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Roy Hill Iron Ore Mine Revised Proposal

Response to Submissions

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1 Introduction

Roy Hill Iron Ore Pty Ltd (Roy Hill) currently implements Roy Hill 1 Iron Ore Mining Project Stage 1 and Roy Hill 1 Iron Ore Mining Stage 2 proposals under Ministerial Statements 824 (December 2009) and 829 (March, 2010) respectively. The Roy Hill Iron Ore Mine is located approximately 110 km north of Newman in the Pilbara region of West Australia.

On 1 March 2019 Roy Hill submitted a section 38 referral for the Roy Hill Iron Ore Mine Revised Proposal (Revised Proposal) for the extension of the existing Roy Hill Iron Ore Mine. The Revised Proposal sought to change the existing mining operations to include:

- Additional ground disturbance within a Revised Development Envelope.
- Changes to a Life of Mine water management strategy including:
 - managed aquifer reinjection;
 - increase in dewatering volumes; and
 - changes to the approved permanent surface water diversion structures.
- In-pit tailings disposal.
- Changes to waste rock management including pit backfilling and waste rock landforms.
- An increase in greenhouse gas emissions.

In June 2019, the Environmental Protection Authority (EPA) set a level of assessment of Public Environmental Review for the Revised Proposal (Assessment Number 2214). Subsequently Roy Hill prepared an Environmental Scoping Document (OP-APP-00066) which was approved for release on 13 January 2021. Following consultation with the Department of Water and Environment and Regulation's (DWER) EPA services, Roy Hill revised its Environmental Review Document (ERD) (Roy Hill, 2020a) (OP-APP-00049), which was released for a 2-week public comment period in January 2021.

On 2 February 2021 following the consultation period for the Revised Proposal, Roy Hill received 21 public submissions. The public submissions included comments relating to the following matters:

- Potential increase in Greenhouse Gas emissions.
- Potential impacts to priority ecological communities, threatened Priority flora and Fauna from:
 - Changes in the Life of Mine water management strategy.
 - Direct impacts from clearing.

Roy Hill response to the public submissions were provided to DWER on 25 February 2021. The responses are included in Section 2 below.

Submissions from Government agencies were provided to Roy Hill over the period of February 2021 to April 2021.

Submissions from the Karlka Nyiyaparli Aboriginal Corporation (KNAC) were submitted to Roy Hill on 2 March 2021. Roy Hill provided response to these submissions and supporting documents in May 2021.

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DWER confirmed on 24 May 2021 that the department had commenced reviewing the response to submissions. During this assessment period, DWER requested clarification in regard to the impact calculations defined in the ERD given a reduction in the development envelope in due to heritage exclusion zones. In response, Roy Hill submitted a change to proposal during assessment under section 43a of the *Environmental Protection Act 1986* on 30 August 2021. The EPA Chair consented to the change to impact areas for the proposal in the Notice of Decision to Consent to Change to Proposal During Assessment dated 31 August 2021. The changes to impact calculations have also been incorporated into the Response to Submissions document.

During the assessment of submissions, DWER requested specific clarification regarding surface water diversion structures and associated impacts to vegetation, revised impacts to priority 3 species, *Rhagodia sp. Hamersley (M. Trudgen 17794)* and consultation with traditional owners regarding social surroundings. Roy Hill submitted its response to DWER's request on 6 August 2021. This information has been included in the response to submissions below.

In response to comments provided by DWER over the period May to July 2021, Roy Hill submitted a revised response to Government agency submissions on 20 August 2021. The revised response included the revised management plans and supporting documentation that were requested during the response to submissions from February to August 2021.

Roy Hills responses to submissions including the revised documents are included in the following sections and appendices.

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2 Response to Public Submissions

Figure 1– Response to Public Submissions

Submitter	Submission and/or issue	Response to comments
General comments		
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters suggest that the modelling for the Original Proposal was flawed in many areas and that the Revised Proposal may also be flawed, and the impacts downplayed. They cite examples of the original tailings storage facility (TSF) being considered not large enough; that the ore grades appear to have been miscalculated; and the proposals to reinstate flowlines are questioned as not desirable. Further, the submitters state that the costs of undertaking the revised proposal are extraordinarily high but have been downplayed by putting them in a global and Australia wide context, particularly regarding increases in carbon dioxide emissions and water.	Since the commencement of the Original Proposal, RHIO has deepened its knowledge of the orebody, specifically relating to ore quality in various locations within the mining tenements. This has resulted in changes to the life-of-mine (LOM) plan resulting in flow-on impacts to management of water, materials, and tailings. RHIO is committed to a model of continual improvement for all operational matters including the environment. During operations, RHIO has gained additional data which has been fed into models to refine and improve outcomes. For example, in-pit tailings options are now preferred from a safety and environmental perspective, over additional raises of the existing TSF, which can have more complex rehabilitation and closure requirements. RHIO asserts that assessing the Revised Proposal’s potential impacts in a wider context (i.e., nationally and globally) is appropriate, particularly for increases in GHG emissions as a proportion of global carbon emissions.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	Regarding the object and principles of the <i>Environmental Protection Act 1986</i> and the principle of intergenerational equity, the submitters request more evidence based data and ask about the long term impacts and socio-economic benefits of the Revised Proposal.	RHIO’s assessment is based on evidence where available, including from surveys, monitoring, and existing reports. The assessment attempts to determine the potential impacts of the Revised Proposal during and after the LOM. Section 2.2.2 of the ERD describes the socio-economic benefits of the Revised Proposal.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters request evidence regarding RHIO’s current waste recycling scheme and ask how much [waste] is recycled.	The Revised Proposal does not increase or change the amount of waste generated, managed, recycled, or disposed. RHIO’s existing operations use a waste management contractor that manages waste on its behalf. The contractor provides monthly records of all materials that are sent off site for recycling.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters ask how RHIO will improve its energy use.	RHIO has established a Strategic Power Group that is continuously reviewing and assessing emerging technologies to improve energy use and reduce carbon emissions. Refer to section 3.5 of the GHG Management Plan (GHGMP) for details on the initiatives currently under assessment.

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Flora and Vegetation		
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters identify that cumulative impacts to vegetation units within the proposed clearing areas were difficult to ascertain because of differences and availability in contextual data leading to problems in assessing the true potential impacts of the proposal.	RHIO acknowledges the difficulties in carrying out a cumulative assessment and has done so using best available information. RHIO has outlined assumptions that have been made in the cumulative assessment and consider that a conservative approach has been undertaken in relation to cumulative impacts. RHIO is proactively supporting government in initiatives to improve the information available publicly to inform cumulative impact assessments.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters ask how minimisation of clearing is demonstrated.	All disturbance is managed using RHIO's Ground Disturbance Permit Procedure (OP-PRO-00193) to avoid the unauthorised clearing of vegetation. Areas of existing disturbance are utilised, where possible, before clearing of new ground.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters ask what proportion of the progressive rehabilitation has taken place and what is the status of the rehabilitation in terms of reaching closure criteria.	Appendices 5 and 43 of the ERD outline the success of the rehabilitation and closure undertaken to date.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters consider that the impacts of clearing have been downplayed as the Revised Proposal represents an additional 50% clearing of vegetation, of which 11,506.87 ha is in Excellent condition and 2,123.06 is in Very Good condition.	RHIO confirms the Revised Proposal is seeking an additional 5,402 ha of clearing, representing a 52.5% increase of the clearing required for the Original Proposal (s43a Change to proposal during assessment). Of the 5,402 ha required for the Proposed Changes, 1,307 ha is within vegetation of Excellent condition and 2,123 ha is within vegetation of Very Good condition (Table 4-16, page 155 of the ERD; s43a application).
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters requests clarification regarding the impacts on the Priority 3 Ecological Community (PEC) Narbung Land System.	RHIO confirms that up to 256 ha of the Priority 3 Ecological Community (PEC) Narbung Land System will be impacted through the implementation of the Revised Proposal. Of the 256 ha, it is anticipated that 253 ha will be directly impacted by clearing and 3.74 ha has a moderate potential for indirect impacts arising from the mine Water Management Strategy. Overall, the potential impacts from the Revised Proposal represent 1.60% of the Narbung Land System (Table 4-13, page 149 of the ERD). There are no known cumulative impacts associated with third-party operators to the Narbung Land System. The identified impacts to the PEC are not expected to compromise its value due to the low intensity nature of the borefields and ability to avoid direct impacts to priority flora and vegetation and associated habitat.

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ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters identify that potentially 14.39% of known individuals of <i>Goodenia nuda</i> may be destroyed for the Revised Proposal but that the assessment does not consider it a significant impact. They also note that it is proposed to clear 35% of the known distribution of <i>Triodia veniciae</i> and 63% of the known distribution of <i>Rhagodia sp. Hamersley</i> (M. Trudgen 17794). The submitters suggest that this priority flora can be avoided by pegging all avoidance areas in the field.	RHIO's impacts to Priority flora from the Original Proposal, Proposed Changes and Revised Proposal (combination of the Original Proposal and Proposed Changes) are outlined in Table 4-17, page 155 of the ERD. The cumulative impacts to Priority flora including the Revised Proposal and third party records are included in Table 4-22, page 161 of the ERD. RHIO will not directly impact greater than 5% of Priority 1 and Priority 2 individuals within the Remote Managed Aquifer Reinjection and Southern borefields of the Revised Development Envelope through the implementation of the Proposed Changes. As outlined in Section 4.3.6.1 of the ERD, impacts to Priority flora will be managed through the Ground Disturbance Permit (GDP) process whereby Priority flora avoidance areas will be added to the GIS avoidance area database. The survey team will be required to peg all avoidance areas in the field to ensure they are clearly visible to the operators conducting the clearing activities and can subsequently be avoided.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters state that no tangible evidence has been provided of how effective weed management has been in existing operations and whether the spread of weeds has been mitigated and can be prevented from becoming a permanent fixture within the areas currently mapped as in Good to Excellent condition.	Spread of weeds has been assessed as a part of the Original Proposal. Works associated with the Proposed Changes do not alter the risk of introduction and spread of weeds to that previously assessed. RHIO will continue to implement weed management and control measures that have been well established and undertaken during the operation of the Original Proposal. Table 4-26 of the ERD outlines the weed avoidance, minimisation, rehabilitation and monitoring measures that will be implemented through the Revised Proposal. These include, but are not limited to: <ul style="list-style-type: none"> - Weed eradication programs will be implemented where declared weeds, or weeds in rehabilitation areas, are recorded; - Manage rehabilitation and weeds in accordance with the RHIO Mine Closure Plan, approved by the Department of Mines, Industry Regulation and Safety (DMIRS); and - Topsoil from weed risk areas will be treated as waste and buried.
Terrestrial Fauna		
ANON-TX95-TCGN-6	The submitter identified an error in the stated distance from Port Hedland in Section 1.1 of the Fauna Management Plan.	This is an error and should be 280 km south of Port Hedland. The correct value has been updated in the Fauna Management Plan.
ANON-TX95-TCGN-6	The submitter states that Fauna Management Plan should reflect the updated EPA technical guidance issued in July 2020.	The assessment used the correct EPA guidelines in force at the time of the assessment and submission to the EPA. However, the Fauna Management Plan has since been updated to reflect the updated 2020 guidelines.

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ANON-TX95-TCGN-6	The submitter requests further information regarding the 160 m exclusion area over a diurnal roost for the Ghost Bat specified in the Fauna Management Plan.	The 160 m exclusion area is deemed adequate as the roost is located to the east of the gazetted realigned Marble Bar Road, which sits between the roost and the mine and acts as a hard barrier preventing mine related disturbance. The closest proposed mining pit activity is located approximately 500 m to the west of the exclusion zone. This justification for the distance is outlined in Section 1.2.3.1.1 of the Fauna Management Plan.
ANON-TX95-TCGN-6	The submitted asks for confirmation and clarification on the exclusion zone around the ghost bat cave.	RHIO confirms that a 160 m exclusion zone will be implemented over the ghost bat cave (80 m either side). The wording in Table 8 of the Fauna Management Plan has been updated to reflect this.
ANON-TX95-TCGN-6	The submitted questions how 'direct' and 'indirect' impacts will be measured, monitored, or reported.	A detailed explanation of direct and indirect impacts to fauna and how they are measured, monitored, and reported is available in Sections 4.4.4, 4.4.5 and 4.4.6 of the ERD.
ANON-TX95-TCGN-6	The submitter is of the view that the Fauna Management only provides general overarching statements but lacks specificity and it does not use Specific, Measurable, Achievable, Relevant, or Timebound (SMART) objectives, criteria, and management actions. The submitter considers that the plan is vague and non-specific and enables RHIO to do very little of any consequence. The submitter asserts that the underlying principle of all fauna management plans is that they contain a clear and concise statement of intended outcomes, which are quantified, measurable and timebound; and the specific actions to achieve these outcomes should then be described.	As stated in Section 2 of the Fauna Management Plan: <i>'The Mine Vertebrate Fauna Management Plan (MVFMP) outlines both outcome-based and management-based provisions and outline the key requirements under this MVFMP. All requirements will be undertaken during operations and until the Mine is Decommissioned'</i> . The management provision tables (Table 7 and 8) have been updated to reflect the submitter's comment and additional timeframes have been added where relevant.
ANON-TX95-TCGN-6	The submitter states that it is important that the Fauna Management Plan clearly describes the key threats to each of the conservation significant species potentially impacted; then in this context, discusses the key threats to these same species that are associated with the proposal and describes how these key threats will be managed. The submitter advises that the plan should list the conservation significant fauna potentially impacted first, followed by information on threats to each of these species rather than the reverse as currently presented.	Sections 1.2.1 and 1.2.2 of the Fauna Management Plan have been updated to reflect the submitters comments.

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ANON-TX95-TCGN-6	The submitters comments that the objectives regarding feral animal control are not based on SMART principles and that the management criteria should reflect a substantial reduction in their abundance with the development envelope.	RHIO commits to implementing additional feral animal control measures for the species that has received a significant increase (>20%) in sightings over the calendar year. Feral animal control during the calendar year is captured in the annual Feral Animal Control Report. Typical control measures include: <ul style="list-style-type: none"> • Baiting (e.g., 1080 poison); • Periodic control programs by pest control contractors; • Opportunistic trapping
ANON-TX95-TCGN-6	The submitter recommends that management objectives in the Fauna Management Plan are reviewed and updated to consider SMART principles.	The management provision tables (Table 7 and 8) in the Fauna Management Plan have been updated to reflect the submitter's comment.
ANON-TX95-TCGN-6	The submitter recommends that mitigation actions and the measurement of outcomes for conservation significant species are reviewed and updated to be more specific.	The management provision tables (Table 7 and 8) in the Fauna Management Plan have been updated to reflect the submitter's comment.
ANON-TX95-TCGN-6	The submitter asks for more information regarding the mitigation of potential impacts on vertebrate fauna; in particular, conservation significant species such as bilby.	As outlined in Section 2 (Table 8) of the Fauna Management Plan, active bilby burrows will be monitored with remote cameras to determine the presence of animals in active areas. This monitoring will give insight into what actions could then be undertaken and implemented to minimize fauna deaths (e.g., exclusion zones/buffers, speed restrictions, site notices). Any new bilby presence will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) and incorporated into RHIO's internal database and management actions. As outlined in Section 4.4.3.4.1.1 of the ERD, in 2019, RHIO received a report of a Greater Bilby sighting and deployed five camera traps in the area. A Greater Bilby was successfully recorded on the cameras on multiple occasions. The Greater Bilby's burrow and active area was in proximity to the main access road into the mine and within 1 km of the mine offices. RHIO was advised by DBCA to leave the bilby in situ and to implement site specific management, rather than to relocate. The management response included bilby road and speed signs, site notices to increase awareness, site visit by zoologist, mapping of habitat across the mine site, pre-clearance fauna surveys (looking for burrows) and liaison with DBCA. These management actions are an example of the actions which would be undertaken should any other conservation significant fauna be located within the Revised Development Envelope.

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ANON-TX95-TCGN-6	The submitter questions the appropriateness and effectiveness of surveys carried out for several fauna species including Bilbies, Spectacled Hare-wallaby, Northern Quolls and Night Parrot. The submitter expects that the Fauna Management Plan should clearly document the location and relative abundance of conservation significant fauna in the development envelope and include a discussion of how the proposed mining operations will potentially impact on each of those species.	Studies, investigations, and survey efforts across the Revised Development Envelope for terrestrial fauna can be found in Section 4.4.3.1 of the ERD; and further information regarding terrestrial fauna within the Revised Development Envelope is available in Section 4.4.3.4. The potential impacts, assessment of impacts and mitigation measures for terrestrial fauna are presented in Sections 4.4.4, 4.4.5 and 4.4.6 of the ERD, respectively.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitter considers that it is unfortunate that RHIO will only offset Greater Bilby habitat that is considered to be in good to excellent condition. The submitter is of the view that surrounding/adjacent vegetation, even in a lesser condition, is likely to provide a buffer and additional foraging habitat for this species and the vegetation that supports it.	As outlined in Section 7.5.3.6 of the Fauna Management Plan, based on the significance test, RHIO consider that there is not a residual impact to the Greater Bilby associated with clearing proposed within the borefield areas due to the low intensity clearing and the design flexibility implemented to avoid occupied Greater Bilby burrows. Therefore, no offset is proposed. Based on the significance test, the Proposed Changes may result in residual impact to the Greater Bilby habitat at the mine site due to the persistent presence of a Greater Bilby in mulga woodland for over a year. As this is not the preferred habitat for the Greater Bilby and is only of moderate importance, it is considered that the residual impact will only be significant where the vegetation of the habitat is in good to excellent condition.
Inland waters		
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters question why the water use requirements for the Original Proposal are lower than the Revised Proposal; i.e., an additional 230 GL is required representing a 58% increase; and hypersaline water disposal increases by 453 GL for the life of mine up from 55 GL for two years.	RHIO confirms an additional 230 GL of dewatering is required for the remainder of the LOM. The 55 GL per year was estimated for an initial two year trial for Managed Aquifer Reinjection; however, there will be surplus water that is required to be disposed of for the LOM. RHIO notes that the 453 GL is for the whole remainder of LOM and does not represent a per annum figure. It is anticipated that a maximum of 55 GL per year will be disposed of; however, this is likely to fluctuate year by year depending on operational requirements.

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ANON-TX95-TCGB-T ANON-TX95-TCGX-G	<p>The submitters ask what the impacts of lowering the groundwater levels by between 5-10 m and an increase in TDS concentration in the groundwater as a consequence of wastewater injection by between 30,000 to 50,000 mg/L will have on vegetation, especially if the recovery is anticipated to take between 20 and 100 years post closure.</p> <p>The submitters also question why groundwater levels pre-mining are not shown in Figure 2-7 of the ERD.</p>	<p>A vegetation risk assessment (Astron, 2019, Appendix 09 of the ERD) was conducted to assess the potential indirect impacts on vegetation from changes in groundwater level associated with the proposed LOM Water Management Strategy as outlined in Section 4.3.5.1.1 of the ERD. The risk assessment identified no areas of vegetation at high risk of decline or mortality. Areas at low to medium risk of decline or mortality were focused within the north-west section of the Revised Development Envelope, near the current mining area, proposed clearing footprint, and reinjection fields (Figure 2-24 of the ERD). RHIO will undertake water monitoring in accordance with the Water Management Plan (Appendix 41) and vegetation monitoring in accordance with the Vegetation Monitoring Plan (Appendix 10) to monitor for any potential impacts to vegetation health. The pre-mining groundwater levels have not been shown on Figure 2-7 of the ERD as the impact to groundwater was previously approved under the Original Proposal. The intent of this figure is to show the change between the Original Proposal and the Revised Proposal. With the introduction of reinjection, the predicted groundwater levels have changed between the Original Proposal and Revised Proposal. In some areas, this is expected to result in higher groundwater levels than the Original Proposal due to the reinjection; however, the overall increase in dewatering has extended the anticipated drawdown footprint as outlined in Figure 2-6 of the ERD.</p>
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	<p>The submitters have concerns about the proposed permanent diversion of flowlines and ask why the mine pits are not prioritised for reinstatement to ground level to enable to recover the flowlines.</p>	<p>RHIO currently has one permanently diverted surface water feature (Kulbee Creek), which was approved under the Original Proposal. Given the success of the Kulbee Creek diversion – which still flows in major rainfall events and has not had a demonstrated detrimental impact on the environment – and the additional knowledge gained during operations, RHIO considers that other creeks can be permanently diverted. One of the primary issues with reinstating creeks over backfilled pits is the continued settlement of the fill material once completed, as outlined in Section 2.4.5.3 of the ERD. Uncompacted backfill usually settles at a rate of 2 to 6% over a 10 year period (GHD, 2015); this introduces the risk that the creek flow may be disrupted and prevented from reaching downstream ecosystems causing detrimental environmental impacts. Based on the studies conducted, it is considered that the permanent diversion of creek lines is preferable to reinstating creek lines over backfilled pits, and provides a lower risk of erosion and loss of flow to downstream surface waters. Permanent surface water diversion structures will be designed and constructed such that flows are redirected to the same catchment, where possible, prior to the Revised Proposal being implemented.</p>

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<p>ANON-TX95-TCGB-T ANON-TX95-TCGX-G</p>	<p>The submitters ask what guarantees there are that hypersaline groundwater will remain 2-3 km away from the Fortescue Marsh.</p>	<p>A solute transport model of the injection of saline water was used to evaluate groundwater quality changes for the injection bores (GHD, 2020, Appendix 03 of the ERD). The results are outlined in Section 4.5.5.1.3.2 of the ERD. The model simulated scenario 2B in which all four injection fields are used at the same time. This scenario was selected as it is considered representative of worst case with regards to environmental receptors. The model provided no indication that the groundwater plume would intersect the Fortescue Marsh due to the long-lasting drawdown effect from mining activities preventing plume migration south towards the marsh. In addition, RHIO has committed to undertaking groundwater monitoring in accordance with the Water Management Plan (Appendix 41 of the ERD), which would identify if the plume were moving towards Fortescue Marsh. As outlined in the Water Management Plan (Table 5), if assessment of water quality data identifies abnormal trends (outside of season fluctuations or forecast water quality changes), RHIO will conduct an investigation to identify the source of the contamination. If the source of the contamination is found to be resulting from RHIO operations, it will engage a suitably qualified specialist to determine the risk to the environment and outline mitigation measures to prevent significant impacts.</p>
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Greenhouse gas emissions		
ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCG3-B ANON-TX95-TCGP-8, ANON-TX95-TCG4-C ANON-TX95-TCGV-E ANON-TX95-TCGQ-9 ANON-TX95-TCG7-F ANON-TX95-TCGM-5 ANON-TX95-TCGK-3 ANON-TX95-TCGR-A ANON-TX95-TCG2-A ANON-TX95-TCGT-C ANON-TX95-TCG5-D ANON-TX95-TCGS-B ANON-TX95-TCGF-X ANON-TX95-TCGB-T ANON-TX95-TCGX-G ANON-TX95-TCG8-G	<p>The majority of submissions and comments were regarding the greenhouse gas emissions associated with the Revised Proposal. In general, submitters raised the following concerns:</p> <ul style="list-style-type: none"> Cumulative impacts of GHG emissions and climate change; Impacts of climate change to agriculture and duty of care; Application of state policy and EPA GHG guidance in regard to achieving no net increases in GHG emissions from the Revised Proposal, including offsetting Scope 3 emissions; Current performance regarding GHG emissions against baseline and 2009 GHG management plan; Application of the object and principles of the EP Act; and Consideration of alternative green practices, renewable energy, offsets, and carbon pricing and effectiveness of RHIO's GHG Management Plan. 	<p>RHIO has attempted to group the submissions received according to the topics/issues raised and provide a response. Where specific submissions have been made regarding the Revised Proposal, these have been responded to below.</p>

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ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCG3-B ANON-TX95-TCGP-8 ANON-TX95-TCG4-C ANON-TX95-TCG7-F ANON-TX95-TCGR-A ANON-TX95-TCG2-A ANON-TX95-TCG5-D ANON-TX95-TCGS-B ANON-TX95-TCGB-T ANON-TX95-TCGX-G	Many submitters raised concern that the ERD did not appropriately consider the impacts that greenhouse gas emissions from the Revised Proposal pose to the environment of Western Australia and, in particular, agriculture. Several submitters raised concerns that climate change was already significantly impacting WA's agricultural productivity, and that the assessment had failed to consider the effect of additional emissions, particularly in the south-west of the State.	RHIO acknowledges that it will generate GHG emissions. Whilst there are environmental impacts associated with climate change, it is not possible to draw a direct link between the emissions from the Revised Proposal and specific environmental impacts on submitters' agricultural properties and/or businesses, or the wider environment of Western Australia. RHIO's assessment of GHG emissions is consistent with the State Greenhouse Emissions Policy for Major Projects and the EPA's Environmental Factor Guideline – Greenhouse Emissions. Consideration of duty-of-care to landholders is inconsistent with the EPA's approach to the assessment of environmental impact, as outlined in the GHG Guideline. The GHG emissions from the proposed changes have been assessed as not significant as they contribute to less than 0.5% of the overall state emissions and are consequently considered acceptable in the context of the many sources of GHG emissions in the state and the reduction opportunities that are available more broadly. Notwithstanding this negligible contribution to state, and subsequently national and global carbon emissions, RHIO is proposing GHG emissions reduction targets to achieve an incremental reduction of emissions over the life of mine. The targets include the use of offsets to mitigate excess emissions in case RHIO is unable to achieve the proposed targets (refer to Section 3 of the GHGMP for details of the proposed offsets).
ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCG3-B ANON-TX95-TCGP-8 ANON-TX95-TCG4-C ANON-TX95-TCGV-E ANON-TX95-TCGM-5 ANON-TX95-TCGR-A ANON-TX95-TCG2-A ANON-TX95-TCGT-C ANON-TX95-TCG5-D	The majority of submitters were of the view that the Revised Proposal should demonstrate no net increase in GHG emissions over the life of the project.	RHIO has identified a number of actions included in the Revised Proposal to avoid and reduce impacts, which reflect the intention of the State GHG Policy to reduce Scope 1 emissions to achieve net zero by 2050. The GHGMP outlines the reasonable and practicable measures that will be implemented to avoid and reduce emissions, which are consistent with the EPA GHG Guideline. However, despite these best endeavours, the Revised Proposal cannot achieve the net zero standard requested by the submitters because of the very nature of the project as a large mining proposal and current technological limitations. RHIO has committed to reviewing the entire content of the GHGMP at least every five years; the review will be conducted in the context of any updated policy and contemporary scientific information regarding equipment, technology and techniques that could be used to improve GHG performance.

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ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCG5-D ANON-TX95-TCGS-B	The submitters raise concerns about RHIO's ability to increase its baseline established under the commonwealth safeguard mechanism and also questioned the performance of the Original Proposal against the actions in the 2009 GHG management plan.	As outlined in Section 3.2 of the GHGMP, in the event that RHIO is not able to meet the proposed interim targets, it will offset the excess emissions by purchasing Australian Carbon Credit Units (ACCUs). For example, in 2019, RHIO surrendered 5,038 ACCUs to the Clean Energy Regulator to offset excess emissions under the safeguard mechanism. These offsets are not dependent on RHIO's performance against the safeguard mechanism baseline, and RHIO has no current plans to review the mine facility's calculated baseline under the safeguard mechanism. Performance against the 2009 GHGMP is detailed in Sections 4.7.4.1.1 and 4.7.4.1.2 of the ERD.
ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCG3-B ANON-TX95-TCG5-D ANON-TX95-TCGS-B	The submitters questioned how RHIO has applied the object and principles of the EP Act, specifically the precautionary principle and polluter pays principle.	The application of the precautionary principle is inherent in the EPA's GHG Guideline, which RHIO has used to conduct its assessment of GHG emissions and prepare the GHGMP for the Revised Proposal. RHIO's investigations into the biological and physical environment provide sufficient scientific certainty to assess the risks and identify the measures to avoid or minimise the impacts, which are detailed in the GHGMP. Measures identified to offset GHG emissions in the event RHIO is unable to achieve its proposed targets include the purchase of ACCUs, which is considered consistent with the polluter pays principle. See section 3 of the GHGMP for details of the proposed offsets.
ANON-TX95-TCGQ-9 ANON-TX95-TCG7-F ANON-TX95-TCGK-3	The submitters request that the Revised Proposal adopts green practices such as renewable energy, site regeneration aligned to indigenous ecological systems and habitats, and use of offset revegetation.	The GHGMP includes commitments to the investigation and use of renewable energy sources where feasible, including the potential installation of a 30 MW solar farm. Section 3.5 of the GHGMP outlines RHIO's efforts in implementing emissions reduction initiatives such as zero emissions technologies. After completion of activities, land will be rehabilitated as soon as possible with vegetation comprised of native species of local provenance to meet closure criteria in accordance with RHIO's Mine Closure Plan (OP-PLN-00250) which has been prepared in accordance with the DMIRS Guidelines for Preparing Mine Closure Plans and approved by DMIRS. RHIO's use of ACCUs to offset its excess emissions also supports regeneration and revegetation projects in the state.
ANON-TX95-TCGB-T ANON-TX95-TCGX-G	The submitters question the insignificant rating assigned to GHG emissions from the Revised Proposal in the ERD and consider that a 60% increase in emission from the Original Proposal is significant in terms of local and state impacts.	Although the Revised Proposal reflects an increase in GHG emission from the Original Proposal, as stated in Section 4.7.4.2 of the ERD, the total GHG emissions from the proposed changes account for only 1.4% of the state mining industry and less than 0.5% of the total state emissions. RHIO considers that these emissions are not significant.

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ANON-TX95-TCG4-C	The submitter requests that, if no net increase cannot be achieved, shipments of iron ore from the Revised Proposal should only be made to steel makers who can reduce their CO ² emissions by applying technology of an appropriate kind, thus ensuring that RHIO's Scope 3 emissions do not increase by 328,000 t/yr.	The Revised Proposal does not increase the emissions associated with shipping to that of the Original Proposal. RHIO is not able to enforce emissions reduction targets on its customers and the third-party steel making operations are outside of RHIO's control. However, RHIO is proposing its own GHG emissions reduction targets that are in line with the State GHG Policy and the EPA GHG Guideline. The targets are outlined in section 3.2 of the GHGMP.
ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCGS-B	<p>The submitters note the following information supplied by RHIO in its ERD in the Executive Summary and at Section 4.7: Ministerial Statements (MS) 824 (2009) as amended and 829 (2010) as amended authorised 280,000 tCO₂-e/yr in the Original Proposal for Stages 1 and 2.</p> <p>RHIO reported Scope 1 GHG emissions in 2018-19 of 412,588 tCO₂-e and in 2019-20 of 427,952 tCO₂-e; that is, Scope 1 emissions well in excess of what had been authorised by Ministerial Statements.</p> <p>The Revised Proposal estimates an increase of:</p> <p>Scope 1 GHG emissions of 186,00 tCO₂-e/yr above the 280,000 tCO₂-e authorised in MS 824, which is to be consistently maintained till mine closure in 2031, and</p> <p>Scope 2 GHG emissions of 142,000 tCO₂-e/yr above the 160,000 tCO₂-e authorised in the Original Proposal, which is to be consistently maintained till mine closure.</p>	As outlined in Section 4.7.4.1.1 of the ERD, the estimates of Scope 1 emissions for the Revised Proposal are significantly different to the Original Proposal due to RHIO's increased knowledge of the mine ore body, changes to the LOM plan, and market conditions. Fuel usage for electricity generation and non-processing infrastructure were also not considered in the Original Proposal but have been accounted for in the Revised Proposal. Additionally, Section 4.7.4.1.2 of the ERD outlines that the estimated Scope 2 emissions included in the Original Proposal are different to the latest estimates for the life of the Revised Proposal. This is a result of assumptions made regarding electricity consumption for processing in the pre-feasibility phase of the operation when detailed electricity demand estimates were not available. The updated electricity consumption forecast in the Revised Proposal is derived from historic electricity consumption figures and detailed estimates of future processing requirements.
ANON-TX95-TCGJ-2 ANON-TX95-TCG9-H ANON-TX95-TCGS-B	The submitters note that Section 2.5.6 of the GHGMP states that the rationale for the management provisions in Section 3 of the plan is that they are 'reasonable and practicable' against various criteria, including 'economic return'. The submitters have concerns that none of the criteria reflect on the increased harm that increasing GHG emissions will cause and suggest that the GHGMP would also benefit from a thorough revision to better present the core information that is presented in the ERD.	<p>As stated in Section 2.5.6 of the GHGMP, the rationale for the choice of provisions has been developed based on the assessment of potential impact of GHG emissions and the requirements of the EPA GHG Guideline. Accordingly, the GHGMP includes core information that is also included in the ERD such as:</p> <ul style="list-style-type: none"> • Estimates of emissions over the life of the revised proposal; • A breakdown of GHG emissions by source; • Projected emissions intensity for the Revised Proposal and benchmarking against other comparable projects; and • Measures to avoid, reduce and offset GHG emissions.
Other		Roy Hill have made some minor administrative changes to Table 8 of the Roy Hill GHGMP and Table 4-66 of the Environmental Review Document

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3 Preliminary Response to KNAC Submissions

Roy Hill submitted its response to KNAC submissions regarding the Roy Hill Iron Ore Mine Revised Proposal to DWER in May 2021 and continues to engage with KNAC regarding Social Surroundings matters relating to Aboriginal heritage and culture.

Roy Hill acknowledges that submissions relating to Aboriginal heritage and culture are culturally sensitive and at the request of KNAC and in consultation with DWER the KNAC responses to submissions have been kept confidential and as such not included in the published Roy Hill Iron Ore Mine Revised Proposal Response to Submissions Report.

