assessment that was undertaken in accordance under the Mining Operations Plan. 	<ul style="list-style-type: none"> ▪ BHOP and EMM met with the NSW RR and DPIE 25 October 2021 to seek agreement on actions necessary to satisfy NSW RR requirements to allow DPIE to approve Mod 6. It was agreed that: <ol style="list-style-type: none"> 1. BHOP will provide a response to RR Advice specifically to MOD 6 activities including post mining land use and rehabilitation objectives. This response will include commitments to the development of a Rehabilitation Strategy and Rehabilitation Management Plan within specified timeframes to address site wide post mining land use and rehabilitation objectives. 2. Progress the Rehabilitation Strategy in accordance with section 34A of the Project Approval within the timeframes to be agreed with the Planning Secretary and NSW RR.

Resources Regulator		<p>3. Develop the Rehabilitation Management Plan in accordance with section 35 of the Project Approval and the Operational Rehabilitation Reforms by 2 July 2022.</p> <ul style="list-style-type: none"> ▪ The Rehabilitation Strategy will be developed in conjunction with the Rehabilitation Management Plan ▪ A supplementary assessment of the post-mining landform options for the landforms relevant to MOD 6 has been undertaken (see Appendix B). ▪ TSF 2 will be rehabilitated as detailed in the approved MOP. ▪ Crown Lands have prepared a draft Broken Hill, Line of Lode Masterplan that outlines a range of projects associated with mining heritage at the Line of Lode including: <ul style="list-style-type: none"> m) interpretative mining tours; n) construction of an amphitheatre for memorial ceremonies, open air cinema or musical performances; o) expansion of the Broken Earth café; and p) construction of new methods of accessing the top of hill including walkways, cycle paths and chair lift. ▪ Attachment 1 of DPIE’s letter to BHOP requires the MOD 6 report to address any requirements of the Broken Hill Rehabilitation Steering Committee (Broken Hill Mining inter-Agency Committee (BHMIAC). To date neither BHMIAC or Crown Lands have provided guidance to BHOP on post-mine land use or rehabilitation however, it can be inferred from the Line of Lode Masterplan that the intent is a mining heritage tourism post-mining land use. ▪ In the absence of specific guidance from the BHMIAC or Crown Lands, BHOP have adopted a ‘fall back’ stable and non-polluting post-mine land-use for the MOD 6 project elements that will not preclude a heritage post-mine land use for the greater mine area. ▪ Rehabilitation constraints relating to MOD 6 include geochemical constraints relating to waste rock lead content, acid rock and mineralised rock drainage potential and tailings geochemistry.
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Resources Regulator		<ul style="list-style-type: none"> ▪ These risks will be mitigated by: <ul style="list-style-type: none"> q) segregating waste rock with low lead (<0.5%) and low sulphur (≤0.2%) for rehabilitation capping purposes. r) Placing waste rock with > 0.2% sulphur in the Kintore Pit for disposal with dry tailings and capping with inert waste rock. If ARD was to occur it would be contained within the pit and ultimately seep into the underground workings. s) The surface of the TSF2 would be covered progressively with screened inert waste rock followed inert run of mine waste rock. Access over the tailing would be by end tipping the waste rock material on previously spread material with vehicles travelling on the previously placed material only. No vehicles would be permitted to travel directly on the tailings surface and disturb the dust control crust on the tailing surface. During these activities monitoring would continue from the monitoring station located adjacent to the Pit (and at other monitoring stations across the site). t) The pit wall geotechnical instability risk be fully mitigated by the complete backfilling of the Kintore Pit with waste rock and tailings. <p>The Little Kintore Pit and the Box cut will also be backfilled with waste rock mitigating any pit wall geotechnical instability.</p>
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	<p>Issue: Rehabilitation Objectives and Domains</p> <ul style="list-style-type: none"> ▪ Comment: Rehabilitation objectives and completion criteria are not provided for significant features of the project (e.g. Kintore Pit TSF3 and Blackwood Pit TSF2) and should be considered upfront. It is understood that these details will be provided with submission of the Rehabilitation Management Plan in accordance with the implementation of the Operational Rehabilitation Reform, however this information has been requested as part of the project SEARs. Taking into consideration the conceptual final forms provided in the Modification Report, a clear statement is required that surface water management, including spillways in the final landform will be designed to meet hydrological projections associated with industry accepted guidelines for tailings storage facility closure – specifically ANCOLD Guidelines on Tailings Dams (2019) and the ICMM Global Tailings Standard. 	<ul style="list-style-type: none"> ▪ A supplementary assessment of the post-mining landform options for the landforms relevant to MOD 6 has been undertaken (see Appendix B). ▪ The assessment describes the staged approach that BHOP intends to take to submit the Rehabilitation Strategy and Rehabilitation Management Plan. These documents will be provided to Resources Regulator for comment and approval in accordance with the agreed schedule. The rehabilitation objectives, completion criteria and performance indicators are detailed in Table 8.2 of Appendix B. ▪ Three post mining landforms that vary from those proposed in the current approved Mine Operations Plan (MOP): <ul style="list-style-type: none"> - the existing portal in the Kintore Pit will be sealed and the pit will be backfilled with tailings and waste rock and will be capped with inert waste rock to form a gently sloping final landform - the Little Kintore Pit will be backfilled with waste rock from the excavation of the Box Cut to form a permanent stormwater detention pond; and - the proposed portal in the Box Cut will be sealed and the cut will be partially backfilled with waste rock to form a permanent stormwater detention pond. ▪ BHOP will investigate the feasibility of growth media manufacture realising that a successful outcome will require collaboration with Broken Hill City Council, Landcare Broken Hill and other industries and that additional approvals may be required. ▪ If it is determined that the process is feasible, then BHOP would undertake rehabilitation trails on site where the manufactured growth media would be mixed with inert waste rock and then seeded with appropriate native grass and ground cover species.
Broken Hill City Council (BHCC)	<ul style="list-style-type: none"> ▪ Noise – Council is satisfied that no additional noise impacts from future MOD 6 operations are predicted to affect surrounding residential receivers as a result of proposed future MOD 6 operations. Council notes the overall benefit of a reduction in noise from the reduced ore haulage route from the new portal to the ROM Pad. ▪ It is anticipated and expected that there will be noise generated from construction activities during construction stage. ▪ Council would support the imposition of conditions aimed to manage noise during construction stage. Suggested conditions include (but not necessarily limited to): Construction activities (other than within Kintore Pit) should be during daytime hours only. No construction work on Public holidays. ▪ Dust – Council acknowledges the haul route will be shorter distance from the new Portal to the ROM Pad, and believes that this will be beneficial to dust reduction during operations. It is noted that this haulage road is to be sealed. 	<ul style="list-style-type: none"> ▪ BHOP notes and appreciates the support it receives from BHCC. ▪ BHOP has committed to undertaking surface construction activities during approved daytime construction hours, to manage noise impacts on the community. ▪ BHOP will continue to implement the Air Quality Management Plan and Construction Environmental Management Plan for the project, which will be updated to cover the additional MOD 6 activities. ▪ The HHRA and supplementary assessment at Appendix A show that the impacts of MOD 6 will not be likely to be significantly different to impacts previously assessed and approved for the project. Strict measures will be in place to minimise air quality impacts on the community, including: <ul style="list-style-type: none"> u) regular application of chemical dust suppressant to ‘free (undisturbed) areas’; v) continual watering of haul roads and other trafficable areas; w) application of a suitable dust suppressant on unsealed roads; x) additional use of water trucks during approved construction works; and

	<ul style="list-style-type: none"> ▪ Impact on heritage items on the mining lease – Council notes that the works and operations as a result of MOD 6, will not have any direct impact on any heritage listed items on the Mining Lease. There are no concerns raised from a heritage perspective. ▪ Community health – A long-held concern of the local community has centred around health risk from the generation of Pb (lead) bearing dust emitted from local mining leases and its potential impact on blood lead levels, particularly young children. It is noted that a human Health Risk Assessment report was provided with the Modification application. The report outlined that Blood Pb (lead) concentrations in children living in Broken Hill were not anticipated to be affected by activities associated with MOD 6, and that the risk of exceeding health-based toxicity reference values for other metals as a result of the modification construction or operations was very low. ▪ The proposed mitigation measures for air quality are expected to assist with reducing Pb (lead) dust, and Council re-iterates the importance that these measures are implemented and enforced through the approval. 	<ul style="list-style-type: none"> y) an enclosed primary crusher building under negative pressure. ▪ BHOP will implement a Construction Environmental Management Plan to also assist in dust mitigation during the construction stage of MOD 6.
<p>Ms Jenny-Lee Rowbotham, Broken Hill</p>	<ul style="list-style-type: none"> ▪ Concerns raised in relation to: <ul style="list-style-type: none"> z) Waste disposal locations and the potential for contamination. aa) Management of lead dust in the community. bb) Historic concerns in regard to the operation of the site. <p>Comments:</p> <ul style="list-style-type: none"> ▪ I have concerns in regards that the site will be an environmental concern to the community living there in broken hill <ol style="list-style-type: none"> 1. waist disposal site 1700 north 50 east hazardous waste on site from former power stations [sic]. <ul style="list-style-type: none"> ▪ blood air soil testing only reporting insoluble lead and only 10ppm environmental reports have concerns on under reporting of toxic levels. ▪ Health community being exposed to dust that is going to be generated from the site with the high levels of ceracite lead soluble which is not included in testing of all above there for under reported by health department as well as manganese levels in the site which are not reported or tested i have a concern that toxic dust levels generated from the site will not be contained especially crushing and transporting this toxic material same approvals where give in the 1980s to MMM mine company and Broken Hill community was poisoned what is going to be put place community in regards testing partial size less than 10ppm and soluble laed and other heavy metals that is laden in the material they intent to extract from this site the dust generated from the 	<ul style="list-style-type: none"> ▪ The Human Health Risk Assessment is included as Appendix D1 of the Modification Report. The key concerns raised in the submission are addressed in the SLR supplementary assessment at Appendix A of this report. Its key findings are: <ol style="list-style-type: none"> a) both soluble and insoluble lead, i.e. total lead, was included in testing undertaken to inform the assessment; b) the latest health advice has been taken into account in the assessment of the Proposal, (i.e. the lower blood lead action level of 5 µg/dL was used in the assessment); c) input parameters into the modelling were chosen based on relevant data for Broken Hill. The input assumptions into the modelling are conservative and consequently more likely to overpredict than underpredict modelled blood lead; and d) the HHRA predicted there will be negligible change to blood lead levels of children as a result of MOD 6. ▪ In general, BHOP has selected the locations for its mine waste disposal very carefully so it can contain its waste within the site and limit the risk of off-site contamination. The proposed modification involves the progressive rehabilitation of the waste rock areas and the selective emplacement of waste at the surface which has very low lead levels. ▪ Lead dust in the community is a key management issue for the site. BHOP has strict controls in place to ensure lead dust levels are minimised. These controls, which include regular monitoring and a trigger action response plan which contains key actions if elevated levels of lead are detected, would continue to be applied for MOD 6.

	site will poison the community same as it had in 1980s community will have another generation of children with cognitive impairment [sic].	
Supplementary submission	<ul style="list-style-type: none"> “DECC does not support the public exhibition of the Environmental Assessment Director General’s requirements not met by mining company. Air Quality Assessment. Dated 15 April 2008” [sic]. 	<ul style="list-style-type: none"> This is a historic issue which has been adequately resolved through the assessment of the original Project Approval, and is therefore not relevant to the assessment of MOD 6. The conditions of approval provide an appropriate regulatory framework for the management of air quality impacts.
	<ul style="list-style-type: none"> “Understanding on managing lead contaminated public land to be kept highly confidential” – Facsimile dated 28 November 2000 	<ul style="list-style-type: none"> This is also a historic issue does not appear to be specific to Broken Hill Operations (BHOP) or MOD 6. BHOP is required to regularly report on its operations to relevant NSW Government agencies, including EPA and NSW Health.
	<ul style="list-style-type: none"> Reference to Dust survey conducted by Pasminco and Department of Mineral Resources 	<ul style="list-style-type: none"> This comment relates to a historic issue with subsequent studies conducted. BHOP’s operations are aimed at minimizing dust generation on site. BHOP regularly reports its monitoring data from a network of air monitoring devices in accordance with the conditions of approval and its Environmental Protection Licence.
	<ul style="list-style-type: none"> Steering Committee meeting 14/8/95 - “Pathology encouraged to change there method of testing..... calibrate machine to only read insoluble lead”. 	<ul style="list-style-type: none"> This comment relates to a historic issue which is not directly related to BHOP. A detailed response from independent consultant SLR dated 11 October 2021 provides further explanation on the scope of the Human Health Risk Assessment and shows that both soluble and insoluble lead were included in calculations.
	<ul style="list-style-type: none"> Reference is made to “30% of Broken Hill Births – Blood lead cord not tested under reporting blood lead card” [sic]. 	<ul style="list-style-type: none"> This reporting is not associated with BHOP.
	<ul style="list-style-type: none"> Reference is made to “still births record for dates 1990 + 2005” 	<ul style="list-style-type: none"> This data is historic and is prior to BHOP commencing mining at the site. The conditions of approval strictly regulate the lead impacts on the community. BHOP is required to regularly report on its air quality emissions and operates a comprehensive monitoring network to ensure compliance with approved air quality criteria.
	<ul style="list-style-type: none"> Reference is made to a Report of Board Appointed to inquire into the prevalence and prevention of lead poisoning and “1982 chemical analysis CML7 mine site BHP Pit – Blackwood pit” 	<ul style="list-style-type: none"> A detailed response from independent consultant SLR dated 11 October 2021 (which conducted the Human Health Risk Assessment) states that “The HHRA predicted there will be negligible change to blood lead levels of children as a result of the Proposal”. BHOP will continue to monitor its air quality impacts in accordance with the conditions of approval and the EPL.
	<ul style="list-style-type: none"> Reference is made to surface mining activities conducted at the Rasp Mine between 2019-2020 	<ul style="list-style-type: none"> The area referenced is related to construction of Embankment 2 as part of Modification 4. These approved activities are not the subject of MOD 6.
	<ul style="list-style-type: none"> Reference is made to a Minute Paper dated 24th February 1998 in which South Mine (CML7) workers had elevated lead levels. 	<ul style="list-style-type: none"> This comment relates to historic data that occurred prior to BHOP commencing mining activities and does not relate to the project modification. BHOP manages the risk in accordance with its Lead Management Plan, which including regular blood lead level testing of its workers.

	<ul style="list-style-type: none"> Reference is made to the “Rasp Mine TSF Design”, Blackwood Pit and TSF1. 	<ul style="list-style-type: none"> BHOP cannot identify any specific concern in relation to this reference. The TSFs at the site are strictly regulated under the conditions of approval and the EPL.
	<ul style="list-style-type: none"> Reference is made to an Environmental Assessment Report. 	<ul style="list-style-type: none"> BHOP cannot identify any specific concern in relation to this reference.
	<ul style="list-style-type: none"> Reference is made to responses from Minister for Minerals and Energy NSW dated 14 January 1991, Minister for the Environment dated 8 April 1991, State Pollution and Control Commission dated 4 April 1991 and Minister for Mineral and Energy dated 23 July 1990 	<ul style="list-style-type: none"> These are historic responses that have been provided by the relevant party and are not related to MOD 6.
	<ul style="list-style-type: none"> Reference is made to a newspaper article regarding a Mining Company being fined \$1.5M and that contaminated was originally sourced from the MMM mine site – CML7 lease. 	<ul style="list-style-type: none"> This statement does not relate to MOD 6 and BHOP cannot comment as to the validity of this statement, as this was prior BHOP acquiring the mining lease and commencing mining activities at the site.
	<ul style="list-style-type: none"> Reference is made to a broken glass jar on a TEOM air monitoring device from 2016 and the Rasp Mine still providing results. This issue was reported to the EPA Environment Line on 12/9/18. 	<ul style="list-style-type: none"> BHOP resolved this issue in consultation with the EPA at the time of the complaint. The TEOMS utilised by BHOP are continually monitored by an independent third party, which validates data in accordance with the Australian Standard. BHOP visually inspect its TEOMs on a weekly basis, with inspection records maintained. TEOMs are regularly serviced by equipment specialists.
	<ul style="list-style-type: none"> Dust from the CML7 Lease 	<ul style="list-style-type: none"> BHOP minimises dust lift off from the mine site through a range of activities, including: <ul style="list-style-type: none"> regular application of chemical dust suppressant to ‘free (undisturbed) areas’; continual watering of haul roads and other trafficable areas; application of a suitable dust suppressant on unsealed roads; additional use of water trucks during approved construction works, and an enclosed primary crusher building under negative pressure. BHOP is also in the process of installing an automated sprinkler system across the Blackwood Pit Tails Storage facility (TSF2) in accordance with MOD4. In addition, BHOP is proposing progressive capping of ‘free areas’ as part of MOD 6.
	<ul style="list-style-type: none"> Reference is made to dust/blast fumes coming from the main underground exhaust 29/10/21 and proximity to residential homes. 	<ul style="list-style-type: none"> This issue of dust/blast fumes coming from the exhaust was addressed in consultation with the EPA in 2018/2019. This resulted in a water spray/misting system being established around the main exhaust to suppress particles and mitigate emissions. The main exhaust emissions are tested every 3 months by an independent third party in accordance with Environmental Protection Licence requirements. Monitoring results to date have verified that emissions have complied with licence conditions.

5 Conclusion

The Department received responses from 11 NSW Government agencies, 1 from Broken Hill City Council and 1 submission from a community member in response to its public exhibition of 07_0018 MOD 6.

None of the public authorities objected to the proposal and made recommendations to ensure the potential impacts are minimised. Broken Hill City Council supports the proposal. The community submitter raised concerns about the air quality and human health impacts of the proposal.

The issues raised in submissions are either already being addressed or are regulated under the current conditions of approval, or would be managed under updated management plans for the site in accordance with the commitments made in the Environmental Assessment for the proposed modification.

Additional assessments undertaken since MOD 6 was exhibited clarify that the human health risks presented by MOD 6 are no different to that which has already been assessed and approved. A range of mitigation actions would be implemented to ensure the protection of human health during the construction and operation of the activities subject to the modification.

BHOP has committed to preparing the necessary strategy and management plan for the progressive rehabilitation of the site.

BHOP will continue to closely monitor its impacts on the local community during the construction and operation of MOD 6 to ensure it meets its environmental obligations required under the strict conditions of approval.

If you have any questions or would like to discuss the matter further, please contact Joel Sulicich HSET Manager on 0427 610 774 or joelsulicich@cbhresources.com.au.

Yours sincerely



Giorgio Dall'Armi

General Manager

Broken Hill Operations Pty. Ltd.

Appendix A Submissions register

Submitter	Location	Stakeholder type	View	No comment	Socio-economic	Resource recovery	Land tenure	Health	Biodiversity	Tailings storage	Traffic and transport	Air quality	Noise	Historic heritage	Rehabilitation	Surface water
Crown Lands	Wagga Wagga, NSW	Government	Comment				1									
DPIE - Biodiversity and Conservation Division	Parramatta, NSW	Government	Comment						1							
DPIE - Mining, Exploration and Geoscience Division	Maitland, NSW	Government	Comment		1	1										
Heritage NSW	Parramatta, NSW	Government	Comment											1		
DPIE - Water, Natural Resources Access Regulator	Parramatta, NSW	Government	Comment													1
Environment Protection Authority	Parramatta, NSW	Government	Comment									1				
NSW Health	Dubbo, NSW	Government	Comment					1				1				
Resources Regulator	Maitland, NSW	Government	Comment												1	
Heritage Council of NSW	Parramatta, NSW	Government	Comment											1		
Transport for NSW	Parkes, NSW	Government	Comment	1												
Dams Safety NSW	Parramatta, NSW	Government	Comment							1						
Broken Hill City Council	Broken Hill, NSW	Government	Comment		1			1			1	1		1	1	
Ms Jenny Rowbotham	Broken Hill, NSW	Individual	Object					1		1		1				

Appendix B Updated mitigation measures

Aspect	Mitigation measure
Rehabilitation	<p>BHOP will segregate and preserve waste rock with low lead (<0.5%) and low sulphur ($\leq 0.2\%$) for rehabilitation capping purposes (inert waste rock). The inert waste rock will provide the necessary protection from water and wind erosion. Erosion modelling will be undertaken during the development of the RMP to verify the erosion stability of the waste rock.</p>
Growth media	<p>BHOP will investigate the feasibility of growth media manufacture realising that a successful outcome will require collaboration with Broken Hill City Council, Landcare Broken Hill and other industries and that additional approvals may be required.</p> <p>If it is determined that the process is feasible, then BHOP would undertake rehabilitation trails on site where the manufactured growth media would be mixed with inert waste rock and then seeded with appropriate native grass and ground cover species.</p>
Waste rock	<p>Waste rock with > 0.2% sulphur will be placed in the Kintore Pit for disposal with dry tailings and ultimately capped with inert waste rock. If ARD was to occur it would be contained within the pit and ultimately seep into the underground workings.</p>
TSF 2	<p>It is proposed that in the final stages of tailings deposition the delivery system would be realigned to also discharge tailings from along the crest of TSF 2 Embankment 2 shaping the surface to direct runoff towards the spillway. The tailings beach surface near the spillway would be shaped by selective tailings placement from Embankment 2 to fill the environment containment freeboard to a point that the remaining depression below the spillway level would contain the 1:100-year 72-hour rainfall runoff event from the TSF2 catchment area.</p> <p>Following deposition of the tailings to the designed level an application of soil stabilising polymer would be applied through the water spray system to minimise dust entrainment by wind while the tailings are allowed to settle and consolidate. Ponding water would be allowed to evaporate or be recirculated over the dryer part of the beach to remove the water from the low areas and promote drying of the tailings prior to the placement of cover material. It is expected that the tailings beach may be accessible for construction works within a few months after final placement of tailings.</p> <p>The surface of the TSF2 would be covered progressively with screened inert waste rock followed inert run of mine waste rock. Access over the tailing would be by end tipping the waste rock material on previously spread material with vehicles travelling on the previously placed material only. No vehicles would be permitted to travel directly on the tailings surface and disturb the dust control crust on the tailing surface. During these activities monitoring would continue from the monitoring station located adjacent to the Pit (and at other monitoring stations across the site).</p>
Subsidence	<p>Key subsidence risks are managed and mitigated by:</p> <ul style="list-style-type: none"> • use of empirical slope design charts in conjunction with detailed geotechnical modelling of extraction sequences to ensure ground stresses do not exceed the capabilities of the rock mass; • regular slope inspections used to ascertain if predicted behaviour matches the actual performance of the void; • installation of modern ground support/reinforcement systems which capitalise on the inherent strength of the rock mass;

	<ul style="list-style-type: none"> • placement of mine back fill (eliminating the void) in a timely manner after production has ceased; and • use of trained and competent people in critical functional roles such as mine technical services and mining operations. <p>As part of the mine design process, each stope undergoes an individual risk assessment. The assessment addresses the following:</p> <ul style="list-style-type: none"> • stope size and shape; • ground support requirements, including additional support into the hanging wall if required; • ring design and stope firing sequence; and • back fill requirements. <p>This process mitigates the potential for localised failures within the stoping blocks. Additional diamond drilling and geological mapping of the orebody, footwall and hanging-wall occurs as underground development progresses. This additional geological and geotechnical information is used for the individual stope assessments and in the larger mine planning process to further mitigate the risk of localised failures.</p>
Geotechnical stability	<p>Works have been proposed by Golder to support the slopes during tailings and waste rock placement and safety bunds have been included in the conceptual placement design to mitigate these risks.</p> <p>The pit wall geotechnical instability risk be fully mitigated by the complete backfilling of the Kintore Pit with waste rock and tailings.</p> <p>The Little Kintore Pit and the Box cut will also be backfilled with waste rock mitigating any pit wall geotechnical instability.</p>
Human health	<p>BHOP aims to minimise any dust lift off from the Mine site through the following activities:</p> <ul style="list-style-type: none"> • regular application of chemical dust suppressant to ‘free (undisturbed) areas’, • continual watering of haul roads and other trafficable areas, • application of a suitable dust suppressant on unsealed roads, • additional use of water trucks during approved construction works, • and an enclosed primary crusher building under negative pressure. <p>In addition, BHOP is in the process of installing an automated sprinkler system across the Blackwood Pit Tails Storage facility (TSF2).</p>

Appendix C HIRA supplementary response

11 October 2021

640.30307-L01-v2.0-20211011 (Response to HHRA comments).docx

Broken Hill Operations Pty Ltd

Attention: Joel Sulicich

Dear Joel

Response to Public Comments BHOP HHRA for MOD6

In this letter I have considered public comments received on the MOD6 Proposal from a member of the public, Ms Rowbotham.

Comment Received

Ms Rowbotham has expressed concerns that the Proposal presents an environmental concern to the community of Broken Hill for the following reasons (the full submission is attached as Appendix A to this letter):

1. *"waist disposal site 1700 north 50 east hazardous waste on site from former power stations."*

Response: The coordinates (and photograph) referred to by Ms Rowbotham relate to the location of construction work undertaken as part of a previous modification, MOD4 which is not the subject of the MOD6 Proposal. It is noted dust modelling undertaken for the MOD4 construction work showed the small changes in air and soil lead concentrations over a short period of time are unlikely to materially influence existing exposures to lead¹. It was also noted the modelling undertaken over-predicts Pb deposition in dust, thus considerations are conservative.

2. *"blood air soil testing only reporting insoluble lead and only 10ppm environmental reports have concerns on under reporting of toxic levels."*

Response: Both soluble and insoluble lead, i.e. total lead, was included in testing undertaken to inform the assessment (refer to the detailed response below). With respect to the second part of this concern, I believe Ms Rowbotham is referring to the change in the latest health advice for lead in which the blood lead action level was reduced from 10 to 5 µg/dL in 2015 (NHMRC 2015)². I confirm that the latest health advice has been taken into account in the assessment of the Proposal, i.e. the lower blood lead action level of 5 µg/dL was used in the assessment. Upon consultation of Ms Rowbotham's supporting documentation, she may also be referring to the fact that in 2018 approximately 30% of all births were Caesareans and cord blood from these women is not usually tested for lead and therefore is not included in the geometric mean umbilical cord lead levels

¹ ToxConsult (2017). Does Modification 4 at Rasp Mine need a Health Risk Assessment? ToxConsult document ToxCRO80317-TF2, dated 3rd April 2017.

² NHMRC (2015). NHMRC information paper: evidence on the effects of lead on human health, National Health and Medical Research Council. May 2015.