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4 Response to Agency Submissions

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Inland Waters			
1	DAWE	<p>Submission on draft ERD</p> <p>As part of a Managed Aquifer Recharge (MAR) scheme, the proponent is proposing to increase the reinjection of surplus water from mine operations to 453 GL with an increase in TDS to 50,000µS/cm into the southern borefield. Given the proximity to the Fortescue Marsh and clay pans to the southern borefield, further information is required to ensure the modelled injection does not impact on MNES that may use the Fortescue Marsh and clay pans during the wet season. Such considerations should include management measures for the injection system such as saline water and mounding triggers.</p> <p>Further discussion on the potential environmental impacts to MNES habitat within the Fortescue Marsh is required. Specific information addressing impacts to MNES is required, such as migratory species that may utilise the development envelope and the Fortescue Marsh, for example the mitigation measures that could be implemented if migratory species are found utilising the marsh and clay pans during the wet season.</p> <p>Current submission</p> <p>The previous submission has not been addressed.</p>	<p>Roy Hill considers this information is addressed in Sections 4.6.4.2, 4.6.5.4 and 7.5.9 of the Environmental Review Document - Revised Proposal for the Roy Hill Iron Ore Mine (Roy Hill, 2020a) (ERD).</p> <p>Roy Hill would like to outline the below commitments from the ERD (Roy Hill, 2020a) in relation to the Fortescue Marsh and Matters of National Environmental Significance (MNES):</p> <ul style="list-style-type: none"> - There is expected to be no direct impacts to the Fortescue Marsh as a result of the Revised Proposal and with the implementation of the approved management plans there will be no indirect impact on Fortescue Marsh. There are also no predicted impacts within claypans or the Fortescue Marsh PEC. - Vegetation health monitoring as part of the Roy Hill Vegetation Management Plan will assist in monitoring for potential impacts to groundwater dependent vegetation. Roy Hill do not anticipate any impacts on this vegetation or on Fortescue Marsh and therefore do not intend to monitor migratory species. <p>Further details relating to the assessment of impacts to the Fortescue Marsh and MNES are included in the Roy Hill Response to submissions number 120.</p>
2	DAWE	<p>The first row in Table 2-1 of the ERD (under the heading 'Potential Environmental Impacts') is incomplete. Provide a full explanation of the mitigation</p>	<p>As outlined in Table 2-1, full mitigation measures for environmental impacts for surplus water disposal are outlined in Section 4.6.6 of the ERD.</p>

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		strategies that will be utilised for the disposal of surplus water.	<p>In response to DAWE’s, DWER’s and other submitters’ concerns about surplus water disposal, Roy Hill have updated and improved the Water Management Plan. In addition to section 4.6.6 of the ERD, the updated Roy Hill Mine Water Management Plan (Roy Hill, 2021a) included as Appendix 5 of this response to submissions document, contains information regarding disposal of surplus water including provisions to address changes in the quality of groundwater from MAR and mounding of groundwater from MAR. Recent changes to the Water Management plan include:</p> <ul style="list-style-type: none"> Information on timeframes for the implementation of response actions. This is included as a foot note to the provisions in Table 2-1 in the Water Management Plan, “Response Actions are to be implemented as soon as reasonably practical to ensure potential impacts to the environment are minimised” and discussed in Section 2.1.1. These timeframes will be further refined and finalised prior to implementation of the Revised Proposal. Information regarding the water quality analysis suite and rationale behind chosen analytes and the inclusion of contaminants of concern identified in waste characterisation studies and risk assessments is included in Section 1.4.1.3 of the Water Management Plan (Roy Hill, 2021a). Change of wording for response actions in Table 2-1 of the Water Management Plan (Roy Hill, 2021a) relating to managed aquifer re-injection (MAR) including actions to respond to changes in: Water quality (Modify dewatering and/or water distribution arrangement to reduce flow weighted average EC of injected water below threshold level) and Groundwater Mounding (implement management measures to ensure groundwater mounding is reduced below threshold. This would include reducing injection to allow a recession of mounding within the impacted areas). <p>Roy Hill confirms that up to 3.7 GL of saline water is currently approved under Ministerial Statements 824 and 829 for dust suppression. The Water Management Plan (Roy Hill, 2021a) also includes reference and discussion regarding the Groundwater and Surface Water Monitoring Review (Stantec, 2020) in Section 1.4.1.4 including (but not limited to) the assessment of saline water for dust suppression. It was determined that there is a slight to minor risk from contamination of surface water quality from above ground infrastructure, but that the levels of potential contaminants of concern (using TSF decant water) are well below the Environmental Investigation Levels.</p> <p>As such, it is considered that surface water quality sampling is not required, however, RHIO are committing to undertaking opportunistic ‘grab sampling’ of surface water during flow events in</p>

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			ephemeral creeks in proximity to the mine for the purpose of identifying surface water contamination from mining activities.
3	DAWE	Section 4.6.5.1.1 of the ERD states there is a need for the permanent surface water diversions based on the limitation of compacting the backfill rather than technical difficulties of re-establishing the surface water flows. The Department considers that installing permanent surface water diversions should only occur when technically required. Provide further evidence to support this requirement. Long-term levee maintenance, riparian establishment/rehabilitation, and monitoring will be required if permanent structures are put in place.	<p>Section 4.6.5.1.1.4 of the ERD (Roy Hill, 2020a) outlines the limitations or planning constraints of permanent hydraulic structures, which include:</p> <ul style="list-style-type: none"> - Limitations of operating land space and pit placement - Reinstatement of creeks over a backfilled pit could be in areas that are backfilled to ground water level so there is a drop structure in a channel. <p>The technical requirement for a permanent structure includes closure planning as part of preliminary design. In some cases, realigning the diversion through a backfilled pit is considered detrimental to the environment (for example in areas of an in-pit tailings dams) given unsuitable conditions. Therefore, the diversions left in a permanent location could be beneficial and will be rehabilitated. This will depend on the closure design and utilising a risk-based approach to design.</p> <p>The name of each structure that is deemed permanent is provided in Attachment No.2 - Table 2 of GHD letter dated 18 June 2021 (GHD, 2021), and Table 7 of the GHD S38 Hydraulic Structures Assessment (GHD, 2021), Appendix 4 of this response to submissions document.</p> <p>Monitoring of each hydraulic structure is currently underway during operation and will continue post construction. Downstream of the diversions several monitoring points are located as per Section 5 of Appendix 4 (GHD, 2021) of this response to submissions document. The current proposed reinstatement of channels over backfilled pits are identified in Table 7:</p> <ul style="list-style-type: none"> • Golf 203 (Table 2 name is “drainage reconstruction Channel 4” of Original Proposal) • Sierra 104b (Table 2 name is “flood bund 3” of Original Proposal) • Sierra 203 (Table 2 name is “Channel 12” of Original Proposal) <p>In these areas backfill will be to ground level for the reinstated creekline to avoid a drop structure. During a trial of a creek reinstatement over a backfilled pit (Z101 creek reinstatement – Tributary of the original proposed Channel 1), Roy Hill concluded that settlement within the pit occurred in the first year of backfill. In three years, there was enough data to provide evidence that the water was performing as per modelling and expectations.</p>

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			<p>The permanent structures monitoring program, maintenance requirements will be as per the mine closure plan which will be updated by Roy Hill and reviewed by DMIRS every three years during operation. The major components of this include:</p> <ul style="list-style-type: none"> • The installation of samplers and data loggers to record water levels and water quality • Samples will be analysed for metals as well as total suspended sediments, Total Nitrogen and Total Phosphorus and alkalinity. • Monitoring geomorphic change to creek lines • Rehabilitated areas to be designed to manage erosion and sedimentation events • Site specific approaches to each rehabilitation site <p>Roy Hill will undertake an adaptive management approach and commit to sampling and comparing trends from samples in a safe manner that is acceptable by DMIRS and within Australia and New Zealand Environment Conservation Council (ANZECC) 2018 guidelines. A minimum monitoring program will endure for at least 5 years post construction. This can be considered as “long-term”, unless deemed by DMIRS that additional or less monitoring is required for closure purposes. Refer to the Water Management Plan (Appendix 5 of this response to submissions document).</p>
4	DAWE	Provide the referenced report: GHD (2018) Section 38 Referral, Hydraulic structures, Unpublished report prepared for Roy Hill Iron Ore, August 2018.	This was provided as Appendix 6 of the ERD. GHD provided supplementary correspondence (GHD, 2021) regarding hydraulic structures (attached).
5	DAWE	In Section 3.2.3 in Appendix 6, the modelled outcomes for 50%, 10%, 5%, 2%, 1% and 0.1% chance Annual Exceedance Probability (AEP) events for both Water Flow Rates and Water Stream Power need to be presented in maps and have a supporting discussion (e.g. Figures 3 and 5 in Appendix 6) to assist the assessment of impacts.	Appendix 4 of this response to submissions document -Table 5 (GHD, 2021a) provides guidelines for stream power based on material research of power ranges for alluvial and bedrock waterways. Figures 29 to 56 are provided at each reporting location. The Stream power is within acceptable ranges at each reporting location for material definition. There is an annual geomorphic review of each diversion to maintain any identified areas of scour risk. The reporting locations of 4 and 9 have increased flows will be included in the Geomorphic surveys as per the Water Management Plan (Appendix 5).

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6	DAWE	<p>The assessment in Appendix 41 determined that there is a minor risk of surface water quality contamination from the upstream infrastructure and mining activities however there is no commitment for long-term monitoring and sampling these contaminants, thresholds and management actions when these thresholds have been exceeded. There is a risk that contaminants may reach the Fortescue Marsh given its proximity. This has also been confirmed in Appendix 39. The Fortescue Marsh has been nominated for consideration as a Ramsar wetland and provides significant habitat for several listed threatened and migratory species. Groundwater and surface water quality monitoring in relation to potential impacts from waste rock landforms tailing storage facilities (TSFs) and landfill should be undertaken until it can be demonstrated that no contamination to the Fortescue Marsh is occurring. Discuss and confirm this commitment.</p>	<p>Potential contamination impacts to Fortescue Marsh and other Groundwater Dependent Ecosystems due to waste management and groundwater operations will be monitored in accordance with the Water Management Plan (OP-PLN-00300) (Roy Hill, 2021a)</p> <p>The risk of surface water quality contamination from the upstream infrastructure and mining activities is assessed as “low risk” in Appendix 41 of the ERD, Water Management Plan (Roy Hill, 2020e) and updated the Water Management Plan (Roy Hill, 2021a) as requested by DAWE and DWER (Appendix 5).</p> <p>As described in Appendix 6 (GHD, 2018) of the ERD (Roy Hill, 2020a), the catchment of the Roy Hill mine is only 0.15% of the Fortescue Marsh catchment and located between 2-20km from the marsh. In addition, Roy Hill will retain the existing surface water vegetated buffer area that has been established to mitigate sheet flow impacts to Fortescue Marsh.</p> <p>There are neighbouring lease holders with potential to impact the Fortescue Marsh and Roy Hill is limited to being able to monitor within its lease areas, which includes areas within and outside its Development Envelope.</p> <p>Since submission of the ERD, the Water Management Plan (Roy Hill, 2020e) has been updated (Appendix 41 of the ERD). The revised Water Management Plan (Roy Hill, 2021a) is provided as an attachment to this response to submissions (Appendix 5). The updated Water Management Plan (Roy Hill, 2021a) includes opportunistic surface water monitoring which will be undertaken during flow events. Infield analysis and NATA accredited analysis will be undertaken for contamination of groundwater resulting from mining and associated activities and contamination of groundwater from leaching of Waste Rock Landform (WRL) and TSF.</p> <p>In addition, vegetation will be monitored in accordance with the updated Vegetation Management Plan (Roy Hill, 2021g) which includes vegetation monitoring sites within and outside the Revised Development Envelope and monitors for potential impacts to vegetation that may be related to Roy Hill operations (Appendix 7).</p>
7	DAWE	<p>Evaporation ponds are being considered as a contingency measure to dispose the above ground Tailings Storage Facility decant water, reverse osmosis</p>	<p>The evaporation ponds were approved under the Original Proposal for Stage 1 and 2 of Roy Hill Mine, being Ministerial Statements 824 and 829 respectively. A summary of design criteria and standards</p>

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		<p>reject water, and saline water. Evaporation ponds should not be used due to the potential contamination risks. However, if evaporation ponds or basins were to be used to store saline wastewater at surface, flood modelling, supporting engineering designs, and contingency management planning will need to be presented to demonstrate that high rainfall events will not cause overflow of pond walls or seepage will occur. This modelling will need to be supported by and considered within the modelled outcomes for 50%, 10%, 5%, 2%, 1% and 0.1% chance AEP events for potential overflow events. Provides this information and an associated discussion.</p>	<p>for evaporation pond was included in the Roy Hill Iron ore Mining Project, Stage 1 Public Environmental Review document (Roy Hill, 2009a).</p> <p>As the Evaporation Ponds are currently a contingency measure, detailed design has not been completed to date. Evaporation ponds will be designed and constructed with all relevant safety and environmental considerations.</p> <p>Secondary approvals under Western Australian legislation under both the <i>Environmental Protection Act 1986</i> (regulated by DWER) and <i>Mining Act 1978</i> (regulated by DMIRS) will be sought and obtained prior to construction and operation of the Evaporation Ponds.</p> <p>Evaporation ponds are located so that they do not obstruct the flow of the natural drainage systems. Surface water diversion channels upslope will be designed to accommodate extreme events and stormwater will be managed to encapsulate water within the adjacent recharge basin via the emergency spillway. At closure, these ponds will be removed or encapsulated in accordance with approved Mine Closure Plan (MCP).</p>
8	DAWE	<p>Table 8-1 of the ERD states in relation to post mine closure that monitoring will cease at a time when the Chief Executive Officer has deemed appropriate. However, as presented in the comments above and in the Appendix 6, there have been multiple changes observed to the surface waters since the construction of the hydraulic structures, including the following:</p> <ul style="list-style-type: none"> ● Mine closure flow rates at reporting locations 5, 6 and 7 are substantially lower than pre-mine conditions. <ul style="list-style-type: none"> ○ At location 5 this is due to the open cut pits preventing runoff. ○ At location 6, this is due to the previously approved Kulbee Creek Diversion limiting flows. 	<p>Comparing impacts to flow rates for reporting locations 4, 5, 6 and 7 to pre-mining conditions does not take into consideration the changes to surface flows that were approved under MS824 and MS829. No change is expected, as a result of the revised proposal, in the catchment areas for surface flows from the current approved extent, for reporting locations 4, 5, 6 and 7. (Table 1 of GHD's supplementary information letter (GHD, 2021).</p> <p>Roy Hill also confirms that Figure 4-25 and Table 4-25 of the ERD had not been updated from the Referral (May 2019) and as such the ERD released for Public Review in January 2020 still depicted potential direct impacts to Reporting locations 3 and 7. These figures have subsequently been updated.</p> <p>Roy Hill will monitor potential impacts to Fortescue Marsh, riparian vegetation, and surface water dependent vegetation as detailed in Appendix 5 and 7 of this response to submissions (Water Management Plan (Roy Hill, 2021a) and Vegetation Management Plan (Roy Hill, 2021c).</p> <p>Compliance with outcomes will be measured by assessment of monitoring results against trigger and threshold criteria. A deviation from trigger and threshold criteria will result in the implementation of</p>

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		<ul style="list-style-type: none"> ○ The reduction of flows at location 7 is due to Golf 201 diversion, affecting approximately 3.7 km of riparian vegetation. ● Flow rates at location 8 are reduced by the Sierra 104 diversion, but largely replaced by the Golf 201 diversion. ● Flows are increased at location 4 due to the Kulbee Creek Diversion. <p>Should these hydraulic structures remain, ongoing monitoring of the structures and environmental variables should occur to ensure short and long-term impacts are determined to ensure the continued protection of the ecologically significant Fortescue Marsh, riparian vegetation, and surface water dependent vegetation.</p>	<p>proportionate management responses in order to avoid impacts to Fortescue Marsh, riparian vegetation, and surface water dependent vegetation.</p> <p>Roy Hill will adopt a risk-based approach to hydraulic structures that will assess impacts downstream of the diversion during detailed design and closure phases of the project. Any environmental impacts including those on vegetation and fauna, as well as the integrity of the diversion channel, will be reported in the Annual Environmental Report.</p> <p>Monitoring of flora, fauna and channel stability will continue on permanent surface water structures in accordance with relevant DMIRS approved MCP until it can be demonstrated there are no long-term impacts, and the site can be relinquished.</p> <p>In accordance with the MCP a minimum timeframe for relinquishment will be determined by DMIRS. The requirement is that the final landform is safe, stable and non-polluting post closure. This approach is consistent with recommendations in DMIRS guideline for MCPs. As per the Original Proposal, Roy Hill is committed to monitoring post closure until performing as expected for regular AEP events, which include 1 in a 100 year and 1 in a 1000 year events, following which Roy Hill can relinquish.</p>
9	DAWE	<p>Table 3 and Figure 3 in Appendix 6 discuss that the reporting location 10 flow rates are substantially lower than pre-mine conditions due to mining activities proposed north of the runway that require the use of Sierra 401 and 204 diversion structures. Please explain:</p> <ul style="list-style-type: none"> ● Why that ‘due to topographic limitations, it is not possible to return these diverted flows to the original waterway.’ ● What is deemed ‘a significant change for the purpose of riparian protection.’ 	<p>As the mine operation progresses, surface water will be diverted around the infrastructure perimeters or within a footprint between pits (Appendix 6 (GHD, 2018) of the ERD and Appendix 30 of this response to submissions (GHD, 2021)).</p> <p>While some of the flows will remain permanently diverted, as these creeks are generally tributaries of larger main feed creeks the same water will return to receiving catchments off lease. Within the lease, however, there may be impacts to vegetation within the tributaries where water resources are lowered.</p> <p>Vegetation monitoring programs, as outlined in, the Vegetation Management Plan (Roy Hill, 2021c), Appendix 7 of this response to submissions, will identify and quantify any significant indirect impacts (such as decline in vegetation health due to change in surface water flows) that occur to vegetation and flora. Indirect impacts resulting from alterations in surface water flow are considered in the ERD</p>

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			(Roy Hill, 2020a) as outlined in Section 4.3.5.1.3 as well as the LOM WMS Vegetation Risk Assessment Consequence Memo (Astron, 2020) (Appendix 3 of this submission). If the vegetation is not recoverable after a period of 5 years, and has been attributed to impact from operations, then the area of impact will be determined and will be reported on in the relevant impact reconciliation annual report and hence offset.										
10	DAWE	There is no discussion in Appendix 41 of the ERD of how the reinjection of saline wastewater into the Tertiary detrital unit that is underlying the Fortescue Marsh will and may impact the Marsh and MNES. There is also no mention of monitoring the potential migration of the wastewater through the detrital to the Fortescue Marsh and the potential impacts to ephemeral and surface water resources or Ground Water Dependent Ecosystems (GDEs), including riparian zones. Modelling is required to demonstrate the impacts of potential migration pathways on ephemeral and surface water resources and the GDEs of the Fortescue Marsh.	<p>Fig 3-4 and Fig 3-20 of the LOM WMS (Appendix 2 of the ERD) (GHD, 2019b) represent a generalised geological and hydrogeological sequence at Roy Hill. The distribution of the geological units represented in the groundwater model is presented in Appendix C of the report at Appendix A. A supplementary detailed conceptual cross section that shows the distribution of the various geological units is presented in Figure 1 (Appendix 12 of this response to submissions). Reference should be made to Table 1 (below) for local descriptors that have been applied to the various geological units referred to for clarification of stratigraphic identification. The aquifers that are targeted for reinjection in the SWIB are the Lower Detritals and weathered/fractured Marra Mamba formation in close proximity to the mine and the Lower Detritals and weathered/fractured Wittenoom Dolomite adjacent to the mine.</p> <p>Table 1: Roy Hill Project Geological units and local descriptors</p> <table border="1"> <thead> <tr> <th>Geological Unit</th> <th>Local scale descriptors</th> </tr> </thead> <tbody> <tr> <td>Marra Mamba Formation</td> <td> <ol style="list-style-type: none"> 1. Nammuldi Formation 2. Weathered Marra Mamba Formation/ Nammuldi Formation 3. Fractured Marra Mamba Formation/ Nammuldi Formation 4. Banded Iron Formation </td> </tr> <tr> <td>Wittenoom Formation</td> <td> <ol style="list-style-type: none"> 1. Dolomite 2. Weathered Dolomite 3. Fractured Dolomite 4. Unweathered Dolomite </td> </tr> <tr> <td>Lower Detritals</td> <td> <ol style="list-style-type: none"> 1. Detrital iron deposits 2. Detrital waste 3. Channel iron deposits 4. Iron rich deposits </td> </tr> <tr> <td>Upper Detritals</td> <td> <ol style="list-style-type: none"> 1. Lacustrine deposits 2. Alluvial deposits </td> </tr> </tbody> </table>	Geological Unit	Local scale descriptors	Marra Mamba Formation	<ol style="list-style-type: none"> 1. Nammuldi Formation 2. Weathered Marra Mamba Formation/ Nammuldi Formation 3. Fractured Marra Mamba Formation/ Nammuldi Formation 4. Banded Iron Formation 	Wittenoom Formation	<ol style="list-style-type: none"> 1. Dolomite 2. Weathered Dolomite 3. Fractured Dolomite 4. Unweathered Dolomite 	Lower Detritals	<ol style="list-style-type: none"> 1. Detrital iron deposits 2. Detrital waste 3. Channel iron deposits 4. Iron rich deposits 	Upper Detritals	<ol style="list-style-type: none"> 1. Lacustrine deposits 2. Alluvial deposits
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			<table border="1"> <tr> <td></td> <td>3. Calcretised deposits 4. Clay</td> </tr> <tr> <td>Alluvium</td> <td>1. Alluvials 2. Alluvial deposits</td> </tr> </table> <p>The Tertiary detrital unit referred should be specifically referred to as the Lower Detritals that together with the Marra Mamba and Wittenoorn Dolomite form the target aquifers for reinjection, depending on proximity to the mine. The combined target aquifers range in thickness from about 10-30m. These are overlain by the Upper Detrital unit that ranges in thickness from about 20 to 40m and comprises low permeability sediments. A laterally persistent very low permeability clay unit that ranges up to 20m in thickness (thickens towards Fortescue Marsh) is present within the Upper Detritals. The distribution of this clay unit has been determined with high confidence having been systematically geologically logged in numerous holes drilled across the SWIB. The low permeability Upper Detrital unit effectively confines the injection aquifers from the overlying alluvium and thus from potential impacts to GDEs and Fortescue Marsh. Comprehensive groundwater modelling has been completed to demonstrate the hydraulic response in the alluvium due to injection into the deep Lower Detrital aquifer (Appendix 2 and Appendix 3 of the ERD) (GHD, 2019b).</p> <p>Potential impacts to GDEs and Fortescue Marsh due to mounding will be monitored in accordance with Water Management Plan (OP-PLN-00300) (Roy Hill, 2021a), Appendix 5 of this response to submissions. Trigger and threshold criteria for water levels have been set to protect GDEs. Any mounding that may occur will be maintained at established trigger levels to protect GDEs and as a consequence there will be no impact to ephemeral and surface water systems.</p> <p>Notwithstanding the very low permeability lithologies overlying the target injection aquifers mounding has been predicted by modelling in the alluvium due to injection into the Lower Detritals (Appendix 2 of the ERD) (GHD, 2019b). Any mounding that may develop will be largely within the cone of depression that has been developed due to the adjacent substantial dewatering operations. This will ensure any mounding (or leakage) will substantially migrate towards the mine and not to the Fortescue Marsh. The migration of any residual mounding not captured by the cone of depression will be negligible due to the insignificant head differential within the low permeability alluvium.</p> <p>The potential for contaminant effects on the Fortescue Marsh from MAR at SWIB have been assessed as negligible both during mining and post closure (Appendix 3 of the ERD) (GHD, 2020b). It is noted</p>		3. Calcretised deposits 4. Clay	Alluvium	1. Alluvials 2. Alluvial deposits
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			<p>that the groundwater quality in monitoring bores screened in the alluvium adjacent to the Fortescue Marsh is naturally hypersaline as demonstrated by groundwater and surface water monitoring carried out by Roy Hill. However, Roy Hill have developed the Water Management Plan (Appendix 5 of this response to submissions) to monitor for groundwater and surface change attributed to Roy Hill activities. For a detailed description of the methodology for determining triggers and thresholds, see response item No. 51.</p> <p>This distribution of hydrostratigraphic units referred is consistent with Roy Hill understanding of the conceptual hydrogeological arrangement for the neighbouring Christmas Creek Project located to west of Roy Hill (FMG, 2015).</p> <p>Observed groundwater response to injection operations over last 3 years are consistent with outcomes predicted in Roy Hill’s modelling and demonstrate the Roy Hill mining operation and injection of surplus dewatering water at the SWIB will have negligible impact on the surface and groundwater systems of the Fortescue Marsh (Figure 1a), Appendix 13 of this response to submissions.</p>
11	DAWE	Riparian impacts have been quantified and identified in Table 4 and Figure 5 in Appendix 6 (Section 38 Referral Hydraulic structures). Use the modelling requested above to provide a discussion about how impacts to the riparian zones will be minimised and mitigated and whether rehabilitation/establishment will be undertaken.	<p>The areas of impact in Table 4 of Appendix 6 (GHD, 2018), where flows are changed, will continue to be monitored and if necessary, and measures will be taken to ensure that indirect impacts are contained to within the disturbance footprint, however, given that:</p> <ul style="list-style-type: none"> there will only be a 3% of the catchment area, and that it is expected that surface water flows in riparian zones are maintained close to baseline conditions through the implementation of diversion structure, and the mine has been operating for five years with diversion structures in place and has not had any impact on riparian vegetation, and it is likely that impacts would likely become apparent after two to five years, <p>There does not appear to be a strong likelihood of impact to vegetation associated with proposed changes to surface water management at the Mine (Astron, 2021 – Appendix 3 of this response to submissions document).</p> <p>Vegetation monitoring programs, as outlined in the Vegetation Management Plan (Roy Hill, 2021c), Appendix 7 of the ERD, will identify and quantify any significant indirect impacts (such as decline in</p>

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			vegetation health due to change in surface water flows) that occur to vegetation and flora. If the vegetation is not recoverable after a period of 5 years, and has been attributed to impact from operations, then the area of impact will be determined and will be reported on in the relevant impact reconciliation annual report and hence offset.
12	DAWE	Appendix 2 (Life of Mine Water Management Strategy) states that 'homogenous bulk hydraulic properties are applied for the major aquifer units considered in this conceptual and numerical model' based on the 'principle of parsimony'. However, it appears that no sensitivity analysis has been conducted. The Department recommends this analysis is undertaken given the proximity to the Fortescue Marsh and the volume of water to be re-injected. In addition, the hydraulic conductivity analysis needs to be provided to assess how the re-injected water will impact the Fortescue Marsh, since if the values are unrealistically high, then it would provide greater confidence that no impacts would occur to this area.	<p>Regional groundwater model sensitivity and uncertainty analysis was undertaken by GHD in Appendix 3 of the ERD (GHD, 2020), focussing on assessing the potential for shallow water table variability after the ERD (Roy Hill, 2020a) was submitted in January 2020. Roy Hill identified a potential risk related to mounding that may manifest in the alluvium due to injection.</p> <p>Key results of this assessment are:</p> <ul style="list-style-type: none"> The most sensitive parameters for predicting the effects of reinjection on the water table elevation/depth to water are the horizontal hydraulic conductivity of relevant hydrostratigraphic units (notably weathered Wittenoorn dolomite), vertical hydraulic conductivity of the Upper Detritals Clay/Lacustrine Deposits (regional aquitard) and specific yield of unconfined aquifers within which the water table fluctuates. Within the Southwest Injection Borefield (SWIB), there is moderate to high confidence that depth to water would remain below the 5 m depth to water threshold for acceptable impact. The elevated risk areas are in the proximity of the injection borefield. At these locations, the minimum depth to water of up to around 2.5 m is predicted (without controls) based on the 90% confidence interval, however, a high level of management control is available in this area and, should it be necessary, the groundwater reinjection will be managed to ensure that water levels do not rise above the threshold depth of 5 m. With respect to the remote MAR areas, in the low-lying area near the Fortescue Marsh, modelling indicates that the water table in this area is naturally shallow and is already within 5 m of ground surface, with a 90% confidence interval of generally less than ± 0.5 m. Elsewhere within remote MAR, there is high confidence that depth to water would remain below the 5 m depth to water threshold, however, as with the SWIB, groundwater reinjection in the MAR will be managed to ensure that water levels do not rise above the threshold depth of 5 m. <p>Roy Hill will test model sensitivity in future modelling revisions to demonstrate parameter validity. Regular reconciliation of model outputs against groundwater monitoring data will provide further confidence to adopted parameters.</p>

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13	DAWE	Provide evidence and discussion of the potential long-term impacts of density-driven flow caused by the re-injection process. In particular, address this density-driven flow in relationship to the Fortescue Marsh.	<p>A revised conceptual hydrogeological cross section illustrating distribution of hydrogeological units, saline groundwater and water management activities is presented in Figure 1 (Appendix 12 of this response to submissions document. This is consistent with Roy Hill's understanding of the conceptual hydrogeological arrangement for the neighbouring Cloudbreak Project located to west of Roy Hill (FMG, 2015).</p> <p>A significant portion of the Upper Fortescue groundwater catchment contains saline to hyper saline groundwater. Roy Hill's operations are located on the fringe of the saline groundwater system. A conceptual diagram showing the influence of the Roy Hill Mine and infrastructure on the regional aquifer water balance is presented in Figure 2 (Appendix 14 of this response to submissions).</p> <p>Of total abstractions ~18% is expected to be removed and used by the mine, ~62% is returned in the SWIB area and 20% is injected into the Remote MAR area. Most of the injected water to SWIB is expected to flow towards the north occupying storage depleted by dewatering. Minor water will transmit southward resulting in some increased pressure in deep aquifer system during operations phase. However, the lower groundwater head in the mine area (due to depleted storage) will result in water transmitting towards the mine and reducing the groundwater pressure created by injection. Replenishment of fresh to brackish water from recharge over Chichester Ranges will occur over longer term.</p> <p>Roy Hill acknowledges the potential complexity of groundwater flow due to density effects. High salinity groundwater and the associated density driven hydrodynamics is a regional scale feature of the Upper Fortescue Valley groundwater system. Roy Hill groundwater operations occur on the fringe of this feature and as such will not disrupt this regional dynamic (Figure 1, 2 included as Appendices 12 and 14 of this response to submissions document).</p> <p>The potential modelled impacts (mounding) of Roy Hill mining activities on the alluvium is also minor with the water table remaining >5m below surface in the SWIB area. Potential impact on groundwater quality is thus also expected to be negligible due to physical and density controls on upward migration, mixing and attenuation. Downgradient of the SWIB towards the Fortescue Marsh where water levels are naturally <5m below ground level in the alluvium, modelling demonstrates negligible impact of injection on the water table and thus similarly on potential impact to groundwater dependent vegetation.</p>

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			Roy Hill studies concluded to date, have not demonstrated a potential risk due to the dynamics of density driven flow thereby negating the requirement to specifically model density driven groundwater flow. However, Roy Hill commits to investigating this issue in future groundwater model updates.										
14	DAWE	<p>Address the inconsistencies in the ERD and Appendices that confuse which formation(s) the re-injection will occur in the South West Injection Borefield (SWIB). The following discrepancies were found:</p> <ul style="list-style-type: none"> The ERD states that Bennelongia (2020) (Appendix 37) completed a desktop assessment of potential impacts of reinjection 'into the Marra Mamba Formation' at the SWIB, Remote MAR borefield and the Southern Borefield. Table 5 Appendix 37 indicates that the Nammuldi Member of the Marra Mamba Formation as the formation where re-injection will occur in the SWIB. Appendix 2 notes the Nammuldi Member as having high hydraulic permeability. Figure 3 in Appendix 37 appears to indicate that re-injection at SWIB will be into the Oakover Formation, which is discussed in section 3.2.7 in Appendix 2 as part of the Forte7scue Marsh formations. Section 2.1 in Appendix 4 (MAR Operations Data Review Report) states that '[i]n the SWIB area injection bores target the fractured and weathered Marra Mamba Formation and Wittenoom Dolomite' however page 12 the same document states that injection occurs into the weathered Dolomite and/or Marra Mamba Formation. There are also differences in the location of SWIB between the ERD and Figure 3 in Appendix 4, which indicates 	<p>Roy Hill acknowledge that local scale descriptors have been used variably to describe formations. For clarification, Table 1 below provides a consolidation of regional scale geological units and corresponding local scale descriptors.</p> <p>An updated representative conceptual hydrogeological cross section illustrating the distribution of geological units is presented in Figure 1 (Appendix 12 of this response to submissions document).</p> <p>Table 1: Roy Hill Project Geological units and local descriptors</p> <table border="1"> <thead> <tr> <th>Geological Unit</th> <th>Local scale descriptors</th> </tr> </thead> <tbody> <tr> <td>Marra Mamba Formation</td> <td> <ol style="list-style-type: none"> Nammuldi Formation Weathered Marra Mamba Formation/ Nammuldi Formation Fractured Marra Mamba Formation/ Nammuldi Formation Banded Iron Formation </td> </tr> <tr> <td>Wittenoom Formation</td> <td> <ol style="list-style-type: none"> Dolomite Weathered Dolomite Fractured Dolomite Unweathered Dolomite </td> </tr> <tr> <td>Lower Detritals</td> <td> <ol style="list-style-type: none"> Detrital iron deposits Detrital waste Channel iron deposits Iron rich deposits </td> </tr> <tr> <td>Upper Detritals</td> <td> <ol style="list-style-type: none"> Lacustrine deposits </td> </tr> </tbody> </table>	Geological Unit	Local scale descriptors	Marra Mamba Formation	<ol style="list-style-type: none"> Nammuldi Formation Weathered Marra Mamba Formation/ Nammuldi Formation Fractured Marra Mamba Formation/ Nammuldi Formation Banded Iron Formation 	Wittenoom Formation	<ol style="list-style-type: none"> Dolomite Weathered Dolomite Fractured Dolomite Unweathered Dolomite 	Lower Detritals	<ol style="list-style-type: none"> Detrital iron deposits Detrital waste Channel iron deposits Iron rich deposits 	Upper Detritals	<ol style="list-style-type: none"> Lacustrine deposits
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		<p>different locations for the SWIB as well as differences in the geology of the area (e.g. the latter does not show the dolomite to be present in the SWIB area).</p> <ul style="list-style-type: none"> Section 3.31 in Appendix 2 states that ‘excess groundwater discharge, generated at a rate of up to 205 ML/d (on average 87 ML/d) is planned to be returned to the aquifer system at various sites, including the resource area (into the Tertiary detrital units and Nammuldi Member, up to 109ML/d, on average 67ML/d at SWIB)...’. However, Figure 4-51 of the ERD shows the Tertiary detritals abutting the calcrete which underlies the Fortescue Marsh, noting that these are not identified on Figure 2-7 of the ERD. If this is the case, there is a potential migration pathway for the water injected into the Tertiary detritals to move into the calcrete and hence the Fortescue Marsh. <p>Noting the above comments, address the following:</p> <ul style="list-style-type: none"> Identify which formation the re-injection will occur at the SWIB and relative volumes; Address why there are these inconsistencies within the documentation, Explain why there are differences in the location of the SWIB in the ERD and Figure 3 in Appendix 4; Clarify the possible differences in the modelling undertaken due to these inconsistencies; 	<table border="1"> <tr> <td></td> <td> <ol style="list-style-type: none"> Alluvial deposits Calcretised deposits Clay </td> </tr> <tr> <td>Alluvium</td> <td> <ol style="list-style-type: none"> Alluvials Alluvial deposits </td> </tr> </table> <p>In regional geological terms the SWIB borefield is located at the northern margin of the Wittenoom dolomite. The Wittenoom Dolomite (Hamersley Group) is the primary Archean-Proterozoic geology to the south of the tenements associated with the Roy Hill mine. The Marra Mamba Formation (Hamersley Group) and underlying Jerrinah Formation (Fortescue Group) are the primary Archean-Proterozoic geological units to the north of the Roy Hill mining tenements. Lateritised basement formations are overlain by Cenozoic sediments comprising older sequences of detrital iron (Lower Detritals), overlain by lacustrine/alluvial deposits (Upper Detritals), clay (Upper Detritals) formed in the Fortescue valley and subsequent sequence of alluvial fan sediments (Alluvium). Calcretisation is a significant feature of the lower detrital, lacustrine and alluvial fan deposits.</p> <p>SWIB injection bores are screened across the Marra Mamba Formation and the Wittenoom Formation geological domains and the overlying Lower Detritals (Figure 1 attached). The target aquifers for injection are the Marra Mamba Formation, the weathered Wittenoom Formation and the Lower Detritals.</p> <p>The volumes that are injected into each target aquifer depend on the permeability of the target aquifer. This permeability is not identified in each unit to the extent that the proportion of injected water can be assigned individually to the Lower Detritals/Marra Mamba/Wittenoom Formations. The target aquifers are treated as a single unit for the purpose of injection as they are hydraulically connected with one another. The relative injection volumes as a percentage on a regional scale aquifer water balance basis is provided in Figure 3.</p> <p>The movement of injected water in the SWIB is largely governed by the drawdown cone developed by the mine dewatering operations. Approximately 85% of the injected water returns to depleted storage or is recirculated. The remaining 15% moves in the direction of the Fortescue Marsh and intersects the hypersaline interface that defines the Fortescue Marsh groundwater system. A minor component of reinjected water migrates vertically to create a mound centred on the injection</p>		<ol style="list-style-type: none"> Alluvial deposits Calcretised deposits Clay 	Alluvium	<ol style="list-style-type: none"> Alluvials Alluvial deposits
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		<ul style="list-style-type: none"> Provide evidence that the modelling has been undertaken in the correct formation(s) and the potential impacts of re-injection into the formation(s) is robust; and Provide the relative injection volumes between the Tertiary detritals and the Nammuldi Member to help assess the risk of this pathway into the Fortescue Marsh. 	<p>borefield. Again, this mound is substantially captured by the dewatering drawdown cone. Migration of that component not under the influence of the dewatering drawdown cone will be negligible due to the insignificant head differential within the low permeability alluvium.</p> <p>The space between the bore casing and the bore hole is sealed to prevent leakage from the Lower Detritals into upper units. There is no direct potential pathway for the migration of injected water to the upper units and thence to the Fortescue Marsh. The primary units that retard vertical flow are unconsolidated and with high clay content. While Roy Hill considers deformation of these units to be unlikely, if it was to occur, deformation would be limited to plastic response and not a brittle deformational style response, and therefore would not change the hydraulic characteristics of the units. Roy Hill considers that there is no potential for low permeability saturated clay dominant units to develop “cracks” or preferential pathways as a consequence of the reinjection of water into the SWIB. Notwithstanding, in the event this was to occur, the Water Management Plan (Appendix 5 of this response to submissions) outlines groundwater quality and level monitoring that would detect such an occurrence.</p> <p>Increasing injection capacity and thus pressure in these receiving units may result in vertical leakage around the injection borefield, where the maximum pressure occurs. Away from the injection borefield and towards the Fortescue Marsh, the pressure reduces, and the clay rich Upper Detrital unit thickens effectively retarding vertical water movement (Figure 1 attached). This unit has been mapped at drilling locations on either side of the Fortescue Valley by Roy Hill and more extensively (including within the Fortescue Marsh) by FMG (FMG, 2013). Potential exists for mounding in the upper units that is addressed under Section 3.6.4 of Appendix 2 (GHD, 2019b) of the ERD (Roy Hill, 2020a).</p> <p>Apparent inconsistencies in regard to referencing of the relevant geological units in the various documents referred is related to use of local scale descriptors clarified in Table 1. Further some of the apparent inconsistencies referred are from reports that are not specifically reporting on groundwater modelling and reference to geological formations in these reports is used in a general sense for context. There are no differences in modelling results due to these apparent naming inconsistencies as consistent individual unit hydraulic parameters have been adopted in the reports that have specifically reported groundwater modelling. Reference should be made to Appendix 2 of the ERD (GHD, 2019b) and Appendix 3 of the ERD (GHD, 2020b) in regard to groundwater modelling. Roy Hill</p>

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			<p>is entirely satisfied that the correct parameters have been applied to the stratigraphic units referred in the expert consultant reports (Appendix 2 and Appendix 3 of the ERD) Apparent confusion is limited to the use of local scale descriptors in general text and clarified in Table 1.</p> <p>The relative regional locations of the SWIB and Stage 1 Borefield is given in Figure 1 in Appendix 4 (Roy Hill, 2020c) of the ERD (Roy Hill, 2020a). Figure 2 in Appendix 4 (Roy Hill, 2020c) provides a cross section across the SWIB. Figure 3 in Appendix 4 provides a cross section across the Stage 1 Borefield. The location of the SWIB is clearly identified in Figures 2-1, 2-5 and 2-8 of the ERD (Roy Hill, 2020a). Further illustration of the locations of the SWIB and Stage 1 Borefield is given in Figure 2-11 and 2-12 of the ERD (Roy Hill, 2020a).</p>
15	DAWE	<p>Section 2.4.4.3 of the ERD presents the results of a Managed Aquifer Recharge (MAR) trial from November 2017 to December 2018, where 6,897,135 kL of surplus dewatering was injected in the SWIB. As 1kL equals 1m³ this is 6,897,135m³, which equates to a swimming pool 6000 m x 1150 m x 1 m deep. This would occupy a space in the receiving aquifer of 6000 m x 2000 m x 1 m given that the porosity is likely to be no greater than 20%. Address the following:</p> <ul style="list-style-type: none"> The MAR borefield description in section 3 of Appendix 4 states that there are two sets of monitoring bores: 1) the 'control piezometer' nested with one bore in the alluvial sequence and 2) another bore installed in the receiving aquifer (weathered Wittenoon Dolomite/Marra Mamba Formation). However, Figure 3 in Appendix 4 does not show that dolomite is in the SWIB area. Explain why Figure 3 in Appendix 4 does not support the formation(s) in which the monitoring bores were installed. Figures 17 and 18 in Appendix 4 show the groundwater levels for the shallow monitoring 	<p>The MAR trial referred has been superseded by around 2.5 years of MAR operations. Details of MAR performance is provided in Roy Hill Managed Aquifer Recharge Operations Data Review Report (Appendix 4 of the ERD) (Roy Hill, 2020c). The Roy Hill Mine Annual Aquifer Review (Aug-19 to Jul-20) has also now been provided (Appendix 29 of this response to submissions document).</p> <p>During the period of the Annual Aquifer Review injection has progressively been increased to a peak daily rate equivalent to approximately 14 GL/a. Following this period dewatering and MAR operations have continued to ramp up with peak daily injection rate equivalent to approximately 30 GL/a being achieved during 2021. Groundwater levels continue to remain within expected ranges. Reporting of the Roy Hill Mine Annual Aquifer Review (Aug-20 to Jul-21) is planned to be issued in October 2021. MAR operations at SWIB will continue to ramp up and are expected to range between ~37 to ~45 GL/a from mid-2021 onwards. Ongoing detailed monitoring of the response of the aquifer to injection, the response of the overlying water table and the injection bore capacity will continue to inform Roy Hill of the performance of the borefield. The executed monitoring programme will enable Roy Hill to adjust the injection strategy should any potential deleterious trends be observed.</p> <p>RHPZ0075 and RHPZ0185 are screened in the shallow alluvial sequence above the Upper Detritals Clay (Figure 1 of Appendix 4 of the ERD (Roy Hill, 2020c)) and are therefore hydraulically isolated from the aquifers targeted for injection. Roy Hill has constructed monitoring bores within and downgradient of the injection borefield (in the direction of the Fortescue Marsh) that are screened in the alluvium, together with separate deeper monitoring bores that are screened across the lower formations and that are sealed from the upper alluvium. These deeper bores (RHPZ0281D,</p>

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		<p>boreholes in the alluvial sequence next to the injection bore and the regional monitoring boreholes. Appendix 4 also shows the hydrographs for the deeper monitoring boreholes.</p> <p>Unsurprisingly, there is no indication of impact from the reinjection trial. Allowing that the vertical scale is coarse, there is little indication of groundwater level rise in these boreholes (e.g. RHPZ0075 and RHPZ0185).</p> <p>However, given RHPZ0185 is approximately 500 m towards Fortescue Marsh and along the groundwater flow line from two injection boreholes RHIB0232 and RHIB0234, it is surprising that the reinjected water was not identified. The Department is concerned where such a significant volume of injection water has gone noting the calculations presented in Appendix 4, given these deeper boreholes are meant to be installed in the same formation as the injecting boreholes and that no information is provided as to which geological units the deeper monitoring boreholes are completed. The reason there was no indication of impact from the MAR trial may be because there is no monitoring in the geological unit used for reinjection, the Tertiary detritals according to section 3.31 of Appendix 2.</p> <p>The Department is concerned with the issues surrounding the outcomes of the MAR borefield trial. Therefore, please provide further evidence on the outcomes of the trial, address the points above and the discrepancies across the documentation.</p>	<p>RHPZ0286D, RHPZ0287D, RHPZ0292D and RHPZ293D) monitor the response of injection on the target aquifer on a more regional basis (Figure 3 of Appendix 4 of the ERD (Roy Hill, 2020c)).</p> <p>Roy Hill considers the multi-year history of dewatering, MAR and associated measurement of aquifer response demonstrate a sustained and substantial scale of operation to verify forecasts and provide confidence for ongoing ramp up.</p> <p>Each injection borehole has an associated control piezometer that is screened across the receiving aquifer and a shallow monitoring borehole screened across the upper alluvium. The control piezometer has instrumentation that allows the performance of the injection borehole to be remotely monitored. The shallow monitoring borehole has instrumentation that allows any potential mounding in the shallow geological units due to injection in the deeper units to be monitored remotely. The target aquifers for injection include the Wittenoom Dolomite, Marra Mamba and overlying Lower Detritals. The conceptual hydrogeological cross section referenced (Figure 3 of Appendix 4 of the ERD) (Roy Hill, 2020c) does not intersect the SWIB borefield location. The location of this section is further to the south-east of the project. An updated conceptual hydrogeological cross section representative of the SWIB area is presented in Figure 1 (Roy Hill, 2020c). Figure 1 shows the Wittenoom Dolomite underlying the SWIB that forms one of the key target aquifers for injection (Roy Hill, 2020c).</p> <p>With reference to Figures 17 and Figure 18 of Appendix 4 of the ERD (Roy Hill, 2020c); the impact of injection on the water levels in the deep aquifer are expressed as head increases that are restricted to the immediate vicinity of the injection borefield. This head increase dissipates rapidly away from the injection sites. The conceptual aquifer water balance (Figure 2 of Appendix 4 of this response to submissions document) provides the estimated distribution of injected water (Roy Hill, 2020c). The majority of injected water occupies storage developed as a result of mine dewatering with a component of this water being recirculated back through the mine dewatering system and then reinjected.</p> <p>A comprehensive routine monitoring programme is executed by Roy Hill to enable the potential impact of injection on the receiving environment to be assessed. Results of the monitoring completed to date are presented in the Roy Hill Managed Aquifer Recharge Operations Data Review Report and the Roy Hill Mine Annual Aquifer Review (Aug-19 to Jul-20). Monitoring of deep aquifer water levels downgradient of the SWIB does not form a compliance requirement of the Groundwater Licence (GWL). Roy Hill nonetheless maintains telemetry logging infrastructure at these locations to</p>

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			accurately monitor water table response. A summary of this data is provided in Figures 3 to Figures 5 of Appendix 4 of the ERD (Roy Hill, 2020c).
16	DAWE	Figures 4-82 and 4-83 of the ERD present the cumulative groundwater impacts from the Christmas Creek mine. These maps only show the cumulative impacts in the mining area. Provide a further assessment of the potential cumulative groundwater impacts on the Fortescue Marsh taking into consideration the above points above.	<p>Roy Hill have outlined cumulative impacts from all nearby known and approved operations as outlined in Section 2.6 of the ERD (Roy Hill, 2020a).</p> <p>In the long term (post-operations) Christmas Creek and Roy Hill operations result in elongated water table drawdown footprint along the flank of Chichester Ranges and Fortescue Marsh. During operations areas of mounding are forecast to occur also. In general, the max drawdown is represented by the maximum of either Christmas Creek or Roy Hill drawdown footprint. Superposition effect (where modelled drawdown impacts overlap with each other during operations of both mines) immediately between the two projects can result in drawdown greater than the maximum of either drawdown. Analysis of the superposition effect of the post-operations drawdown footprints shows minor increase of the maximum drawdown in a limited area, which is not expected to exceed 0.5m locally near Fortescue Marsh (Figure 3 – Appendix 20 of this response to submissions).</p>
17	DAWE	Figure 4-1 in Appendix 39 provides a conceptual model for causal pathways for TSF decant water impacts however does not appear to include the accumulation of contaminants in the shallow subsurface soils. This accumulation would occur due to accumulations on the surface migrating downwards through the soil profile due to low to moderate rainfall (i.e. when overland flow from heavy rainfall does not occur). The lateral movement of these accumulations could impact on vegetation and the Fortescue Marsh in a worse-case scenario. Assess these potential impacts.	<p>As outlined in Section 4.3.5.1.4, the risk assessment for TSF decant water for dust suppression impacts are predicted to be the same as that of saline dewater which has previously been assessed and approved.</p> <p>TSF decant water and saline water for dust suppression is not expected to have a significant impact to either vegetation adjacent to roads or to vegetation and the Fortescue Marsh through lateral movement of contaminants in the subsoil due to the comparatively low volume required for dust suppression proving inconsequential. Tables 4-5 and 4-6 in Appendix 39 of the ERD demonstrate that the concentrations of metals in soils will not increase significantly, and that the TSF water is well within ANZECC livestock limits with the exception of selenium, which is only marginally above that limit and given that pooled water from any dust suppression would be ephemeral, this would not likely be a major source of water for fauna.</p> <p>The use of saline water or TSF decant water for dust suppression under this Revised Proposal does not change the impacts from that previously assessed.</p>

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18	DAWE	Table 4 in Appendix 41 states that appropriate management responses will be identified and implemented in response to exceedances of certain triggers and threshold values outlined for key impacts. Advise the detailed response plans will be provided for review.	<p>The Water Management Plan (Appendix 41 of the ERD) (Roy Hill, 2020e) was updated by the Water Management Plan (Roy Hill, 2021a), Appendix 5 of this response to submissions. The revised Water Management Plan (Roy Hill, 2021a) includes threshold exceedance actions to implement an appropriate management response to mitigate potential impacts to key environmental values. The level and type of response will be dependent on the outcomes of an impact assessment and will be relative to the impact consequence. This methodology utilizes the benefits of adaptive management and will result in a response that is tailored to the outcome. Thresholds and trigger levels will be developed prior to finalisation of the Water Management Plan.</p> <p>Section 2.1 of the Water Management Plan (Roy Hill, 2021a) includes details for the types of responses that will be implemented in the event of a trigger or threshold exceedance including but not limited to:</p> <ul style="list-style-type: none"> • Reduce abstraction or reinjection from/to bores, turn off bores; • Manage aquifer reinjection rates across borefields to re-establish and maintain groundwater levels; • Conduct earthworks/engineering to restore surface flows at site; and • Undertake rehabilitation to impacted sites.
19	DAWE	Table 4 in Appendix 41 identifies the trigger and threshold values for salinity of reinjected water into the SWIB as 45,000 mg/L and 50,000 mg/L TDS. This is above the conditioned/licensed value of 30,000 mg/L as stated in the data review report in Appendix 4. Clarify and revise these trigger and threshold values to reflect the license conditions.	The Revised Proposal is seeking to increase the TDS limits that were previously approved. The Licence will be updated to reflect these new limits if the Revised Proposal is approved.
20	DAWE	Indirect impacts to MNES habitat	The supporting maps and data visualisation for the risk and likelihood of impact to vegetation from the Life of Mine Water Management Strategy (LOM WMS) Vegetation Risk Assessment, is illustrated in Figure 5 of Appendix 9 of the ERD (Astron, 2019). An additional map illustrating the 1m increment

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		<p>Figure 8 in Appendix 9 concludes there is a medium risk to samphire vegetation in the Fortescue Marsh due to groundwater mounding. Appendix 9 also provides an addendum that improves the models by increasing the resolution and water levels to 1m increments. The new conclusion is that there is no likelihood of any impacts or risks to Fortescue Marsh vegetation due to hydrological changes caused by the proposed action. However, the addendum is missing key supporting data. The following is required:</p> <ul style="list-style-type: none"> Supporting maps and data visualisation to compare the outcomes provided in Figure 8 of Appendix 9. Discussion on the limitations of how the risk assessment is based on the accuracy of the hydrology modelling (e.g. the lack of sensitivity analysis). Provide revised matrices of the addendum modelling to compare with Tables C2-C5 in Appendix 9. The risk assessment is based on vegetation mapping using aerial and satellite imagery. Section 3.1.2 of Appendix 9 states that aerial mapping only identifies groundwater dependent vegetation with approximately 60% accuracy. Provide a map detailing which areas were surveyed by each type of method and whether ground surveyance of vegetation was included in the models. 	<p>groundwater change has been developed by Astron and is available as supporting evidence. See Appendix 31 of this response to submissions document (Astron, 2021).</p> <p>The LOM WMS (GHD, 2019b) (Appendix 2 of the ERD) was used as the basis for the LOM WMS Vegetation Risk Assessment (Appendix 9) (Astron, 2019) and includes predicted groundwater level change and discussion for uncertainty of conclusions. Section 3.1.1 of Appendix 9 discusses the LOM WMS and hydrological modelling scenarios. Scenario 2B was selected for this assessment as it included injection in all four water management areas (simultaneously) and pose the greatest threat to vegetation. Temporally, the model output for 2026 was selected to represent a period of high risk of decline or mortality because it represents the phase of the LOM WMS when mounding and drawdown are at their greatest. In 2020, Roy Hill engaged GHD (Appendix 3 of the ERD) to undertake a Groundwater Model Sensitivity and Uncertainty Analysis, using Scenario 2B as the test case of the study (GHD, 2020). The average 90% confidence interval of 32 shallow monitoring locations (existing and virtual) strategically positioned at and near the future re-injection sites vary from ± 0.2 m to ± 2.4 m of the predicted heads, with an average of around ± 1 m. This means the heads (depth to water) predicted by the model are generally confident to within 2 m of those predicted based on the current best estimate (calibrated) parameters. Roy Hill incorporated the sensitivity analysis (GHD, 2020) into the LOM WMS.</p> <p>The revised likelihood matrix for the LOM WMS Vegetation Risk Assessment (Astron, 2020), Addendum, is included as Appendix 1 of this response to submissions document. The revised likelihood matrix includes groundwater change scenarios for possible groundwater water level changes from MAR. However, as outlined in the Section 2.4.4.2 of the ERD and in the provisions of the Water Management Plan, Roy Hill has committed to limiting mounding from MAR to below 5mbgl for bores with antecedent water levels of 5mbgl or more in the central injection area.</p> <p>For the purpose of the Appendix 9 (of the ERD) Addendum, WV3 satellite imagery was used to identify vegetation cover across the model extent using a modified soil adjusted vegetation index (MSAVI) threshold of 0.36 where the risk from mounding was more than negligible (Astron, 2021). A memo discussing the details of the methodology for the vegetation classification has been provided (Astron, 2021a) including a map of the WV3 estimated vegetation cover across the model extent and justification for the methodology used (Astron, 2021a). The area of vegetation estimated from MSAVI was 4% larger than the maximum entropy approach, but there was considerable variation from</p>

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			location to location, particularly where the estimated cover was greater than 40%. Where MSAVI was low (less than ~15% cover) it tended to under estimate cover. In general, it is likely that the 'all vegetation' classification used in the model based on MSAVI overestimated actual vegetation cover, especially where the actual vegetation cover was relatively high. However, an overestimation of the magnitude detected in this analysis can be considered a feature that is appropriately conservative.
21	DAWE	<p>Indirect impacts to MNES habitat</p> <p>Explain how the groundwater dependent vegetation identified in Figures 4-16 and 4-17 of the ERD is considered at low risk of impact in Figures 4-12 to 4-13 of the ERD. These communities are likely to be at a higher risk of being impacted by the proposed action due to the vegetation associations with riparian area, which has been confirmed and described within section 4.3.3.2.5.2 of the ERD.</p>	<p>The LOM WMS Vegetation Risk Assessment (Appendix 9 of the ERD) (Astron, 2020) assigned elevated consequence levels for vegetation types with ecohydrological associations (Phreatophyte, Halophyte, Sheet flow dependant etc.). Groundwater dependent vegetation (namely <i>Eucalyptus victrix</i> and <i>Eucalyptus camaldulensis</i>) were assigned a consequence level of 'Moderate' and a score of 3.</p> <p>Vegetation risk classification was determined using the antecedent groundwater level (m) and magnitude of mounding or drawdown (m) matrix illustrated in Figure 1 of the Appendix 9 Addendum (Appendix 9 Of the ERD and this response to submissions document). The risk assessment was applied to the model extent including the vegetation with ecohydrological associations.</p> <p>Despite the higher consequence level, the risk assessment outlined that only 3.76 ha (as outlined in Table 4-15) of groundwater dependent vegetation is at risk of indirect impacts from the LOM WMS as outlined in Figure 4-12 and 4-13 due to the low likelihood of impact.</p> <p>The revised likelihood matrix includes groundwater change scenarios for all possible groundwater water level changes from MAR. However, as outlined in the Section 2.4.4.2 of the ERD and in the provisions of the Water Management Plan, Roy Hill has committed to limiting mounding from MAR to below 5mbgl for bores with antecedent water levels of 5mbgl or more.</p> <p>The 5mbgl mounding limit significantly reduces the area that is likely to be at risk from mounding.</p>
22	DAWE	<p>Indirect impacts to MNES habitat</p> <p>Figure 4-24 (also Figures 4-12 to 4-14) which displays the vegetation risk of decline and mortality does not</p>	<p>Roy Hill engaged Astron to undertake an additional assessment with refined hydrological criteria to identify at risk areas depending on the rate of mounding or antecedent Standing Water Level (SWL) at 1m change resolution. This is included as an Addendum to Appendix 9 of the ERD (Astron, 2020). The risk areas to vegetation illustrated in Figure 4-24 and Figures 4-12 to 4-14 are derived from the model output illustrated in Figure 5 of the Addendum to Appendix 9 not Appendix 9 (Figure 8). Hence</p>

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		match the outcomes of the modelling undertaken in Appendix 9 (Figure 8), which demonstrates the high risk areas and impacts to the Fortescue Marsh. Provide an explanation and an updated map that demonstrates these modelling outcomes in relationship to the mapped vegetation.	<p>the difference between risk areas in Appendix 9 (Figure 8) and Figure 4-24 and Figures 4-12 to 4-14 of the ERD</p> <p>There are no areas within the model extent with a high risk classification. The difference between the models from the original risk assessment and the addendum involved the refinement of the hydrological criteria for the antecedent groundwater level magnitude of mounding into 1m increments, and the constraint to the area of vegetation cover within each mapped vegetation type based on Worldview spatial data.</p>
23	DAWE	<p>Indirect impacts to MNES habitat</p> <p>Explain why Table 4-14 does not seem to be linked (e.g. low, moderate) to the risk assessment undertaken in section 4.3.5 of the ERD.</p>	<p>They are linked. The significance ratings applied to the vegetation units in Table 4-14 of the ERD (Roy Hill, 2020a) are assigned depending on the presence (or absence) of flora or vegetation units of significance</p> <p>A description of the vegetation values that determine significance is included within Table 4-14 of the ERD (Roy Hill, 2020a) and listed below:</p> <ul style="list-style-type: none"> - Priority flora, - Sheet flow dependant mulga, - GDV, - Drainage foci, - AxTos (VT30) and - Perennial tussock grassland <p>These vegetation types, collectively referred to as “Vegetation of Other Significance”, are assessed and discussed in Section 4.3.5.2.5 of the ERD (Roy Hill, 2020a).</p> <p>The LOM WMS Vegetation Risk Assessment (Astron, 2020) does not align with Table 4-14 due to the different impacts to vegetation types from mounding and drawdown at various locations across the project area originally not including un-mapped vegetation areas. This was rectified in Table 4-14 and Table 4-15 of the S43a (Roy Hill, 2021b).</p>
24	DAWE	Indirect impacts to MNES habitat	Roy Hill clarifies the matrix C.2 of Appendix 9 of the ERD (Astron, 2020) Addendum outlines that the likelihood matrix for the risk of decline or mortality owing to groundwater drawdown, is that a

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		<p>Some of the matrices provided in Appendix C of Appendix 9 do not appear to accurately assess the likelihood of impacts. For example, a drawdown of >20m is deemed unlikely to impact phreatophytes growing over antecedent groundwater <5 m deep. The Department considers that a higher likelihood of impact should be allocated due to the purposes of risk management, especially where vegetation mapping or hydrological monitoring could be inaccurate. Note the following and re-evaluate the matrices provided in Appendix 9:</p> <ul style="list-style-type: none"> ● Samphire vegetation is related to be of moderate consequence however, justification have not been provided for this assessment, such as DWER's (2017) <i>Guideline: Risk Assessments Part V, Division 3, Environmental Protection Act 1986</i>. The rating of major may be more appropriate based on evidence of the importance of this vegetation for supporting migratory and wetland birds and that the Fortescue Marsh is being considered for classification as a Ramsar wetland (e.g. area of high conservation value). ● Hummock grasslands (i.e. Triodia and spinifex sandplain) are related to be of slight consequence however this habitat is critical for the Greater Bilby as confirmed in section 7.5.3.5.1 of the ERD. Therefore, the Department suggests that the consequences to this vegetation type be re-classified as moderate. 	<p>drawdown of >20m over antecedent groundwater of <5 m deep in areas of phreatophyte growth would have a risk rating of 5 (severe). There are no known areas representing this scenario within the model extent.</p> <p>Roy Hill engaged Astron to supply additional justification for the consequence ratings assigned to Samphire Vegetation and Hummock grassland for the LOM WMS Vegetation Risk Assessment (Astron, 2021), Appendix 3 of this response to submissions document.</p> <p>Samphire Vegetation:</p> <p>The risk model was set to elevate the consequence level when a vegetation polygon intersected a Priority Ecological Community (PEC). Approximately 80% of the area classified as Samphire Fringe and 86% of the area classified as Samphire Marsh intersected the Fortescue Marsh PEC, thereby elevating the consequence value from Moderate to Major. The assigned consequence rating of Moderate for Samphire Marsh and Samphire Fringe vegetation types equal highest rating in the risk model and is equivalent to the consequence rating of Riparian vegetation. Furthermore, In light of this, the risk rating of Moderate for Samphire Fringe and Samphire Marsh vegetation types is considered appropriate.</p> <p>Hummock Grasslands:</p> <p>Roy Hill acknowledges the importance of Hummock grassland as habitat for the Greater Bilby. The LOM WMS Vegetation Risk Assessment determined consequence of Hummock Grassland depending on resource availability, substrate type and adequacy of vegetation mapping with the outcome of the assessment resulting in an overall consequence rating of 'Slight'.</p> <p>Resource availability is spatially and temporally variable in the landscape due factors such as fire and rainfall and are largely unknown across the model extent. Hummock grassland could not be distinguished from Tussock grassland and bare soil across much of the assessment area due to the method used for the mapping (satellite/aerial imagery). As such, substrate type is especially relevant for the distribution of burrowing mammals such at the Greater Bilby. Characteristic landscape types occupied by the Greater Bilby include sand, sandy clay, sandy loam and alluvial and calcareous areas, as well as red earthy and sandy soils. The Grassland/bare soil vegetation type of the LOM WMS Risk Assessment falls within the Fortescue Valley Soil-Landscape zone, which is characterised by alluvial</p>

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			<p>plains, hardpan wash plains and sandplains (with stony plains, floodplains and some salt lakes) on alluvial deposits over sedimentary rocks of the Hamersley Basin. Although this substrate would not preclude Greater Bilby burrowing, it does not represent an optimal soil type for the species and consequently the original consequence level of Slight is considered appropriate.</p> <p>It should also be noted that as with the Samphire vegetation, where the Grassland intersected a PEC, the consequence level was elevated from Slight to Minor.</p> <p>Roy Hill would like to reference the 5mbgl mounding limit that will reduce the likelihood of impacts to vegetation by limiting the potential for groundwater interaction with the root zones of plants in areas proximal to the injection site.</p>
25	DAWE	<p>Indirect impacts to MNES habitat</p> <p>Provide a combined map that displays risks of impacts to vegetation due to groundwater changes (e.g. Figure 4-24 updated) and surface water (e.g. Figure 4-25). Currently, Figures 4-12 to 4-14 may be only displaying groundwater risks to vegetation. If not, then a different colour scheme is required to display these high risk areas. Clarify and update whether the combined risks displayed in Table 4-14 are only groundwater risks.</p>	<p>A map combining potential impacts from changes to groundwater and impacts from alterations to surface water structures has been provided as Figure 4 (Appendix 21 of this response to submission document).</p> <p>Within the ERD, potential impacts to vegetation from the LOM WMS changes to groundwater are illustrated in Figure 4-24 and outlined in Tables 4-14 (Roy Hill, 2020a). Impacts to riparian vegetation associated with alterations to surface water flows are illustrated in Figure 4-25 and outlined in Table 4-25, and these were incorporated into the overall direct impacts for the Proposed Changes figure of 5,402 ha.</p> <p>The above Roy Hill impact hectares and figures have been revised to reflect changes to the proposal including (but not limited to) a reduction in the size of the development envelope, a reduction in amount of clearing proposed, and to amend topology errors identified during the assessment, as outlined in the s43A application (Roy Hill, 2021b), Appendix 6 of this response to submissions document.</p>
26	DAWE	Indirect impacts to MNES habitat	<p>Potential impacts to vegetation associated with the LOM WMS changes to groundwater are illustrated in Figure 4-24 and outlined in Table 4-14 of the ERD (Roy Hill, 2020a). Impacts to vegetation associated with alterations to surface water flows are illustrated in Figure 4-25 and outlined in Table 4-25 of the ERD (Roy Hill, 2020a). The impact area for surface water impacts (85.92 ha) was incorporated into the disturbance footprint figure of 5,402 ha. To reduce the complexity of</p>

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		Table 4-14 and section 4.3.5 only consider the indirect impacts of changes to groundwater on vegetation types in terms of areas of impacts considered for the proposed action. However, the ERD and supporting Appendices state that other indirect impacts need to be considered. Explain why Table 4-14 and the assessment of total indirect impacts to vegetation do not consider impacts of surface water changes and decant water. This should also include the discussions provided in section 4.3.5.2.5 of the ERD.	<p>the assessment, potential impacts to groundwater and surface water were assessed and discussed in separate sections of the ERD.</p> <p>Indirect impacts to vegetation from the use of decant water for dust suppression are discussed in section 4.3.5.1.4 of the ERD (Roy Hill, 2020a). In 2019, GHD conducted a risk assessment of the use of decant water for dust suppression and found that it poses a low risk to native vegetation and are predicted to be the same as that of saline dewater which has previously been assessed and approved.</p> <p>The above Roy Hill impact hectares and figures have been revised to reflect changes to the proposal including (but not limited to) a reduction in the size of the development envelope, a reduction in amount of clearing proposed, and to amend topology errors identified during the assessment, as outlined in the s43A application, Appendix 6 of this response to submissions document (Roy Hill, 2021b).</p>
27	DWER	<p>Sensitivity analysis was partially conducted with simulations reported during manual calibration, but the outcomes not individually reported (Section 3.5.3-Appendix 2). Given the way the sensitivity analysis was conducted it appears the risk associated with higher conductivity values was not adequately assessed. It is possible, for example, that with high conductivity values, the change in groundwater salinity from reinjection which is predicted to not reach the Fortescue Marsh (GHD, 2020) (Section 4.6.5.1.2.4), and the drawdown footprint might be closer to Fortescue Marsh than predicted.</p> <p>Recommendation: Roy Hill is to incorporate sensitivity analysis in future modelling revisions to incorporate worst case scenario impact assessment.</p>	<p>Considering the location of the SWIB between the Fortescue Marsh and the mining operations injecting surplus dewatering abstraction with similar groundwater salinity concentrations to the groundwater quality in the injection area and downgradient of the injection area, Roy Hill does not anticipate risks in regard to potential adverse changes in groundwater salinity as a consequence of injection. The dewatering of the mine will cause a flow towards the mine rather than towards the Fortescue Marsh. Further, the extent of the cone of depression expansion toward the Fortescue Marsh due to dewatering is mitigated by the injection of water into SWIB. Instead, Roy Hill identified potential risk as a result of the mounding in the alluvium resulting from injection. For this reason, an uncertainty analysis assessment focussed on potential water table variability. This study has been undertaken subsequent to the ERD submission.</p> <p>The Roy Hill Regional Groundwater Model Sensitivity and Uncertainty Analysis (GHD, 2020), Appendix 3 of the ERD, addresses queries regarding parameter sensitivity and predicted water table uncertainty.</p> <p>Key results of this assessment are:</p> <ul style="list-style-type: none"> The most sensitive parameters for predicting the effects of reinjection on the water table elevation/depth to water are the horizontal hydraulic conductivity of relevant hydrostratigraphic units (notably weathered Wittenoom dolomite), vertical hydraulic conductivity of Detrital

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			<p>Clay/Lacustrine Deposits (regional aquitard) and specific yield of unconfined aquifers within which the water table fluctuates.</p> <ul style="list-style-type: none"> • Within the SWIB, there is moderate to high confidence that depth to water would generally remain below the 5 m depth to water – management measures include automatic shutdown of injection bores prior to the 5m bgl threshold being exceeded. The elevated risk areas are in the proximity of the injection borefield. At these locations, a minimum depth to water was modelled of up to around 2.5 m without management measures based on the 90% confidence interval, however a high level of management control will be applied in this area and should the groundwater levels show a tendency to rise above the threshold depth of 5 m, injection rates can be reduced or reallocated. • With respect to the remote MAR areas, in the low-lying area near the Fortescue Marsh, modelling indicates that the water table in this area is naturally shallow and is already within 5 m of ground surface, with a 90% confidence interval of generally less than ± 0.5 m. Elsewhere within remote MAR, there is high confidence that depth to water would remain below the 5 m depth to water threshold, however, as with the SWIB, groundwater reinjection in the MAR will be managed to ensure that water levels do not rise above the threshold depth of 5 m. <p>Roy Hill will test model sensitivity in future modelling revisions to demonstrate parameter validity. Regular reconciliation of model outputs against groundwater monitoring data will provide further confidence to adopted parameters.</p>
28	DWER	Despite some sections of the modelling guidelines not being included in the modelling, the model provides a reasonable preliminary estimate of dewatering volumes and impact assessment. This ERD shows that Roy Hill will be handling a lot more water (both dewatering and reinjection) than currently approved. The modelling shows an increased dewatering footprint and mounding mainly in the South West Injection Borefield (SWIB) and to a lesser extent in the Southern Borefield.	Comment noted

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		The predicted LOM drawdown and mounding footprints do not extend as far as the Fortescue Marsh (Figure 2-6). Roy Hill has developed adaptive management strategies previously approved as part of the original proposal to manage and mitigate adverse impacts from the LOM project. Monitoring data and reporting associated with current operations have not demonstrated any adverse impacts and non-compliances. Therefore, the monitoring management strategies can be considered suitable to manage potential impacts.	
29	DWER	<p>Density driven scenarios and impacts were not modelled in potentially higher concentrations in shallow horizons (Section 4.4 - Appendix 3). DWER has identified the potential for density driven groundwater flow to impact groundwater quality at the Fortescue Marsh and groundwater dependent vegetation.</p> <p>Recommendation: The proponent to demonstrate why modelling was not undertaken to address the potential impacts to groundwater quality.</p>	<p>A revised conceptual hydrogeological cross section illustrating distribution of geological and hydrogeological units, saline groundwater and water management activities is presented in Figure 1 (Appendix 12 of this response to submissions). This is consistent with Roy Hill's understanding of the conceptual hydrogeological arrangement for the neighbouring Cloudbreak Project located to west of Roy Hill (FMG, 2015).</p> <p>A significant portion of the upper Fortescue groundwater catchment contains saline to hyper saline groundwater. Roy Hill operations are located on the fringe of the saline groundwater system.</p> <p>A conceptual diagram showing the expected influence of the Roy Hill operations on the aquifer water balance is presented in Figure 2 (Appendix 14 of this response to submissions document).</p> <p>Of total abstractions ~18% is estimated to be removed and used by the mine, ~62% is returned in the Southern Borefields area and ~20% in the Remote MAR area. The majority of the water injected in the SWIB area flows towards the north occupying storage depleted by mine dewatering with some groundwater being recirculated. A lesser component of the injected water transmits towards the south resulting in some increased pressure in deep aquifer system (confined below the Upper Detrital – Clay) during operations phase. The lower groundwater head in the mine area (due to depleted storage due to dewatering) at cessation of mining will result in groundwater flow towards the mine</p>

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			<p>thereby reducing any groundwater pressure created by injection. Replenishment of fresh to brackish water from recharge over Chichester Ranges will occur over longer term.</p> <p>Roy Hill acknowledges the potential complexity of groundwater flow due to density effects. However, consideration of the hydrogeological conceptual understanding (Figure 1 (Appendix 12) and Figure 2 (Appendix 14) demonstrates that dewatering and injection activities associated with Roy Hill mining activities are unlikely to significantly impact the dynamics of the hypersaline/saline interface and therefore the overall quality of groundwater beneath the Fortescue Marsh. The potential modelled impacts (mounding) of Roy Hill mining activities on the shallow horizons (interpreted to be the groundwater flow system above the upper detrital clay) are also minor with the water table remaining >5m below surface in the SWIB area. Potential impact on groundwater quality is thus also expected to be negligible, despite the increase to up to 50000 mg/l TDS, due to physical and density controls on upward migration and mixing. Downgradient of the SWIB towards the Fortescue Marsh, where water levels are naturally <5m below ground level in the upper horizons, modelling demonstrates negligible impact of injection on the water table and thus similarly on potential impact to groundwater dependent vegetation or salt tolerant species within or fringing Fortescue Marsh.</p> <p>Roy Hill studies concluded, based on the above, that to date have not demonstrated the potential for long term effects due to the dynamics of density driven flow negating the requirement to specifically model density driven groundwater flow.</p>
30	DWER	Water quality for dust suppression has been increased from 30,000mg/L in the original proposal to 50,000mg/L in this Revised proposal (Figure 2-3). This may increase the likelihood of adverse impact on creeks/surface water and riparian vegetation. The ERD outlines the use of surplus saline water for dust suppression will be undertaken in accordance with the RHIO Saline Water Use Management Procedure (OP-PRO-01073). This document has not included within the ERD and was not available to be reviewed in conjunction with the ERD.	<p>Roy Hill is proposing to increase the TDS of water reinjected into SWIB from 30,000 mg/L to 50,000mg/L.</p> <p>The Water Management Plan (Roy Hill, 2021a) also includes reference and discussion regarding the Groundwater and Surface Water Monitoring Review (Stantec, 2020) in Section 1.4.1.4 including (but not limited to) the assessment of saline water for dust suppression. It was determined that there is a slight to minor risk from contamination of surface water quality from above ground infrastructure, but that the levels of potential contaminants of concern (using TSF decant water) are well below the Environmental Investigation Levels. As such, it is considered that surface water quality sampling is not required, however, RHIO are committing to undertaking opportunistic 'grab sampling' of surface</p>