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/eh58a_information_paper_effects_lead_human_health_a.pdf.

reported in community blood lead testing for Broken Hill. This does not affect the interpretation or conclusions of the assessment undertaken for the Proposal.

3. *“Health community being exposed to dust that is going to be generated from the site with the high levels of ceracite lead soluble which is not included in testing of all above.”*

Response: As noted above and discussed in detail below, both soluble and insoluble lead, i.e. total lead, was included in testing undertaken to inform the assessment.

4. She has also expressed concern that manganese levels on the site were not reported or tested and that dust generated from the site will not be contained especially when crushing and transporting this material.

Response: I can confirm manganese measurements were taken from soil/dust collected on and off the mine site and the results were included in the assessment undertaken.

A more detailed responses to the concerns raised is provided below.

Detailed Response

Broken Hill Operations Pty Ltd (BHOP) is seeking to modify its Project Approval primarily to allow for tailings to be co-deposited with excess waste rock from underground mining operations into Kintore Pit as a Tailings Storage Facility. The collective proposed modification is termed Modification 6 (MOD6).

In order to understand whether the proposed change in operations may result in a change in exposure of persons in Broken Hill to altered dust emissions from the Mine site and/or from associated roadways, a detailed Human Health Risk Assessment (HHRA)³ was undertaken in accordance with national guidelines for undertaking such assessments⁴.

The HHRA used air dispersion modelling predictions generated by ERM for a range of metals in dust (lead, silver, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, mercury, manganese, nickel and zinc). These predictions are reported as total concentrations for each metal; this includes both soluble and insoluble amounts of each metal. However, total metal concentrations are not a good indication of how much is absorbed into the body.

Bioaccessibility is the amount of metal released from soil in the gastrointestinal tract, and which is available to be absorbed into the systemic circulation. Not all that is released from soil/dust is absorbed. For the HHRA, existing soil/dust metal concentrations in Broken Hill were informed by existing scientific literature information and by a comprehensive sampling program which included collection of 56 samples of soil/dust from the mine site as well as in urban locations within Broken Hill. The samples were tested for bioaccessibility of lead, arsenic, chromium, iron, manganese, and cadmium. Where data were not available for a particular metal, it was conservatively assumed the metal may be fully (i.e. 100%) soluble for HHRA calculations.

For the assessment of lead exposures, potential health impacts were assessed by using a validated model (IEUBK)⁵ from US EPA to predict blood lead in 1-2 year old children. The HHRA predicted there will be negligible change to blood lead levels of children as a result of the Proposal, i.e. blood lead concentrations in children living

³ HHRA Reference: SLR (2020). Human Health Risk Assessment for Rasp Mine, Modification 6. SLR Ref: 640.12028-R01-v3.0. December 2020.

⁴ enHealth (2012). Environmental health risk assessment guidelines for assessing human health risks from environmental hazards. Commissioned by the enHealth Council. <http://www.eh.org.au/documents/item/916>.

⁵ Integrated Exposure Uptake and Biokinetic Model.

in Broken Hill are not anticipated to be affected by activities associated with the Proposal. Input parameters into the modelling were chosen based on relevant data for Broken Hill. The input assumptions into the modelling are conservative and consequently more likely to overpredict than underpredict modelled blood lead.

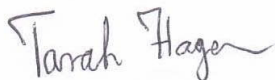
For the assessment of exposures to other metals, risk of exceedance of a chronic toxicity reference value (TRV; adjusted for possible 'background' exposures) or chronic air guideline value is used to judge potential risk of harm. It is conservatively assumed the metals may have additive effects even though this is very unlikely. The HHRA found that estimated exposures to metals other than lead (which includes manganese) are all well below their respective health guidelines. It is concluded the risk of exceeding health-based toxicity reference values as a result of the Proposal is very low. The assessment is conservative.

It is also noted BHOP aim to minimise any dust lift off from the Mine site through the following activities:

- regular application of chemical dust suppressant to 'free (undisturbed) areas',
- continual watering of haul roads and other trafficable areas,
- application of a suitable dust suppressant on unsealed roads,
- additional use of water trucks during approved construction works,
- and an enclosed primary crusher building under negative pressure.

In addition, BHOP is in the process of installing an automated sprinkler system across the Blackwood Pit Tails Storage facility (TSF2).

Yours sincerely



TARAH HAGEN, MSC, DABT, RACTRA
Technical Discipline Manager - Toxicology & Risk Assessment

Checked/
Authorised by: GDN

Appendix A: Ms Rowbotham's submission

Search by Project Name or ID

[Back to Submission List](#)

Submission for: MOD 6 – New Tailing Storage Facility

Comments

jenny-lee Rowbotham

BROKEN HILL, New South Wales

Message

I have concerns in regards that the site will be an environmental concern to the community living there in broken hill

1. waist disposal site 1700 north 50 east hazardous waste on site from former power stations
2. blood air soil testing only reporting insoluble lead and only 10ppm environmental reports have concerns on under reporting of toxic levels
- 3 Health community being exposed to dust that is going to be generated from the site with the high levels of ceracite lead soluble which is not included in testing of all above there for under reported by health department as well as manganese levels in the site which are not reported or tested i have a concern that toxic dust levels generated from the site will not be contained especialy crushing and transporting this toxic material same approvals where give in the 1980s to mmm mine company and broken hill community was poisoned what is going to be put place community in regards testing partical size less than 10ppm and soluble laed and other heavy metals that is laden in the material they intent to extract from this site the dust generated from the site will poison the community same as it had in 1980s community will have another generation of children with cognetive impairment

The Department of Planning, Industry and Environment acknowledges the Traditional Custodians of the land and pays respect to all Elders past, present and future.

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Appendix D Rehabilitation response

Rasp Mine Modification 6

Response to NSW Resources Regulator

Prepared for Broken Hill Operation Pty Ltd
November 2021

EMM Newcastle
Level 3, 175 Scott Street
Newcastle NSW 2300

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E info@emmconsulting.com.au

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Rasp Mine Modification 6

Response to NSW Resources Regulator

Report Number

E211010 RP#1

Client

Broken Hill Operation Pty Ltd

Date

29 November 2021

Version

v1 Final

Prepared by

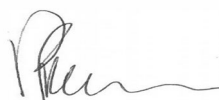


Michael Frankcombe

National Technical Leader - Land, Water and Rehabilitation

29 November 2021

Approved by



Paul Freeman

Associate Director

29 November 2021

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Executive Summary

Broken Hill Operations Pty Ltd (BHOP), a wholly owned subsidiary of CBH Resources Limited, owns and operates the Rasp Mine (the mine), located centrally within Broken Hill on Consolidated Mine Lease 7 (CML7). The mine produces zinc and lead concentrates that it transports via rail to Port Pirie in South Australia and Newcastle in New South Wales for export.

BHOP has made application to the Department of Planning, Industry and Environment (DPIE) to modify the mine project approval (PA 07_0018) (Mod 6) under section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP Act) to allow co-disposal of waste rock and tailings into the Kintore Pit to allow continued operations as the existing tailings storage facility (TSF2) is anticipated to reach capacity in late 2022.

DPIE sought advice from the NSW Resources Regulator (NSW RR) on environmental assessment requirements to be addressed to be in the Mod 6 application which was provided to DPIE via letter 9 April 2019 (Appendix 1).

DPIE provided the Modification Report to the NSW RR 3 September 2021. The NSW RR responded 6 October 2021 (Appendix 2) indicating that the Modification Report had not addressed the environmental assessment requirements requested in the letter of 9 April 2019, and they requested several additional matters be addressed (see section 3) focusing on the assessment of post mining land use options, landform design and closure criteria.

Three post mining landforms that vary from those proposed in the current approved Mine Operations Plan (MOP):

- the existing portal in the Kintore Pit will be sealed and the pit will be backfilled with tailings and waste rock and will be capped with inert waste rock to form a gently sloping final landform;
- the Little Kintore Pit will be backfilled with waste rock from the excavation of the Box Cut to form a permanent stormwater detention pond; and
- the proposed portal in the Box Cut will be sealed and the cut will be partially backfilled with waste rock to form a permanent stormwater detention pond.

TSF 2 will be rehabilitated as detailed in the approved MOP.

Crown Lands have prepared a draft Broken Hill, Line of Load Masterplan that outlines a range of projects associated with mining heritage at the line of load including:

- interpretative mining tours;
- construction of an amphitheatre for memorial ceremonies, open air cinema or musical performances;
- expansion of the Broken Earth café; and
- construction of new methods of accessing the top of hill including walkways, cycle paths and chair lift.

Attachment 1 of DPIE's letter to BHOP requires the MOD 6 report to address any requirements of the Broken Hill Rehabilitation Steering Committee (Broken Hill Mining inter-Agency Committee (BHMIAC)). To date neither BHMIAC or Crown Lands have provided guidance to BHOP on post-mine land use or rehabilitation however, it can be inferred from the Line of Load Masterplan that the intent is a mining heritage tourism post-mining land use.

In the absence of specific guidance from the BHMIAC or Crown Lands, BHOP have adopted a 'fall back' stable and non-polluting post-mine land-use for the MOD 6 project elements that will not preclude a heritage post-mine land use for the greater mine area.

BHOP have identified that the key limitations for alternate post mining uses are the arid climate and lack of any grow media due to past mining practices. To this end BHOP will undertake an assessment to determine if it is feasible to manufacture growing media from recycled organics sourced locally and if so, undertake a native revegetation trial using manufactured growth media mixed with inert waste rock.

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Photograph 5.1 Tree death due to drought conditions

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1 Context

Broken Hill Operations Pty Ltd (BHOP), a wholly owned subsidiary of CBH Resources Limited, owns and operates the Rasp Mine (the mine), located centrally within Broken Hill on Consolidated Mine Lease 7 (CML7). The mine produces zinc and lead concentrates that it transports via rail to Port Pirie in South Australia and Newcastle in New South Wales for export.

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DPIE provided the Modification Report to the NSW RR 3 September 2021. The NSW RR responded 6 October 2021 (Appendix 2) indicating that the Modification Report had not address the environmental assessment requirements requested in the letter of 9 April 2019, and they requested several additional matters be addressed (see section 3).

EMM Consulting (EMM) have been engaged by BHOP to address the rehabilitation matters requested by the NSW RR.

2 Scope

BHOP and EMM met with the NSW RR and DPIE 25 October 2021 to seek agreement on actions necessary to satisfy NSW RR requirements to allow DPIE to approve Mod 6. It was agreed that:

1. BHOP will provide a response to RR Advice specifically to MOD 6 activities including post mining land use and rehabilitation objectives. This response will include commitments to the development of a Rehabilitation Strategy and Rehabilitation Management Plan within specified timeframes to address site wide post mining land use and rehabilitation objectives.
2. Progress the Rehabilitation Strategy in accordance with section 34A of the Project Approval within the timeframes to be agreed with the Planning Secretary and NSW RR.
3. Develop the Rehabilitation Management Plan in accordance section 35 of the Project Approval and the Operational Rehabilitation Reforms by 2 July 2022.

This letter report addresses Item 1.

3 NSW Resources Regulator Assessment Requirements

The NSW RR assessment requirements of 9 April 2019 and 6 October 2021 are summarised Table 3.1.

Table 3.1 NSW RR Mod 6 Rehabilitation Assessment requirements

Aspect	Requirement	Where addressed in this report
9 April 2019		
Rehabilitation	Include details of the revised rehabilitation strategy, proposed final landform and post closure maintenance, specifically in relation to the proposed modification, and any requirements of the Broken Hill Rehabilitation Steering Committee.	s.5, s.6 and s.9
	The measures proposed and presented in the Modification Report must be developed in consultation with the Department’s Division of Resources and Geoscience and the Resources Regulator.	s.4
6 October 2021		
Post Mining Land Use	The environmental assessment should include an identification and assessment of post-mining land use options in consideration of the constraints and opportunities associated with the site, regardless of pending guidance on closure objectives from the Inter-agency Panel on the Line of Load. This should incorporate the outcomes of the Rasp Mine Dust Management Options Assessment that was undertaken in accordance with the Mining Operations Plan.	s. 4 and s.5
Rehabilitation Objectives and Domains	Rehabilitation objectives and completion criteria are not provided for significant features of the project (eg Kintore Pit (TSF3) and Blackwood Pit (TSF2) and should be considered upfront. It is understood that these details will be provided with submission of the Rehabilitation Management Plan in accordance with the implementation of the Operational Rehabilitation Reforms, however this information has been requested as part of the project SEARs. Taking into consideration the conceptual final forms provided in the Modification Report, a clear statement is required that surface water management, including spillways in the final landform will be designed to meet hydrological projections associated with industry accepted guidelines for tailings storage facility closure specifically ANCOLD Guidelines on Tailings Dams (2019) and the ICMM Global Tailings Standard.	s.7 and s.8

4 Agency consultation

Consultation with the NSW RR regarding rehabilitation and closure has involved:

- submission of the Mine Operations Plan (MOP) and associated response from NSW RR;
- discussions and formal correspondence associated with the Targeted Assessment Program – Soil and Materials Management inspection undertaken by the NSW RR 2 November 2020;
- discussions and formal correspondence associated with the Targeted Assessment Program – Landform establishment inspection undertaken by the NSW RR 25 May 2021; and
- submission of the 2018 Annual Environmental Management Report/Annual Review and formal correspondence from NSW RR.

One of the functions Broken Hill Mining inter-Agency Committee (BHMIAC) is provide guidance to BHOP on rehabilitation and post mine land use for the mine but to date no guidance has been provided.