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		<p>Recommendation: The proponent is to address potential impacts of water quality changes within the Saline Water Use Management Procedure (OP-PRO-01073). The proponent to provide the Saline Water Use Management Procedure (OP-PRO-01073).</p>	<p>water during flow events in ephemeral creeks in proximity to the mine for the purpose of identifying surface water contamination from mining activities.</p>
31	DWER	<p>Table ESO-3 under monitor as a mitigation measure for inland waters quality-the statement 'Groundwater levels to remain >5 mg/l at the MAR Control Bores in all borefields SWIB, Remote MAR Borefield, Stage 1, Southern Borefield and Mine Borefield'.</p> <p>Recommendation: The proponent to change the monitoring and mitigation measure to groundwater mounding and not dewatering.</p>	<p>Error noted. The Water Management Plan (Roy Hill, 2021a), Appendix 5 of this response to submissions document, has been updated.</p>
32	DWER	<p>The proponent proposes to utilise MAR via the pit voids with the Mine Borefield to dispose excess water and assist in drawdown recovery. This scenario has not been modelled for the Mine Borefield area, with Roy Hill committing to conduct these studies once suitable areas have been identified (Section 2.4.4.2).</p> <p>Recommendation: The proponent is to make a commitment in the ERD to advise the EPA and Industry Regulation (Part V of the EP Act) when additional areas and/or MAR injection scenarios are required and to submit the appropriate discharge licence application/amendments.</p>	<p>Future updates of the Water Management Plan (Roy Hill, 2021a) will include monitoring of injection into the mine borefield. Roy Hill will seek approval under Part V of the EP Act (via an operating licence amendment) to any injection into additional areas (including but not limited to Remote MAR, Stage 2 Borefield and Mine pit areas). Roy Hill is not proposing to notify EPA for new injection areas in pit areas.</p>

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33	DWER	<p>The 2-year MAR trial was approved for reinjection of 55GL/a but only about 7GL was reinjected into SWIB between 1 November 2017 and 31 December 2019 (Section 4.1.1-Appendix 4). Given this trial was meant to inform viability of the MAR scheme in managing excess water at Roy Hill, it appears the MAR system was not tested to its limits to determine the feasibility of reinjecting large volumes.</p> <p>Recommendation: The proponent is to demonstrate (with monitoring data, up to date water balance/s, modelling etc) and discuss the reasoning of not undertaking the full proposed MAR trial program.</p> <p>Recommendation: The proponent is to commit to providing a technical analysis report of the MAR trial. The report is to outline the data collected, and must demonstrate how the data will inform the ongoing management of inland waters to LOM MAR.</p>	<p>The S45C application (March 2018) which this comment refers to was to incorporate MAR in the Roy Hill water management strategy and was framed around potential peak dewatering rate for the 2018 Life of Mine Plan (LOMP). Several opportunities for reducing peak dewatering rates were identified, however assessment of an alternate mining strategy was not completed prior to submission of the MAR application. Subsequent revision of the 2018 LOMP resulted in a reduction of near-term dewatering requirements, providing a beneficial environmental outcome.</p> <p>Notwithstanding the changes referred above, reinjection of some 13% of the approved MAR capacity limit did demonstrate the viability of the MAR scheme and provided Roy Hill with key data to support the ongoing use of the SWIB for sustained surplus water disposal.</p> <p>Details of MAR performance is provided in Appendix 4 of the ERD (Roy Hill, 2020c), Roy Hill Managed Aquifer Recharge Operations Data Review Report. In addition, the Roy Hill water balance and details of groundwater response to MAR operations for the period to Jul-20 is reported in the Roy Hill Mine Annual Aquifer Review (Aug-19 to Jul-20) which has now also been provided (Appendix 29 of this response to submissions). During this period, injection has progressively been increased to a peak daily rate equivalent to approximately 14 GL/a. Following this period dewatering and MAR operations have continued to ramp up with peak daily rate equivalent to approximately 30 GL/a being achieved during 2021. Groundwater levels continue to remain within expected ranges. Reporting of the Roy Hill Mine Annual Aquifer Review (Aug-20 to Jul-21) is planned to be issued relevant agencies in October 2021. MAR operations at SWIB will continue to ramp up and are expected to range between ~37 to ~45 GL/a from mid-2021 onwards. Ongoing detailed monitoring of the response of the aquifer to injection, the response of the overlying water table and the injection bore capacity will continue to inform Roy Hill of the performance of the injection borefield. The executed monitoring programme will enable Roy Hill to adjust the injection strategy should the need arise and adapt to any changes managing the volumes of water being reinjected across each borefield. This will allow water levels to be kept below the 5mbgl threshold.</p> <p>Roy Hill considers the multi-year history of dewatering, MAR and associated measurement of aquifer response demonstrate a sustained and substantial scale of operation to verify forecasts and provide confidence for ongoing ramp up.</p>

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34	DWER	<p>It is not clear what the target aquifers for injection in SWIB are. Figure 2-7 shows injection in the weathered dolomite and the calcrete.</p> <p>Recommendation: The proponent to clarify the proposed injection targets and proposed volumes /rates of injection.</p>	See answer to 14.
35	DWER	<p>Section 2.4.4.2 states ‘The bore injection rates in the SWIB were optimised for water level in the mound to not exceed 5mbgl in the Injection Bores during maximum injection’. The annual volumes have not been provided in the ERD.</p> <p>Recommendation: The range of injection volumes are to be provided to Industry Regulation team (Part V licensing). This will inform the Part V licensing and inform appropriate monitoring and management responses.</p>	Roy Hill will provide annual volumes for Part V licensing through the annual environmental reporting requirements.
36	DWER	<p>Disposal of Tailings Storage Facility decant water into the SWIB is subject to Part V assessment and was previously approved for the MAR trial period, however was never undertaken. The ERD is not clear whether decant water will be reinjected into SWIB.</p> <p>Recommendation: Roy Hill to describe (through either available monitoring information, modelling scenarios</p>	<p>Information regarding decant water for reinjection is outlined in Section 4.6.5.1.2.4 of the ERD (Roy Hill, 2020a).</p> <p>Reinjection of decant water in SWIB had not commenced at the time of the submission of the ERD. Disposal of decant water in SWIB borefield has occurred in the period Dec-20 to Feb-21. Reinjection of decant water is approved under Roy Hill’s current Operating Licence. Roy Hill’s preference is to reuse TSF decant water in the process plant and or dust suppression. Maximising return water to the process plant and dust suppression has minimised requirement to dispose of TSF Decant to MAR. There are circumstances under which TSF decant water cannot be returned to the plant and/or dust</p>

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		or operations under the Revised Proposal) the management of TSF decant water.	<p>suppression, which is the reason this option for disposal has been assessed and included in the ERD (Roy Hill, 2020a).</p> <p>The risk of using of using decant water in reinjection is summarised in Table 5-3 of TSF Decant Water Disposal Risk Assessment (Appendix 39 of the ERD). Where decant water is included in reinjection management of injection rates will be controlled to ensure that mounding stays within approved thresholds. This mound is expected to dissipate within 1-2 years post reinjection ceasing.</p> <p>A plume would result from this reinjection, which would disappear within approximately 40 years after closure. The long-lasting drawdown effect from mining activities is likely to prevent this plume from intersecting with Fortescue Marsh.</p>
37	DWER	<p>The ERD includes contradicting statements regarding the quality of dewater to be injected via the Mine borefield. Paragraph 6 of Section 2.4.4.2 refers to saline water whereas paragraph 9 refers to Brackish water (<5000mg/L) similar to the groundwater quality in the area. It is understood that the volume and quality of reinjection water may potentially vary (locations and times) on a case by case basis.</p> <p>Recommendation: The proponent to review and clarify the contradicting statements within the ERD.</p>	<p>This is an error. Roy Hill will reinject water into the Mine Pit area that is matched to the existing background water quality. In some parts of the Mine, injection water will be saline and in others brackish depending on the existing water quality.</p>
38	DWER	<p>TDS is predicted to increase in the area around SWIB in the shallow aquifer and along the southern boundary of the tenement in the SWIB area by the end of mining in 2031 and this level will remain in the aquifer post closure. Although the change in groundwater salinity is predicted to not reach the Fortescue Marsh (GHD, 2020) & (Section 4.6.5.1.2.4), there may be water</p>	<p>Indirect impacts to flora and vegetation resulting from changes in groundwater level and quality is outlined in Section 4.3.5.1.1 of the ERD (Roy Hill, 2020a) and the LOM WMS Vegetation Risk Assessment Addendum (Astron, 2020 Appendix 1 of this response to submissions document).</p>

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		<p>quality impacts on groundwater dependent vegetation and riparian vegetation.</p> <p>Recommendation: The proponent to address the potential for increase in salinity around the SWIB and potential impacts to the shallow aquifer and groundwater dependent vegetation.</p>	
39	DWER	<p>The proponent has identified Zulu and Bravo pits as additional pits for in-pit tailings. Although the proposed in-pit Tailings Storage Facilities are not expected to have a significant impact on the groundwater chemistry due to dewatering within the mine area, detailed design and relevant studies including groundwater impact assessments on each potential in-pit TSF have not yet been undertaken. Roy Hill commits to conducting these studies and submit applications for Operating Licence amendments under Part V of the EP Act and revisions of a Mining Proposal under the <i>Mining Act 1978</i>, for each individual pit upon completion of the detailed information (Section 2.4.6; Section 4.6.5.1.2.3).</p> <p>Recommendation: The proponent is to determine the type of in-pit TSFs groundwater system. The groundwater systems (through flow/groundwater sink etc) are to be outlined in the mine closure plan documents. Mine closure objectives are also to be developed addressing potential contamination following closure.</p>	<p>During detailed design for in-pit TSFs and the secondary approvals process, Roy Hill will address in-pit TSFs groundwater systems and management of closure including potential impacts to groundwater following closure.</p> <p>Preliminary results from the Groundwater Change Assessment for in pit TSF's are that they are situated within the area controlled by dewatering during mining with a slow rebound after mining, and due to the low rates of seepage, mass loading of solutes will be limited.</p>

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		<p>Recommendation: The proponent is to commit to undertaking studies and/or investigations that include evaluation of hydraulic parameters of the tailings material. This includes but is not limited to address the potential movement of contaminants plumes when mine pits become throughflow systems following groundwater level recovery. Based on testing conducted, and the management measures for encapsulation of PAF in in-pit waste dumps, contamination of surface water from leaching of WRLs is unlikely to occur (Section 4.6.5.1.1.2), however the potential release of contaminants from the in pit dumps is possible.</p> <p>Recommendation: RHIO is to conduct studies and/or investigations to assess potential impacts to groundwater quality following closure. Details on the depths of the encapsulation are also to be provided in future revisions of the Mine Closure Plan.</p>	
40	DWER	<p>There are inconsistencies in the RMAR borefields names. RMAR refer to either or both RMAR-N and RMAR-s/southern borefield (e.g. Figure 2-10 & Figure 3-23-Appendix 2, Section 2.4.4.2 & Figure 2-8, Table ESO-3 page 11, section 3.7 of ERD). Southern borefield and RMAR-S are used interchangeably which can be confusing.</p>	<p>The following naming convention is to be adopted:</p> <ul style="list-style-type: none"> • South West Injection Borefield (SWIB) – primary injection borefield - location SW of mining area • Stage 1 Borefield /S1 Borefield – primary injection borefield for brackish water and primary borefield for fresh water where dewatering water is not suitable - location north of airport • Remote MAR North (RMARN) – additional injection only borefield planned to commence operation in Jun 22 – location immediately south of Fortescue River. <p>Remote MAR South (RMARS)/Stage 2 Borefield/Southern Borefield has come about as the borefield has either been described as an injection borefield or a water supply borefield. When this borefield</p>

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		<p>Recommendation: The proponent to review and clarify naming of borefields within the ERD and Appendices.</p>	<p>area is potentially required as an injection borefield it will be termed RMARS. When this borefield will be required as a water supply borefield it will be called Stage 2 Borefield.</p>
41	DWER	<p>The naming of the geological units within the ERD is inconsistent. Section 2.1 & Section 3 in Appendix 4 injection target in the SWIB is the fractured and weathered Marra Mamba and Wittenoom Dolomite, however cross section in Figure 2, Figure 3 in Appendix 4, and Figure 2-7 in the ERD, present more specific descriptions of the Marra Mamba, Nammuldi BIF, Wittenoom Dolomite vs dolomite.</p> <p>Recommendation: The proponent to review and clarify naming of geological units within the ERD and Appendices.</p>	<p>See response to 14.</p>
42	DWER	<p>The figures presented within the ERD are generally not clear and difficult to interpret. The borefields and reinjection areas presented on Figure 2-3 are not provided in the legend, colours in the legend do not match those in the map and the map does not show what it is meant to show as per Table 2-3. Figure 2-4 does not distinguish between remote MAR location and Southern Borefield location and does not link clearly to Figure 2-3 as the locations of the infrastructure for these MAR borefields are not provided in Figure 2-3.</p> <p>Recommendation: The proponent is to review and update the figures and geological cross sections. The updates are to consider references that correctly</p>	<p>Figure 2-3 and Figure 2-4 were included in the ERD (Roy Hill, 2020a) to indicate a conceptual footprint and distinguish between what clearing was approved under the Original Proposal and which areas Roy Hill is seeking approval for now.</p> <p>An updated Figure 2-3 (Roy Hill, 2021i) and Figure 2-4 (Roy Hill, 2021i) of the ERD are attached as Appendices 15 and 16.</p> <p>Geological units and related local scale descriptors are presented in Table 1 included in the response to 14. A representative conceptual hydrogeological cross section illustrating the distribution of geological units is presented in Figure 1 (Appendix 12 of this response to submissions).</p>

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		correspond throughout the ERD and legends correspond to figure titles.	
43	DWER	<p>Table 3, under Potential Impacts does not include potential groundwater drawdown, mounding and reinjection impacts on the Key Environmental Value, Fortescue Marsh, for the Inland Water environmental factor. Even though these potential impacts have been identified in Table 3.</p> <p>Recommendation: The proponent is to update Table 3 to address the management of potential impacts from groundwater drawdown, mounding and reinjection impacts on the Fortescue Marsh to reflect the potential impacts and associated management outlined in the ERD.</p> <p>Recommendation: The proponent is to update the water management plan and submit to the EPA for review and comment.</p>	<p>Table 1-2(formerly Table 3) of the Water Management Plan (Roy Hill, 2021a), as been updated to reflect the ERD potential impacts from groundwater drawdown, mounding, and reinjection on the Fortescue Marsh for the Inland Waters Environmental Factor.</p> <p>A copy of the updated Water Management Plan (Roy Hill, 2021a) has been provided (Appendix 5 of this response to submissions document,)</p>
44	DWER	<p>Incorrect reference in Section 1.4.1: 'The results of this assessment have contributed to the assessment of potential impacts to inland waters associated with the mine outlined in section 1.2.1.' There is no Section 1.2.1 in the WMS document.</p> <p>Recommendation: The proponent to review and include the correct referencing within the management plan.</p> <p>Section 1.4.2 first point under key assumptions and uncertainties states 'as the LOM changes, the exact</p>	<p>Referencing in Section 1.4.1 and recommended wording for Section 1.4.2 has been updated in the revised Water Management Plan (Roy Hill, 2021a), - Appendix 5 of this response to submissions document</p>

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		<p>location, extent and duration of groundwater abstraction and reinjection may change over time.’</p> <p>Recommendation: The proponent to change the above statement to ‘as LOM schedule/sequencing/plan changes the exact location, extent and duration of groundwater abstraction and reinjection may change over time”.</p>	
45	DWER	<p>The water management plan states that quarterly surface water level monitoring will be occurring in the injection areas.</p> <p>Recommendation: The proponent to clarify and update the type of surface water level monitoring proposed. i.e. will manual, logger monitoring etc.</p>	<p>Roy Hill have interpreted the submission as referring to the Standing Water Level (SWL) monitoring proposed for monitoring groundwater mounding associated with MAR and TSF in the Water Management Plan.</p> <p>Wording within the Water Management plan ((Roy Hill, 2021a), - Appendix 5 of this response to submissions document), has been updated to specify the type of standing water level monitoring to be undertaken.</p>
46	DWER	<p>The Water Management Plan management action 2 for mounding of groundwater from MAR and TSF (Table 5) is to address water level trends and not water quality trends. The proposed monitoring is to address water level monitoring and not water quality monitoring.</p>	<p>Wording within the Water Management Plan (Roy Hill, 2021a) has been updated to outline monitoring of water level, and not water quality, for mounding of groundwater from MAR and TSF. (See Appendix 5 of this response to submissions document)</p>
47	DWER	<p>GDV (<i>Eucalyptus camaldulensis</i> and <i>E. victrix</i>) is identified as being of high significance in itself, plus having additional value as habitat. Up to 5% (16.74 ha) may be directly or indirectly impacted (Table 4.15). Although not a large area, GDV is largely restricted to small areas of the southern borefield and MAR area associated with the Fortescue River. The significance of this vegetation means losing even a small area, could</p>	<p>Roy Hill recognise the importance of GDV within the environment and have identified it as a significant environmental value within the ERD and Vegetation Management Plan. Monitoring of impacts will be undertaken in accordance with the Water Management Plan (Roy Hill, 2021a) and Vegetation Management Plan (Roy Hill, 2021c). (See Appendices 5 and 7 of this response to submissions document)</p>

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		be important for its long term resilience and habitat values.	
48	DWER	<p>A comprehensive vegetation management plan is proposed (Appendix 9). The program aims to detect changes in vegetation condition using approaches widely accepted to reflect increases (MAR) or decreases (abstraction) in water availability. Although triggers and thresholds in place for GDV condition are appropriate, only triggers and thresholds related to increases in dtgw from MAR (i.e. 6m trigger, 5m threshold) have been set with no corresponding monitoring of local groundwater levels in areas that may be impacted by abstraction (shown as drawdown of 10-20m in Figures 2.9 and 2.10).</p> <p>Recommendation: Couple GDV condition monitoring with local groundwater level monitoring to clarify/ identify relationships between changes in water availability and veg health. Provide map/ location of proposed GDV and coupled GW monitoring sites. Improve the resolution of Figure 2.9.</p>	<p>The Roy Hill LOM WMS Vegetation Risk Assessment (Appendix 9 of the ERD) (Astron, 2020) identified the potential impacts to GDV from groundwater level drawdown for water abstraction at the mine. The assessment identified 4.7 ha of vegetation at risk of indirect impact from drawdown. This consists of 0.2 ha at medium risk and 4.5 ha at low risk. This is illustrated in Figure 5 of the Appendix 9 (Astron, 2019) of the ERD (Roy Hill, 2020a).</p> <p>The vegetation monitoring program has been designed to identify impacts to vegetation from drawdown and includes monitoring sites that target drawdown risk areas.</p> <p>Roy Hill have not included groundwater SWL monitoring for impacts to GDV from drawdown as part of the Water Management Plan due to the negligible risk areas identified in the risk assessment (the majority of which is classified as low). Roy Hill conduct extensive SWL monitoring across the mine for operational purposes and should vegetation health demonstrate decline this data will be reviewed to assist in the assessment of impacts to GDV from drawdown.</p> <p>A higher resolution copy of Figure 2-9 can be seen in the LOM Water Management Strategy (GHD, 2019b) Appendix 2 of the ERD.</p>
49	DWER	No pools have been considered to be fauna habitat. However, Panderamba Pool (on the Fortescue River) which was assessed as persisting more than 80% of the time in DWERs Pilbara Pool mapping project, appears	Panderamba Pool. is not within the Revised Development Envelope and will not be directly impacted by clearing and ground disturbance. The Panderamba Pool is outside the modelled groundwater

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		<p>to have been excised from the mine development area. This is potentially in recognition that it is the most persistent pool in the Roy Hill mine area. Despite being encircled by the development area, potential values and impacts have not been assessed as it is not included in the mine area.</p> <p>Recommendation: Consider the values of Panderamba Pool - including aquatic and GDV habitats – and assess impacts of abstraction and MAR and incorporate into monitoring/ management programs.</p>	<p>drawdown and mounding footprints from dewatering and MAR so will not be indirectly impacted from the LOM water management strategy.</p>
50	DWER	<p>In the Water Management Plan (Appendix 2) the trigger and threshold for changes in groundwater flow by abstraction for water supply and mine dewatering are set as volumes abstracted (trigger 65 gl/annum, threshold 70 gl/ annum), representing a regional scale approach. As discussed above, this will not adequately support monitoring of impacts to GDV.</p> <p>Recommendation: Develop triggers and threshold for monitoring bores located within areas of predicted drawdown, associated with GDV or inland water features.</p>	<p>Roy Hill have not included groundwater SWL monitoring for impacts to GDV from drawdown as part of the Water Management Plan due to the insignificant risk areas identified in the risk assessment (the majority of which is classified as low).</p> <p>The Roy Hill LOM WMS Vegetation Risk Assessment (Appendix 9 of the ERD) (Astron, 2020) identified the potential impacts to GDV from groundwater level drawdown for water abstraction at the mine. The assessment identified 4.7 ha of vegetation (of which only 0.064 ha is considered GDV) at risk of indirect impact from drawdown. This consisted of 0.2 ha at medium risk and 4.5 ha at low risk. This is illustrated in Figure 5 of the Appendix 9.</p> <p>The vegetation monitoring program has been designed to identify impacts to vegetation from drawdown and includes monitoring sites that target drawdown risk areas.</p> <p>Drawdown vegetation risk areas were determined in the original assessment, prior to the WV3 GDV vegetation mapping in the LOM Vegetation Risk Assessment (Appendix 9 of the ERD). Drawdown of 4.7 ha was determined using broadscale mapping units from Astron illustrated in Figure 4 and Figure</p>

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			<p>5 of the Addendum (Astron, 2020). Potential impacts to GDV from drawdown (which are actually 0.064 ha) is where there was WV3 GDV mapped within the drawdown risk areas.</p> <p>Roy Hill conduct extensive SWL monitoring across the mine for operational purposes and should vegetation health demonstrate decline this data will be made available to regulators to assist in the assessment of impacts to GDV from drawdown.</p>
51	DWER	<p>Impacts to the 'minor river' (labelled in DWER hydro layer) from drawdown of up to 6m by 2031 (Figure 2.9) and residual drawdown of up to 5m 20 years post closure (Figure 10) do not appear to have been assessed. See the comments above regarding GDV monitoring – also applies to Fortescue River (or tributary).</p> <p>Recommendation:</p> <p>Consider potential impacts to creek/ river and associated potential GDV beyond development envelope</p>	<p>Roy Hill understands that the minor river that is being referred to is within the Development Envelope of Christmas Creek mine.</p> <p>The risk of drawdown was also addressed in the LOM WMS Vegetation Risk Assessment (Appendix 9 of the ERD). While not identified as at risk from the model, it was identified that combined drawdown in association with Fortescue Metal's Christmas Creek operation has the potential to impact GDV on the minor river. However, as this location is outside Roy Hill's tenure, accurate information on the specific hydrological environment is not available. It would therefore be problematic to directly link impacts with Roy Hill's operation.</p> <p>Roy Hill is committing to undertake groundwater level monitoring for drawdown in the Water Management Plan, on the boundary of the mining lease to ensure drawdown extent is not larger than the model predicted.</p>
52	EPA Services	<p>Appendix 2 of the existing operating licence (L8621/2011/1) sets depth to water triggers for regional bores associated with the trial MAR. How were these triggers arrived at? What is the MAR Trigger Level Framework within MAR Vegetation Monitoring Zones in Table 7?</p>	<p>There is no requirement in the Part V EP Act Mine Operating Licence to meet groundwater level trigger levels. Appendix 2 of Licence L8621/2011/1 is a legacy page from when Roy Hill had multiple amendments to Mine Operating Licence (L8621/2011/1). As such there is no condition which refers to Appendix 2 of L8621/2011/1.</p> <p>Roy Hill have updated the Water Management Plan (Appendix 5 of this response to submissions document) including a best practice approach to verify that groundwater quality change is consistent with predicted change in the Alluvium – Water table zone. The approach is based on appropriate water quality characterisation of the Alluvium – water table zone and potential groundwater quality change. The triggers and thresholds do not represent a level at which environmental harm will occur but rather provide a measure against which to verify the predicted water quality change.</p> <p>Groundwater quality change in the Alluvium – Water table zone is predicted to manifest as localised plumes surrounding the injection borefields. Water quality change is a function of injection, creating</p>

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			<p>higher pressure in the underlying receiving aquifer leading to diffuse upward migration of groundwater. Three zones are defined as follows:</p> <ul style="list-style-type: none"> - Central injection area: area of predicted maximum water quality change - Proximal injection area: area of predicted lower water quality change; and - Distal injection area: area of predicted no water quality change <p>Monitoring bores have been selected to represent each zone and be in the orientation of the principal environmental value, the Fortescue Marsh.</p> <p>For the central and proximal injection areas where water quality change is predicted:</p> <ul style="list-style-type: none"> - Triggers are set based on the sum of background mean, potential future background variability and ~80% predicted water quality change; and - Thresholds are set based on sum of background mean, potential future background variability and 100% predicted water quality change <p>For distal areas, where no impact is expected, the triggers and thresholds are set at three standard deviations from the mean.</p> <p>The Vegetation Management Plan (Appendix 7 of this response to submissions document) includes vegetation health monitoring provisions in areas relevant to risk areas identified by the LOM WMS Vegetation Risk Assessment (Appendix 9 of the ERD).</p>
53	EPA Services	The current approvals (Ministerial Statements 824 and 829) require that groundwater drawdown does not extend beyond specified coordinates. How is drawdown monitored and managed presently to meet this condition and how is this proposed to be adapted to address the larger predicted drawdown associated with the Revised Proposal, including drawdown outside the development envelope? The Mine Water Management Plan in Appendix 41 of the ERD does not address this.	<p>MS829 outlines that 'drawdown of groundwater does not extend beyond the co-ordinates in Schedule 2 or 3'. Schedule 2 outlines that the co-ordinates are for the 2-metre drawdown at year 20 of mining and Roy Hill has not yet reached this stage. Roy Hill currently manages this via monitoring and modelling of drawdown.</p> <p>Roy Hill does undertake groundwater monitoring at the boundary of the tenement as well as annual vegetation health monitoring. To date there has been no demonstrated impact to vegetation from dewatering or mining activities.</p> <p>This has not been addressed in the Mine Water Management Plan (Appendix 5 of this response to submissions document) as Roy Hill is seeking to have this condition changed. Instead, Roy Hill considers that the provisions in the Water Management Plan are better associated with impact to sensitive receptors.</p>

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54	EPA Services	<p>Describe the proposed changes to surface water diversion structures under the Revised Proposal relative to the Original Proposal. Refer to the original referrals and use tables and figures to help describe the changes.</p> <p>The revised proposal, as currently described, suggests that the only change in this regard is the option for these structures to be permanent structures. However, it is apparent from reading the ERD and supporting documents that the change is more than this. EPA Services notes that there was a section 46 process in respect to the conditions applying to the Original Proposal that removed rigidity on where these structures could be located, however, the Revised Proposal presents a more intensive/dense disturbance footprint across the mine area which logically necessitates additional diversion infrastructure. The ERD goes on to acknowledge this and partly addresses the impacts of this (pp.135 to 167).</p> <p>Provide an assessment of the impact of the Revised Proposal on surface water flows and consequent impact on Flora and Vegetation. This will require an assessment of the combined impact of the Original Proposal and Proposed Changes (together representing the Revised Proposal). The impact of the Proposed Changes cannot be assessed without regard to the whole.</p> <p>Please ensure that the assessment brings together all the relevant technical information and documentation including the Surface Flow Dependent Vegetation Risk</p>	<p>Appendix 30 of the response to submissions (GHD, 2021) describes the changes to the surface water diversion structures relative to the Original Proposal, which concluded that the Revised Proposal may impact riparian in a small number of locations, however the impacts will be less than the Original Proposal.</p> <p>Appendix 32 of this response to submissions document, the Roy Hill Mine – Surface Water Flows – Memo (Astron 2021b) assessed in more detail the impacts of the revised diversion structures.</p> <p>There will only a 3% reduction in the catchment area caused by the Revised Proposal and the ability maintain close to baseline conditions will be maintained.</p> <p>The whole landscape downstream from the Mine can potentially support sheet flow under certain conditions; unpredictable large rainfall events are likely to generate broad scale sheet flow that may be somewhat impeded by mine infrastructure, but Surface Flow Dependent Vegetation (SFDV) would likely still receive a high volume of sheet flow. SFDV is naturally adapted to smaller rainfall events and sheet flow generated at the local scale, which can be protected via existing buffer zones.</p> <p>Roy Hill’s current condition 7 of MS979 and 980 outlines that surface water diversions related to the implementation of the proposal are designed and managed to minimise impacts to Mulga and riparian vegetation. Roy Hill will continue to meet this requirement.</p> <p>Roy Hill has undertaken vegetation health monitoring to date since the commencement of the Project and has not seen any decline in vegetation health due to surface water diversions. These reports are supplied annually to the DWER</p>

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		<p>Assessment by Astron (2020) (provided to EPA Services on 8 June 2021) and the work by GHD's (2019) Section 38 Referral Hydraulic structures document (Appendix 6 of the ERD). Ensure that the conclusions reached are supported by the technical work. The conclusion on page 166 of the ERD that impacts to Flora and Vegetation from alteration in surface water flows are considered minor and localised to small areas around open pits, is not supported by Astron's risk assessment which identifies a significant area at medium to high risk of impact due to disturbed surface water flows, including in proximity to Fortescue Marsh. Given Astron's Risk Assessment, explain why RHIO is confident that impacts will be minor and localised, why the Fortescue Marsh is not at risk, what mitigation will ensure that those areas of risk do not become areas of impact.</p>	
55	EPA Services	<p>The Surface Water Dependent Vegetation Risk Assessment (Astron 2020) (provided to EPA Services on 8 June 2021) is relevant to the assessment of the Revised Proposal both in terms of identifying the best monitoring sites and determining whether indirect impacts to surface water dependent vegetation can, in fact, be avoided as the ERD concludes. There is no clear line between the assessment (ERD, ERD Appendix 6, and Astron 2020), and that conclusion. The Astron (2020) assessment shows large areas of vegetation at medium to high risk of impact. It helps that no decline has been recorded to date but that does not provide</p>	<p>Appendix 32 of this response to submissions document, the Roy Hill Mine – Surface Water Flows – Memo (Astron 2021) addressed impacts of diversions on riparian and SFDV.</p> <p>This report concluded that there does not appear to be a strong likelihood of impact to vegetation associated with proposed changes to surface water management at the Mine. In particular, the following points are noted:</p> <ul style="list-style-type: none"> • There is only a 3% reduction in the catchment area, and surface water flows in riparian zones are maintained close to baseline conditions through the implementation of diversion structures. • The whole landscape downstream from the Mine can potentially support sheet flow under certain conditions; unpredictable large rainfall events are likely to generate broad scale sheet flow that may be somewhat impeded by mine infrastructure, but SFDV would likely still receive a high volume of

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		<p>the necessary level of certainty that there will be no impacts going forward.</p> <p>EPA Services notes that diversions will return flow to the same catchment in most cases and ultimately the volume of flow exiting the site downstream is substantially the same as pre-mining. However, that overall water balance does not account for local impacts which appear to be a particular risk in association with locations 4, 9 and 10 (according to Figure 2 of Astron 2020); 5, 7 and 10 (according to Figure 1 of GHD 2019); and 3, 7 and 10 (according to Figure 4-25 of the ERD). The overall water balance also does not account for substantial medium and high-risk areas identified by Astron (2020) associated with alterations to sheet flow from general disturbance. This needs to be rationalised into one assessment (referencing both technical assessments – GHD 2019 and Astron 2020) showing a clear line between assessment and assessment conclusion. If this assessment draws different conclusions or shows something different to the technical assessments ensure there is a clear and robust reason/rationale for this within the assessment.</p> <p>Ensure that the assessment addresses the whole Revised Proposal, not just changes relative to the original proposal.</p>	<p>sheet flow. SFDV is naturally adapted to smaller rainfall events and sheet flow generated at the local scale, which can be protected via existing buffer zones.</p> <ul style="list-style-type: none"> • To date, the Mine has not had a negative impact on SFDV or riparian vegetation. If the Mine was impacting on vegetation, it is likely that this would have become evident in the vegetation monitoring and aerial imagery assessments undertaken to date, given that impacts would likely become apparent within 2 to 5 years. • If vegetation changes were detected, they would need to be considered in the context of the broader environment, given the variability of rainfall in the Pilbara and the previous history of land management, and also the proposed life of mine, which is relatively short compared to the time scales over which the ecohydrological processes involved operate. <p>Roy Hill has designed each diversion structure individually, so it is most suitable for its location and this allows better management of water flows. Roy Hill commits to containing indirect impacts to surface water dependent vegetation within its disturbance footprint. Roy Hill will monitor potential impacts to Fortescue Marsh, riparian vegetation, and surface water dependent vegetation as detailed in the Water Management Plan (Roy Hill, 2021a) and Vegetation Management Plan (Roy Hill, 2021c), Appendices 5 and 7 of this response to submissions document.</p>
Flora and Vegetation			

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56	DAWE	<p>The total direct (5998.72 ha) and indirect (367.82 ha) vegetation impact areas in Table 4-14 of the ERD do not match Table 4-15, section 4.3.5.1 and all other parts of the ERD documentation. Please clarify the following:</p> <ul style="list-style-type: none"> Total vegetation area that will be directly impacted Total vegetation area that will be indirectly impacted <p>Total area to be cleared that includes vegetation and other land types (e.g. bare ground).</p>	<p>The discrepancy in direct and indirect impact figures of the RDE (Roy Hill, 2020a) between Table 4-14 and Table 4-15 has arisen from rounding errors and overlooking the potential indirect impacts that could occur outside the development envelope.</p> <p>Impacts are as follows:</p> <ul style="list-style-type: none"> Total vegetation area that will be directly impacted = 5,402 ha Total vegetation area that will be indirectly impacted = 539.56 Total area to be cleared that includes vegetation and other land types (e.g., bare ground) = 5,402 ha <p>The above figures reflect the s43A application (Roy Hill, 2021b) which reduced the development envelope by 3,472 ha and reduced the disturbance area by 593 ha.</p>
57	EPA Services	<p>Regarding Tables 4-14 and 4-15 of the ERD explain how the 367.84 ha indirect impact figure derived from the Vegetation Risk Assessment.</p> <p>It is clear from Astron (Table 11 and Figure 5) that 4.7 ha is at low or medium risk from drawdown. It follows that the remaining 363.14 hectares is from groundwater mounding and salinisation. However, Addendum Table 3 identifies 534 ha at low or medium risk of indirect impact from mounding and salinisation. What is the spatial extent (in yellow and orange) illustrated in Figure 4-24 and the updated Figure 6 in the response to submissions? Is that 534 ha or 363.14 ha or neither of these? If it is the latter, how did you get to this figure given the 534 ha identified by Astron?</p>	<p>It should be noted that the LOM WMS Vegetation Risk Assessment Addendum (Astron, 2020), Appendix 1 of this response to submissions document, only reviewed the risks associated with mounding and salinisation. Therefore, the potential impacts from drawdown outlined in Appendix 9 (Astron, 2020) of the ERD (Roy Hill, 2020a) should be considered on top of the information outlined in the Addendum. Hence, the spatial extent of the indirect impacts (in yellow and orange that is illustrated in Figure 4-24 and updated Addendum Figure 6) is 539.56 ha consisting of:</p> <ul style="list-style-type: none"> Potential Impacts from Mounding and Salinisation = 534.92 ha Potential Impacts from Drawdown = 4.63 ha Total = 539.56 ha <p>The 367.84 ha of vegetation at medium or low risk of indirect impacts (including both mounding/salinity and drawdown) is the potential indirect risk area over Roy Hill's vegetation type mapping extent as per below:</p> <ul style="list-style-type: none"> Potential Impacts from Mounding and Salinisation = 363.16 ha Potential Impacts from Drawdown = 4.63 ha

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			<ul style="list-style-type: none"> Total = 367.84 ha <p>The area at medium or low risk of indirect impacts outside of Roy Hill's vegetation mapping extent for vegetation units is 171.76 ha. This consists of:</p> <ul style="list-style-type: none"> Low risk = 38.15 ha Medium risk = 133.55 ha <p>Tables 4-14 and 4-15 of the ERD have been updated to reflect these changes.</p> <p>Roy Hill has adopted a precautionary approach and considers that the method used in relation to quantifying indirect impacts and included potential indirect impacts with all level of risk is conservative. It is considered that these medium and low risks of impacts can be managed to avoid indirect impacts with appropriate mitigation measures as outlined in Table 4-26 of the ERD (Roy Hill, 2020a).</p>
58	EPA Services	How much of the 5,995 ha of direct impact comprises riparian vegetation in addition to the 85.92 ha predicted to be directly impacted from altered surface water flows and what would the total impact on riparian vegetation be under the revised proposal?	<p>There is 1,083.56 ha of riparian vegetation within the revised disturbance footprint. 310.12 ha of this is within the additional 5,402 ha disturbance area.</p> <p>Up to 984.5 ha of the 1,083.56 ha will be directly cleared and 99.1 ha (not 85.92 ha) may be indirectly cleared from reduced flow downstream of surface water diversion structures.</p>
59	EPA Services	Section 4.3.5.2.5.2 identifies 7.52 ha of indirect impact to GDV (3.76 ha from dewatering/abstraction and 3.76 ha from mounding). Given this, why has 3.76 ha of indirect impact on GDV been identified in Table 4-15 and not 7.52 ha?	<p>This is an error from within the ERD (Roy Hill, 2020a), the total indirect impacts to Groundwater Dependent Vegetation (GDV) from changes to groundwater (drawdown and mounding) as reflected in Tables 4-14 and 4-15 of Appendix 6 of this response to submissions document, are 3.76 ha.</p> <p>Indirect impact areas:</p> <p>Mounding and Salinisation = 3.69 ha</p> <p>Groundwater Drawdown = 0.064 ha</p>

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60	EPA Services	Table 4-15 identifies 6.72 ha indirect impact to Perennial Tussock Grassland but the risk to this vegetation is considered negligible according to Astron and cited in the ERD page 178. Why does Table 4-15 identify an indirect impact to this vegetation given the risk is negligible?	The Astron LOM WMS Vegetation Risk assessment identified 6.72 ha of Perennial Tussock Grassland in an area at low or moderate risk of indirect impacts from mounding associated with MAR (Table 4-15 of the ERD) . An assessment of these impacts then determined the likely risk to be negligible due to the 5mbgl mounding limit reducing the likelihood of groundwater interacting with the Tussock Grassland root zone (Astron, 2019).
61	EPA Services	Vegetation Units 16 and 19 are missing from Table 4-14. Why?	Vegetation units not specifically outlined in Table 4-14 are the Mosaic Vegetation types (VT). VT16 is a mosaic vegetation type and is incorporated with vegetation type 20. VT 19 is included within Table 4-14. VT 18 is another mosaic unit and is incorporated within VT25. This is detailed within the Consolidated Flora and Vegetation Report Table 4 (Strategen , 2020) (Appendix 8 of the ERD).
62	EPA Services	Clarify why the total impact of the revised proposal on Flora and Vegetation (17,762 ha) is less than the total disturbance footprint (17,998 ha).	As a result of this query, Roy Hill has submitted the s43A application (Roy Hill, 2021b). This has changed the impact areas to the following: <ul style="list-style-type: none"> • Direct – Original Proposal= 11,993 ha • Direct – Proposed Changes = 5,402 ha • Indirect = 539.55 ha • Total = 17,934.56
63	EPA Services	Provide a map or maps that illustrates the information in Table 4-15.	Roy Hill have provided Figure 4-16 provided in supporting evidence folder (Roy Hill, 2021n), Appendix 23 of this response to submissions document.
64	EPA Services	Update Appendix 6 Figure 1 to also show the riparian impacts associated with the original proposal, including the Kulbee Creek diversion.	Appendix 32 of this response to submissions document, the Roy Hill Mine – Surface Water Flows – Memo (Astron 2021) addressed potential impacts downstream from diversion structures, including Kulbee Creek. To date there have been no major change to vegetation that can be attributed to diversion structures. Given that impacts are likely to become apparent after 2-5 years, and the mine has been

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			operating for 5 years, Roy Hill consider that impacts to downstream vegetation are unlikely as result of the diversion structures.
65	EPA Services	Clarify what is meant by 'Riparian Impacts' in Appendix 6, Figure 1. GHD refers to the 'length of waterway impacted'. Does this mean a reduced flow along these lengths and consequently there is a risk of impact to riparian vegetation along those lengths (which extend beyond the development envelope), rather than an impact <i>per se</i> ?	Roy Hill confirm DWER's interpretation. As outlined in Section 3.1.2 of Appendix 6 (GHD, 2018), riparian vegetation impacts are the potential impacts associated with a reduction in flow in waterways that are downstream from surface water diversion structures.
66	EPA Services	How does Appendix 6 Figure 1 relate to Figure 4-25 in the ERD? What are they not consistent? And how were the riparian impact areas in Figure 4-25 arrived at? Combine the two figures to show: <ul style="list-style-type: none"> - Length of waterway impacted/at risk (within GHD's meaning of this) - Areas of riparian vegetation directly disturbed downstream of diversions (including from the original proposal). 	In Roy Hill's initial Referral document (OP-APP-00049) (Roy Hill, 2019a), the riparian impact from reduced flows immediately downstream from the diversion was conservatively considered as a direct impact, rather than a potential indirect impact. During the development of the ERD (Roy Hill, 2020a), GHD completed the Surface Water Diversion Assessment, Appendix 6 of the ERD (GHD, 2018). However, Figure 4-25 of the ERD (Roy Hill, 2020a) was not updated with the updated information from GHD. Supplementary information (Appendix 30 of this response to submissions document) provided to DWER in June 2021 includes the GHD correspondence (GHD, 2021) that further clarifies the changes in surface water impacts between the Original Proposal and Revised Proposal.
67	EPA Services	The ERD includes a commitment to avoid drainage foci in the Southern Borefield. Provide a Figure and associated shapefiles showing the location of the three drainage foci in the Southern	Roy Hill confirms there are two drainage foci within the southern borefields (northern and southern). These are illustrated in Figure 4-11 of the ERD and outlined in Table 4-26 (Roy Hill, 2019a). A 160m (diameter) exclusion buffer surrounds the drainage foci to prevent impacts from clearing. The drainage foci are also considered significant fauna habitat (semi-permanent water bodies) and are included within the provisions of the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021e),

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		Borefield and advise to what extent the drainage foci will be avoided under this commitment.	Appendix 35 of the ERD. The environmental objective from the plan is 'No direct or adverse impacts to semi-permanent water bodies within the development envelope' (p.31)
68	EPA Services	<p><u>Table 4-16 of the ERD</u></p> <p>The figures in the Direct Impacts – Proposed Changes column add up to 5,906 ha. Why not 5,995 ha?</p> <p>The figures in the Indirect Impacts – Proposed Changes column add up to 233.34 ha. Why not 367.84 ha as per Table 4-15?</p>	The figures referenced in tables 4-15 and 4-16 of the ERD are no longer valid. The s43A application (Roy Hill, 2021b) provided updated impact hectares, in Appendix 6 of this response to submissions document.
69	EPA Services	How much of the RDE is already cleared under the Original Proposal?	From the December 2020 aerial fly over (data used for DMIRS - Mine AER 2020), cleared vegetation equals 8,179.05 ha of which 335.88 ha is currently under rehabilitation.
70	EPA Services	Why are Vegetation Types 37, 38, 39 and 40 not included in Table 4-14?	<p>There are no direct or indirect impacts from either the Original or Proposed Changes to vegetation units 38, 39 and 40. Hence they were not included in Table 4-14 (Roy Hill, 2019a).</p> <p>Vegetation unit 37 has Original Proposal direct impacts of 0.47 ha and no other direct or indirect impacts from the Proposed Changes.</p> <p>Figure 4-12 of the ERD illustrates these vegetation units in respect to the direct and indirect impacts from the Revised Proposal.</p> <p>These matters have been addressed in a revised Table 4-14.</p>
71	EPA Services	Why are the areas (hectares) of mapped vegetation extent for each VT type in Table 4-14 different to that reported by Strategen (2020) Table 4.8?	<p>In an early revision of the Consolidated Flora and Vegetation Report (Strategen, 2020), the consultant consolidated the vegetation mapping from Maia, Stantec and Biologic over the Revised Development Envelope and surrounds into 36 units. In a subsequent revision of the Consolidated Flora and Vegetation Report the vegetation units have been split into 40 units. Upon review, it appears there has been a GIS error and the spatial data for these 36 units has been mistakenly used to calculate the impacts associated with the Original Proposal and Proposed Clearing Areas within the ERD.</p> <p>The updated Consolidated Flora and Vegetation Report (Strategen, 2020) report is attached for reference (Appendix 33 of this response to submissions document).</p>

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72	EPA Services	Page 46 of Strategen (2020) refers to 36 vegetation units in Table 4.8. But there are 40 listed in Table 4.8. Even taking out VTs 16 and 18 there are 38 units listed in Table 4.8. Why?	This appears to be an error in the Consolidated Flora and Vegetation Report (Strategen , 2020). As noted, Strategen have referred to 36 vegetation units when there are in fact 40 vegetation units over the Revised Development Envelope and surrounds. The updated Consolidated Flora and Vegetation Report (Strategen , 2020) referencing 40 vegetation units (page 46) has been provided for reference (Appendix 33 of this response to submissions document).
73	EPA Services	Page 46 of Strategen refers to there being 10 VTs/units of significance but there are 13 identified in Table 4.8 (excluding VTs 16 and 18) and in Table 4-14 of the ERD. Is the reference in the Strategen text an error?	This appears to be an error in the Consolidated Flora and Vegetation Report (Strategen , 2020). As noted, the report referred to 10 vegetation units as being of significance when there are in fact 13 vegetation units of significance. The updated Consolidated Flora and Vegetation Report (Strategen , 2020) referencing 13 vegetation units (page 46) has been provided for reference (Appendix 33 of this response to submissions document).
74	EPA Services	Table 4-15 identifies the perennial tussock grassland vegetation units as being 15, 16, 18, 19, 20, 25 and 26 but Strategen (2020) identifies only VTs 15 and 19 as comprising/including perennial tussock grasslands	In the Consolidated Flora and Vegetation Report (Strategen , 2020), Table 4.8 provides an overview of the vegetation units within and around the Revised Development Envelope. Table 4.8 also outlines which vegetation units have 'Other attributes' including where they contain Perennial Tussock Grasslands. Table 4.8 of the report outlines Perennial Tussock Grassland as being associated with vegetation units 15, 16, 18, 19, 20, 25 and 26.
75	EPA Service	Is the list of VTs in the last row of Table 4-15 incorrect or has the assessment of impact to perennial tussock grasslands combined the grove/inter-grove mulga communities with the perennial tussock grassland communities	As outlined in the note at the base of Table 4-15 of the ERD (Roy Hill, 2020a), some vegetation units have environmental values that characterise them into multiple Vegetation of Other Significance groups. In this instance, vegetation units 15, 16, 18, 19, 20 and 25 exhibit attributes that characterise them both as Sheet Flow Dependent Mulga and Perennial Tussock Grassland. Roy Hill have taken the conservative approach when considering vegetation units of significance.

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76	EPA Services	<p>Update Table 4-15 to:</p> <ul style="list-style-type: none"> - Correct errors - Add a row that deals explicitly with riparian vegetation. - Add a row that deals with the Narbung PEC. 	<p>Table 4-15 has been updated to include riparian vegetation and the Narbung Priority 3 Ecological Community (PEC). It should be noted that some vegetation units have been classified into multiple environmental values and therefore impacts addressed more than once. The reason for this being that certain vegetation types exhibit attributes that could classify them into multiple vegetation of significance categories</p>
77	EPA Services	<p>Demonstrate that remaining populations of <i>Rhagodia</i> sp. Hamersley will be viable/sustainable, that the species will persist/survive.</p>	<p>In an effort to increase Roy Hill's database of records for <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794), Biologic (Consultant Botanist) were engaged to conduct additional targeted searches for priority flora within the Revised Development Envelope. In February 2021, Biologic identified an additional 1,159 individuals from 820-point locations, and in July 2021, an additional 1,169 individuals from 948 locations for <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794). The additional records provided an updated total of 4,296 records for this species in the Roy Hill vicinity. As a result, the direct and indirect impacts to <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) from the Revised Proposal were significantly lower when compared to original impact calculations outlined in the ERD (64.97%) (Roy Hill, 2020a).</p> <p>Biologic conducted a review of species (Biologic, 2021), appendix 28 of this response to submissions document. A summary of the review is as follows.</p> <p>The vast majority of the <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) records found were within the Revised Development Envelope and outside of Proposed Clearing areas. The additional records are an extension to a previously recorded population to the south east of the Ginbata Aerodrome and do not represent the full extent of the population at this location. These records are the number of individuals that Biologic (Botanist consultant to Roy Hill) were able to record during the survey timeframe available and is not a true record of what Biologic observed within this locality.</p> <p>The current knowledge on the extent and distribution of <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794), obtained from publicly available datasets, suggests that it is widespread in the south-central and eastern Pilbara, with a concentration of records from the south-central Pilbara, near Rhodes Ridge, West Angelas and Hope Downs 4. The current extent stretches greater than 300 km in an east-west direction from Brockman mine in the west to near Jigalong in the east, and greater than 155 km in a north south direction from Roy Hill/Chichester in the north to south of Newman.</p>

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			<p>In a memo produced for Roy Hill (Appendix 34 of this response to submissions document), Biologic outline that population and number of individuals estimate ranges from several individuals to estimates exceeding 17,000. The number of individuals potentially occurring in the Pilbara is likely to exceed 33,000, however, this is an under-estimation based on the data available and the limited reports reviewed (Biologic, 2021). It is likely that the DBCA hold additional information on the size and extent of populations, while it is also likely there will be additional data held by mining companies and environmental consultancies that is not publicly available.</p> <p><i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) is commonly recorded from hardpan plains dominated by mulga shrubs and trees with the understorey consisting of scattered <i>Eremophila</i> spp., <i>Ptilotus</i> spp., <i>Senna</i> spp. shrubs over annual and perennial grasses. Although this may be the predominant habitat and vegetation community, individuals have been recorded from low hillslopes, stony plains, gullies, low hills, floodplains and claypans. Vegetation communities are variously dominated by shrublands and woodlands of <i>Acacia</i> spp. with individuals frequently observed from hummock grasslands.</p> <p>Based on the information obtained from literature reviews and the publicly available databases, <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) does not have a specific habitat that is important for the persistence of populations, however the mulga hardpan plains are the predominant habitat where individuals are recorded. This habitat is extensive in the south-central and eastern Pilbara. In addition, the review of the publicly available databases indicates that there are several occurrences of <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) within conservation estates. A population is known to occur in Karijini National Park and several other occurrences within ex-Pastoral Leases managed by the DBCA.</p> <p>The taxonomy of <i>Rhagodia</i> sp. Hamersley, and <i>Rhagodia</i> in general, is in need of review, with the taxonomy of <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) uncertain. A review of the taxonomy may find that it is not circumscribed as a good entity and fits within the natural variation of <i>Rhagodia eremaea</i>, which it grows sympatrically with at many locations in the Pilbara.</p>
78	DWER	The ERD (Rev 3, December 2020) concludes that there is no significant impact remaining for the following impacts to flora and vegetation:	<p>This is consistent with the Revised Proposal ERD (Roy Hill, 2020a).</p> <p>Roy Hill note there is a unit error in this DWER Submission relating to <i>Stemodia</i> sp. Battle Hill (Priority 1 BC Act). Where it says 'ha', it should be 'individuals'.</p>

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		<ul style="list-style-type: none"> • Direct impacts to 248.97 ha and indirect impacts to 3.74 ha of the Narbung Priority 3 Ecological Community (PEC). • Direct impacts to 12.48 ha and indirect impacts to 3.76 ha of Groundwater Dependent Vegetation (GDV). • Direct and indirect impacts to 85.92 ha riparian vegetation due to creek diversions. • Direct impacts to 902.78 ha and indirect impacts to 6.72 ha of Vegetation types 15, 16, 17, 18, 20, 25, 26 and 30 (Sheet Flow Dependent Mulga). • Direct impacts to a maximum of 95.79 ha of Vegetation type 30 (AxTos). • Direct impacts to 1004.15 ha and indirect impacts to 6.75 ha of Vegetation types 15, 16, 18, 19, 20, 25 and 26 (Perennial Tussock Grasslands). • Direct impacts to 97 individuals of <i>Eremophila Pilosa</i> (Priority 1 BC Act). • Direct impacts to 86,260 individuals of <i>Triodia veniciae</i> (Priority 1 BC Act). • Indirect impacts to 32 ha <i>Stemodia</i> sp. battle hill (Priority 1 BC Act). 	
79	DWER	The proponent has proposed to counterbalance significant residual impacts of clearing 4636.32 ha of 'good to excellent' vegetation within the revised	Roy Hill can confirm that the clearing of 4,636.32 ha of 'good to excellent' vegetation for the Revised Proposal (Roy Hill, 2020a) is inclusive of vegetation in the borefields.

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		development envelope. It is unclear whether this impact includes clearing of 'good to excellent' vegetation in the borefields. The proponent should clarify whether the clearing of 4636.32 ha 'good to excellent' vegetation is inclusive of impacts within the borefields.	
80	DWER	The proponent has stated that residual impacts to riparian vegetation, the Narbung PEC, several locally significant vegetation types, and specialised fauna habitat are not significant and therefore only require base rate contributions to the PEOF for impacts to these values as part of its contribution to counterbalance impacts to 'good to excellent' vegetation. The proponent should note that there are multiple precedents of the EPA recommending use of the higher rate of the PEOF for impacts to these types of values, particularly for impacts to PECs and riparian vegetation. The proponent should either align with this precedent or provide clear justification as to why they feel that the base rate is appropriate for significant residual impacts to these values.	In consultation with DWER and DAWE, Roy Hill have prepared an updated draft Impact Reconciliation Procedure (Roy Hill, 2021d) that accounts for offset requirements for both the stated EPA precedents and the EPBC Matters of National Environmental Significance (MNES) associated with the Revised Proposal.
81	DWER	DWER notes that vegetation type 30 (also referred to as AxTos) contains locally significant values. Based on the information provided, it appears that this vegetation type overlaps with vegetation associated with the Narbung PEC. Based on the local significance of this value, the EPA may recommend the higher rate of the PEOF is appropriate to counterbalance significant residual impacts to this vegetation type. The proponent should provide clear mapping and figures of	Map illustrating Vegetation Type 30 (formerly known as AxTos) and the Narbung Land System Priority 3 Ecological Community has been included as Figure 5 (Roy Hill, 2021o) Appendix 24 of this response to submissions document. The mapped extent of Vegetation type 30 covers 2,369.54ha, of which 1,445.81ha falls within the Narbung PEC (which covers an overall area of 15,957.54ha).

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		vegetation type 30 in relation to the Narbung PEC and the revised proposal.	
82	DWER	The proponent should clarify the area of vegetation type 30 being impacted. Page 153 of the ERD (Rev 3, December 2020) notes that impacts to 95.96 ha of vegetation unit 30 is expected, while Page 154 notes impact to 95.79 ha of vegetation unit 30 is expected.	The anticipated direct impacts to Vegetation Type 30 from the implementation of the Revised Proposal are 95.79 ha as outlined on Page 153 of the ERD (Roy Hill, 2020a)., page 154 is an error
83	DWER	In the environmental offsets table (Table 6-4) on p407 it indicates 4,640.89 ha of vegetation in good to excellent condition in the revised development envelope as being impacted. This is different to the figure quoted elsewhere in the document (4,636.32 ha) and needs to be clarified and/or corrected.	The anticipated direct impacts to vegetation in good to excellent condition in the Revised Development Envelope are 4,636.32ha. The information on page 407 of the ERD (Roy Hill, 2020a). is an error
84	DWER	The clearing of approximately 4,636.32 ha of 'good to excellent vegetation' within the Chichester and Fortescue IBRA subregions is proposed to be offset. The proponent needs to quantify the area for each IBRA subregion separately to enable offset conditions related to PEOF to be written.	The Revised Proposal proposed new clearing areas include the clearing of approximately 4,636.32 ha of 'good to excellent vegetation' within the Chichester and Fortescue IBRA subregions. This consists of 4,521.18 ha in the Fortescue IBRA subregion and 115.93 ha in the Chichester IBRA subregion. Roy Hill's Impact Reconciliation Procedure has been updated to outline the proposed offsets per IBRA Subregion (Roy Hill, 2021d), Appendix 8 of this response to submissions document.
85	DWER	The proponent should provide clear maps and figures delineating where 'good to excellent' vegetation and critical fauna habitat types are located within the disturbance footprint for the revised proposal.	<p>Figures 4-18 and 4-19 of the ERD illustrate the vegetation condition within the Revised Development Envelope (Roy Hill, 2020a).</p> <p>Critical fauna habitat types present within the Revised Development Envelope include Greater Bilby Habitat and Northern Quoll Habitat. Greater Bilby Habitat within the Revised Development Envelope is illustrated in Figure 7-5 and 7-6 of the ERD. Northern Quoll Habitat within the Revised Development Envelope is illustrated in Figure 7-3 and 7-4 of the ERD.</p>

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Terrestrial Fauna			
86	DAWE	<p><u>Submission on draft ERD</u></p> <p>The proponent identified the direct and indirect risks that weeds can have on vegetation in potential habitat for listed threatened species such as the Greater Bilby (<i>Macrotis lagotis</i>). Provide details of specific management measures the proponent will implement to manage the impacts of weeds.</p> <p><u>Current submission</u></p> <p>The previous submission has been partially met. Please provide a copy of OP-PLN-00125 for review before the assessment phase.</p>	<p>The ERD included the weed management strategies outlined Roy Hill Weed Management Plan (Roy Hill, 2017) which outlines the weed inspection process whereby “Before entering the Mine site, equipment and machinery are inspected by site environment personnel for weeds, seeds and potential contaminants”.</p> <p>Roy Hill will also extend its Weed Management Procedure (Roy Hill, 2018d) (OP-PRO-00010) to include the Remote MAR and southern Borefields (Appendix 35 of this response to submissions document).</p> <p>An updated version of the Weed Management Plan (Roy Hill, 2021g) which integrates the comments below is provided as Appendix 11 of this Response to submissions document (RtS)</p>
87	DAWE	<p><u>Submission on draft ERD</u></p> <p>Additional information regarding the Night Parrot (<i>Pezoporus occidentalis</i>) has been considered referencing the Biologic (2018a) Level 1 Targeted Vertebrate Fauna Assessment (Appendix 26). Noting the potential for the Night Parrot and habitat to occur within the Fortescue Marsh, the Department requires any additional information from surveys that may have been undertaken as part of yearly compliance surveys that would confirm the species presence/absence within the project area.</p> <p>There is a paragraph in Appendix 26 that refers to ‘Princess Parrot survey maps’ however no survey maps for the Princess Parrot have been provided. Advise whether this an error.</p> <p><u>Current submission</u></p>	<p>As outlined previously, Roy Hill does not complete yearly compliance surveys for Night Parrot. Roy Hill is unable to provide additional information other than that already supplied.</p> <p>This is an error; the paragraph has now been updated to state “Night Parrot Survey Maps”.</p>

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		<p>The previous submission has been partially met.</p> <p>Provide a copy of the Davis and Metcalf (2008) reference used in Section 7.5.7.3 of the ERD.</p>	<p>Davis and Metcalf (2008) reference has been provided.</p>
		<p>Discuss (and/or provide an expert review) on why the Princess Parrot (<i>Polytelis alexandrae</i>) was not part of the targeted surveys. The Atlas of Living Australia indicates there are three recorded sightings of the species surrounding the revised development envelope. The species was not recorded in surveys according to the ERD Table 7-3 however no targeted surveys were undertaken in either of the reports referenced in the Table. There is no reference to the Princess Parrot in the Vertebrate Fauna Assessment (Appendix 24, Ecologia 2009d). Further, the preferred habitat used as the guide in Table 4-3 in Appendix 26 is incorrect. The species prefers shrubland in dune swales among emergent trees and spinifex according to the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) Conservation Advice for the Princess Parrot. It occurs less often in woodlands and sometimes in riverine and littoral areas. Nests are commonly found in <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>Eucalyptus gongylocarpa</i> (Marble Gum) and <i>Allocasuarina decaisneana</i> (Desert Oak) hollows.</p>	<p>As outlined in Appendix 26 of the ERD (Roy Hill, 2020a), the 2018 Biologic survey consisted of a desktop assessment, a Level 1 and a targeted survey at the Roy Hill Mine and borefields area. The assessment identified the potential occurrence of conservation significant species (including Princess Parrot) and their supporting habitats within the Study Area. The Princess Parrot was not recorded during this survey or previous surveys and was assessed as unlikely to occur within the Revised Development Envelope as it is located outside of the species known distribution (Biologic, 2018).</p> <p>Figure 4-12 in Appendix 26 of the ERD (Roy Hill, 2020a) outlines previous DBCA records for Birds of conservation significance from NatureMap, which includes one record of the Princess Parrot, recorded approximately 3km west of the Revised Development Envelope by Birdlife Australia in 2012. However, this is considered to be an erroneous record as the habitat is not considered suitable for Princess Parrot and the coordinates of the record appear to be inaccurate (Biologic, 2018).</p> <p>The incorrectly labelled habitat for the species referred to in Appendix 26 of the ERD was an error.</p> <p>In preparation for clearing for investigative drilling in the Remote MAR borefield, Roy Hill recently conducted targeted surveys of the proposed clearing areas and did not find any evidence of the Princess Parrot. The previously provided EPBC advice for the Princess Parrot states the species prefers shrubland in dune swales among emergent trees and spinifex, occurring less often in woodlands and sometimes riverine and littoral areas, with nests commonly found in <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>Eucalyptus gongylocarpa</i> (Marble Gum) and <i>Allocasuarina decaisneana</i> (Desert Oak) hollows. The preferred habitat for the Princess Parrot that occurs within the Revised Development Envelope is “Low eucalypt woodlands, especially Marble Gum”, as outlined in Appendix 26 of the ERD (Roy Hill, 2020a). This habitat mainly occurs along the Fortescue River within the Remote MAR borefield. Furthermore, dune swale habitat is not present within the Revised Development Envelope.</p>

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		<p>Section 7.5.8.5.1 of the ERD states that Spinifex Sandplain is the preferred habitat for the Princess Parrot and will be impacted as part of the proposed action. Given the preferred habitat types have been recorded in the flora surveys outlined in Table 4-8 and Table 4-36, and also include nesting trees <i>Eucalyptus camaldulensis</i>, justify why targeted surveys were not conducted for this species and what survey effort will be conducted prior to the commencement of the proposed action or the precautionary approach may be applied.</p>	<p>As outlined above, targeted surveys were undertaken for all conservation significant fauna potentially present within the Revised Development Envelope, however the Princess Parrot was not recorded during any surveys undertaken to date and was assessed as unlikely to occur within the Revised Development Envelope as it is located outside of the species known distribution. Habitat within the vicinity of previous record of the species (Biologic, 2018) is not considered suitable for the species. The Princess Parrot is most commonly recorded in habitats dominated by <i>Allocasuarina</i> and/or Eucalyptus open woodland over <i>Triodia</i> vegetation, often associated with sandplain or sand dunes, usually in the larger dune swales, which generally don't occur in this area.</p> <p>Given that the most preferable habitat for this species within the Revised Development Envelope is the Spinifex sandplains and Eucalypt sparse Woodland, which occurs in the borefield areas and can contain nesting trees such as <i>Eucalyptus camaldulensis</i>, there may be potential for the Princess Parrot to occur. In preparation for clearing for investigative drilling in the RMAR borefield, Roy Hill recently conducted targeted surveys of the proposed clearing areas and did not find any evidence of the Princess Parrot.</p>
		<p>Section 7.5.8.4 of the ERD states that buffel grass will be controlled to minimise threats to the Princess Parrots. However, it is unclear from Figures 4-22 and 4-23 where Buffel grass occurs in relationship to the preferred habitats of the Princess Parrots (as described above). Please provide this map and a supporting discussion of where the priority weed management will take place within the revised development envelope to minimise potential impacts to the species.</p>	<p>The Weed Management Plan (Roy Hill, 2021g Appendix 11 of this response to submissions document) outlines the management, mitigation and monitoring measures to be implemented for the Roy Hill project. A weed control program is currently underway and will continue to be undertaken to carry out control treatment of known weed infestations within rehabilitation sites or for declared weeds at the Roy Hill mine and borefield areas. Key target species include Calotropis, Mexican Poppy, Kapok and Buffel Grass. Rehabilitation will be carried out in accordance with the approved Mine Closure Plan (MCP).</p> <p>Appendix 17 of this response to submissions document, Figure 2-5 (Roy Hill, 2021k), has been provided indicating Buffel Grass records across the Revised Development Envelope that have been recorded to date.</p> <p>The proposed Revised Development Envelope for this Revised Proposal sits wholly within the Roy Hill Pastoral Station. Roy Hill Station has been an active pastoral enterprise since the early 20th century. <i>Cenchrus ciliaris</i> was widely planted in pastoral regions as a pasture grass, and has since become a widespread weed of roadsides, creek lines, river edges and most vegetation types from Shark Bay to the Pilbara. <i>Cenchrus ciliaris</i> is a very widespread weed both inside and outside of the Roy Hill</p>

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			<p>Revised Development Envelope due to the active pastoral station present and was recorded in surveys prior to mining activity occurring. The widespread distribution of this species is linked with high grazing pressure and cattle trampling which continues to spread this taxon further. A large majority of the Buffel Grass records recorded within the mining area outlined on Figure 2-5 (Roy Hill, 2021k Appendix 17 of this Response to Submissions document) were historical/baseline and have since been cleared. Within the borefields area, which contains the most suitable habitat for Princess Parrots, there are very minimal records of the grass species.</p> <p>As outlined in Condition 10 and 11 of Roy Hill’s Ministerial Statements 824 and 829, Roy Hill undertake rehabilitation to ensure that no new weed species are introduced to the area as a result of the proposal implementation and that the coverage of weeds within rehabilitation areas shall not exceed that identified in baseline monitoring undertaken prior to commencement of operates, or exceed that existent on comparable, nearby land which has not been disturbed during implementation of the proposal (whichever is less).</p> <p>An updated version of the Weed Management Plan (Roy Hill, 2021g) has been provided as Appendix 11 of this response to submissions document.</p>
88	DAWE	<p><u>Northern Quoll</u></p> <p>Section 7.5.2.5.1 and Appendix 26 of the ERD discuss that fresh scats were found near semi-permanent water bodies. Further evidence from Oakwood (2002), states that rocky habitats near water sources are preferred habitat for the species. In section 3.2.4 of the Borefields Targeted Survey report (Appendix 29, Biologic 2020), Major Drainage Lines were included as important habitat for the targeted sampling for the species. However, in section 7.5.2.5.1 and in Table 4-33 of the ERD, the waterbodies (major, minor and pool) are not considered to be of conservation value to the Northern Quoll. This is a concern since section 4.2.2 and Figure 4.1 in Appendix 26 state that there are six waterbodies in the development envelope. Explain why this is not considered important</p>	<p>As outlined in Section 7.5.2.6 of the ERD, the Northern Quoll has been recorded within 5km of the Revised Development Envelope, however no evidence or resident populations of Northern Quoll exist within the Revised Development Envelope. The record (DBCA, 2016) was of a scat from an isolated hill within the Low Rocky Hill habitat. This record was located <1,500m from a scat found in a 2018 survey. Both scat records were collected <1,200m from a semi-permanent waterbody located to the north and outside of Revised Development Envelope, as outlined in Figure 4.11 of ERD Appendix 26 (Biologic, 2018).</p> <p>Furthermore, as stated in Section 7.5.2.5.1 of the ERD (Roy Hill, 2020a), the lack of records for this species within the Revised Development Envelope suggests that individuals may move through this habitat whilst foraging or dispersing through the landscape from a permanent population elsewhere, and/or during periods of regional population highs. Northern Quoll Targeted surveys undertaken by Biologic (2020) considered it unlikely that a population of Northern Quoll resides within or is likely to occur or establish within the Revised Development Envelope (Biologic, 2020). Species distribution</p>

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		supporting foraging habitat for the species and considered as part of the total impact to the species.	<p>modelling completed by Molloy et. al, (2015), depicts the habitat nearby the Revised Development Envelope is likely of low to moderate significance only (Molloy, et al., 2015).</p> <p>s outlined in Section 4.2.2 and Figure 4.1 of ERD Appendix 26 (Biologic, 2018), a total of six water bodies were recorded during the study. One semi-permanent water body and four claypans were recorded within the Revised Development Envelope and one semi-permanent water body was recorded outside of the development envelope and Roy Hill's tenure. The semi-permanent water body and claypans found within the Revised Development Envelope, which Roy Hill has committed to avoiding, are located in the southern borefields, which does not contain any low rocky hill's habitat and hence would not be suitable or support Northern Quoll populations.</p>
89	DAWE	<p><u>Northern Quoll</u></p> <p>Section 7.5.2.5.1 of the ERD states that the revised development footprint is considered to be used for foraging by the Northern Quoll (also identified in Table 7-6). Due to the proximity of the recorded locations (<2km) to the revised development envelope boundary and the approximate size of home ranges, it would suggest that the loss of habitat will likely impact foraging of the species. Discuss the loss of this habitat and why it is not considered part of the impact to the species and explain the statement in Table 7-6 of the ERD that extensive areas of potential denning and foraging habitat will remain post-disturbance.</p>	<p>As outlined in Section 4.4.3.4.2.1 of the ERD (Roy Hill, 2020a), the Northern Quoll inhabits complex rocky habitats, including ranges, escarpments, gorges and boulder fields, and can utilise trees and hollows along major drainage and creek lines (Woinarski, et al., 2014). Low Rocky Hills habitat is the most suitable habitat within the Revised Development Envelope but is only considered moderately suitable as it possesses few deep cracks, crevices and few large bolder piles that are the most suitable habitat for denning. Roy Hill's impact hectares have been revised and the Low Rocky Hills habitat extent within the Revised Development Envelope is 1,403.39ha, as outlined in Table 4-33 of the s43A application (Roy Hill, 2021b).</p> <p>As stated in Section 7.5.2.6 of the ERD (Roy Hill, 2020a), there is limited availability of suitable denning habitat (rocky crevices and rock piles and boulders) for the species within the Low Rocky Hills habitat type in the Revised Development Envelope which aligns with species distribution modelling completed by Molloy et. al, (2015); no records of the Northern Quoll occur within the Revised Development Envelope and a low number of records occur within proximity to the Revised Development Envelope (suggesting the habitat within 5km of the Revised Development Envelope is used intermittently by the species dispersing through the landscape); and the availability of similar Low Rocky Hills habitat in the surrounding area (Biologic, 2018). The southern borefields do not contain any low rocky hills habitat (which is preferred Northern Quoll habitat type) and hence would not support Northern Quoll populations.</p> <p>The potential foraging/dispersal habitat is major and minor drainage line habitat, as they can utilise trees and hollows along major drainage and creek lines. Roy Hill's impact hectares have been revised</p>