5 Rehabilitation constraints and opportunities

Broken Hill has been a significant mining centre since the discovery of silver-lead-zinc ore bodies in 1883. The history of mineral development at Broken Hill and the heritage value of associated infrastructure has State and National significance (NSW Government, 2020). In January 2015, the City of Broken Hill was granted heritage status and placed on the National Heritage Listing for its contribution to mining (Australian Government, 2020).

From 1885, mining has been undertaken continuously, by multiple companies, on earlier leases that now comprise CML7. Minerals Mining and Metallurgy (MMM) ceased mining on CML7 in April 1991. Normandy Mining Limited held a controlling interest in MMM. Rehabilitation of CML7 commenced in 1991 and was completed in 1999 (Normandy, 2000). The Mine was purchased by CBH from Normandy Mining in 2001.

Historic operations have left the Mine area highly modified and disturbed. The original landform has been significantly altered, most native vegetation has been removed and soils have been degraded and covered with waste rock or tailings (BHOP, 2020a).

5.1 Climate

5.1.1 Constraint

The Mine is situated in the NSW arid zone which has a hot dry climate. A median rainfall of 254 mm has been recorded at the Broken Hill Airport Station with most rain falling in the summer months. The mean maximum temperatures range from 15.6°C in July to 33.6°C in January, while the mean minimum temperatures range from 4.8°C in July to 19.3°C in January. The annual evaporation rate is high, in the order of 2,614 mm (BOM, 2021).

Current climatic conditions (ie drought and high evaporation rates) are hostile to the germination of seed and plant growth particularly with the lack of suitable growth media within Mine areas. Successful revegetation programs in the region have utilised irrigation to overcome the climatic issues. The use of town water for irrigation, however, is not considered to be a viable long-term closure solution. Wastewater was used successfully for the establishment of vegetation in the 1930s in the Broken Hill area. Irrigation is unlikely to be a suitable option given the value of water resources in Broken Hill and the likely failure of the revegetation once irrigation activities cease.

The climate of the mine is characterised by low annual rainfall and high evaporation rates. During 2019 and 2020, the mine experienced drought conditions with total annual rainfall being 96 mm and 109 mm respectively. Both years were below the long-term annual average rainfall (150 mm) at Broken Hill (BOM, 2021). There is evidence of tree death within the mine due to these drought conditions (Photograph 5.1).



Photograph 5.1 Tree death due to drought conditions

The frequent drought conditions are considered unlikely to support revegetation adequate for water or wind erosion control purposes.

Vegetation is commonly used to stabilise rehabilitated mining landforms against erosion and this approach is generally appropriate for where rainfall is adequate to support plant growth where soil surface cover equal to or greater than 60% can be achieved. However, in semi-arid and arid rainfall environment, the impacts of vegetation on erosion are generally minimal because the prevailing rain cannot sustain sufficient vegetation cover to control erosion.

The cover response curve developed by Kirby (1969) (Figure 5.1) shows that the impact of contact cover on erosion is not adequate until a cover level greater than approximately 30% is achieved.

Data from the United States of America (USA) suggests that peak erosion rates occur where annual rainfall is in the order of 300 mm-350 mm/h (Figure 5.2) which is slightly more than the annual average rainfall at the mine.

This means that other forms of soil surface cover such as timber debris or rock in combination with vegetation will be required to provide adequate erosion protection on rehabilitated landforms.

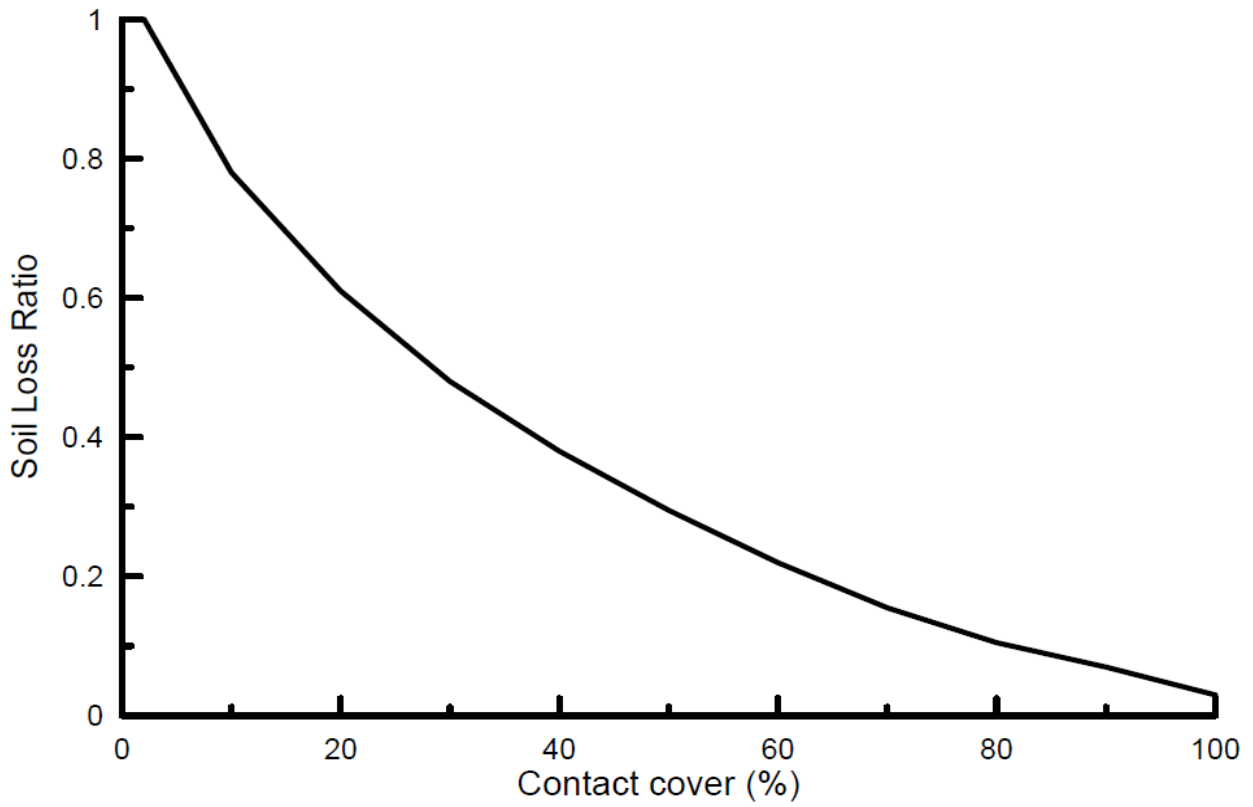


Figure 5.1 Relationship between contact cover and soil loss (Kirby 1969)

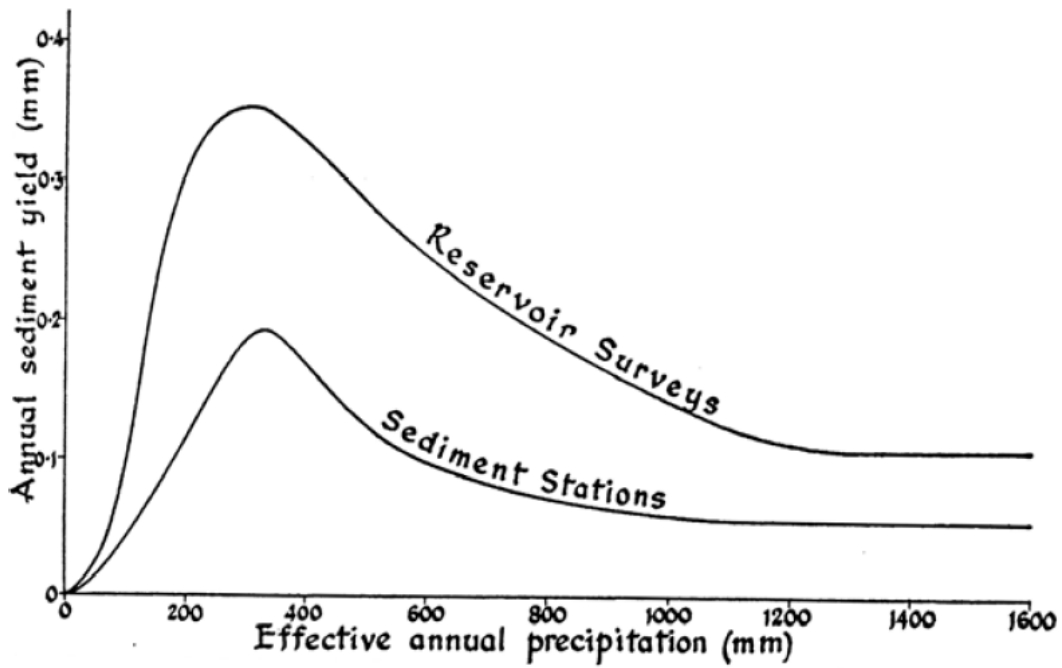


Figure 5.2 Relationship between annual rain and erosion (Kirby 1969)

5.1.2 Management and mitigation

BHOP will segregate and preserve waste rock with low lead (<0.5%) and low sulphur ($\leq 0.2\%$) for rehabilitation capping purposes (inert waste rock). The inert waste rock will provide the necessary protection from water and wind erosion. Erosion modelling will be undertaken during the development of the RMP to verify the erosion stability of the waste rock.

5.1.3 Constraint

There are no topsoil or subsoil resources available within the mining area due to past historical mining practices. Waste rock is the only growth medium present at the Mine. During the site inspection, vegetation was not typically observed on areas treated with waste rock. This is most likely associated with low concentrations of nutrients, low water holding capacity of the waste rock and high surface temperatures.

Waste rock has been used as a growth medium at other mine sites throughout Australia, however the success of revegetation has been varied with vegetation typically taking longer to establish. If waste rock is used as a growth medium, ameliorants are typically required to increase the water holding capacity, improve the nutrient status and increase the concentration of organic matter.

Rock/soil matrices have been used successfully on other mine sites in Australia with these climatic constraints, the most relevant being Cowal Gold in NSW. They consist of a ratio of approximately three parts rocks to one part soil with proportions adjusted such that it is close to the optimal packing density for binary mixture (pers.comm. R Loch).

Because of its high level of erosion resistance and low rates of erosion, the rock/soil matrix layer only needs to be 300 – 500 mm deep. Importantly:

- the rock/soil matrices move with the underlying waste rock and is unaffected by any settlement or movement that may occur;
- vegetation growth is vigorous when sufficient soil is mixed with the rock and the properties of the rock are not detrimental to vegetation growth (non-acid forming, non-saline);
- high surface roughness means that cross-slope concentration of flow is minimised or eliminated and therefore gully formation is unlikely; and
- erosion control and stability of the rock/soil matrices are predictable and reliable.

Rock/soil matrices rely on having suitable growing media to mix with the rock. Given the absence of soil resources on site, suitable soil would either need to be imported to site or manufactured from suitable organic material.

BHOP consider the importation of growing media to unsustainable due to cost and the potential environmental impacts on the source borrow area.

5.1.4 Management and mitigation

BHOP consider that the manufacture of a growing media may be possible using locally sourced organic material feed sources such as mechanically harvested weeds, municipal organic and putrescible wastes, biosolids and woody wastes such as tub-ground pallets and will investigate the feasibility of doing this.

The manufacture of growing media for green wastes and waste organic material is anticipated to require treatment via composting or biological breakdown using processes such as the VRM Biologik Groundswell® Continuous Fermentation process.

Composting is an aerobic process that involves shredding the organic material into finer particles and then forming them into triangular or trapezoidal shaped windrows. The stockpiles need to have a moisture content between 45 to 65%. During warmer months it often necessary to apply additional water to maintain moisture levels.

Turning is required more often during the initial stages of rapid decomposition and less frequently as decomposition approaches completion.

The Groundswell® continuous fermentation process is a licenced process that facilitates and accentuates the activity of a special group of photosynthetic bacteria that manage the production and consumption of odour producing substances and promote the digestion of organic material. This forms a product that is closer to an organic soil than a compost, called Humisoil®.

It involves the addition of two inoculants mixed with water during the organic shredding process, or in layers during the windrowing process, to achieve a 40% moisture content in the windrow. The material is formed into 'M' shaped windrows and then covered with a tarpaulin for a six-week period.

The windrow is then spread out and the process repeated, and the windrow is covered again for a 20-week period.

At the end of 20-week period the process is complete and the Humisoil® would be available for rehabilitation purposes on site.

Manufactured growth mediums such as high-quality composts and Humisoil® organic soil can rapidly establish beneficial soil bacteria and arbuscular mycorrhizal fungi further binding the soil with glomalin (soil carbon cement) and increasing soil aggregation (Hendrickson et.al 2008).

In seasonally dry, variable, or unpredictable environments like the mine, mycorrhizal fungi play an extremely important role in plant-water dynamics. The hyphal tips are hydrophilic – both the end in the plant and the end in the soil – enabling both water and nutrients to diffuse from one end to the other along a moisture gradient (Allen 2007).

Mycorrhizal fungi can supply moisture to plants in dry environments by exploring micropores not accessible to plant roots. They can also improve hydraulic conductivity by bridging macropores in dry soils of low water-holding capacity. Further, mycorrhizal fungi can increase drought resistance by stimulating an increase in the number and depth of plant roots (Solaiman *et al.* 2010).