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			<p>and the Major and Minor Drainage Line habitat extent within the Revised Development Envelope is 3,823.04 ha, as outlined in Table 4-33 of the s43A application (Roy Hill, 2021b).</p> <p>Table 7-6 in the ERD (Roy Hill, 2020a) outlines that “There will be a loss of denning and foraging habitat. However, extensive areas of potential denning and foraging habitat will remain post-disturbance. It is unlikely that the proposed clearing will result in a decline in Northern Quoll numbers in the local area”. This statement refers to the remaining habitat outside of the Revised Development Envelope that will remain undisturbed.</p> <p>In addition to this, as part of a change to the proposal, approved under S43a of the EP Act on 31/08/21, a Heritage Management Area has been delineated, which contains a significant proportion of the low rocky hill habitat mapped within the development envelope. Implementation of this HMA will ensure this habitat is retained within the development area (see Appendix 6 of this response to submissions document)</p> <p>For these reasons and with consideration of avoidance and mitigation measures, the Proposed Change is considered unlikely to result in significant impacts to Northern Quoll populations.</p>
90	DAWE	<p><u>Northern Quoll</u></p> <p>Appendix 26 states that recorded evidence of the Northern Quoll was found at surrounding waterbody RH-WB-01 to the north of the revised development envelope. The Department notes that this water body crosses into the revised development envelope and the downstream flows will be impacted as part of the proposed action and modelling in Appendix 6. The Department also notes that this may be the same waterbody that is part of the ‘design of closure structures’ for surface water diversions featured in Figure 4-71 of the ERD, or if not, may be included in the surface water diversions as part of the proposed action (Figures 4-75 and 4-76 of ERD). Provide a discussion</p>	<p>As outlined in Section 4.6.3.4.1 of the ERD (Roy Hill, 2020a), surface water systems that flow through operational areas at the Mine are currently diverted around major disturbance areas (i.e. pits) by surface drainage structures to facilitate surface flow and prevent upstream containment of flows. It is Roy Hill’s intent, as part of the detailed design process, to ensure there are no impacts to the upstream surface water drainage lines. Appendix 30 of this response to submissions document (GHD, 2021), has demonstrated that the removal of cascading structures has reduced the risk of ponding and consequent upstream impacts as a result of these diversions.</p> <p>Furthermore, Section 4.2.2 and Figure 4.1 of Appendix 26 (Biologic, 2018) outline that RH-WB-01 and the potential Northern Quoll habitat which surrounds it is located outside of Roy Hill’s Development Envelope and Tenure, which is outside of Roy Hill’s authority and control. Roy Hill acknowledges that creek diversions and mining activities by third party operations may cause cumulative surface water impacts to water bodies outside of Roy Hill’s Development Envelope.</p>

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		and evidence that the water body upstream near the recorded sightings of the Northern Quoll will not be impacted as part of the of proposed action including mitigation measures that will be put in place to minimise the impact to this important habitat for the Northern Quoll.	<p>The Roy Hill Vegetation Management Plan (Roy Hill, 2021c) and Mine Water Management Plan (Roy Hill, 2021a) outline both outcome-based and management-based actions and the key requirements for protecting fauna habitat and flora and vegetation health. These plans include early response indicators and thresholds for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat.</p> <p>For this reason and with consideration of avoidance and mitigation measures outlined in Table 4-38 of the ERD (Roy Hill, 2020a), the Proposed Changes are considered unlikely to result in significant impacts to Northern Quoll populations.</p>
91	DAWE	<p><u>Northern Quoll</u></p> <p>The ERD states that Cane Toads are currently managed by Kimberley Toad Busters, Stop the Toad Foundation and WA Department of Biodiversity, Conservation and Attractions (DBCA). The ERD states that no cane toads have been found in the revised development envelope. However, there is a real possibility that cane toads may invade this area over the life of the proposed project. Discuss how cane toad monitoring will be conducted within the revised development envelope, if there will be active collaboration with the above groups, and whether eradication will be integrated in the Mine Vertebrate Fauna Management Plan (Appendix 35).</p>	<p>The Kimberly region has recorded and is a known breeding area for Cane Toads. The <i>Cane toad strategy for Western Australia 2014 – 2019</i> (Department of Parks and Wildlife, 2014) outlines that Parks and Wildlife cane toad detector dogs inspect trucks and other high priority freight in the Kimberley for ‘hitchhiker’ cane toads, which is a key source of Cane toad movement. This process assists in preventing cane toads from travelling to other parts of Western Australia (WA).</p> <p>As outlined in Section 7.5.2.4 of the ERD (Roy Hill, 2020a), a deceased Cane toad was found at the Roy Hill Mine in 2015 during construction of the Mine. It is believed that this animal arrived as a ‘hitch-hiker’ in equipment that travelled from the Kimberley. A response strategy was formed immediately, which included targeted Cane toad surveys that were undertaken by Roy Hill staff. No Cane toads were found at the time and no Cane toads have been found at the Mine since. Similar response actions would be put in place in the future, if required.</p> <p>Before entering the Mine site, equipment and machinery are inspected by site environment personnel for weeds, seeds and potential contaminants. Coupled with on-site education and inductions for all personnel, Roy Hill does not consider that Cane toads are a threat to Northern Quolls or other terrestrial fauna at the Roy Hill Mine. Furthermore, the Revised Proposal does not increase the risk of Cane Toads over that associated with the Original Proposal.</p> <p>Roy Hill has now also included ‘Introduction of pest fauna species’ as a threat in Table 4 of the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f), Appendix 10 of this response to submissions document.</p>

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92	DAWE	<p><u>Northern Quoll</u></p> <p>Section 4.3.3.3.2 of the ERD identifies the weeds in the revised development envelope. One of the Threat Abatement Plans (TAP) for the Northern Quoll is the <i>Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses</i>. Provide the Weed Management Plan for the revised proposal and ensure it addresses whether the grasses outlined in the TAP have been found, and how these grasses will be monitored and managed in the revised development envelope to reduce the impact on Northern Quoll foraging habitat and for the purposes of fire management.</p>	<p>The updated Weed Management Plan (Roy Hill, 2021g), Appendix 11 of this response to submissions document, outlines the management, mitigation and monitoring measures to be implemented for the Roy Hill project. It should be noted that the Revised Development Envelope occurs within an active pastoral station, whereby weeds were present prior to the Roy Hill mine as identified in baseline surveys.</p> <p>The five listed grasses outlined in the <i>Threat abatement plan (TAP) to reduce the impacts on northern Australia's biodiversity by the five listed grasses</i> (Department of Sustainability, Environment, Water, Population and Communities, 2012) have not been recorded to date within the Revised Development Envelope. If any of the five listed grasses were to be recorded, the TAP and Weed Management Plan would assist in the development of specific management and mitigation measures to reduce impact on terrestrial fauna habitat.</p> <p>The updated Weed Management Plan (Roy Hill, 2021g) Appendix 11 of this response to submissions document, also includes current weed management control programs, including the commitment to monitor and manage the weeds should they be recorded within the Revised Development Envelope.</p>
93	DAWE	<p><u>Northern Quoll</u></p> <p>The Mine Vertebrate Fauna Management Plan (Appendix 35) identifies lighting impacts as a threat to Northern Quoll and states that light overspill impacts will be minimised by using directional lighting where practicable. Provide further discussion on how these measures will follow the principles of best lighting design outlined in the <i>National Light Pollution Guidelines for Wildlife</i> and what monitoring and iterative management actions will be put in place to minimise the impact to the Northern Quoll and other Matters of National Environmental Significance (MNES) (e.g. the Ghost Bat) identified in the revised development envelope.</p>	<p>A formal assessment on potential light spill impact area has not been undertaken. As the previous activities for pits were assessed under the Original Proposal, Roy Hill considered there will be minimal change from the Original Proposal in the mining area. Furthermore, there will be minimal lighting in the borefields as the water operations team does not currently work nightshift unless there is a significant maintenance issue.</p> <p>As per the <i>EPBC National Light Pollution Guidelines for Wildlife</i> (Department of Environment and Energy, 2020), directional lighting will be used in active mining areas, the airport and accommodation village. It is a requirement that sufficient lighting is provided to maintain a safe working environment.</p> <p>In addition to this, as outlined in the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f Appendix 10 in this response to submissions document), Roy Hill will implement the following mitigation measures to minimise the impact to terrestrial fauna:</p> <ul style="list-style-type: none"> - Machinery and equipment will be fitted with noise attenuation measures to meet personnel safety requirements.

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			<ul style="list-style-type: none"> - Installation of lighting that direct lights toward plant areas to minimise light spill into adjacent vegetated areas. - Equipment design will specify compliance with Australian Standard noise limits. - Maintain equipment to minimise noise and vibration in accordance with manufacturers requirements. <p>There will be minimal artificial lighting used in the borefields as the water operations team does not currently work nightshift. In the case of a significant maintenance issue that requires lighting, sufficient lighting would be used to maintain a safe working environment. Non-directional lighting will be used where possible.</p> <p>The Revised Proposal does not increase the risk of lighting impacts to Northern Quolls, over that associated with the Original Proposal, as Northern Quoll habitat is not located near the Borefield.</p>
94	DAWE	<p><u>Northern Quoll</u></p> <p>The ERD and Appendix 26 acknowledge vehicle strike as a threat to the Northern Quoll. There is a northern access road to the mine that intercepts the recorded locations of the Northern Quoll. The Mine Vertebrate Fauna Management Plan (Appendix 35) states that speed limits will be established however more information is needed regarding speed limits, how these will be enforced, and/or if physical structures (slow points) will be implemented to force the reduction of traffic speed in the area. See the following study by Jones (2020) recommending <20km speed zones in Spotted Quoll habitat: <i>Road upgrade, road mortality and remedial measures: Impacts on a population of eastern quolls and Tasmanian devils</i>. Wildlife Research, 2000,27, 289–296.</p>	<p>As stated in Section 4.4.3.4.2.1 of the ERD (Roy Hill, 2020a), pre-clearance surveys were undertaken for Northern Quoll within potential habitat areas in 2014, in accordance with the Vertebrate Fauna Management Plan for the Roy Hill Rail Corridor (Roy Hill, 2009b) and Fauna Trapping and Translocation Program Guideline (Roy Hill, 2010). The surveys targeted potential habitat for the species in a small area within the Roy Hill mine tenements near the rail loop. Targeted surveys for Northern Quoll, completed late 2019 and early 2020 did not record any evidence of Northern Quoll or suitable denning habitat within the Revised Development Envelope (Biologic, 2020).</p> <p>No records of the Northern Quoll occur within the Revised Development Envelope and a low number of records occur within proximity to the Revised Development Envelope (suggesting the habitat within 5km of the Revised Development Envelope is used intermittently by the species dispersing through the landscape). The Revised Proposal does not increase the risk over that associated with the Original Proposal.</p> <p>As stated in the methods section of the Jones (2000) study, 60km/hr speed zones were assigned and slow points were implemented which subsequently reduced speeds through Sites 2 and 3 by 20km/hr to 47–59 km/hr and median speeds at Site 1 dropped slightly to 41-57km/hr (Jones, 2000).</p>

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			If evidence of Northern Quoll is recorded within the Revised Development Envelope in the future, adaptive and precautionary management measures similar to those taken when the Bilby was present, will be implemented. Table 8 of the Mine Vertebrate Fauna Management Plan has been updated to include this commitment (Roy Hill, 2021f) (Appendix 10 of this response to submissions document).
95	DAWE	<p><u>Greater Bilby</u></p> <p>The ERD states that inappropriate fire regimes may impact the Greater Bilby and that the Roy Hill Iron Ore (RHIO) Fire Management Plan will be developed to manage fuel loads, fire breaks maintenance and emergency response procedures. Further details will be required and expert advice must be sought in the development of this plan to minimise the impact to the Greater Bilby habitat and other MNES identified within the revised development envelope. Some species require habitats of non-burnt spinifex sandplain and grasslands (e.g. Night Parrot, Princess Parrot). Impacts to MNES from firebreak establishment also needs to be considered. Advise how this management plan will be developed and encompass these points.</p>	<p>The Roy Hill Fire Management Plan will be developed for emergency response purposes only. Fire breaks would be created around buildings and maintenance areas for safety and emergency purposes via clearing. Roy Hill does not propose to undertake prescribed burns. The implementation of bushfire mitigation and management measures, reduces the risk of accidental fires and ensures that firefighting equipment and procedures are operational on site.</p> <p>Ongoing fire management for buildings and infrastructure within the Revised Development Envelope would include fuel load assessments, firebreak maintenance and emergency response procedures. Roy Hill does not commit to fire management practices for other purposes.</p> <p>The likelihood of extensive and intense fires occurring as a result of the Proposed Changes is low and unlikely to result in a significant impact to the Greater Bilby.</p>
96	DAWE	<p><u>Greater Bilby</u></p> <p>Vehicle strike has also been acknowledged as a threat to the Greater Bilby. The Department notes that measures to minimise the risk of vehicle strike include a 1 km buffer zone around the known occupied Greater Bilby burrows, speed limits, road signs, and 40 km speed limit. The Mine Vertebrate Fauna Management Plan (Appendix 35) states that speed limits will be established, however, section 4.1.1 of</p>	<p>As outlined in Section 4.4.3.4.1.1 of the ERD (Roy Hill, 2020a), Roy Hill received a report of a Greater Bilby sighting in July 2018 close to existing Mine infrastructure. Roy Hill staff located a potential active Greater Bilby burrow and positioned five camera traps in the area. A Greater Bilby was successfully recorded on the cameras on multiple occasions. The Greater Bilby's burrow and active area was in proximity to the main access road into the Roy Hill mine and within 1km of the Roy Hill mine offices, which is major road and an extremely busy area. Roy Hill was advised by the Department of Biodiversity, Conservation and Attractions (DBCA) to leave the identified Greater Bilby in situ and to implement site specific management, rather than to relocate. The Greater Bilby survived for over a</p>

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		<p>Appendix 29 states that signage and speed limits were put in place in the mine site near the previous Greater Bilby burrow but still resulted in the individual being killed by vehicle strike. Provide justification regarding how these measures will be sufficient to avoid this type of impact in future and whether additional measures need to be put in place. This should include a much lower speed limit (justify best practices speed limits for the Greater Bilby), how the speed limit will be enforced with personnel, and whether physical structures (slow points) will be implemented to force the reduction of traffic speed.</p>	<p>year whilst these management measures were in place, before it was hit and killed by a vehicle in September 2019.</p> <p>Physical structures are not currently proposed to be implemented and speed limits would be enforced through signage, site notices and inductions/on-site education. If evidence of Greater Bilby is recorded within the Development Envelope in the future, adaptive and precautionary management measures will be implemented, in consultation and with advice from DBCA. The speed restrictions implemented will be considered for each location depending on the speed of the surrounding area (e.g. 80 to 40km/hr or 40km/hr to 20 km/hr) and potential risk to fauna.</p> <p>The Greater Bilby exclusion zone has now been updated to a restriction zone after consultation with the EPA and the term has been clarified within the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f Appendix 10 of this response to submissions document).</p> <p>A 1km buffer 'restricted zone' is centralised on known and potentially active Bilby burrows. This is not an exclusion zone and still allows clearing, however monitoring and survey of the known and/or potentially active Bilby burrow must be undertaken prior to any disturbance within this 1km buffer. If clearing /disturbance is required within the Bilby 'restricted zone', and/or over the actual burrow, a Bilby fauna survey must be undertaken in accordance with the Bilby Fauna Survey Work Instruction (Roy Hill, 2018c).</p> <p>Where active bilby burrows are identified, speed restrictions will be applied to roads for a 1km diameter centred at the active bilby burrow.</p> <p>The Mine Vertebrate Fauna Management Plan has been updated to reflect these changes (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>
97	DAWE	<p><u>Greater Bilby</u></p> <p>Provide more details about the annual Feral Animal Control Program and what species will be included in the monitoring, what control methods will be used, and timeframes that these management practices and measures will be implemented; and clarify that foxes,</p>	<p>Annual feral control programs currently target feral cats and wild dogs as these are the species that have been identified to date.</p> <p>All fauna sightings, including feral animals, are recorded on the Roy Hill Fauna Sightings Register. This register assists in providing information, to target particular areas either more prone to feral animals,</p>

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		rabbitats and cats will be included as part these management measures since these feral animals have identified as key threats to the Greater Bilby.	<p>or where species of high conservation significance resides, which in turn leads to better chances of success in the program. Additional feral species will be targeted if these are sighted on site.</p> <p>Feral animal control is performed by a licenced feral pest technician using the most humane, target specific, cost effective and efficacious techniques available. The results and details of feral animal control programs across Roy Hill facilities are maintained in internal registers and reports.</p> <p>The Mine Vertebrate Fauna Management Plan (Appendix 10 of this response to submissions document) includes management actions, monitoring and reporting regarding the introduction of fauna and pest species.</p>
98	DAWE	<p><u>Greater Bilby</u></p> <p>No domestic animals will be permitted on site according to Table 7-9 of the ERD however the Mine Vertebrate Fauna Management Plan (Appendix 35) does not outline that personnel pets/domestic animals will not be allowed within the revised development envelope.</p>	The Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f), Appendix 10 of this response to submissions document, has been updated to confirm that no domestic animals will be permitted on site. The Revised Proposal does not increase the risk of domestic animals, over the Original Proposal.
99	DAWE	<p><u>Greater Bilby</u></p> <p>The Department notes that the borefield design will work to avoid active Greater Bilby burrows. The proposed pipelines will be buried at short intervals to avoid fragmentation and ensure continued access connectivity to the surrounding habitat. Clarify whether expert independent review of the final design will be undertaken to ensure these intended outcomes.</p>	<p>Due to the low impact nature of clearing required to develop borefields, relatively small areas required for drill pads and tracks, and with the ability to avoid identified significant fauna locations (i.e. identified Greater Bilby burrows etc), it is not considered that clearing or ground disturbance would have significant impacts to any species of conservation significance in this habitat.</p> <p>The final borefield design will be informed by preclearance surveys and input from Roy Hill's environmental manager and engineering teams. As outlined in Table 4-38 of the ERD, Roy Hill has committed that a targeted fauna survey will be undertaken prior to final borefield alignment to ensure that bilbies and their burrows can be avoided (Roy Hill, 2020a).</p> <p>Where active bilby burrows are identified, a restriction zone will be applied.</p>

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100	DAWE	<p><u>Greater Bilby</u></p> <p>Section 4.3.3.2.5.1. of the ERD confirms that Mulga communities are highly dependent on sheet-flow and changes to surface hydrology can impact these communities. Figures 4-16 and 4-17 of the ERD demonstrate that these habitats are extensive across the Southern Borefield and Remote MAR. Given these habitats are important in supporting the Greater Bilby (and Pilbara Leaf-nosed Bat), advise how these impacts will be minimised, proposed monitoring programs to be implemented and thresholds and management actions that will be put in place for the management of impacts from changes to surface hydrology in these areas.</p>	<p>Roy Hill does not consider that the mine infrastructure and diversion structures will have any significant impact on sheet-flow. Appendix 3 of this response to submissions, Surface Water Flows – Memo (Astron 2021) concluded that the whole landscape downstream from the Mine can potentially support sheet flow under certain conditions; unpredictable large rainfall events are likely to generate broad scale sheet flow that may be somewhat impeded by mine infrastructure, but SFDV would likely still receive a high volume of sheet flow. SFDV is naturally adapted to smaller rainfall events and sheet flow generated at the local scale, which can be protected via existing buffer zones.</p> <p>Roy Hill does not expect the construction of the Remote MAR and Southern Borefield to have any significant impacts on sheet-flow as none of the structures are expected to present any large impediments to surface water flow.</p> <p>In consultation with the Department of Water and Environmental Regulation, Roy Hill have updated Vegetation Management Plan and Mine Water Management Plan, Appendix 7 and 5 of this response to submissions document (Roy Hill, 2021c; Roy Hill, 2021a). These plans outline both outcome-based and management-based actions and the key requirements for protecting fauna habitat and flora and vegetation health. Early response indicators and thresholds have also been included for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat. Clearing and land disturbance activities are managed through the Roy Hill GDP process.</p> <p>“Significant Habitat features” within the Mine Vertebrate Fauna Management Plan refers to specific features, such as a burrow, a cave or water feature, and does not represent habitats in general. Table 7 of MVFMP has been updated to reflect this (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>
101	DAWE	<p><u>Greater Bilby</u></p> <p>2,428.3 ha of habitat is within the mine site, however, only 1,419 ha of good to excellent habitat is proposed to be offset. According to the ERD, surveys and recordings demonstrate that the species actively utilised the “poorer” quality habitats for up to a year before being killed. Provide further justification of why</p>	<p>Roy Hill acknowledge the importance of Mulga Woodland, Mulga Drainage, Mulga Spinifex and Spinifex Sandplain habitat for the Greater Bilby and will offset for these habitats that are impacted from the implementation of the Revised Proposal. Roy Hill’s Impact Reconciliation Procedure (Roy Hill, 2021a) has been updated to outline the proposed offsets per IBRA Subregion (Roy Hill, 2021d).</p>

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		only habitat in good and excellent condition will be offset for the species.	
10 2	DAWE	<p><u>Greater Bilby</u></p> <p>Discuss and provide supporting map(s) (possibly adding to Figures 7-5 and 7-7) of where the 1,419 ha of good/excellent habitat and supporting Greater Bilby habitat is located within the revised development envelope and what 'patches' are needing to be offset.</p>	Roy Hill acknowledge the importance of Mulga Woodland, Mulga Drainage, Mulga Spinifex and Spinifex Sandplain habitat for the Greater Bilby and will offset for these habitats that are impacted from the implementation of the Revised Proposal. Roy Hill's Impact Reconciliation Procedure, Appendix 8 of this response to submissions document (Roy Hill, 2021d), has been updated to outline the proposed offsets per IBRA Subregion.
10 3	DAWE	<p><u>Greater Bilby</u></p> <p>The Remote MAR borefield diagram in Figure 7-5 of the ERD demonstrates that there is a significant amount of high importance habitat, which corresponds with the historical Greater Bilby evidence in the area. However, this area does not look like it will have the flexibility in alternative areas as shown further south in Figure 7-6 of the ERD. Please provide further justification that there will be no significant residual impact to the species in this area and the design will have the flexibility to avoid this area.</p>	<p>The flexible nature of the infrastructure for borefields provides the ability to avoid direct impacts to threatened Priority flora and fauna, associated habitat and identified significant fauna locations. As the Borefield pipeline route and bore locations have not yet been finalised, Roy Hill is committing to undertaking targeted fauna surveys to occur prior to final borefield alignment to ensure that threatened fauna and associated habitats can be avoided where possible.</p> <p>In addition, following the targeted fauna surveys, field-based personnel who undertake the ground disturbance will be trained in identifying Greater Bilby burrows, scats, and signs to enable avoidance of occupied burrows.</p> <p>Where an occupied Greater Bilby burrow is located near a proposed infrastructure barrier (e.g. pipelines), it will be designed and built in a way that does not fragment Greater Bilby habitat (for example, pipelines will be buried at short intervals to ensure continual habitat conductivity and be incorporated into basis of design).</p> <p>Roy Hill has designed the development envelope to be of sufficient area for the Remote MAR to permit this flexibility. Where active bilby burrows are identified, a restriction zone will be applied.</p> <p>Roy Hill considers trapping and translocation to be a last resort option and would be assessed on a case-by-case basis, depending on the species. There are several measures which would be implemented prior to this option, including but not limited to; total avoidance, assessment/monitoring of the area and ultimately consultation with DBCA prior to any form of disturbance. Trapping and translocation of conservation significant species would only be performed</p>

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			<p>based on ecologist advice and in consultation with DBCA to ensure it is the most suitable mitigation measure.</p> <p>As outlined in Section 4.4.3.1 of the ERD, the Borefield pipeline route and bore locations have not yet been finalised and Roy Hill is committing to undertaking targeted fauna surveys prior to final borefield alignment to ensure that threatened fauna and associated habitats can be avoided. Given the flexible nature of the borefields, Roy Hill anticipates that active bilby burrows can be avoided (Roy Hill, 2020a).</p> <p>In the event that a conservation significant species was identified as occurring and was required to be translocated, Roy Hill would engage with DBCA on methodology and proposed relocation area. When Roy Hill found the bilby on site, Roy Hill engaged with DBCA (Dr Martin Dziminski, DBCA Research Scientist) on the management response that was applied to minimise harm to this individual and would consult with DBCA if a similar situation arose again, to ensure an agreed mitigation strategy is implemented.</p>
104	DAWE	<p><u>Greater Bilby</u></p> <p>Figure 8 in the Vegetation Risk Assessment report (Appendix 9, Astron 2019) demonstrates that the groundwater will mound to >10 m in the southwestern borefield and 1-5 m around the southern borefield in areas where antecedent groundwater levels are 5-10 m deep. However, the risk to the surrounding vegetation has been classified as ‘medium’ in the original vegetation risk assessment, which the Department considers maybe an underestimate based on consequences to the Greater Bilby. Further, the Greater Bilby is known to burrow in this habitat, with burrows potentially reaching 2 m deep, which may place them at minor risk of inundation by the potential mounding. Therefore, a more detailed analysis of the impacts to Greater Bilby habitat within the spinifex</p>	<p>Roy Hill engaged Astron to undertake an additional assessment with refined hydrological criteria to identify at risk areas depending on the rate of mounding or antecedent SWL at 1m change resolution. This is included as an Addendum (Astron, 2020) to Appendix 9 of the ERD, in Appendix 1 of this response to submissions document).</p> <p>Additional information relating to consequence ratings assigned to Hummock grasslands in the Southern borefield has been provided by Astron and is available below and in the Astron LOM WMS Vegetation Risk Assessment Consequence Memo, Appendix 3 of this response to submissions document (Astron, 2021).</p> <p>Roy Hill acknowledge the importance of Hummock grassland as habitat for the Greater Bilby. The LOM WMS Vegetation Risk Assessment (Astron, 2019) determined consequence of Hummock Grassland depending on resource availability, substrate type and adequacy of vegetation mapping. Resource availability is spatially and temporally variable in the landscape due to factors such as fire and rainfall and are largely unknown across the model extent. Hummock grassland could not be distinguished from Tussock grassland and bare soil across much of the assessment area due to the method used for the mapping (satellite/aerial imagery). As such, substrate type is especially relevant</p>

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		<p>sandplains from groundwater mounding and salinisation near these borefields need to be provided. Subsequent monitoring programs of the impacts to this habitat, thresholds and management actions will also need to be established to minimise the impacts to the Greater Bilby.</p>	<p>for the distribution of burrowing mammals such as the Greater Bilby. Characteristic landscape types occupied by the Greater Bilby include sand, sandy clay, sandy loam and alluvial and calcareous areas, as well as red earthy and sandy soils. The Grassland/bare soil vegetation type of the LOM WMS Risk Assessment falls within the Fortescue Valley Soil-Landscape zone, which is characterised by alluvial plains, hardpan wash plains and sandplains (with stony plains, floodplains and some salt lakes) on alluvial deposits over sedimentary rocks of the Hamersley Basin. Although this substrate would not preclude Greater Bilby burrowing, it does not represent an optimal soil type for the species. Based on these observations of variable resource availability, sub-optimal substrate for burrowing and uncertainty in the actual distribution of Hummock grassland across the assessment area, the original consequence level of Slight is considered appropriate.</p> <p>It should also be noted that where the Grassland intersected a PEC, the consequence level was elevated from Slight to Minor.</p> <p>The Roy Hill LOM Water Management Strategy (GHD, 2019b), Appendix 2 of the ERD, outlines that any groundwater mounding that may occur will be managed to ensure it will not come within 5m of the ground surface (as outlined in Table 2-1 of the Water Management Plan (Roy Hill, 2021a)). Control MAR monitoring bores installed next to each injection bore will provide data on the responses to reinjection in both the shallow and deep aquifers and are used to control and regulate the operation of the reinjection bores in terms of water flows and groundwater levels. Regional MAR monitoring bores have been installed within and outside the borefield to monitor the regional impacts of the reinjection. The 5mbgl mounding limit outlined in Table 2-1 of the Water Management Plan significantly reduces the number of potential impact outcomes in the risk assessment. As an example, a groundwater level change scenario where antecedent water levels are 5mbgl and mounding is between 6-7m theoretically leading to vegetation inundation would not occur. The Water Management Plan provisions trigger and threshold for mounding of groundwater from MAR is 6mbgl and 5mbgl respectively. Therefore, the risk to vegetation is negligible. For this reason, it is unlikely that Greater Bilby habitat and burrows would be affected by groundwater mounding (Roy Hill, 2021a; Appendix 4 of this response to submissions document).</p> <p>Table 4-38 in Section 4.4.6 of the ERD outlines mitigation measures for Terrestrial Fauna (Roy Hill, 2020a).</p>

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			The Roy Hill Vegetation Management Plan (Roy Hill, 2021c; Appendix 7 of this response to submissions document) and Water Management Plan (Roy Hill, 2021a) (Appendix 4 of this response to submissions document) outline both outcome-based and objective-based actions and the key requirements for protecting fauna habitat and flora and vegetation health. These plans include early response indicators and thresholds for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat.
10 5	DAWE	<p><u>Greater Bilby</u></p> <p>Only direct impacts to Greater Bilby habitat are proposed to be offset. Given the uncertainty of the indirect impacts of changes of hydrology, especially in the borefields, these impacts may be much larger than what have been currently modelled. Further explain how indirect impacts will be monitored alongside Greater Bilby populations, and how further offsets for these impacts will be managed.</p>	<p>As outlined in Section 6.2.3 of the ERD, Roy Hill is committed to providing offset for vegetation in good to excellent condition and Greater Bilby habitat in good to excellent condition in the Mine area (Roy Hill, 2020a). All other aspects from the Proposed Changes are deemed to be manageable within the mitigation hierarchy and will not result in a significant residual impact. The Roy Hill Vegetation Management Plan (Roy Hill, 2021c; Appendix 7 of this response to submissions document) and Water Management Plan (Roy Hill, 2021a; Appendix 5 of this response to submissions document) outline both outcome-based and management-based actions and early response indicators and thresholds for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat. With implementation of these management plans, which contain triggers and thresholds to monitor impacts, indirect impacts are not expected to occur.</p> <p>These plans will be used in consultation with the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f; Appendix 10 of this response to submissions document) to monitor and manage impacts to terrestrial fauna.</p> <p>Vegetation monitoring programs, as outlined in the Vegetation Management Plan (Roy Hill, 2021c; Appendix 7 of this response to submissions document), will identify and quantify any significant indirect impacts that occur to vegetation and flora. If the vegetation is not recoverable after a period of 5 years, and has been attributed to impact from operations, then the area of impact will be determined and will be reported on in the relevant impact reconciliation annual report (Roy Hill, 2021d; Appendix 8 of this response to submissions document).</p>
106	DAWE	<p><u>Ghost Bat</u></p> <p>Figure 7-10 of the ERD identifies a different revised development envelope boundary than all the other</p>	Figure 1-3 of the ERD provides clear illustration of Roy Hill's current granted tenure, application tenure and the Revised Development Envelope. Figure 2-3 of the ERD outlines the current Roy Hill

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		<p>figures provided in the ERD (e.g. Figure 2-3) or the shapefile provided to the Department as part of the referral. Figure 7-10 shows that the Ghost Bat cave is not within the revised development envelope, which is different to what is provided in Figure 4.11 in Appendix 26. Advise whether the revised development envelope boundary was modified in this instance and provide evidence of which one is correct throughout the ERD. Please also address why section 7.5.4.5.1 of the ERD states that the cave is outside of the boundary but looks like it is well inside the boundary in Figure 4.11 in Appendix 26.</p>	<p>mining project tenure granted through the Original Proposal, not the revised development envelope boundary.</p> <p>Figure 4.11 of Appendix 26 of the ERD shows the vertebrate fauna records recorded within the Roy Hill tenements, not the Revised Development Envelope. The survey maps provided within the Biologic report are based on the Roy Hill tenements (Biologic, 2018). As outlined in Section 1 in Appendix 26 of the ERD, the area surveyed included a 2km buffer extending out from Roy Hill's tenement boundaries (Biologic, 2018).</p> <p>Figure 7-10 in the ERD outlines Ghost Bat habitat relative to the Revised Development Envelope (Roy Hill, 2020a). During development of the Revised Proposal, the original development envelope was amended to exclude the Ghost Bat cave to ensure it was protected. The Ghost Bat cave is located approximately 50m outside of the Revised Development Envelope, with the realigned gazetted Marble Bar public road located between the mine and cave. Figure 2-6 has been provided indicating the location of the cave outside of the Revised Development Envelope (Roy Hill, 2021i; Appendix 18 of this response to submissions document).</p> <p>An updated Figure 2-3 has been provided that includes both Roy Hill's tenure and the Revised Development Envelope boundary (Roy Hill, 2021i; Appendix 15 of this response to submissions document).</p>
107	DAWE	<p><u>Ghost Bat</u></p> <p>The ERD states that a 160 m exclusion zone (80 m either side) has been implemented to avoid any disturbance to the cave and that it is approximately 500 m away from any mining activities. Provide modelled evidence and expert opinion that the mining operations will not indirectly impact the cave structural integrity such as blasts, vibration of machinery, removal of overburden, and any other mining activities and that the 160 m exclusion zone is appropriate based on best practices for the species</p>	<p>After consultation with the Department of Water and Environmental Regulation, the 160m cave exclusion zone has been updated to 1km (500m either side), where development, clearing of vegetation, mining activities and unauthorised access are not permitted. The Mine Vertebrate Fauna Management Plan has been updated to include this requirement in Section 2 (Roy Hill, 2021f; Appendix 10 of this response to submissions document) and Figure 2-7 has been provided to illustrate the updated exclusion zone (Roy Hill, 2021m; Appendix 19 of this response to submission document).</p> <p>The Ghost Bat cave is located approximately 50m outside of the Revised Development Envelope and Roy Hill confirms that no mining activities will be undertaken within 500m radius of the cave. The standard blast exclusion zone is 500m, outside of which, there is unlikely to be impacts from the blast. As outlined in Table 7-12 of the ERD, there will be no impacts to the diurnal Ghost Bat roost</p>

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		and expert advice. The microclimate conditions of the cave will also need to be maintained to support the species. Clarify how ongoing monitoring (including timing) and repairs of the cave condition will be part of the mitigation measures for the Ghost Bat and, if the cave is destroyed as part of the proposed action, how this impact will be offset.	<p>cave as it is located outside the Revised Development Envelope (Roy Hill, 2020a). There was no specific modelling or investigation completed to determine and justify the ghost bat cave exclusion zone. The Ghost Bat cave is located 170 metres from the Marble Bar Road which is a public road beyond the jurisdiction of Roy Hill. Roy Hill does not believe entry signage to be appropriate along this public road as it may attract increased public visitation. There is a fence between Marble Bar Rd and the cave which restricts public access.</p> <p>Clearing or impact outside of the tenure and development envelope is a reportable event and will be non-compliant with Ministerial Statement. In the unlikely event that the cave was cleared or impacted, the event would be reported to DWER and management actions would be developed.</p> <p>After recent consultation with the EPA, Roy Hill has committed to monitoring the Ghost Bat cave through fixed point laser scanning. Baseline scanning has been completed prior to any blasting occurring within 600m of the cave. Additional scanning will be conducted annually within those years where mining activities are undertaken within 600m of the cave feature. Entry to the Ghost Bat cave will only occur by authorised Roy Hill personnel for the purposes of environmental monitoring. Structural monitoring of the Ghost bat cave has now been included in Table 9 of the Vertebrate Fauna Management Plan (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p> <p>Roy Hill does not consider that temperature and humidity of the Ghost Bat cave would change from current measurements as a result of mining activities. Roy Hill considers any monitoring within the cave (i.e. which includes human visitation to the cave entrance) to be potentially invasive and could result in occupying ghost bats abandoning the cave, and hence Roy Hill is not supportive of implementing such disturbance activities.</p> <p>The Conservation Significant Fauna Offsets Strategy has been updated to outline that Roy Hill will provide offsets if the Ghost Bat cave is damaged or destroyed indirectly from mining activities. Roy Hill will comply with the commitments outlined in the Mine Vertebrate Fauna Management plan to not impact within the exclusion zone and minimise Ghost bat mortality (Roy Hill, 2021f; Appendix 10 of this response to submissions documentRTS).</p>
108	DAWE	<u>Ghost Bat</u>	Roy Hill's basis of design requires no barbed wire be used for fences on-site unless required for safety purposes (eg around the explosives facilities). The pastoral fence in the vicinity of the cave have been

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		<p>Section 7.5.4.3 of the ERD states that the 2018 fauna surveys (Appendix 26) found a deceased Ghost Bat on a barbed-wire pastoral fence. Section 7.5.4.5.4 and Appendix 35 (Mine Vertebrate Fauna Management Plan) of the ERD state that the pastoral fences in the vicinity of the cave will be changed to plain wire. Discuss how much barbed wire remains within the revised development envelope and indicate whether abandoned barbed wire fencing will be removed as part of the mitigation measures for the species.</p>	<p>changed to plain wire, in consultation with the Pastoral manager, and the replaced barbed wire was removed from site.</p> <p>There are other pastoral fences within the Development Envelope which contain barbed wire which are not associated with the Revised Proposal. It is considered that the Revised Proposal does not increase the risk over that of the Original Proposal.</p> <p>There is only one explosives facility on site and it is located near the Tailings Storage Facility, roughly 12.8km north-west of the Ghost Bat Cave and 9km south-west of the overhangs present outside of the Revised Development Envelope.</p> <p>The length of the fence located in front of the Ghost Bat cave is now installed with plain wire. Roy Hill commit to not using any barbed wire within the 1000m (500m radius) exclusion zone. The Mine Vertebrate Fauna Management Plan has been updated to reflect this commitment (Appendix 10 of this response to submissions document; Roy Hill, 2021e).</p>
109	DAWE	<p><u>Ghost Bat</u></p> <p>Table 7-12 of the ERD mentions there is a diurnal roost identified in the revised development envelope. Provide a map that shows where in the revised development envelope this roost is located as well as the two shelters identified in the 2018 fauna surveys (Appendix 26)</p>	<p>A map outlining the location of the diurnal roost cave and the two overhangs has been provided with supporting evidence (Figure 2-6; Appendix 18 of this response to submissions document). These three features are located outside of the Revised Development Envelope (Roy Hill, 2021l).</p> <p>Table 7-12 of the ERD states that one diurnal Ghost Bat roost cave was recorded outside the Revised Development Envelope (currently located within the original development envelope).</p>
110	DAWE	<p><u>Ghost Bat</u></p> <p>The Mine Vertebrate Fauna Management Plan (Appendix 35) outlines some measures to ensure limited human disturbance impacts on the maternal cave. Outline specific mitigation measures to control human interaction and domestic animals that will be</p>	<p>Roy Hill would like to clarify that the Ghost Bat cave is a diurnal cave.</p> <p>A 1km (500m radius) exclusion zone has been placed over the roost whereby development, clearing of vegetation and unauthorised access is not permitted. Figure 2-7 has been provided to illustrate the exclusion zone (Roy Hill, 2021m; Appendix 19 of this response to submissions document). The cave is located to the east of the gazetted realigned Marble Bar Road which sits between the roost and the Mine and acts as a hard barrier preventing mine related disturbance. The closest proposed mining pit</p>

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		implemented to protect the cave and confirm how this will be enforced.	<p>activity is located approximately 500m to the west of the exclusion zone. The Ghost Bat cave is located approximately 50m outside of the Revised Development Envelope.</p> <p>After recent consultation with the DWER, Roy Hill has committed to monitoring the Ghost Bat cave through fixed point laser scanning. Baseline scanning has been completed prior to any blasting occurring within 600m of the cave. Additional scanning will be conducted annually within those years where mining activities are undertaken within 600m of the cave feature.</p> <p>Clearing outside of the Revised Development Envelope is a reportable event. The incident would be reported to DWER and subsequent action and measures would be established. Clearing and land disturbance activities are managed through the Roy Hill GDP process.</p> <p>Fauna and habitat mitigation and management measures are outlined in the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p> <p>Roy Hill will implement the following management actions:</p> <ul style="list-style-type: none"> - Increase the size of the cave habitat exclusion zone (CHEZ) to 1000 m (500 m radius) - Roy Hill will implement a 50 km night-time speed limit on Roy Hill roads within the Revised Development Envelope area which falls within the 1000m CHEZ. - Inductions to include biosecurity information for cane toads to increase personnel awareness and reporting. - Response strategy and actions will be put in place and implemented if Cane Toads are found on site. - Directional lighting will be used. This should prevent light impacting the roosting site. - Fixed point laser scanning of the cave feature to obtain baseline structural data and ensure the structural integrity of the cave feature is maintained <p>Roy Hill does not believe that it will either directly or indirectly impact the Ghost Bat Cave, however, as a precaution, it has committed to offsetting any impact to the cave. The Mine Vertebrate Fauna Management Plan has been updated to include these requirements in Section 2 (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>

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111	DAWE	<p><u>Ghost Bat</u></p> <p>Section 7.5.4.5.1 of the ERD states that lighting and noise impacts will be mitigated using a 160m buffer to the cave and the Mine Vertebrate Fauna Management Plan states that lighting impacts will be mitigated where practicable. Discuss how these measures will follow the principles of best lighting design outlined in the <i>National Light Pollution Guidelines for Wildlife</i> and provide evidence that lighting impacts will be monitored and iteratively adjusted to the responses of Ghost Bat populations. Remove all references to 'where practicable' from Management Plans including the Mine Vertebrate Fauna Management Plan.</p>	<p>As per the <i>EPBC National Light Pollution Guidelines for Wildlife</i>, directional lighting will be used in active mining areas, the airport and accommodation village. It is a requirement that sufficient lighting is provided to maintain a safe working environment.</p> <p>The Ghost Bat cave is located approximately 50m outside of the Revised Development Envelope, to the east of the gazetted realigned Marble Bar Road, which sits between the roost and the Mine and acts as a hard barrier preventing mine related disturbance. Mining activities will be undertaken more than 500m radius away from the Ghost Bat cave and directional lighting will be used. This should prevent light impacting the roosting site.</p> <p>In addition to this, as outlined in the Mine Vertebrate Fauna Management Plan (Roy Hill, 2021f; Appendix 10 of this response to submissions document), Roy Hill will implement the following mitigation measures to minimise the impact to terrestrial fauna:</p> <ul style="list-style-type: none"> - Machinery and equipment will be fitted with noise attenuation measures to meet personnel safety requirements. - Installation of lighting that direct lights toward plant areas to minimise light spill into adjacent vegetated areas. - Equipment design will specify compliance with Australian Standard noise limits. - Maintain equipment to minimise noise and vibration in accordance with manufacturers requirements. <p>Roy Hill has undertaken a review of the 'where practicable' in the Mine Vertebrate Fauna Management Plan and removed where necessary.</p>
112	DAWE	<p><u>Ghost Bat</u></p> <p>Discuss how the possible cane toad invasion of the revised development envelope will be monitored and the control measures that will be put in place.</p>	<p>The cane toad's key area of distribution in WA is currently confined to the Kimberly region and evidence of unaided movement into the Pilbara region has not been recorded. As outlined in Section 7.5.2.4 of the ERD, a deceased Cane toad was found at the Roy Hill Mine in 2015 during construction of the Mine. However, it is believed that this animal arrived as a 'hitch-hiker' in equipment that travelled from the Kimberley (Roy Hill, 2020a). A response strategy was formed immediately, which included targeted Cane toad surveys that were undertaken by Roy Hill staff. No Cane toads were found at the time and no Cane toads have been found at the Mine since.</p> <p>Before entering the Mine site, equipment and machinery are inspected by site environment personnel for weeds, seeds and potential contaminants. Coupled with on-site education and</p>

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			inductions for all personnel, Roy Hill does not consider that Cane toads are a threat at the Roy Hill Mine. In the event that this changes in the future, Roy Hill would put in place similar response actions that were utilised in 2015.																								
113	DAWE	<p><u>Pilbara Olive Python</u></p> <p>Section 7.5.6.5.1 of the ERD states that the proposed changes will increase the direct impacts to the Pilbara Olive Python by 53.61%. Clarify what type of habitat this will be impacting or if it's a combination of Low Rocky Hills and Major Drainage Line habitat.</p>	<p>As outlined in Section 4.4.3.4.1.9 of the ERD, potential suitable habitat within the Revised Development Envelope consists of Low Rocky Hills and Major Drainage Line habitats. These habitats include the habitat features – Low Rocky Hills, Mulga drainage line, Major drainage line and Minor drainage line (shown in Table 4-33). Roy Hill impact hectares have been revised, as outlined in Table 7-19 of the s43A application (Roy Hill, 2021b). The preferred habitat total includes these four habitat features.</p> <table border="1"> <thead> <tr> <th>Habitat Feature</th> <th>Mapped extent</th> <th>Direct impacts – Proposed Changes</th> <th>Direct im Proposal</th> </tr> </thead> <tbody> <tr> <td>Mulga drainage line</td> <td>2873.24</td> <td>416.29</td> <td>1336.21</td> </tr> <tr> <td>Major drainage line</td> <td>2574.15</td> <td>101.87</td> <td>405.49</td> </tr> <tr> <td>Minor drainage line</td> <td>1248.89</td> <td>44.64</td> <td>183.25</td> </tr> <tr> <td>Low rocky hills</td> <td>1403.39</td> <td>0.71</td> <td>289.76</td> </tr> <tr> <td>Total</td> <td>8,099.68</td> <td>563.51</td> <td>2214.71</td> </tr> </tbody> </table>	Habitat Feature	Mapped extent	Direct impacts – Proposed Changes	Direct im Proposal	Mulga drainage line	2873.24	416.29	1336.21	Major drainage line	2574.15	101.87	405.49	Minor drainage line	1248.89	44.64	183.25	Low rocky hills	1403.39	0.71	289.76	Total	8,099.68	563.51	2214.71
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114	DAWE	<p><u>Pilbara Olive Python</u></p> <p>Figure 7-14 of the ERD shows that the southern borefield will intersect with the semi-permanent waterbody. The water pools (and associated Groundwater Dependent Vegetation) will not be impacted according to Table 4-33.</p>	<p>The flexible nature of the infrastructure for borefields provides the ability to avoid direct impacts to habitat features such as semi-permanent water bodies. The proposed infrastructure barriers, (e.g. pipelines) will be designed and built in a way that does not fragment MNES habitat. For example, pipelines will be buried at short intervals to ensure continual habitat conductivity, allowing fauna access to the water body and be incorporated into basis of design. Roy Hill has also committed to avoiding claypans and semi-permanent waterbodies. This is managed through the design process and then enforced through the Ground Disturbance Permit (GDP process).</p>																								

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115	DAWE	<p><u>Pilbara Olive Python</u></p> <p>The Conservation Advice for the Pilbara Olive Python identifies road kills associated with increased road traffic as a threat for the species. Clarify whether speed limits will be imposed for the species and if so what type of enforcement will be implemented. Discuss if identification/reporting of the species from a vehicle will also be part of the personnel training in the Mine Vertebrate Fauna Management Plan (Appendix 35).</p>	<p>On-site environmental inductions include training regarding Pilbara Olive Python and other conservation significant fauna, including reporting any sightings to the Environmental department. Given the limited sightings to date, Roy Hill is not proposing to implement speed limits for the Pilbara Olive Python. This is consistent with public roads in the Pilbara that do not have speed restrictions for the Pilbara Olive Python in potential habitat.</p> <p>In preparation for clearing for investigative drilling in the RMAR borefield, Roy Hill recently conducted targeted surveys of the proposed clearing areas and did not find any evidence of Pilbara Olive Python. The final borefield alignment will be designed and built in a way so that MNES habitat will not be fragmented.</p>
116	DAWE	<p><u>Night Parrot</u></p>	<p>As outlined in the Night Parrot Recovery Plan, “Night Parrots are essentially birds of the arid zone and require dense, low vegetation, under or in which they hide during the day. Most commonly they have</p>

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		<p>The Department notes a confirmed sighting of two individuals within samphire vegetation at the Fortescue Marsh in 2005. Provide a discussion that considers the risk assessment undertaken in Table 9 of Appendix 9 and the comments provided in relation to Fortescue Marsh that more critically assesses the impacts to this species</p>	<p>been found in hummock grasslands of porcupine grass or ‘spinifex’ (Triodia and Plectrachne species) or ‘samphire assemblages’...They have also been reported in low chenopod shrublands with saltbush and bluebush.” (Blyth, 1996).</p> <p>As outlined in Table 7-20 of the ERD, the Night Parrot was not recorded during surveys, despite extensive survey effort being undertaken. It is still possible that the species may occur due to the large size of the Revised Development Envelope, the inability for acoustic recorders to completely survey for the species and the expansive amount of potentially suitable habitat (Roy Hill, 2020a). However, Strategen (2018b) (Appendix 30 of the ERD) identified the likelihood of this species occurring in the Revised Development Envelope as low, with survey effort undertaken within the Revised Development Envelope as sufficient based on expert advice from Dr Steve Murphy, a recognised Night Parrot expert and Nick Leseberg, a PhD candidate examining the ecology of the Night Parrot (Strategen, 2018b; Appendix 30 of the ERD).</p> <p>Spinifex sandplain is considered to be potentially the most suitable habitat within the Revised Development Envelope. Roy Hill impact hectares have been revised, as outlined in Table 4-33 of the s43A application (Roy Hill, 2021b; Appendix 6 of this response to submissions document). A total of 10,023.46ha of Spinifex Sandplain habitat considered as potentially suitable for the species, occurs within the Revised Development Envelope and is in very good to excellent condition.</p> <p>Potential impacts resulting from habitat loss to the Night Parrot are considered low, as less than 4% of Spinifex Sandplain habitat within the Revised Development Envelope is directly impacted by the Proposed Changes. The majority of clearing within this habitat type is associated with low impact clearing of tracks in the Borefield area and no individuals have been found within the Revised Development Envelope. Due to the low impact nature of clearing associated with borefields (being low intensity clearing of relatively small areas for drill pads and tracks), the paucity of records for this species, it is considered that potential impacts from habitat clearing to the Night Parrot will be negligible.</p> <p>Indirect impacts from groundwater mounding, salinity or unbalanced growth could result in habitat degradation. The Astron (2019) LOM Vegetation Risk Model (Appendix 28 of this response to submissions document) identified areas where groundwater mounding and salinization due to mounding may potentially occur. It was estimated that there were low to medium risks of groundwater mounding potentially degrading 6.21ha of potential species habitat (Astron, 2019),</p>

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			<p>Appendix 1 of this response to submissions document. The Proposed Changes are unlikely to modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.</p> <p>Current vegetation monitoring does not cover spinifex habitat. Roy Hill will monitor spinifex habitat using a combination of remote sensing data (Worldview3, Sentinel and/or UAV) and on-ground verification, which can be added to the annual vegetation health monitoring once a practical program has been developed.</p> <p>As outlined in Section 4.4.3.4.2.4 of the ERD, despite extensive survey effort being undertaken, the Night Parrot was not recorded during any of the surveys. Whilst the survey area and amount of potentially suitable habitat is expansive, the likelihood of this species occurring and the risk of impact to this species in the Revised Development Envelope is considered to be low (Roy Hill, 2020a).</p>
117	DAWE	<p><u>Night Parrot</u></p> <p>Given the extensive amount of habitat across the revised development envelope and the nearby Fortescue Marsh that may support the Night Parrot, please confirm that a long-term monitoring program will be established for the species.</p>	<p>Given the information outlined in the line item above, Roy Hill do not consider that a long-term monitoring program is required.</p> <p>Current vegetation monitoring does not cover spinifex habitat. Roy Hill will monitor spinifex habitat using a combination of remote sensing data (Worldview3, Sentinel and/or UAV) and on-ground verification, which can be added to the annual vegetation health monitoring once a practical program has been developed.</p>
118	DAWE	<p><u>Night Parrot</u></p> <p>Section 7.5.7.5.3 of the ERD states that a Fire Management Plan will be implemented to control fuel loads, maintain fire breaks, and for the implementation of emergency response procedures. Discuss how this management plan will avoid and protect the preferred habitats for Night Parrot (and Princess Parrots), which is long-unburnt spinifex habitat (classified as Spinifex Sandplain in ERD).</p>	<p>The Roy Hill Fire Management Plan will be developed for emergency response purposes only. Fire breaks would be created around buildings and maintenance areas for safety and emergency purposes.</p> <p>Ongoing fire management for buildings and infrastructure within the Revised Development Envelope would include fuel load assessments, firebreak maintenance and emergency response procedures. Roy Hill does not commit to fire management practices for other purposes.</p>

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			The likelihood of extensive and intense fires occurring is low and inappropriate fire regimes are unlikely to result in a significant impact to the Night Parrot or Princess Parrot as a result of the Proposed Changes.
119	DAWE	<p><u>Migratory Birds</u></p> <p>Figures 7-15 to 7-17 of the ERD demonstrate that there is important habitat for Migratory Birds within the revised development envelope. Discuss how these habitats will be monitored for indirect impacts due to changes in hydrology and clarify how this monitoring will be used to assess impacts to Migratory birds, thresholds that will be used, and actions in place to mitigate and rehabilitate these potential impacts.</p>	<p>Table 4-38 in the ERD outlines mitigation measures to address potential impacts to terrestrial fauna. To reduce indirect impacts to Migratory bird habitat associated with the Proposed Changes, Roy Hill will align access tracks to avoid clearing claypan habitat (Roy Hill, 2020a).</p> <p>When the mitigation and management measures have been implemented, the Revised Proposal does not trigger the criteria outlined in Table 4-38 of a significant impact for listed migratory species. Therefore, significant impacts to migratory waterbirds as a result of the Revised Proposal are considered unlikely.</p> <p>In consultation with the Department of Water and Environmental Regulation, Roy Hill have updated the Vegetation Management Plan and Mine Water Management Plan (Roy Hill, 2021c; Roy Hill, 2021a; Appendix 7 and 5 of this response to submissions document). These plans outline both outcome-based and management-based actions and the key requirements for protecting fauna habitat and flora and vegetation health. Early response indicators and thresholds have also been included for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat.</p>
120	DAWE	<p><u>Migratory Birds</u></p> <p>The Fortescue Marsh has known recordings of the Curlew Sandpiper (<i>Calidris ferruginea</i>) and Australian Painted Snipe (<i>Rostratula australis</i>). Discuss whether monitoring programs for the potential impacts to the Fortescue Marsh will also include corresponding surveys of Migratory Birds to assess the indirect impacts from the dewatering program.</p>	<p>There is expected to be no direct impacts to the Fortescue Marsh as a result of the Revised Proposal and with the implementation of the approved management plans there will be no indirect impact on Fortescue Marsh. There are also no predicted impacts within claypans or the Fortescue Marsh PEC. Impacts to migratory bird habitat in the Fortescue Marsh from alteration in surface water flows resulting from the Proposed Changes are not considered to be of significance. The updated Roy Hill Vegetation Management Plan (Roy Hill, 2021c; Appendix 7 of this response to submissions document) and Mine Water Management Plan (Roy Hill, 2021a; Appendix 5 of this response to submissions document) outline both outcome-based and management-based actions and the key requirements for protecting fauna habitat and flora and vegetation health. These plans include early response</p>

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			<p>indicators and thresholds for vegetation health and condition decline, which has potential to impact fauna through loss or degradation of habitat.</p> <p>Vegetation health monitoring as part of the Roy Hill Vegetation Management Plan will assist in monitoring for potential impacts to groundwater dependent vegetation. Roy Hill do not anticipate any impacts on this vegetation or on Fortescue Marsh and therefore do not intend to monitor migratory species.</p>
121	DWER	Table ESO-3 Page 16 and the fauna management plan (FMP) states that no measurable reduction in the populations of conservation significant fauna or SRE. Confirm that this relates to Table 7 FMP if not provide further information /clarification on this outcome action.	Roy Hill confirm the intent is for the provisions outlined in the Mine Vertebrate Fauna Management Plan (MVFMP) to meet the objectives of the MVFMP (Roy Hill, 2021f; Appendix 10 of this response to submissions document).
122	DWER	Not all significant terrestrial fauna species are referenced within the FMP i.e. SRE <i>Antichiropus Sloanae</i>	Roy Hill would like to clarify this is because the MVFMP is related to <i>Vertebrate</i> Fauna species only.
123	DWER	Table 4-33 the direct impact for the proposed change (not the combined original and proposed change) of the fauna habitats appears to equate to 7,157 ha, however, section 4.4.5.1.1 and 4.4.7 states that the direct impact of the revised (new area) is 5,995 ha. Please confirm the fauna habitat to be directly impacted and the environmental significance of each fauna habitat type.	<p>As outlined in Table 4-33 of the ERD, the Hill Crest/Hill slope fauna habitat type outlines potential habitat for Short Range Endemics (SREs) whilst the other fauna habitat types are for vertebrate fauna (Roy Hill, 2020a). The Hill Crest /Hill slope habitat type groups several habitat types to outline the potential habitat for the Roy Hill Millipede (<i>Antichiropus sloanae</i>) as outlined in Figure 4-35 of the ERD and hence why it is greater than the direct area that Roy Hill is seeking approval for (5,402 ha) (Roy Hill, 2020a).</p> <p>In essence the Hill Crest/Slope habitat is not part of the direct impact/disturbance as it is already accounted for under the other recorded habitat types.</p>
124	DWER	Table 4-34, 4-36 includes Alluvial Plain as a fauna habitat but was not identified in Table 4-33. Please confirm.	In Table 4-33 of the ERD, Alluvial Plains is included within Major and Minor Drainage. This is an error as it should have been outlined that it was also included within the Drainage line values.

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			In Section 4.4.4.1 of the ERD, below Table 4-34, it outlines that some Fauna Habitats have been grouped to allow for comparison across sites (Roy Hill, 2020a).
125	DWER	ERD referenced Vertebrate Fauna Management Plan (100RH-3000-EN-REP-2009) the Vertebrate Fauna Management Plan (ERD Appendix 35) has a different reference No. OP-PLN-00324. Please confirm that this is the same management plan.	Roy Hill would like to clarify that these are different management plans. The Vertebrate Fauna Management Plan (100RH-3000-EN-REP-2009; Roy Hill, 2009b), was utilised along the rail corridor in 2014 for clearing.
126	DWER	Section 4.4.5.2.5.1 confirm that 723.66 ha of open tussock to be cleared (direct impact) in proposal area is incorrect as other areas referenced is 406.77 ha.	Roy Hill impact hectares have been revised and the updated direct and indirect impacts to Open Tussock Grassland is 715.83ha, consisting of 398.81ha direct impacts and 14.29ha indirect impacts as outlined in Table 4-33 of the s43a Application (Roy Hill, 2021b), Appendix 6 Of this response to submissions document.
127	DWER	Table 7-13 includes total foraging habitat, ghost cave. Table 4-30 and Section 7.5.4.1 indicates that Low Rocky Hills are potential roosting habitat for the species. Confirm whether this should also be included within the table.	<p>Section 7.5.4.1 of the ERD outlines – “The Low Rocky Hills habitat (1,403.39ha) can potentially contain roosting habitat (caves or deep crevices) for the Ghost Bat and despite extensive searches, only one roost cave for the species was identified within this habitat type. Potential foraging habitat for the Ghost Bat within the Revised Development Envelope includes Minor and Major Drainage Line habitat and Mulga wooded plains comprising 72,821.43ha within the Revised Development Envelope”.</p> <p>Table 4-30 of the ERD had an error as it does not list Eucalypt Woodland as habitat for the ghost bat.</p> <p>Roy Hill impact tables have been revised as outlined in the s43A application (Roy Hill, 2021b), Appendix 6 of this response to submissions document. The updated figures in Table 7-13 (below) are inclusive of Low Rocky Hills habitat.</p>

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			<p>Table 7-13: Habitat impacts for Ghost Bat</p> <table border="1"> <thead> <tr> <th>Fauna Habitat</th> <th>Roy Hill Mapped Habitat Extent (ha)</th> <th>Direct Impacts Original Proposal (ha)</th> <th>Direct Impact – Proposed Changes (ha)</th> <th>Proposed Changes Habitat Impact (%)</th> <th>Direct and Indirect Impacts - Proposed Changes (ha)</th> <th>Direct and Indirect Impacts - Revised and Original Proposals (ha)</th> <th>Direct Impacts – Heritage Management Area only (ha)</th> </tr> </thead> <tbody> <tr> <td>Total Foraging Habitat</td> <td>72,821.43</td> <td>5,792.55</td> <td>4,014.38</td> <td>5.51%</td> <td>4,471.58</td> <td>10,264.13</td> <td>259.57</td> </tr> <tr> <td>Ghost Bat Cave</td> <td>-</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Fauna Habitat	Roy Hill Mapped Habitat Extent (ha)	Direct Impacts Original Proposal (ha)	Direct Impact – Proposed Changes (ha)	Proposed Changes Habitat Impact (%)	Direct and Indirect Impacts - Proposed Changes (ha)	Direct and Indirect Impacts - Revised and Original Proposals (ha)	Direct Impacts – Heritage Management Area only (ha)	Total Foraging Habitat	72,821.43	5,792.55	4,014.38	5.51%	4,471.58	10,264.13	259.57	Ghost Bat Cave	-	0	0	0	0	0	0
Fauna Habitat	Roy Hill Mapped Habitat Extent (ha)	Direct Impacts Original Proposal (ha)	Direct Impact – Proposed Changes (ha)	Proposed Changes Habitat Impact (%)	Direct and Indirect Impacts - Proposed Changes (ha)	Direct and Indirect Impacts - Revised and Original Proposals (ha)	Direct Impacts – Heritage Management Area only (ha)																				
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Ghost Bat Cave	-	0	0	0	0	0	0																				
128	DWER	<p>Please provide a copy of the following (which are referenced in the ERD)</p> <ul style="list-style-type: none"> • Saline Water Use Procedure (OP-PRO-01073) • Annual feral animal management control program • Fauna Management Procedure (OP-PRO- 00134) • Greater Bilby Fauna Survey Work Instruction (OPWIN-06784) • Fauna Trapping and Translocation Program Guideline (100RH-0000-EN-GUI-2010). 	<p>Roy Hill has provided a copy of these documents except the Fauna Trapping and Translocation Program Guideline as this plan was utilised along the rail corridor for the clearing in 2014 and is no longer considered relevant.</p>																								
129	DWER	<p>The ERD refers to the VFMP in relation to noise emissions, which states: “Maintain equipment to minimise noise and vibration in accordance with manufacturers requirements” and the emission will be “Monitored during regular workplace and environmental inspections”:</p> <ul style="list-style-type: none"> ○ How are emissions monitored? 	<p>Noise emission monitoring is determined from discussions with people undertaking the inspections and those in the workforce who utilise and operate the equipment.</p>																								
130	DWER	<p>VFMP (2021-Rev 3) (OP-PLN-00324). The following amendments are proposed/suggested for the VFMP:</p> <ul style="list-style-type: none"> • The term “exclusion zone” this need to be clarified within the mgt plan. For example, <ul style="list-style-type: none"> ○ exclusion zone for bat cave includes no development, no clearing of vegetation and no unauthorised access. 	<p>The following changes have been incorporated into the MVFMP (Roy Hill, 2021f; Appendix 10 of this response to submissions document):</p> <ul style="list-style-type: none"> • Exclusion zone has been defined in Section 1.2.3.1.1 and included in the definitions table in Section 5. • The 1km Bilby ‘exclusion zone’ has been updated to ‘restricted zone’ and has also been defined within definitions table in Section 5. • The restricted zone has been updated throughout the plan. The Greater Bilby Work Instruction has been included as references in Table 8. 																								

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		<ul style="list-style-type: none"> ○ Based on the information and discussions (02/06/2021) the 1km Greater Bilby exclusion zone is more a 'restricted zone'. ○ Clarify the procedures for the 'restricted zone'. Potential cross reference with the Greater Bilby Work procedure (Table 7). ● Table 7/ 8 No direct or adverse impacts to the cave habitat feature <ul style="list-style-type: none"> ○ Threshold Criteria: add 'Permanent structural damage to potential diurnal/maternal Ghost Bat roost cave as shown in Figure 1-7' 	<ul style="list-style-type: none"> ● Roy Hill has updated Table 7 – Outcome-based provisions within the plan to include 'Permanent structural damage to potential diurnal cave' as a threshold criterion.
131	DWER	<ul style="list-style-type: none"> ● Table 7- response actions state 'rehabilitate the disturbance area as appropriate' (for clearing within Claypan habitat, Bilby habitat, semi-water body habitat. What is the completion criteria for the rehabilitation of these habitats? Need to include within the plan. 	Roy Hill considers that rehabilitation including completion criteria is addressed in the Mine Closure Plan which is approved by DMIRS.
132	DAWE	<p>Please, specify what the speed limit will be when a known significant fauna habitat feature is close to the mining activities.</p> <p>Moreover, if the proponent has jurisdiction in the highway (Marble Bar Road) located close to the cave. Please, establish a speed limit to avoid or minimize vehicle strikes with Ghost bats because the closest distance between the highway and the cave is less than 160m. The speed limit should be established at least for the parts of the highway that lays within the CHEZ.</p>	<p>Roy Hill does not have jurisdiction over Marble Bar Road and cannot alter the speed limits set for this Highway. Jurisdiction for this highway falls under Main Roads.</p> <p>The MVFMP has been updated to include these requirements in Section 2 (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>
133	DAWE	<p>Please include biosecurity measures to avoid the introduction of cane toads to the proposal site. The proposal site contains suitable foraging habitat for the Ghost bat; therefore it is relevant that cane toads do not be present within the proposal site where Ghost</p>	<p>Roy Hill site inductions will be updated to include biosecurity information for cane toads to increase personnel awareness and promote reporting of cane toads.</p> <p>Roy Hill will put in place and implement response strategy and actions if Cane Toads are found on site.</p>

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		<p>bats forage. Ghost bats can be poisoned by eating cane toads.</p> <p>The Department recommends including cane toads in a “feral animal and introduced species control and management plan” which should include monitoring, assessment, and control measures to avoid the introduction of cane toads in the proposal area.</p>	<p>The MVFMP has been updated to include these requirements in Section 2 (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>
134	DAWE	<p>In this section the Department recommends adding additional information about noise, light, and vibration mitigation measures to minimise indirect significant impact on the important Ghost bat roosting site.</p> <p>For light impacts: please provide more detailed information about artificial light management measures to mitigate impacts on the roost site and within the proposal site that contains suitable foraging habitat for this species. The Department experts recommend that artificial light should not spill into roost sites. This is because artificial light can interfere with natural lighting cues and emergence routes, may affect juvenile growth rates, reduce bat numbers, and can even lead to roost abandonment or deaths. Also, excessive light is likely to have an effect on the natural foraging behaviour of Ghost bats. Ghost bats are highly susceptible to roost disturbance and its predicted behavioural response to light is of avoidant. Therefore, precaution measures should be taken, and artificial light should be avoided at or near roost sites to avoid or potential effects. Also, artificial light mitigation measures should be implemented taking into account the presence of foraging habitat for the species within the proposal site.</p> <p>Best practices are to light only the object or area intended, use the lowest intensity lighting appropriate for the task and chose the appropriate commercial luminaire type if still artificial light is needed for</p>	<p>As outlined by the Department, Ghost Bats are highly susceptible to roost disturbance, and Roy Hill believes that installing monitoring equipment within the roost could potentially disturb any Ghost Bats present within the cave.</p> <p>Roy Hill confirm that the cave is a diurnal roost. This cave feature does not represent a biologically important feature as it is not used continuously by Ghost bats, but rather is occupied on an ad hoc basis. Roy Hill does not believe that light, dust, noise would affect microclimatic conditions of the Ghost Bat cave, only structural changes would alter this (e.g. cave collapse). Roy Hill is performing Fixed point laser scanning of the cave feature to obtain baseline structural data, and annually thereafter for within those years where mining activities are undertaken within 600m of the cave feature and outside the CHEZ extent. This monitoring will aim to ensure the structural integrity of the cave feature is maintained.</p> <p>Roy Hill does not believe that it will either directly or indirectly impact the Ghost Bat Cave, however, as a precaution, it has committed to offsetting any impact to the cave.</p> <p>As outlined by the Department’s information, it has been indicated that Ghost bats can habituate to the sound from mining activities when a buffer of several hundred meters from the entrance is established. As mining activities will be located more than 500m from the ghost bat cave entrance, Roy Hill does not believe the Ghost Bats will be susceptible to noise impacts from the Roy Hill operations.</p> <p>As outlined by the Department’s information, it has been indicated that blasting at distance between 50 to 400 m from a roost site will provide levels of vibration that may disturb the Ghost bats. As Roy Hill will not be undertaking any mining activity within 500m of the cave, Roy Hill does not believe the Ghost Bats will be susceptible to vibration impacts from the Roy Hill operations.</p>

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		<p>human safety. Please refer to the table A (below) for appropriate commercial luminaire types.</p> <p>Additionally, please take into account that according to Department's information, the species has persisted at 500 metres from mining operations in projects located in the Pilbara.</p> <p>For noise impacts: please provide information about noise management measures to mitigate impacts on the roost site. The Department's experts state that sound pollution caused by blasting, haul trucks, loaders/excavators, dozers, drill rigs and service trucks could affect Ghost bats. Ghost bats may abandon the roost if the noise disturbance is sufficiently high. Therefore, the Department recommends establishing a noise limit at the roost entrance.</p> <p>Best practice is to limit sound pressure levels to below 70 dB(Z) at roost entrances. Department's information indicates that Ghost bat can habituate to the sound from mining activities when a buffer of several hundred meters from the entrance is established. The Department recommends the use of empirical data to assess and determine an appropriate buffer size and the implementation of noise monitoring to ensure noise levels within the roost are below 70 dB(Z).</p> <p>For vibration impacts: please provide information about vibration management measures. Department's information indicates that blasting at distance between 50 to 400 m from a roost site will provide levels of vibration that may disturb the Ghost bats. Best practice is to limit the underground vibration levels to 10 mms-1 peak particle velocity (PPV) within the roost. Further field work can be conducted to establish higher safe PPV limits.</p>	
135	DAWE	In this section the Department recommends adding details of an ongoing monitoring to confirm that the important Ghost bat roosting site remains viable.	Roy Hill confirm that the cave is a diurnal roost that is occupied on an ad hoc basis by Ghost Bats. No presence of Ghost Bats may mean they have travelled elsewhere for a time and does not necessarily mean that they have abandoned the roost permanently. Ghost bats are highly susceptible to roost disturbance and Roy Hill considers any monitoring within the cave (i.e. which includes human

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		<p>Department’s information indicates that a periodic monitoring of the presence/usage of important roosting habitat is recommended for important Ghost bat roosting habitat that are distant and not directly under threat by the project.</p> <p>Please provide a monitoring program that will confirm if the 1000 m CHEZ is adequate to conserve the Ghost bat roost or if it need to be modified to protect the Ghost bats from the mining activities. This monitoring should ensure a timely implication of management responses in noise, vibration, and light effects.</p>	<p>visitation to the cave entrance) to be potentially invasive and could result in occupying ghost bats abandoning the cave, and hence Roy Hill is not supportive of implementing such disturbance activities.</p> <p>Roy Hill has committed to performing fixed point laser scanning of the cave feature to obtain baseline structural data, and annually thereafter for within those years where mining activities are undertaken within 600m of the cave feature but outside the CHEZ extent. This monitoring will aim to ensure the structural integrity of the cave feature is maintained.</p> <p>The MVFMP has been updated to include this requirement in Section 2.3 (Roy Hill, 2021f; Appendix 10 of this response to submissions document).</p>
Offsets – Terrestrial Fauna			
136	DAWE	<p><u>Submission on draft ERD</u></p> <p>The ERD states that a total of 2428.3 ha of Greater Bilby habitat will be impacted by the proposed action and only 1419.1 ha of good to excellent condition habitat will require an offset. This is inconsistent with the Department’s Offset Policy as the entire 2428.3 ha is identified as Greater Bilby habitat and requires offsetting.</p> <p>The Department requires a larger offset to compensate for the remaining 1009.2 ha Mulga Woodlands and drainage lines which is not proposed to be offset as these areas are also considered habitat for the Greater Bilby.</p> <p>The Department understands that the proponent is proposing to acquit all offset requirements via a \$4,615,948.80 financial contribution for recovery and research activities that are likely to realise a conservation benefit for Greater Bilby as part of a Conservation Significant Fauna Offset Strategy to be approved.</p>	<p>No records of the Northern Quoll occur within the Revised Development Envelope and a low number of records occur within proximity to the Revised Development Envelope (suggesting the habitat within 5km of the Revised Development Envelope is used intermittently by the species dispersing through the landscape). Also, there is limited availability of suitable denning habitat and there is availability of similar Low Rocky Hills habitat in the surrounding area as outlined in Section 7.5.2. This is further backed up by species distribution modelling completed by Molloy et. al, (2015) discussed in Section 7.5.2 of the ERD, which suggests that the habitat near the Revised Development is likely of low to moderate significance to Northern Quoll (Molloy, et al., 2015; Roy Hill, 2020a).</p> <p>Roy Hill acknowledge the importance of Mulga Woodland, Mulga Drainage, Mulga Spinifex and Spinifex Sandplain habitat for the Greater Bilby and will offset for these habitats that are impacted from the implementation of the Revised Proposal. Roy Hill’s Impact Reconciliation Procedure (Roy Hill, 2021a) has been updated to outline the proposed offsets per IBRA Subregion (Roy Hill, 2021d</p> <p>In consultation with DWER and DAWE, Roy Hill have prepared an updated draft Impact Reconciliation Procedure (Roy Hill, 2021d; Appendix 8 of this response to submissions documentRtS) that accounts for offset requirements for both the stated EPA precedents and the EPBC Matters of National Environmental Significance (MNES) associated with the Revised Proposal.</p>

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		<p>The Department is of the view that the proposed offset for 1419.1 ha of Greater Bilby habitat is consistent with previous approvals within the Pilbara Region. However, an additional offset will be required for the remaining 1009.2 ha of Greater Bilby habitat ensuring the offset strategy is compatible with the EPBC Act Environmental Offsets Policy, thus enabling its use in any EPBC Act approval conditions.</p> <p>188.6 ha of Northern Quoll habitat will be directly impacted by the proposed action. Given the proposed action will clear and mine this area, the Department considers that a significant residual impact remains and a suitable offset is required for impacts to the Northern Quoll.</p> <p>Further discussions will be required in relation to potential offsetting for the Ghost Bat.</p> <p><u>Current submission</u></p> <p>Previous comments regarding offsetting of 1009.2 ha Mulga Woodlands and drainage lines, habitat for the Greater Bilby and Northern Quoll, have not been addressed in the revised ERD. Further discussions will be required regarding suitable offsets for these two species and possibly other EPBC listed species impacted by the proposed action.</p> <p>Table 6-4 of the ERD states that the proposed offset contribution will be made to the Pilbara Environmental Offsets Fund (PEOF). The Memorandum of Understanding has been signed and put into effect by the WA Environmental Protection Authority and DAWE.</p>	<p>Roy Hill has committed to not directly or indirectly impact the Ghost Bat cave located 50m outside of the Development Envelope as it is considered an important habitat feature. In the unlikely event that the cave was indirectly impacted or destroyed from mining activities, Roy Hill will offset for any impact to the Ghost Bat cave. Appendix 8 of this response to submissions document has been updated to include this and the revised offsets for Greater Bilby habitat,</p>

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		Appendix 44 must be revised to meet the PEOF and EPBC Act Environmental Offsets Policy. Further consultation with DAWE should be sought on developing the proposed offsets.	
137	DWER	<p>The ERD concludes that there is no significant impact remaining for the following impacts to terrestrial fauna:</p> <ul style="list-style-type: none"> • Direct impacts to 319.96 ha and indirect impacts to 6.2 ha to Spinifex Sandplain that is denning and foraging habitat for greater bilby, and potential habitat for princess parrot <i>Polytelis alexandrae</i> (Vulnerable EPBC Act and Priority 4 BC Act) and night parrot <i>Pezoporus occidentalis</i> (Endangered EPBC Act and Critically Endangered BC Act). • Direct impacts to 3177.43 ha and indirect impacts to 275.67 ha of Mulga Woodlands, which is denning and foraging habitat for greater bilby, and foraging habitat for ghost bat <i>Macroderma gigas</i> (Vulnerable EPBC Act and BC Act) and Pilbara leaf nosed bat <i>Rhinonictes aurantia</i> (Pilbara) (Vulnerable EPBC Act and BC Act). • Direct impacts to 86.78 ha of Mulga Spinifex, which is habitat for greater bilby and foraging habitat for ghost bat. • Direct impacts to 459.77 ha and 83.35 ha of Mulga Drainage line, which is habitat for greater bilby and foraging habitat for ghost bat. • Direct impacts to 51.10 ha of Snakewood Shrubland, which is foraging habitat for ghost bat. • Direct impacts to 117.58 ha and indirect impacts to 121.92 ha of Major Drainage Line, which is potential habitat for Pilbara olive python <i>Liasis</i> 	<p>This is consistent with the Revised Proposal ERD (Roy Hill, 2020a).</p> <p>Roy Hill has reviewed and updated the impact hectares and figures as outlined in the s43A application (Roy Hill, 2021b), Appendix 6 of this response to submissions document.</p>

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		<p><i>olivaceus barroni</i> (Vulnerable EPBC Act and BC Act), Pilbara flatheaded blind snake <i>Anilius ganei</i> (Priority 1 BC Act), northern brushtail possum, and foraging habitat for ghost bat and Pilbara leaf nosed bat.</p> <ul style="list-style-type: none"> • Direct impacts to 78.49 ha of Minor Drainage Line, which is habitat for Pilbara olive python, Pilbara flatheaded blind snake, and foraging habitat for ghost bat. • Direct impacts to 406.77 ha and indirect impacts to 14.37 ha of Open Tussock Grassland, which is foraging habitat for greater bilby and Pilbara leaf nosed bat. • Direct impacts to 188.59 ha of Low Rocky Hills, which is habitat for the Northern quoll <i>Dasyurus hallucatus</i> (Endangered EPBC Act and BC Act), Pilbara olive python, ghost bat, Pilbara flatheaded blind snake, Black Flanked Wallaby <i>Petrogale lateralis lateralis</i> (Vulnerable EPBC Act and Endangered BC Act), and Roy Hill Millipede <i>Antichiropus sloanae</i> (Priority 1 BC Act). • Direct impacts to 1185.42 ha of Hill Crest/Hill Slope, which is habitat for Roy Hill Millipede <i>Antichiropus sloanae</i>. 	
138	DWER	The proponent has determined that only residual impacts to 1419 ha of Mulga woodland and Mulga drainage line habitat types in good to excellent condition are significant for the greater bilby and proposes to counterbalance the significant residual impact through contributions to the PEOF.	Roy Hill have provided a tabular analysis of habitat types for all potentially conservation significant species present within the Revised Development Envelope, including which species are likely to occur within each habitat type in Table 4-30 and 4-33 of the ERD (Roy Hill, 2020a). Critical and supporting fauna habitat types present within the Revised Development Envelope for Pilbara Olive Python, Ghost Bat, Greater Bilby and Northern Quoll Habitat have been identified and accounted for within the Impact Reconciliation Procedure (Roy Hill, 2021d).