Morris, 2004 identified that a 1% increase soil humus can result in a 4% increase in stored soil water or 160,000 L of water per hectare based on a 0.3 m soil depth.

BHOP will investigate the feasibility of growth media manufacture realising that a successful outcome will require collaboration with Broken Hill City Council, Landcare Broken Hill and other industries and that additional approvals may be required.

If it is determined that the process is feasible, then BHOP would undertake rehabilitation trails on site where the manufactured growth media would be mixed with inert waste rock and then seeded with appropriate native grass and ground cover species.

5.2 Geochemistry

5.2.1 General

Underground waste rock material comprises the following geological units:

- Metasediments – The most abundant rock type comprising psamimite (quartz – feldspar) and pelite (biotite, sillimanite, garnet, feldspar).
- Potosi Gneiss – A leucocratic quartzo-feldspathic gneiss comprising quartz + feldspar + biotite + garnet with varying occurrences of sillimanite.
- Pegmatite – Coarse grained leucocratic quartzo - feldspathic rocks comprising feldspar and quartz with lesser amounts of muscovite. Locally biotite may be present.
- Amphibolites – A rock which contains greater than 40% mafic minerals, generally comprising pyroxenes, amphibole, plagioclase, garnet. Grades into garnet, amphibolite and soliated, quartz – feldspar – biotite – garnet rock.

Mine ore lacks pyrite and contains only traces of protoxide, acid waters are not generated from ore oxidation and tailings oxidation. Furthermore, calcite is a common mineral in Broken Hill ores. The presence of calcite buffers any acid fluid and, with oxidative coatings on galena and sphalerite in tailings, acid mine waters have not derived from the ore or tailings over the last 130 years of mining. While there is minor visual evidence of isolated pockets of waste rock oxidation, ground and surface water monitoring records all reveal stable pH ranging from 5.09 to 7.3.

Assay records from metallurgy do not detect free sulphur.

The Potosi Gneiss unit is quarried as “blue metal” from an adjacent quarry. This rock is used for road base in Broken Hill and surrounding areas. As such, Potosi Gneiss from development activities will be crushed onsite and used for road base in the construction of the underground roads.

Waste rock from underground mine development is primarily used for back filling underground voids. Small amounts are also used for road base, surface covering to reduce dust and noise bunding. Grading of waste rock will be integrated into future rehabilitation trials.

Waste material is tested and low grade (<0.5% Pb, ≤0.2% S) material is used for road repair, surface coverings and noise abatement bunds, where required.

Placement of waste rock is critical to meeting the rehabilitation requirement to minimise dust generation from the site post closure.

5.2.2 Waste rock lead dust potential

i Constraint

In 2017 BHOP engaged Pacific Environment Ltd to study waste rock and provide recommendations for its suitability and effectiveness as a medium for dust suppression over selected surfaces of the Rasp Mine.

Pacific Environment (PE 2017) undertook an assessment of waste rock from the stockpile within Kintore Pit, to use as embankment material for the extension of the Blackwood Pit TSF2, proposed by PA MOD4, and more generally, its use for other dust suppression applications as part of the rehabilitation process for the Mine site. This will include cover for existing areas that may otherwise have a potential to generate dust containing elevated lead concentrations. The rock is known to contain potentially elevated lead concentrations due to the ore bodies being mined.

To minimise any potential health affects for the local community the original EA stipulated that any waste rock material used for rehabilitation, or other site surface purposes, will be 'inert'. What constitutes 'inert' material has not been defined in the EA and no directly applicable criteria are available for assessing the potential for hazardous dusts generated from the weathering of waste rock at the site, potentially resulting in exposure scenarios for inhalation/ingestion by residents outside the site, or for site users post-rehabilitation.

For rehabilitation planning purposes inert waste rock shall be waste rock that contains <0.5% Pb and ≤0.2% S.

The study utilised a 'multiple lines of evidence approach', in accordance with the NEPM 2013. This is used for evaluating and integrating information from different sources of data and uses best professional judgement to assess the consistency and plausibility of the conclusions which can be drawn.

PE, 2017 studied the rock type (geological description), moisture content, particle size distribution (PSD), and metals content of the waste rock. In addition, consideration was given to the prior Human Health Risk Assessment work undertaken by Toxikos (2010, 2015), background soil/dust data, air quality modelling and recent Confined Air Burst Chamber (CABC) testing undertaken by Pacific Environment on-site for the purposes of quantifying dust control.

The results of the waste rock assessment identified that:

- the rock type varies, however all rock types identified are competent and mostly hard, with good resistance to weathering;
- the rock comprises only approximately 1% fines capable of producing dust;
- this was qualified by Confined Air Burst Chamber tests, which identified a 99.7% reduction in dust generation from the waste rock, compared to disturbed dry tailings;
- lead concentrations averaged 2,371.5 mg/kg (0.24%) and were taken from crushed samples (and therefore conservative). This is approximately 4 times the NEPM HIL-C criterion (600 mg/kg), but significantly below surface dust averages (15,640 mg/kg, or 1.56%). Whilst the NEPM criteria are not directly applicable, they do represent a level below which soils would not be considered a risk to human health;
- bioaccessibility is very low (7.3% on average). This is much lower than the 50% (bioavailability) assumed for the calculation of HIL's. This would suggest that results, if adjusted for bioaccessibility, would meet HIL-C criteria; and
- air quality modelling conducted by PE (2017), assumed a waste rock concentration of 0.5% (5,000 mg/kg). Results demonstrate compliance with all the NSW EPA impact assessment criteria for all air quality parameters assessed.

The results support the use of the waste rock for dust suppression for the TSF and 'free areas' and are considered unlikely to cause an unacceptable risk to human health based upon the site's ultimate final land use as a proposed tourist/recreational site (see section 6).

Air quality modelling has assumed lead concentrations above those identified in the waste rock on site (0.5% compared to 0.24%), and therefore the waste rock is likely to meet NSW EPA impact assessment criteria and is unlikely to impact further upon surface soil lead concentrations within local communities. The very low dusting potential of the rock supports this conclusion.

PEL concluded that the 0.5% lead concentration adopted by the air quality model is a suitable criterion for waste rock placement on-site and that the waste rock, when placed, is suitable as a means of reducing, to an acceptable level, the potential for dust generation from the TSF and 'free areas' of the site.

PEL recommended that:

- waste rock be tested prior to placement to ensure median level of lead concentration does not exceed 0.5%; and
- dust suppression water spraying is carried out during capping material (waste rock) placement to ensure finer particles are washed between the larger rocks.

ii Management and mitigation

BHOP will segregate and preserve waste rock with low lead (<0.5%) and low sulphur ($\leq 0.2\%$) for rehabilitation capping purposes. The waste rock will provide the necessary surface roughness and soil surface cover to limit wind erosion and the generation of dust. Waste rock will be water during placement and spreading to minimise dust generation.

5.2.3 Waste rock acid rock drainage potential

i Constraints

The low levels of sulphur and pyrite in the ore indicate there is negligible potential for acid generation. This is confirmed by site ground (pH 5.09 to 7.3) and surface water (pH 5.78 to 7.59) monitoring records all reveal stable pH.

The drainage, while neutral, does contain metals, particularly where water contacts with rock materials as is the case with the *in-situ* orebody as well as ores altered by processing (grinding and refining).

ERM 2021 undertook geochemical analysis of the waste rock material and found that regarding the potential for acidic drainage:

- Most samples tested were classified as non-acid forming (NAF) (76%) with low sulphur (S) (<0.3%) and low to moderate acid neutralising capacity (ANC), only 3 of the 50 samples showed moderate to high sulphur (0.42% to 1.14%).
- Two psammopelite samples (4% of samples) were classified as potentially acid forming (PAF) and 10 samples (20%) as uncertain (UC). All PAF and UC samples were <0.2% sulphur.
- Mineralogy testing demonstrated that the samples mostly consist of quartz and very slow to slow reacting silicates. Some chlorite was present in most samples, a mineral with immediate reactivity. Garnets were identified in all samples, which can provide fast reacting silicate buffering. No carbonate minerals were identified.
- All rock type groupings, including the psammopelite rock type, had average net potential ratio (NPR) values ≥ 2 . The NPR ratio is the ratio of acid neutralisation capacity (ANC) over maximum potential acidity (MPA), with a ratio above 2 indicating that the material is NAF.

ERM 2021 concluded that while a small subset of samples were identified as PAF, the central tendency in the data (and specifically the average NPR ratio ≥ 2 for all rock types) indicate that the material is expected to be largely NAF.

ii Management and mitigation

Waste rock with > 0.2% sulphur will be placed in the Kintore Pit for disposal with dry tailings and ultimately capped with inert waste rock. If ARD was to occur it would be contained within the pit and ultimately seep into the underground workings.

Groundwater studies in the area and on site have demonstrated that groundwater within the bedrock aquifer is generally unsuitable for potable use or irrigation and marginal for stock watering. Baseline groundwater sampling is compared with the descriptive statistics for the waste rock leach testing results and results are shown in Table 5.1.

Table 5.1 Comparison of metalliferous drainage data with ground baseline data

Grouping	Ec ($\mu\text{S}/\text{cm}^2$)	SO ₄ (mg/L)	Cd (mg/L)	Pb (mg/L)	Mn (mg/L)	Zn (mg/L)	Fe (mg/L)
Groundwater baseline	13,900	9,660	6.32	2.25	907	3,330	1.57
DI leach - median	320	37.5	0.0001	0.0015	0.009	0.005	0.1115
DI leach – 90 th percentile	689	37.5	0.0001	0.0015	0.009	0.005	0.115
DI leach - maximum	1,900	432	0.0003	0.02	0.415	0.028	1.57
NAF liquor - median	210	45	0.0015	0.001	0.12	0.005	0.05
NAF liquor – 90 th percentile	277	78	0.035	0.53	0.45	2.88	4.23
NAF liquor - maximum	709	312	0.31	5.93	1.02	87.5	33

Results show that all median leaching values were well below baseline values, with the exception of Fe for NAG liquor data.

ERM 2021 concluded from the results obtained that the waste rock analysed, in comparison with the background groundwater baseline data, that there was potential for metalliferous drainage from the waste rock. However, this would have limited if any material impact on the existing water quality of the basement rock aquifer.

5.2.4 Waste rock mineralised drainage potential

i Constraints

ERM 2021 undertook geochemical analysis of the waste rock material and made the following conclusions with regard to the potential for metalliferous drainage:

- Elemental enrichment, based on the total elemental data for the samples and using the geochemical abundance index (GAI), identified a number of elements enriched more than 12 times the average crustal abundance.
- The majority of these were identified for psammopelite samples and elements enriched at this level included silver (Ag), arsenic (As), bismuth (Bi), cadmium (Cd), Molybdenum (Mo), Pb, antimony (Sb) and Zn.
- Analysis of a deionised (DI) water leach at a solid to liquid ratio of 1:2 and of the NAG test liquor for the samples indicate the potential for metalliferous drainage when the metal content of the leachate is compared to conservative freshwater aquatic ecology guidelines (specifically the freshwater aquatic guidelines for slightly to moderately disturbed aquatic ecosystems - ANZECC & ARMCANC, 2000).

- Metals leaching at concentrations above the conservative aquatic guidelines for both the DI leachate and NAG liquor included (but were not limited to) aluminium (Al), chromium (Cr), copper (Cu) and Pb. It should be noted that the NAG liquor data presents a conservative estimation for drainage quality in the long term, with NAG testing entailing aggressive oxidation of a pulverised rock sample.
- While most samples have been classified as non-acid generating, the DI leachate and the NAG testing indicate that the most of material sampled has potential to generate metalliferous drainage.
- All median leaching values (for both DI leach and NAG liquor) are well below the baseline values at the Rasp Mine, except for iron (Fe) for the NAG liquor data, all 90th percentile values are also below the baseline values.

ERM 2021 concluded that given these results potential metalliferous drainage from the waste rock should have limited if any material impact on the existing water quality of the basement rock aquifer.

ERM 2021 also conducted a detailed risk assessment based using a source-pathway-receptor (SPR) evaluation process for surface water runoff and concluded:

“The risk assessment for the mine placement domains indicates that potentially complete SPR linkages are limited to on-site receptors. These are related to use of dewatering water and surface water onsite. Risk rankings for these potentially complete SPR linkages were considered to be low”.

ii Management and mitigation measures

As discussed in section 5.1.2, BHOP will segregate and preserve waste rock with low lead (<0.5%) and low sulphur (<0.5%) for rehabilitation capping purposes. Waste rock generated from mining, the construction of the box cut and portal will either be placed in the Kintore Pit (non-inert waste rock) or segregated and preserved for capping of the Kintore Pit (TSF 3) or TSF 2.

Any mineralised drainage is expected to seep to the bottom of the Kintore Pit and into the underground workings. Any mineralised drainage from the capping of the TSF2 will be retained by the liner in the TSF2. As detailed in section 5.3.3 ii, ERM 2021 determined that there was potential for metalliferous drainage from the waste rock. However, this would have limited if any material impact on the existing water quality of the basement rock aquifer.

5.2.5 Tailings geochemistry

i Constraints

The tailings contain, on average, zinc (0.4%), lead (0.4%), silver (8ppm), iron (3.3%) sulphur, (1.2%), arsenic (460ppm), bismuth (70ppm), cadmium (trace) and antimony (45ppm) (BHO AEMR, 2014).

Average lead concentration within the tailings is less than that recommended by PEL for waste rock material. Despite formation of crusts on the surface of the tailings, due to the fine particle size, tailings can be eroded by wind and generate dust.

ii Management and mitigation

a Tailings Storage Facility 2

It is proposed that in the final stages of tailings deposition the delivery system would be realigned to also discharge tailings from along the crest of TSF 2 Embankment 2 shaping the surface to direct runoff towards the spillway. The tailings beach surface near the spillway would be shaped by selective tailings placement from Embankment 2 to fill the environment containment freeboard to a point that the remaining depression below the spillway level would contain the 1:100-year 72-hour rainfall runoff event from the TSF2 catchment area.

Following deposition of the tailings to the designed level an application of soil stabilising polymer would be applied through the water spray system to minimise dust entrainment by wind while the tailings are allowed to settle and consolidate. Ponding water would be allowed to evaporate or be recirculated over the dryer part of the beach to remove the water from the low areas and promote drying of the tailings prior to the placement of cover material. It is expected that the tailings beach may be accessible for construction works within a few months after final placement of tailings.

The surface of the TSF2 would be covered progressively with screened inert waste rock followed inert run of mine waste rock. Access over the tailing would be by end tipping the waste rock material on previously spread material with vehicles travelling on the previously placed material only. No vehicles would be permitted to travel directly on the tailings surface and disturb the dust control crust on the tailing surface. During these activities monitoring would continue from the monitoring station located adjacent to the Pit (and at other monitoring stations across the site).

The proposed design of the cover layer comprises:

- 200 mm thick capillary break layer formed of screened inert waste rock placed over the tailings surface to prevent the capillary rise of contaminants; and
- 300 mm thick cover formed of compacted run of mine inert waste rock. The mine waste rock would contain sufficient fines to create a well graded rockfill after compaction.

The rockfill would be watered and compacted using heavy smooth drum compaction equipment. The cover would be robust and resistant to wind and water erosion. Studies would be conducted to determine if a further in-fill layer is required and the thickness of this additional layer (the current rehabilitation cover thickness allows for 1 m).

The cover layer would be constructed over the entire tailings surface and be integrated into the in-situ rock on the Pit rim and the embankment rockfill. The surface would be shaped to shed water towards the low area near the spillway.

b Tailings Storage Facility 3

TSF3 will be filled to the natural surface level of approximately RL330 (when domed). As the emplaced tailings surface reaches the crest of the pit, the depression formed by the southern branch of the access ramp would be filled in to promote surface runoff toward the stormwater pond to be located near Little Kintore Pit. The waste rock perimeter layers around the pit may be stopped at approximately 10 m below the pit rim, or lower if operation considerations and geotechnical assessments of the emplaced compacted tailings confirm it is not required for tailings liquefaction risk management. Tailings would be placed and compacted against the pit wall.

The final surface of TSF3 will be cover with a screened inert waste rock capillary break and then inert waste rock cover as per TSF 2. After allowing a suitable period to allow for any settlement and consolidation of the tailings and waste rock, the final surface will be shaped as a shallow dome to shed to the sides of the pit and either seep to groundwater or be directed to Little Kintore Pit stormwater detention basin.

5.2.6 Subsidence

i Constraints

Coffey was engaged to assess the potential for subsidence at surface and the effect, if any, on the Broken Hill railway operations to the north-east of the CML7 from mining beneath these facilities. The assessment looked at the stope geometry, geology and the railway infrastructure. An exclusion area and buffer zone of 150 m was established around the rail infrastructure.

The Coffey 2007 analysis of the potential for caving in the western mineralisation found that the most critical type of failure mode from vertical (piping), diverging (outwards) and converging (inward) was converging. However, this is unlikely to propagate to a great extent before the void is able to support the span and vertical failure is the most likely critical failure mode.

The analysis shows that a stope failure is not expected to propagate through to the surface and significant surface subsidence is not predicted above the stopes. The analysis estimates some hanging wall failures with the currently estimated rock mass properties and the open stope geometry proposed. However, these failures are expected to be localised and are not expected to result in continuous caving to the surface. The presence of a more competent Potosi Gneiss unit above the stope hanging walls will restrict any failure from propagating upward assuming the unit is always above the stopes.

After extensive analysis Coffey 2007 concluded that any stope failure (no matter how unlikely) would not propagate through to the surface and therefore significant surface subsidence is not predicted above the stopes.

It is important to note that the analysis indicated that there exists some potential for hanging wall failures, however these failures are expected to be localised in extent. The presence of the more competent Potosi Gneiss above the stope hanging walls limits potential of a failure from propagating upward. Furthermore, if there was a failure, rock expansion would fill the void and prevent failure propagation to the surface.

ii Management and mitigation

Key subsidence risks are managed and mitigated by:

- use of empirical stope design charts in conjunction with detailed geotechnical modelling of extraction sequences to ensure ground stresses do not exceed the capabilities of the rock mass;
- regular stope inspections used to ascertain if predicted behaviour matches the actual performance of the void;
- installation of modern ground support/reinforcement systems which capitalise on the inherent strength of the rock mass;
- placement of mine back fill (eliminating the void) in a timely manner after production has ceased; and
- use of trained and competent people in critical functional roles such as mine technical services and mining operations.

As part of the mine design process, each stope undergoes an individual risk assessment. The assessment addresses the following:

- stope size and shape;
- ground support requirements, including additional support into the hanging wall if required;
- ring design and stope firing sequence; and
- back fill requirements.

This process mitigates the potential for localised failures within the stoping blocks. Additional diamond drilling and geological mapping of the orebody, footwall and hanging-wall occurs as underground development progresses. This additional geological and geotechnical information is used for the individual stope assessments and in the larger mine planning process to further mitigate the risk of localised failures.

5.2.7 Pit wall geotechnical stability

a Constraints

Ground Control Engineering (GCE) to undertake an assessment of the geotechnical stability of the historic tailings with the Kintore Pit (GCE, 2019) and an assessment of geotechnical impacts of the emplacement wet tailings on pit wall stability (GCE 2019a).

The slope stability analyses conducted by GCE highlights the potential for slope scale instability of the historic tailings slope forming the north wall of the Kintore Pit under certain hydrogeological conditions. Circular failure or composite failure with a major circular component was considered by GCE 2019 as the most likely potential failure mechanism.

The progressive placement of fresh tailings against the existing historic tailings slope is expected to increase the stability of the slope.

The assessment of the slope of the waste rock stockpile located in Kintore Pit indicates that the waste rock slope may experience shallow sloughing of the near surface materials and that the placement of engineered fill against the toe would improve the stability of the slope. The slope stability analyses conducted by GCE 2019a indicates that current, free draining, waste rock dump slope has a factor of safety for overall slope scale stability of greater than 1.3.

The modelling highlights the potential for shallow, circular style failure (sloughing) in all cases. This may materialise as minor rilling, which is typical of waste rock slopes.

b Management and mitigation

Works have been proposed by Golder to support the slopes during tailings and waste rock placement and safety bunds have been included in the conceptual placement design to mitigate these risks.

The pit wall geotechnical instability risk be fully mitigated by the complete backfilling of the Kintore Pit with waste rock and tailings.

The Little Kintore Pit and the Box cut will also be backfilled with waste rock mitigating any pit wall geotechnical instability.

6 Post Mine Land Use options analysis

BHOP purchased the Rasp Mine from Normandy Mining Investments (NMI) in March 2001. Prior to the purchase by BHOP, NMI managed the site under a care and maintenance management plan having undertaken and completed rehabilitation of the site to then agreed rehabilitation standards. The mine was being used by the Line of Lode Association (LOLA) as a tourist operation with guided tours conducted through the old processing plant and heritage buildings, and a private tourist operator conducted underground tours via the Delprats Shaft. Tourism operations ceased when the mine reopened in 2010.

The LOLA was established in 1995 as a community-based group to oversee the development of tourism and other commercial possibilities with CML7. Several residential and other buildings were donated to LOLA in 2000. In September 2011 the LOLA was dissolved and their assets located on CML7 transferred to the then Land and Property Management Authority and now DPIE-Crown Land (Crown Lands), that established the Line of Lode Reserve Trust (LOLRT) and act as trustee of these assets. These assets include two residences location on South Road or Bonanza Street, Jamieson House (residence 27A&B), British Flats within Proprietary Square, and the Café and Miners Memorial centrally located on the city side of CML7 atop an old mine waste dump.

Crown Lands have prepared a draft Broken Hill, Line of Load Masterplan that outlines a range of projects associated with mining heritage at the line of load including:

- interpretative mining tours;
- construction of an amphitheatre for memorial ceremonies, open air cinema or musical performances;
- expansion of the Broken Earth café; and
- construction of new methods of accessing the top of hill including walkways, cycle paths and chair lift.

Attachment 1 of DPIE's letter to BHOP requires the MOD 6 report to address any requirements of the Broken Hill Rehabilitation Steering Committee (Broken Hill Mining inter-Agency Committee (BHMIAC)). To date neither BHMIAC or Crown Lands have provided guidance to BHOP on post-mine land use or rehabilitation however, it can be inferred from the Line of Load Masterplan that the intent is a mining heritage tourism post-mining land use.

In the absence of specific guidance from the BHMIAC or Crown Lands, BHOP have adopted a 'fall back' stable and non-polluting post-mine land-use for the MOD 6 project elements that will not preclude a heritage post-mine land use for the greater mine area.

Other alternate post-mine land uses were considered and excluded (Table 6.1).

Table 6.1 Excluded post-mine land uses

Post-mine land use	Reasons
Grazing	Aridity, lack of growing media, lack of suitable water, contamination, available area
Biodiversity	Lack of suitable growing media
Industry	Visual amenity, geotechnical stability, available area, conflict with heritage use
Residential	Geotechnical, contamination, visual amenity, available area, conflict with heritage use

Waste rock typically contains between 1-2% silt and sand sized particles which severely limits the water and nutrient holding capacity of the waste rock and generally results in hostile conditions for plant germination and establishment.

If it is determined that the manufacture of growth media from recycled organics is feasible, and trials indicate that grasses and ground covers can be established on manufactured growth media mixed with inert waste rock then a biodiversity post mine land use may be viable. This will be researched further during the development of the RMP.

7 Domain changes

Some modification to the rehabilitation domains and mining domains is required for the key Mod 6 landforms to that nominated section 5 of the approved Mining Operations Plan (MOP). The current relevant mining and final land use domains from the MOP are reproduced in Table 7.1.

Table 7.1 Current relevant mining and final land-use domains

Mining Domain		Final Land Use Domain	
Code	Domain name	Code	Final land use
2	Tailings Storage Facility (TSF2)	ML	Mining landscape
6	Open cut voids	ML	Mining landscape
7	Underground mining area and shafts	ML	Mining landscape

The necessary changes to the domains because of MOD 6 are provided in Table 7.2.

Table 7.2 MOD 6 relevant mining and final land-use domains

Mining Domain		Final Land Use Domain	
Code	Domain name	Code	Final land use
2	Tailings Storage Facility (TSF 2, TSF 3)	A	Stable, non-polluting landform
6	Open cut voids (Little Kintore Pit)	G	Water management infrastructure
7	Underground mining area and shafts (Box cut and portal)	G	Water management infrastructure

8 Rehabilitation objectives and completion criteria

Some modification to the rehabilitation objectives and rehabilitation completion criteria is required for the key Mod 6 landforms to that nominated section 5 of the approved Mining Operations Plan (MOP). Current draft rehabilitation objectives from the approved MOP are reproduced in Table 8.1.

Table 8.1 Current draft rehabilitation objectives

Code	Mining Domain	Draft Rehabilitation Objectives
2	Tailings Storage Facility (TSF2)	Create a non-polluting and safe structure
6	Open cut voids	Made safe and public access is restricted
7	Underground mining – portal and shafts	Made safe and public access is restricted

The necessary changes to the rehabilitation objectives and proposed completion criteria because of MOD 6 are provided in Table 8.2.

Table 8.2 MOD 6 relevant rehabilitation objectives

Mining domain code	Mining Domain	Final land use domain code	Final land use domain	Objectives	Completion criteria	Performance indices
2	Tailings Storage Facility (TSF2, TSF3)	A	Stable, non-polluting landform	<ul style="list-style-type: none"> All infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials. The tailings storage facility will be capped with inert waste rock to minimise the potential for exposure of potentially environmentally sensitive tailings material in the rehabilitated landform. There is no residual surface contamination on site that is incompatible with the final land use or that poses a threat of environmental harm. The final landform is stable and does not present a risk of environmental harm downstream/downslope of the site or a safety risk to the public and native fauna. 	<ul style="list-style-type: none"> Removal of pumps, cabling, pipes, etc Tailings will be encapsulated to not pose any threat of environmental harm or constrain the intended final land use. The tailings storage facility will be capped and reshaped to be free draining to minimise the potential for exposure and contaminated seepage of potentially environmentally sensitive tailings material in the rehabilitated landform. Tailing’s storage facility has been capped in accordance with an approved capping design. Residual waste materials stored on site (eg. >0.5%Pb) will be appropriately contained/encapsulated so it doesn’t pose any threat of environmental harm or constrain the intended final land use. There is no active rill, gully or tunnel erosion or subsidence and are within the parameters for safe and stable landform. Discharge points from rehabilitated landforms to natural channels are stable. 	<ul style="list-style-type: none"> Infrastructure removed The structural integrity of the TSF has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use and does not pose threat of environmental harm. Final landforms are safe, stable, non-polluting and free draining. Capped tailings geochemical analysis indicates there is no evidence of ARD within the surface materials or wall. Capping depths and materials have been undertaken in accordance the approved capping design. Contamination will be appropriately remediated so that appropriate guidelines for land use are met. The final landform has been constructed in general accordance with the approved Final Landform & Rehabilitation Plan. Presence/absence active rills, gullies and tunnels or subsidence within rehabilitation monitoring transects. Soil rock cover in rehabilitation transects ≥90%.
6	Open cut void	G	Water management infrastructure	<ul style="list-style-type: none"> Surface water quality is similar to background levels. The final landform is stable and does not present a risk of environmental harm downstream/downslope of the site or a safety risk to the public and native fauna. 	<ul style="list-style-type: none"> >0.5% Pb and >0.2% S waste rock will be encapsulated to not pose any threat of environmental harm or constrain the intended final land use. There is no active rill, gully, tunnel erosion or subsidence and are within the parameters for safe and stable landform. 	<ul style="list-style-type: none"> Little Kintore pit backfilled and capped in accordance with design. The final landform has been constructed in general accordance with the approved Final Landform & Rehabilitation Plan. Presence/absence active rills, gullies, tunnels, subsidence within rehabilitation monitoring transects. Soil rock cover in rehabilitation transects ≥90%.
7	Box cut and portal	G	Water management infrastructure	<ul style="list-style-type: none"> All infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials. Surface water quality is similar to background levels. The final landform is stable and does not present a risk of environmental harm downstream/downslope of the site or a safety risk to the public and native fauna. 	<ul style="list-style-type: none"> Underground mining infrastructure removed and the portal sealed. >0.5% Pb and >0.2% S waste rock will be encapsulated to not pose any threat of environmental harm or constrain the intended final land use. There is no active rill, gully, tunnel erosion or subsidence and are within the parameters for safe and stable landform. Safety bunds and signage installed at recommended set back distances. 	<ul style="list-style-type: none"> Underground mining infrastructure removed and the portal sealed. Box Cut backfilled and capped in accordance with design. The final landform has been constructed in general accordance with the approved Final Landform & Rehabilitation Plan. Presence/absence active rills, gullies, tunnels, subsidence within rehabilitation monitoring transects. Soil rock cover in rehabilitation transects ≥90%. Installation of safety bund and signage.

9 Post mining landform designs

The MOD 6 post mining landforms are detailed in section 3.10.2 of the MOD 6 Modification Report and are shown in Figure 9.1, Figure 9.2, Figure 9.4 and Figure 9.5 respectively.

9.1 Kintore Pit (TSF 3)

The Kintore Pit will be completely backfilled with tailings and waste rock and then capped with inert waste rock to form a gently sloping domed landform with slopes ranging from 3.28% - 6.7%. The finished surface will be a rough surface inert waste rock with 1 to 2% (Figure 9.1 and Figure 9.2).

A stormwater diversion bund and associated engineered spillway may be installed to direct any surface metalliferous internally to a stormwater detention pond in the backfilled Kintore Pit. If required, the diversion bund and spillway will be designed and constructed in accordance ANCOLD 2019 and the ICMM 2020 Global Tailings Standard.

The landform design will be further refined during the development of the Rehabilitation Management Plan (RMP) for the mine to determine if it can be modified to avoid the need for the stormwater bund and associated spillway.

9.2 Little Kintore Pit

Little Kintore Pit will be backfilled with waste rock from the excavation of the Box Cut to form a shallow stormwater detention pond designed to capture runoff from the capped Kintore Pit landform up to and including a 1:100-year ARI event (Figure 9.1 and Figure 9.4) where it would evaporate or seep into the floor of the backfilled pit.

The finished surface will be a rough surface inert waste rock with 1 to 2% fines.

9.3 Box Cut

Following cessation of underground operations, removal of all infrastructure and the capping of the portal, the Box Cut will be partially backfilled with waste rock then capped with inert waste rock to form a stormwater detention pond (Figure 9.3 and Figure 9.4). Surface water contained in the stormwater detention pond would be expected to evaporate or seep to ground water.

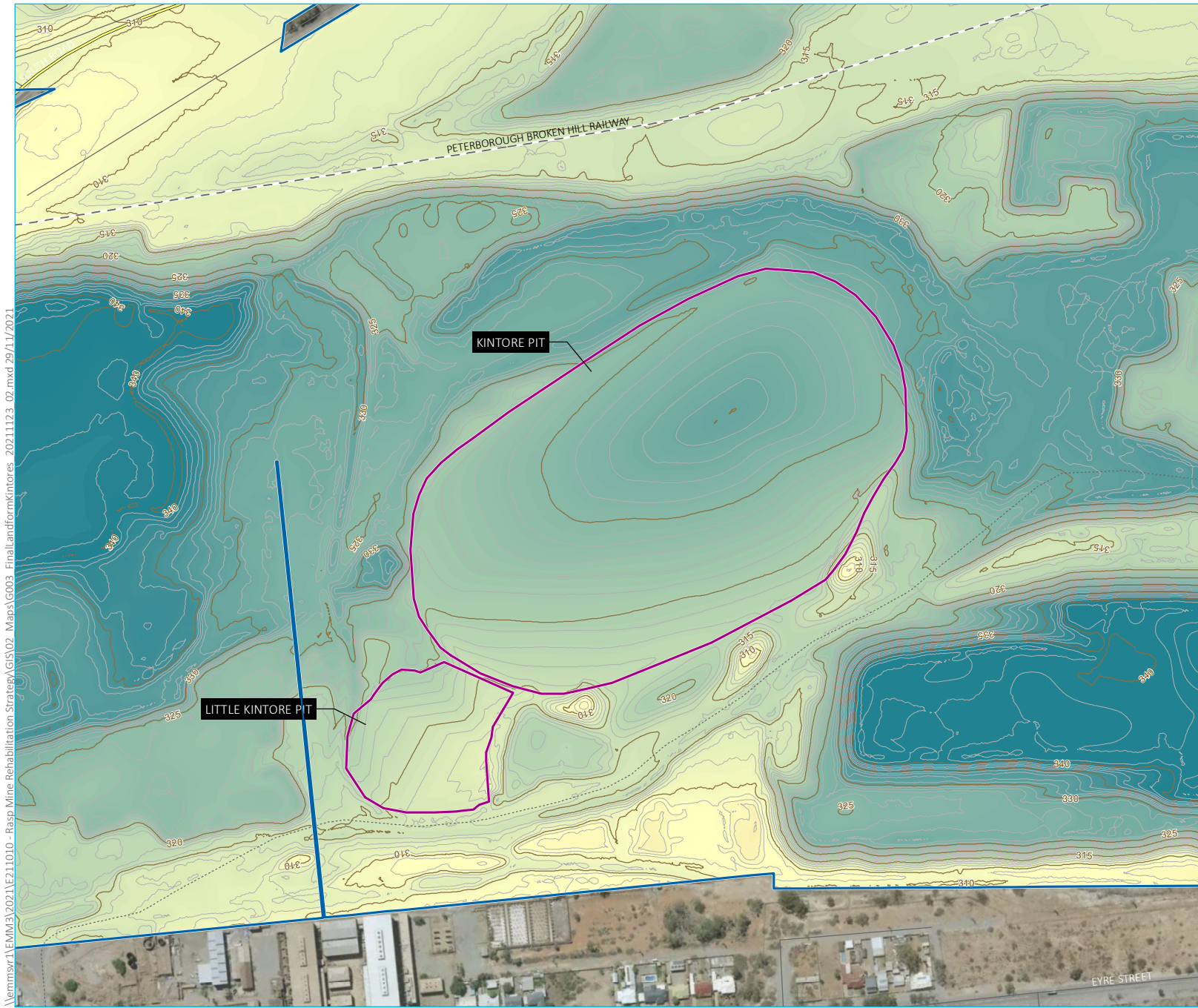
The finished surface will be a rough surface of inert waste rock with 1 to 2% fines.

The sides of the Box Cut above the backfilled surface will be exposed in-situ rock.

9.4 Blackwood Pit (TSF2)

As detailed in section 3.10.2.4 of the MOD 6 Modification Report and s.5.3.5 ii a, during the final stages of mining and processing, tailings would cease to be excavated from TSF 2, and deposited tailings would be used to fill the cells within TSF2 leaving with finished tailings surface with a 1% gradient from west to east.

The surface of the TSF2 would be covered progressively with screened inert waste rock capillary break layer 200 mm thick followed inert run of mine waste rock layer 300 mm thick. The finished surface will be a rough surface of inert waste rock with 1 to 2% fines with a formal engineered spillway in the south-eastern corner be designed and constructed in accordance ANCOLD 2019 and the ICMM 2020 Global Tailings Standard (Figure 9.3 and Figure 9.5).



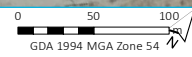
- KEY**
- ▭ Mining lease
 - ▭ Modelled final landform area
 - - - Rail line
 - ▬ Major road
 - ▬ Minor road
 - ⋯⋯⋯ Vehicular track
 - Contour
 - 1 m contour interval
 - 5 m contour interval
 - Elevation (mAHd)
 - 360
 - 215

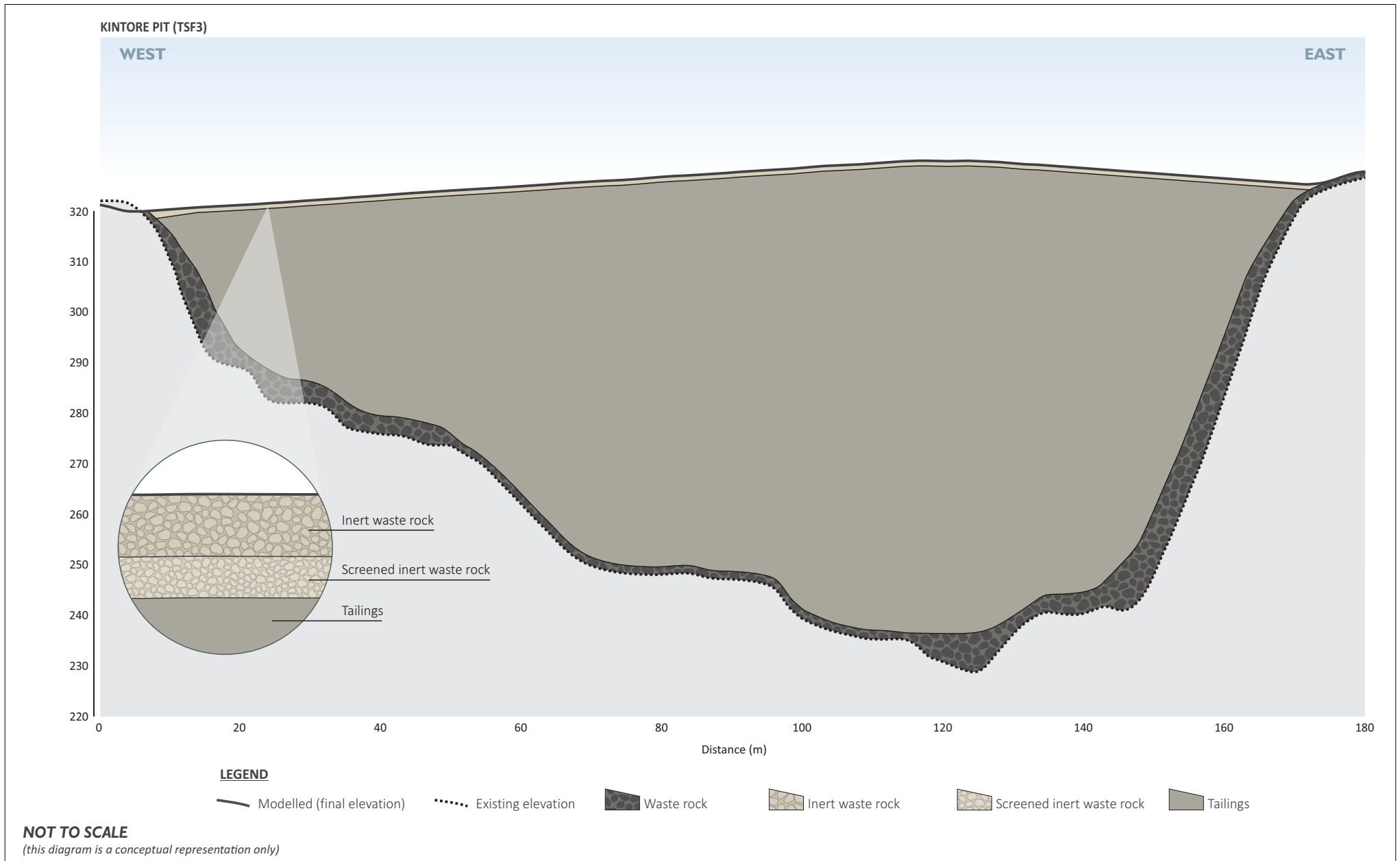
\\lemmsvr1.EMM3\2021\1E211010 - Rasp Mine Rehabilitation Strategy\GIS\02 Maps\G003 Finalandform\kintores_20211123_02.mxd 29/11/2021

Source: EMM (2021); CBH (2021); DPE (2019); DFSI (2017)

Kintore Pit (TSF 3) and Little Kintore Pit final landform

Rasp Mine Mod 6
 Response to NSW Resources Regulator
 Figure 9.1





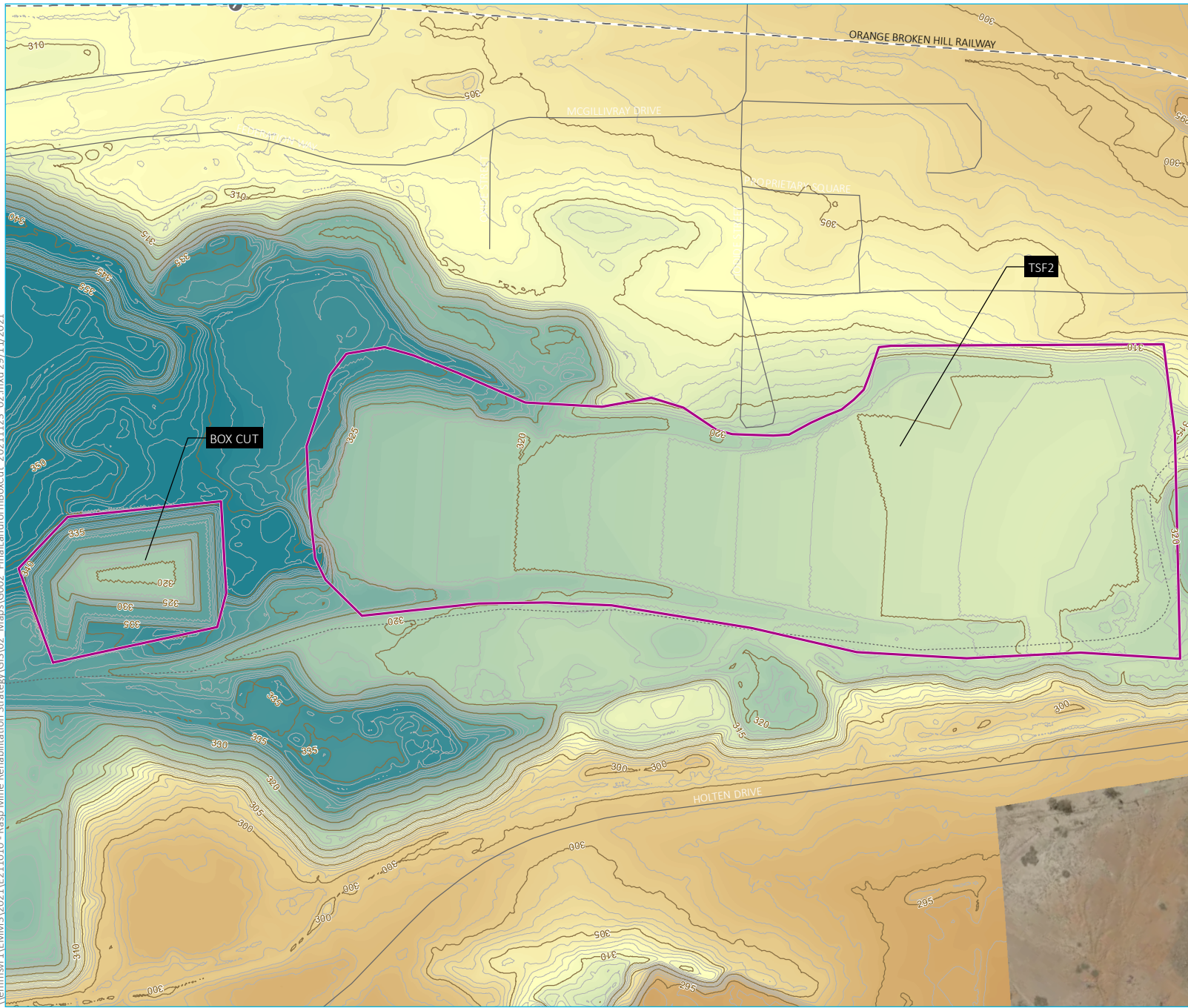
Kintore Pit final landform cross section

RASP Mine MOD 6 – Response to NSW Resource Regulator

Broken Hill Operations Pty Ltd

Figure 9.2

\\lemmsvr1\EMM3\2021\E211010 - Rasp Mine Rehabilitation Strategy\GIS\02 Maps\G002 Final\andformBoxCut_20211123_02.mxd 29/11/2021



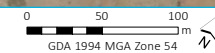
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 - Rail line
 - Minor road
 - Vehicular track
 - Contour
 - 1 m contour interval
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 - Elevation (mAHD)
 - 360
 - 215

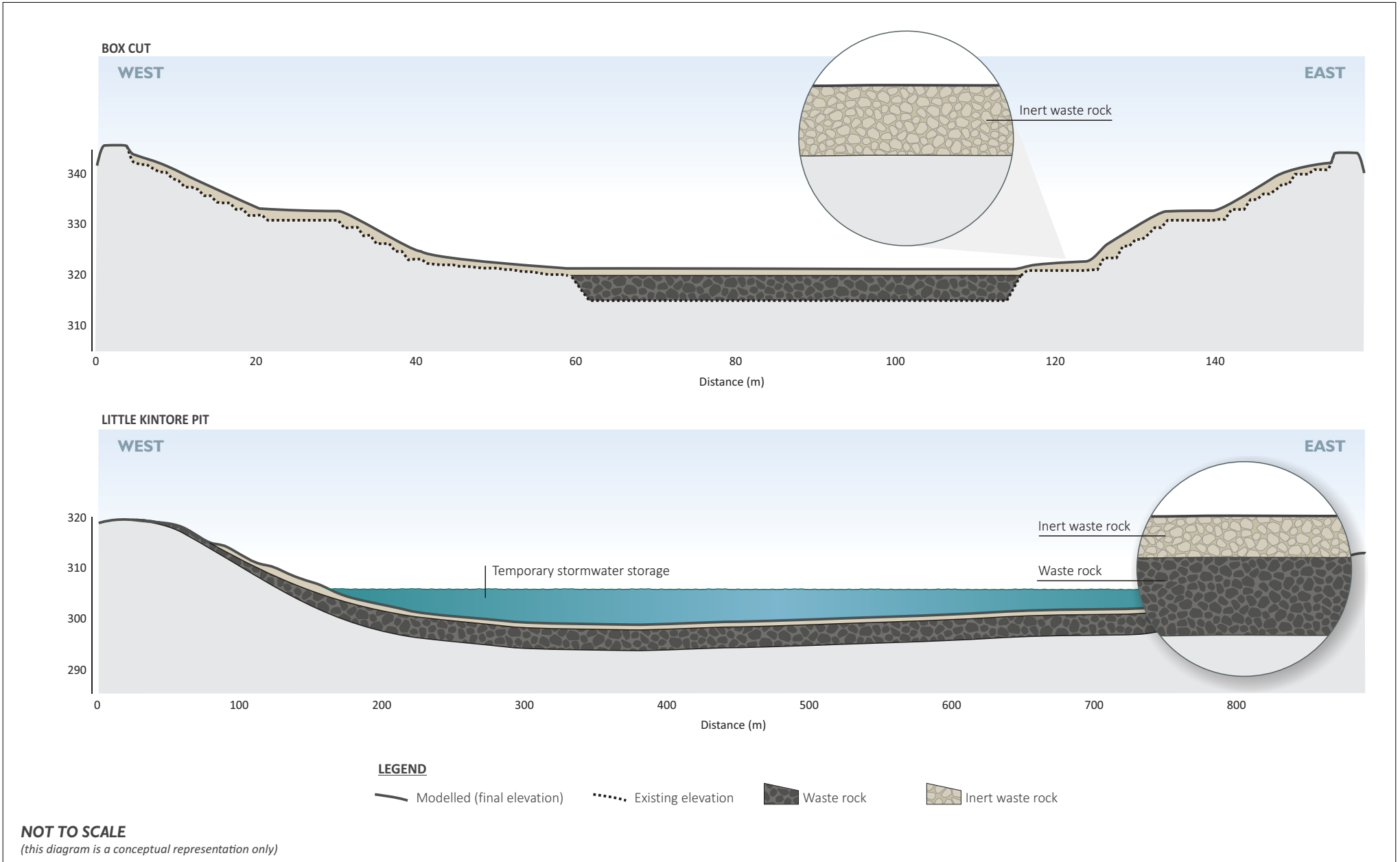
Box Cut and TSF2 final landform

Rasp Mine Mod 6
Response to NSW Resources Regulator
Figure 9.3

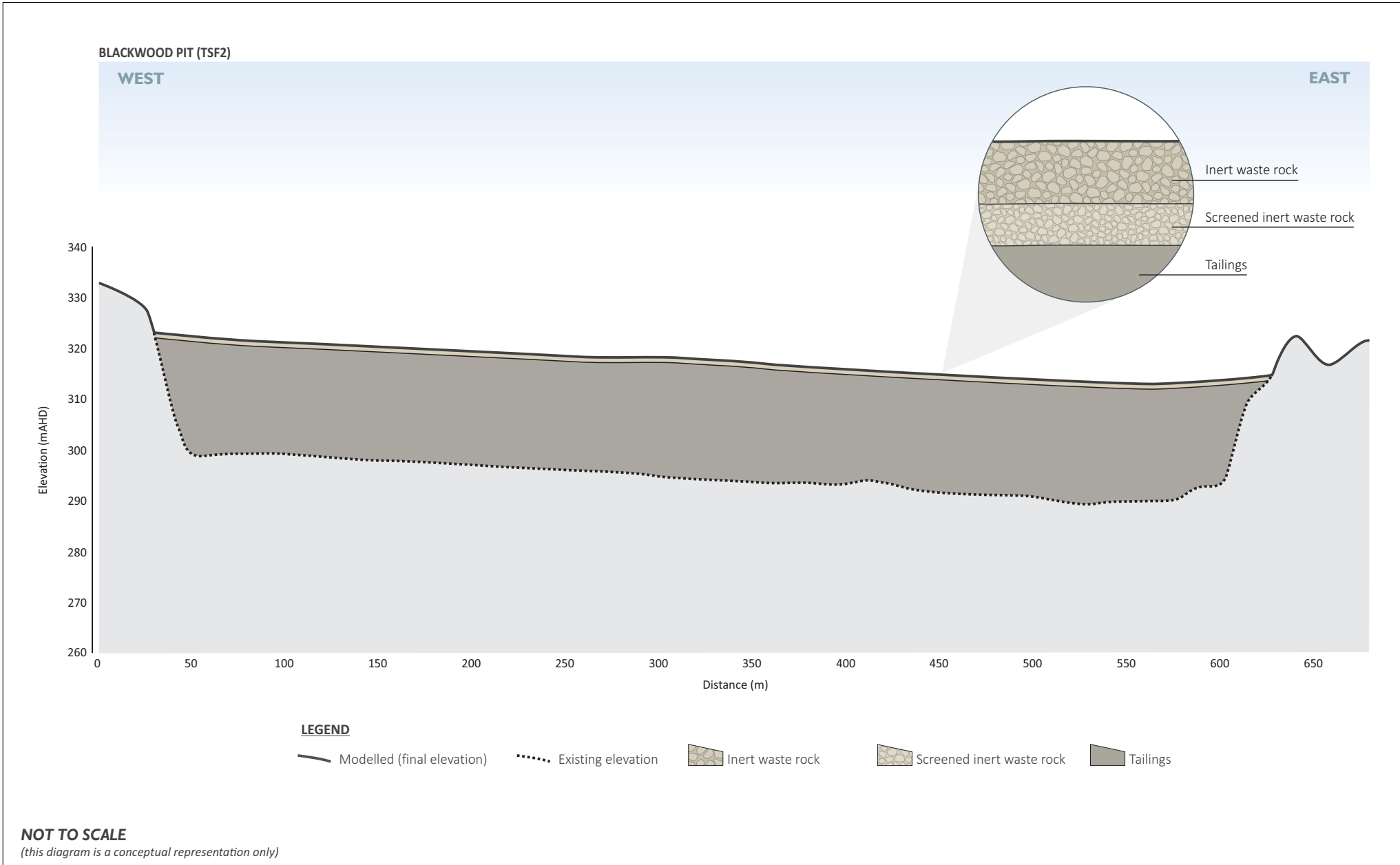


Source: EMM (2021); CBH (2021); DPE (2019); DFSI (2017)





Box Cut and Little Kintore Pit final landform cross section
 RASP Mine MOD 6 – Response to NSW Resource Regulator
 Broken Hill Operations Pty Ltd
 Figure 9.4



Blackwood Pit (TSF2) final landform cross section
 RASP Mine MOD 6 – Response to NSW Resource Regulator
 Broken Hill Operations Pty Ltd
 Figure 9.5

10 Rehabilitation and closure maintenance

Rehabilitation works and rehabilitated landforms will be maintained until rehabilitation closure criteria have been met and the NSW RR has certified that they have been met. The rehabilitated landforms associated with MOD6 are expected to be low maintenance and stable in the long-term requiring negligible management or maintenance due to the inherent stability and durability of the inert waste rock surface.

Potential metalliferous drainage from the MOD6 landforms is expected to seep into the existing backfilled pits and ultimately into the old underground workings.

The major post closure aspect of the mine will be the existing heritage buildings and infrastructure on site, legacy contamination and metalliferous runoff from waste rock and tailings landforms that do not drain internally. These will be addressed the RMP that will be provided to the NSW RR by 2 July 2022.

The key anticipated rehabilitation maintenance following capping is anticipated to be differential settlement of the capped and emplaced tailings and waste rock, and therefore final capping may be delayed allowing this to occur and then additional materials placed on the landforms to achieve the agreed landform designs.

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