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		The proponent should provide a tabular analysis of all conservation significant species with potential to occur in the disturbance footprint and identify critical habitat types present within the disturbance footprint for these species using Recovery Plans available via DBCA and DAWE. Where the proponent identifies critical habitat types for conservation significant species, the EPA may determine that residual impacts for these species are significant and recommend the higher rate of the PEOF is appropriate to counterbalance these impacts.	In consultation with DWER and DAWE, Roy Hill have prepared an updated draft Impact Reconciliation Procedure (Roy Hill, 2021d; Appendix 8 of this response to submissions document) that accounts for offset requirements for both the stated EPA precedents and the EPBC Matters of National Environmental Significance (MNES) associated with the Revised Proposal.
139	DWER	For impacts to habitat types that are not necessarily critical for conservation significant species yet may still be significant for the species (for example foraging habitat for ghost bat and Pilbara leaf-nosed bat), the EPA may recommend the base rate of the PEOF is appropriate to counterbalance these impacts.	<p>The Pilbara leaf-nosed bat has not been recorded and the ghost bat has only been recorded on one occasion within the Revised Development Envelope via a social call. All other records of ghost bat activity have been recorded outside of the Revised Development Envelope. Extensive areas of potential foraging habitat (approximately 84%) within the Revised Development Envelope will remain following the implementation of the Proposed Changes.</p> <p>Mitigation measures outlined in Table 4-38 of the ERD, such as rehabilitation, will increase availability of potential foraging habitat for this species following the Project implementation. Significant areas of foraging habitat for the Ghost Bat will remain post-disturbance. Given that no records of Pilbara Leaf-nosed bat have been recorded and only one sound record of a ghost bat has been recorded within the Revised Development Envelope, the habitat is not considered foraging habitat and therefore not significant.</p>
140	DWER	The proponent has determined that residual impacts to 1185.42 ha of Hill Crest/Hill Slope habitat for the Roy Hill Millipede are not significant and therefore do not require the higher rate contribution to the PEOF. Figure 4-35 shows 2734.21 ha area of <i>Antichiropus sloanae</i> habitat intersecting the revised development envelope which represents 12% of entire habitat for the species. The EPA may determine that residual impacts for this species are significant, and	Roy Hill impact hectares and figures have been revised, as outlined in the s43A application (Roy Hill, 2021b). The revised Table 4-33 of the s43A application outlines the mapped habitat extent for <i>Antichiropus sloanae</i> is 15,891.82ha. the Revised Development Envelope intersects with 2734.21ha of the habitat extent 947.90ha of which has already been approved for clearing under the Original Proposal. The Revised Proposal is seeking to clear an additional 903.82ha of the total 2734.21ha of habitat within the Revised Development Envelope. Furthermore, as 14,042.14ha (88%) of habitat for

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		recommend the higher rate of the PEOF is appropriate to counterbalance the significant residual impacts to this short range endemic species.	this species exists outside the Revised Development Envelope, Roy Hill's level of impact is considered low to moderate.
141	DWER	There is a discrepancy between Table 7-8 p437 which says 319.69 ha of Spinifex Sandplain habitat but elsewhere in ERD it is 319.96 ha (e.g. p16 and p228).	Roy Hill impact hectares have been revised and the Proposed Changes will directly impact 319.97ha of Spinifex Sandplain habitat, as outlined in Table 4-33 of the s43A Application (Roy Hill, 2021b), Appendix 6 of this response to submissions document.
142	DWER	The proponent should provide clear maps and figures delineating where 'good to excellent' vegetation and critical fauna habitat types are located within the disturbance footprint for the revised proposal.	<p>Figures 4-18 and 4-19 of the ERD show the vegetation condition within the Revised Development Envelope (Roy Hill, 2020a).</p> <p>Critical fauna habitat types present within the Revised Development Envelope include Greater Bilby Habitat and Northern Quoll Habitat. Greater Bilby Habitat within the Revised Development Envelope is shown in Figure 7-5 and 7-6. Northern Quoll Habitat within the Revised Development Envelope is outlined in Figure 7-3 and 7-4 of the ERD (Roy Hill, 2020a).</p>
Greenhouse Gas Emissions			
143	DWER	The EPA will need to consider the revised proposal as a whole, not just the proposed changes. The proponent should submit an updated Greenhouse Gas Management Plan (GHGMP) that estimates all scope 1, 2, and 3 GHG emissions from the combined existing proposal and the proposed changes to the proposal.	<p>The Greenhouse Gas Management Plan (GHGMP (Version 4)) includes estimates of all scope 1 and 2 GHG emissions from the Revised Proposal (combined Original Proposal and the proposed changes) (Roy Hill, 2021p; Appendix 9 of this response to submissions document). See sections 3.1.2 and 3.1.3 of the GHGMP for details.</p> <p>The GHGMP has been updated to include estimates of scope 3 emissions from the Revised Proposal. See section 3.1.4 of the GHGMP for details.</p>
144	DWER	The updated GHGMP should include revised (combined) scope 1 emissions targets that align with a trajectory toward net zero by 2050. If this cannot be	The GHGMP has been updated to set emissions reduction targets for the emissions that will arise from the Revised Proposal which include not only emissions from the Proposed Changes but also those approved under the Original Proposal (Roy Hill, 2021p). Regular targets for emissions reduction projects have been established to achieve an incremental reduction in emissions over the life of the

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		achieved, the proponent should clearly articulate why it is not possible to achieve this.	project in line with the state's aspiration to achieve zero net emissions by 2050. See Section 4, Figure 5 of the GHGMP for details (Appendix 9 of this response to submissions document).
145	DWER	<p>The proponent should also update the GHGMP to reflect reporting requirements as per those resulting from the recent appeals on the Waitsia and Pilbara Energy Generation (PEG) power plants, specifically, that the proponent should provide:</p> <ul style="list-style-type: none"> ● A publicly available GHGMP summary plan and progress statement, updated each time the GHGMP is revised, and each time a five yearly report is submitted. ● The summary document would require the proponent to outline key information from the GHGMP (and reports to that time), in an accessible form which can be easily reviewed by third parties for transparency, for example to compare the proposal against other proposals, and against relative contributions to the achievement of EPA objectives for the State. ● The summary document must include <ul style="list-style-type: none"> - A graphical comparison of emission reduction commitments in the GHGMP with 'actual' emissions for compliance periods; - Proposal performance against benchmarking for comparable facilities; - Emissions intensity; - A summary of emission reduction measures undertaken by the proponent; and 	The GHGMP has been updated to include reporting requirements as per those resulting from the recent appeals on the Waitsia and Pilbara Energy Generation (PEG) power plants (Roy Hill, 2021p; Appendix 9 of this response to submissions document). See section 4.6 of the GHGMP for details.

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		<ul style="list-style-type: none"> - A clear statement as to whether interim targets have been achieved. • The proponent should also include a clear statement that any audit and peer review is to be made publicly available. 	
146	DWER	The proponent should commit to reviewing the GHGMP if there is a change to the proposal which means there is a material risk that emissions reduction targets will not be achieved.	The GHGMP has been updated to include a commitment to review the GHGMP if there is a change to the proposal which means there is a material risk that emissions reduction targets will not be achieved (Roy Hill, 2021p; Appendix 9 of this response to submissions document). See section 4.1 of the GHGMP for details.
147	DWER	The GHGMP should also include an assessment of the feasibility and practicability of other design options the proponent considered but did not choose to reduce the GHG emissions for the revised proposal. For example, a brief discussion as to what (if any) renewable energy options could be adopted for the revised proposal, and any alternatives that were considered but not chosen.	The GHGMP includes information outlining what other design options have been assessed but were not progressed as they were considered not feasible (Roy Hill, 2021p; Appendix 9 of this response to submissions document). Additional information has been included in the GHGMP to provide details on why some options were not considered feasible. Similarly, the GHGMP includes information about a number of options currently under assessment. See Tables 9 and 10 in Section 4.5 of the GHGMP for details.
148		Overhaul the current Table 6 as none of it comprises Outcome-based provisions. The Table should have the Columns: # / Outcomes / Monitoring / Reporting. Your outcome is what is identified in Table 8 and shown in Figure 5 – Just articulate it in writing in the Table 6 (e.g. Achieve the emissions reduction targets identified in Table 8 and graphed in Figure 5). The column will be titled ‘Outcomes’ not ‘Management Actions’. Monitoring is as you have described, and Reporting is annually to the CEO of DWER. Retain reference to complying with the SGM as a second outcome. Monitoring and Reporting as you already have for that outcome.	As per discussions with EPA Services, Table 7 of the GHGMP has been updated to incorporate the feedback provided except for the reporting frequency (Roy Hill, 2021p; Appendix 9 of this response to submissions document). The updated GHGMP has been attached to this response.

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		Table 6 - Identify associated monitoring that will be undertaken to demonstrate whether or not the outcome is being met; and reporting details.	
149		Figure 5 – Distinguish emissions that will be offset from the emissions that won't be offset i.e. the emissions above the trajectory (i.e. above the 369,648 tCO ₂ -e per year) will be offset if not otherwise mitigated. I suggest using a different colour.	Figure 5 of the GHGMP has been updated to incorporate the feedback provided (Roy Hill, 2021p; Appendix 9 of this response to submissions document).
150		<p>Table 7 – The specified targets are meaningless as targets. For electricity usage, an alternative construction could be something like:</p> <p>Management action – e.g. By X date every year, establish an annual electricity use target for the coming year.</p> <p>Target – e.g. continuously reduce electricity usage/improve energy efficiency over time.</p> <p>Monitoring – monitor electricity usage against the annual (It would be good to have a really clear description of how you will monitor against the target but this isn't going to be a sticking point for approval of the plan)</p> <p>Reporting – report how the annual target was set/how it was arrived at and performance against the target.</p>	Table 7 of the GHGMP has been updated to incorporate the feedback provided (Roy Hill, 2021p; Appendix 9 of this response to submissions document).
151		Delete Management action # 2 in Table 5 because monitoring of GHGs is dealt in the Column titled 'Monitoring' in Table 6	Table 5 of the GHGMP has been updated to delete monitoring of GHG emissions (Roy Hill, 2021p; Appendix 9 of this response to submissions document).

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152		Section 3.1.2 of the GHGMP estimates peak Scope 1 Emissions at 466,000 tonnes per annum (tpa) CO2-e. This includes the 280,000 tpa CO2-e from the original proposal, plus an increase of 179,800 tpa CO2-e to account for the discrepancy of emissions between the Part IV approval and reporting to the Clean Energy Regulator, plus an additional 6,200 tpa CO2-e to account for works associated with the revised proposal. However, the remainder of the GHGMP, including emissions intensity calculations set out in Section 3.1.2.1, and emissions targets in Section 4.2 discuss estimated Scope 1 emissions of 450,000 tpa CO2-e for the revised proposal. The proponent should clarify the discrepancy between these two numbers, or revise the document to account for the full Scope 1 Emissions of 466,000 tpa CO2-e.	Section 3.1.2 of the GHGMP has been updated to account for the full scope 1 emissions of 466,000 tpa CO2-e (Roy Hill, 2021p; Appendix 9 of this response to submissions document).
153		Section 4.2 sets out the 5 year emissions targets for the revised proposal, including Figure 5 and Table 8. The information in Table 8 shows the cumulative emissions targets over the entire 5 years, however for transparency and clarity it is recommended that the table be amended to include annual 5 year targets only. For example (and based on Figure 5), the first target would be for 2026 and Scope 1 emissions to 369,643 tpa CO2-e (a reduction of 80,357 tpa CO2-e or ~18%); the second target would be for 2031 and Scope 1 emissions to 289,286 tpa CO2-e (a reduction of 80,357 tpa CO2-e or ~22%). Even though this information is presented in the graph, it would be more easily interpretable if it was also presented clearly in tabular format.	As per discussions with EPA Services, Table 8 of the GHGMP has been updated to include annual 5 year targets only (and based on Figure 5 of the GHGMP) (Roy Hill, 2021p; Appendix 9 of this response to submissions document).

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154		Section 4.6 discusses the reporting mechanisms required by the EPA for the GHGMP, including provision of a summary plan. This provision came out of the appeals on the EPA's reports for the Pilbara Energy Generation Power Station (EPA Report 1686) and Waitsia Gas Project Stage 2 (EPA Report 1687). The summary report is intended to be a public-facing document, with clear information for the public regarding reporting and emissions reductions for a proposal. Since this appeals advice, the EPA has decided that an initial summary document should be provided by the proponent during assessment, for approval. The proponent should draft and submit an initial summary document, for the EPAs consideration as soon as possible.	Roy Hill understands that a summary report is required and will prepare and submit one as required.
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Terrestrial Environmental Quality			
155	DMIRS	The latest version of the Mine Closure Plan (MCP) for the project was reviewed and approved by DMIRS on 24 June 2019 as part of Reg ID 78415 (the ERD table 1-2 incorrectly refers to Reg ID 54578). According to this MCP mine closure is expected to occur in 2042 (MCP Table 9-54). Recommendation: Clarify/correct Reg ID	Roy Hill clarifies that the Reg ID in Table 2-3 is an error and should be 78415.
156	DMIRS	The Revised Proposal LOM is stated as 2032 (Last row of ERD Table ES0-2). It is not clear if the LOM stated is	The Revised Proposal Life of Mine (LOM) (being 2032) is correct and the Mine Closure Plan (MCP) will be updated to reflect this in the April 2022 update.

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		<p>based on both high and low grade mining occurring at the same time. The MCP has the LOM as 2032 for high-grade mining and another 10 years of low-grade mining, with closure occurring in 2042.</p> <p>Recommendation: Clarify Life of Mine</p>	
157	DMIRS	<p>The revised proposal seeks an additional 5,995ha of disturbance, resulting in a total disturbance footprint of almost 18,000ha (equivalent to 180 square kilometres).</p> <p>According to the last reviewed MCP, the closure phase is estimated to take three years (MCP Table 9-54), and the reduced ability to complete progressive rehabilitation (due to less backfill being proposed in the ERD) may extend that timeframe further.</p> <p>The amount of disturbance, necessity to keep the ground open due to mining and rehabilitation resourcing constraints will likely result in very long timeframes before a portion of the environmental values lost are restored. Based on information DMIRS has obtained from other mines in the greater Pilbara area, a dedicated mine rehabilitation team with access to sufficient trials, experienced operators, well defined processes, good track record and with no constraints due to mining can rehabilitate approximately 60 hectares of WRD per year (20-25 personnel operating a fleet of about seven vehicles/earthmoving machinery).</p> <p>To be able to rehabilitate the disturbed areas in the anticipated timeframe listed in table 9-54 of the MCP</p>	<p>Roy Hill continue to have the ability to progressively rehabilitate areas such as waste rock landforms (WRLs), Ron of Mine pads (ROMs), industrial infrastructure etc. that close prior to 2032. As stated in the Mine Closure plan, pits that are backfilled to only above groundwater level will require an abandonment bund at closure. No profiling works are required therefore the time required to close is not comparable to a Waste Rock Landform . Once the site has closed, Roy Hill will also have access to production mining fleet which will increase the capacity of completing any remaining rehabilitation works.</p> <p>The following pits have already been backfilled to topography:</p> <ul style="list-style-type: none"> • Z101 • Z103 • D210 • D101 • D102 • D103 • D104 • D301 • D305 • D503 <p>A revised proposed landform rehabilitation schedule will be included in the April 2022 revision of the MCP.</p> <p>Since October 2020, Roy Hill have a dedicated D9 Dozer and site team for WRD rehabilitation. These works will continue throughout life of mine and provide ongoing opportunity for trials.</p>

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		<p>(3 years for WRD/pits) would require running a mining fleet and support services dedicated solely to rehabilitation earthworks. This scenario assumes that sufficient expertise and knowledge has been gained from trials to have a thorough understanding of the methodologies to be adopted and confidence in the outcomes.</p> <p>Recommendation: To understand how long it will take to rehabilitate all of the disturbed areas, the proponent should present a revised landform rehabilitation schedule based on the proposed LOM plan and the learnings obtained from the trials taking place.</p>	<p>The mining companies DMIRS are referring to have been operating for significantly longer than Roy Hill (over 20 years) and have had opportunities to undertake trials over this time. Roy Hill has only been in operation for 5 years, therefore had not had a large amount of WRD area available to progressively rehabilitate prior to 2020. Roy Hill have had the opportunity to undertake some small-scale rehabilitation work on approximately 6 hectares of rehabilitation on which data is currently being collected.</p> <p>Two different rock armouring placement methods were trialled which showed that placing rock then topsoil on top resulted in higher germination than pushing rock and topsoil simultaneously down the batter slope (which resulted in diluting the topsoil, therefore lower germination).</p> <p>A third-party consultant was also engaged to audit the rehabilitation implementation process. The outcomes of this audit have resulted in Roy Hill reviewing and updating the process to include more detailed rehabilitation designs and the development of rehabilitation workpacks. These workpacks provide detailed site-specific step by step task requirements highlighting important hold points that require inspection and signoff or corrective actions prior to commencing to the next stage. A strict compliance to design and inspection sign-off process has also been implemented. Roy Hill will continue to refine these methods and process over time with the ongoing progressive rehabilitation works that are planned.</p> <p>Roy Hill are also part of closure and rehabilitation groups such as Pilbara Rehabilitation Group, CRC TIME and CME Closure and Relinquishment group where information on trials and case studies undertaken by other companies are available.</p>
158	DMIRS	<p>The proposed nominal pit depth increases to 120 metres below ground level (BGL) (previously nominal 100m BGL).</p> <p>The increased pit depth increases the risk of intersecting the underlying Jeerinah formation that is classified as Potentially Acid Forming (PAF). As a result,</p>	<p>The Roy Hill Acid Mine Drainage (AMD) Management Plan (Roy Hill, 2019b) is an evolving document which has been revised since the last submission of the MCP, with another revision planned for 2021. These revisions are based on data collection from the blast hole sampling program Roy Hill commenced in 2018 and remains ongoing. The data is used to refine and validate the AMD waste classification in the mine model on an annual basis. As a result, Roy Hill has been able to remove unnecessary conservatism in the AMD waste rock classification system.</p> <p>As part of an independent audit of Roy Hill's AMD management procedures conducted in 2020 it was identified that significantly less PAF2 (sulfides, as found in the Jeerinah lithology) have been encountered than predicted within the mining model. This is due to both the mining method</p>

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		<p>the risk of Acid and/or Metalliferous Drainage (AMD) developing increases.</p> <p>The current management of PAF material requires the encapsulation of that material and disposal in pit as per Table 9-27 of the MCP. Less pit backfill is proposed and it is not clear if that compromises the current PAF management methodology.</p> <p>Recommendation: A revised risk assessment should be provided to inform the increased AMD likelihood and potential limitations to the envisaged risk treatments.</p>	<p>employed designed to actively avoid disturbing the Jeerinah formation (base of ore) and the blasthole sampling procedure which allows the reclassification of modelled PAF2 material prior to haulage where laboratory data provides justification to do so. The AMD management plan will be reviewed and updated again in 2021 and the material balancing, and scheduling data updated in the next revision of the MCP (April 2022). The revised MCP will also review the revised risk assessment and revise as necessary.</p> <p>The mining pits Roy Hill are proposing to mine deeper are mainly within the Echo region with one pit in Sierra. Revised depths will range between 103m -115m deep compared to the original proposal of 100m.</p> <p>The below table shows the difference in PAF material modelled at the pits from the Mine Closure Plan and the updated proposal. The total has decreased due to the refinement of the AMD waste classification as discussed earlier.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th></th> <th>2018</th> <th>2021</th> </tr> </thead> <tbody> <tr> <td>Echo 1</td> <td>Dry tonnes</td> <td>1,578,187</td> <td>289,238</td> </tr> <tr> <td>Echo 2</td> <td>Dry tonnes</td> <td>2,111,109</td> <td>1,510,733</td> </tr> <tr> <td>Echo 3</td> <td>Dry tonnes</td> <td>332,500</td> <td>25,020</td> </tr> <tr> <td>Sierra 3</td> <td>Dry tonnes</td> <td>1,271,180</td> <td>602,379</td> </tr> </tbody> </table> <p>It should also be noted that a large volume of the acid consuming material is coming from these pits (Echo and Sierra) (23 million tonnes out of the 49 million in total).</p>			2018	2021	Echo 1	Dry tonnes	1,578,187	289,238	Echo 2	Dry tonnes	2,111,109	1,510,733	Echo 3	Dry tonnes	332,500	25,020	Sierra 3	Dry tonnes	1,271,180	602,379
		2018	2021																				
Echo 1	Dry tonnes	1,578,187	289,238																				
Echo 2	Dry tonnes	2,111,109	1,510,733																				
Echo 3	Dry tonnes	332,500	25,020																				
Sierra 3	Dry tonnes	1,271,180	602,379																				

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			The AMD encapsulation methodology will not change as a result of the increased depth. All PAF material will still be encapsulated in-pit. These pits that are increasing in depth are located within pit areas that originally were only going to be backfilled to groundwater level, hence pit backfill capacity has not decreased.
159	DMIRS	<p>The proposed changes to the mining schedule results in less pits being able to be backfilled as per section 2.2.1 of the ERD:</p> <p>‘An increased knowledge of the ore body has identified a higher degree of variability requiring multiple pits to be open at the same time to achieve the ore blend required by RHIO customers.’</p> <p>‘Concurrent mining of pits has reduced the availability of backfill opportunities resulting in the requirement for additional ex pit waste rock disposal options, and the reduced capacity to backfill pits to surrounding ground surface level’.</p> <p>Some of the pits (Bravo and Zulu) will also be used as in-pit tailings storage facilities (Table 2-2). This results in additional out-of-pit storage requirements for waste rock.</p> <p>DMIRS is generally supportive of the disposal of tails in-pit from a mine closure perspective as it reduces the concerns tied to the stability/erosion of aboveground engineered embankments, provided there are no other adverse environmental impacts.</p>	<p>The following pits have already been backfilled to topography:</p> <ul style="list-style-type: none"> • Z101 • Z103 • D210 • D101 • D102 • D103 • D104 • D301 • D305 • D503 <p>As part of the proposal there are a number of pits that that were originally identified as Stage 1 (backfilling to ground level). Instead, they are being reserved for in-pit tailing storage. These are identified below:</p> <p>Z501, Z502, Z503, Z601, Z602, Z903, Z904, Z905, Z906,</p> <p>In addition, D206 and D207 were originally proposed to be backfilled to ground level and will now be backfilled to above groundwater level.</p> <p>The area these pits (Zulu and Delta) cover equates to 440ha.</p> <p>If abandonments bunds are required around each of these pits an additional 260,000m³ of rock will be required to meet DMIRS guidelines.</p> <p>The amount of rock armour material required for closure/rehabilitation purposes over LOM will be updated in April 2022 revision of the MCP.</p>

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		<p>Overall, the proposed changes to the backfilling of pits result in:</p> <ul style="list-style-type: none"> • Fewer areas being available for vegetation rehabilitation compared to the approved proposal (less or no backfilling of stage 1 pits to the ground surface, resulting in more pit voids). • Achieving acceptable rehabilitation/closure outcomes will be more challenging (ex-pit waste rock dumps are inherently less stable than a backfilled to ground level surface pit). • The reduced pit backfill capacity may have a negative impact on the proposed management of PAF material (as discussed in the previous heading). • An increased amount of competent material will be required to be allocated to form abandonment bunds around the pits that are not backfilled to the surface. Such material is generally in short supply at Roy Hill and is a known constraint in terms of achieving stable landforms and rock armour requirements. <p>Recommendation: The proponent should quantify the area of pit that will have modified rehabilitation outcomes as a result of the revised proposal (i.e. no longer backfilled).</p> <p>Recommendation: The proponent should re-assess the requirement for additional competent rock material to form abandonment bunds that will be required to meet the DMIRS guidelines.</p>	

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160	DMIRS	<p>Section 5.3.5 of the ERD states: 'The Rehabilitation Success Report (Appendix 43) has been developed to provide details on the likely success of future rehabilitation activities'.</p> <p>Appendix 43 is not representative of the challenges that are inherent with mine site rehabilitation which make up the overall majority of the disturbances within the mining areas.</p> <p>The document details the successful rehabilitation associated with the development of the railway line and associated borrow pits (2,500ha of temporary disturbance). The rehabilitation success documented is inherently easier to achieve as the areas are not as heavily disturbed, nor for as long, compared to typical open cut mining operations.</p> <p>The rehabilitation success achieved to date associated with linear infrastructure is a reflection of the good planning and adequate resources allocated by Roy Hill to minimise environmental legacies. DMIRS, however, considers that the information presented in appendix 43 does not adequately reflect the likely success of future rehabilitation activities tied to mining landforms. An assessment of the various rehabilitation trials conducted on site to date would better reflect likely success of future mining landform rehabilitation.</p> <p>The waste rock dump and Zulu 101 drainage reinstatement trials mentioned in Appendix 43 have not been inspected by DMIRS. A site inspection is planned for March 2021 after which DMIRS will be in a</p>	<p>The Rehabilitation Success Report (Appendix 43) (Roy Hill, 2020d) was written in February 2020 and since then large changes to the team and rehabilitation processes have occurred on-site. Roy Hill are dedicated to progressive rehabilitation and continual improvement to current processes and methodologies.</p> <p>As Roy Hill has only been operating for 5 years, WRDs have not been readily available for Roy Hill to undertake any large-scale rehabilitation. Roy Hill have plans to implement further trials over the coming years.</p> <p>Roy Hill has also been a member of the Pilbara Rehabilitation Group since 2014 (which includes other mining companies). The group shares information on rehabilitation works and trials that are currently being undertaken within different companies.</p> <p>Roy Hill have had independent reviews undertaken on the waste dump rehabilitation works undertaken to date. An audit of the waste dump rehabilitation was undertaken in 2018 by Mine Earth and brief detail of this summarised in the Roy Hill 2018 mining tenement Annual Environmental Report. Mine Earth now work with Roy Hill on developing detailed rehabilitation designs and instruction workpacks. They also conduct regular visits to audit the process and provide improvement suggestions.</p> <p>An independent review was also undertaken of the current status of the Zulu 101 creek re-instatement by Advisian in 2020. A summary of the results was emailed to DMIRS on 28th of October 2020.</p> <p>The WRD rehabilitation works at WD_M5 have had EFA transects established and monitored by Stantec since works were completed (from 2018). The results have been summarised annually in the DMIRS Annual Environmental Report. The rehabilitation is also being monitored using remote sensing data.</p>

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		<p>better position to comment on the likely success of rehabilitation associated with the mine site.</p> <p>A review of other nearby iron ore sites and their respective trials to show what has or has not worked could also help better understand the likely success of the proposed rehabilitation.</p> <p>A better approach to inform the likely success of future rehabilitation activities would be to commission an independent review of the WRD trials and in pit backfill rehabilitation across all three sites.</p>	
General			
	DAWE	<p>The maps used to describe the areas to be cleared from the areas with previous approval need to be presented in a clearer format. Please address the following:</p> <ul style="list-style-type: none"> Figure 2-4 of the ERD is very low quality and the legend does not include the borefield blue lines. The boundary lines need to be clearer and the polygons that represents areas of existing and proposed need to be sharper. Include in Figure 2-4 the proposed areas of the Waste Rock Landforms and the number of these areas to be developed. The dotted line Figure 1-3 represents area for application tenure and this area is not included in Figure 2-4 (blue polygons). It is also unclear if these lines are existing roads and tracks. 	<p>A high-resolution version of Figure 2-4 was provided in a separate file (Roy Hill, 2021j).</p> <p>Figure 2-4 outlines the proposed borefields. There are no proposed waste rock landforms in this area.</p> <p>The areas of application tenure are not relevant to this Revised Proposal and hence have not been included in the Revised Development Envelope. Any work in these areas (if tenure is granted), will be subject to future approvals. These dotted lines are not existing tracks or roads.</p> <p>An updated Figure 2-3 and Figure 2-4 have been provided that includes both Roy Hill's tenure and the Revised Development Envelope boundary (Roy Hill, 2021i; Roy Hill, 2021j).</p>

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		Provide the modified figures as high-resolution maps and supporting shapefiles.	
	DAWE	Outline the consultation that has been undertaken with DBCA in regard to the potential impacts to the Fortescue Marsh and the concerns and recommendations that DBCA has provided for avoidance and mitigation measures to limit the impacts to the Fortescue Marsh.	As outlined throughout the ERD, there are no predicted impacts to Fortescue Marsh. There has been no specific consultation with DBCA in relation to the Fortescue Marsh, however DBCA have had the opportunity to review the ERD and make comments.

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5 Abbreviations

Table 1 - Abbreviations

Abbreviation	Definition
AER	Annual Environmental Report
AG-TSF	Above Ground Tailings Storage Facility
ANZECC	Australia and New Zealand Environment Conservation Council
DAWE	Department of Agriculture, Water and environment
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EMS	Environmental Management System
ERD	Environmental Review Document
FMG	Fortescue Metals Group
FMMA	Fortescue Marsh Management Area
GDE	Groundwater Dependent Ecosystem
GDP	Ground Disturbance Permit
GDV	Groundwater Dependent Vegetation
GIS	Geographic Information Systems
GL	Gigalitres
GL/a	Gigalitres per annum
GWL	Groundwater Licence
ha	Hectare
km	Kilometres
Km/hr	Kilometres per hour
LOM	Life of Mine
LOM WMS	Life of Mine Water Management Strategy
LOMP	Life of Mine Plan
m	Meter
MAR	Managed Aquifer Re-Injection
mbgl	Meters below ground level
MCP	Mine Closure Plan
mg/L	Milligrams per litre
ML/d	Million litres per day
mm	Millimetres
MMF	Marra Mamba Formation
MNES	Matters of National Environmental Significance
MS	Ministerial Statement
MSAVI	Modified Soil Adjusted Vegetation Index
Mt	Million tonnes

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Abbreviation	Definition
mtpa	Million tonnes per annum
PEC	Priority Ecological Community.
RDE	Revised Development Envelope
RHIO	Roy Hill Iron Ore Pty Ltd
RHWMS	Roy Hill Water Management Strategy
RMAR	Remote MAR
RMARN/S	Remote MAR North/South
ROM	Run of Mine
RtS	Response to Submissions
s	Section
SWDVRA	Surface Water Dependent Vegetation and Life of Mine Risk Assessment
SWIB	South-west Injection Borefield
SWL	Standing Water Level
TDS	Total Dissolved Solids
TSF	Tailing Storage Facilities
TSS	Total Suspended Solids
VT	Vegetation Types
WMS	Water Management Strategy
WRL	Waste Rock Landform

6 References

Table 2 - References

Document number	Title
ANZECC & ARMCANZ, 2018	<i>Australian & New Zealand Guidelines for Fresh and Marine Water Quality</i> , Canberra, ACT.: ANZECC & ARMCANZ.
Astron, 2019	<i>Life of Mine Water Management Strategy Vegetation Risk Assessment</i> , Perth: Astron.
Astron, 2020	<i>LOM WMS Vegetation Risk Assessment Addendum</i> , Perth: Astron.
Astron, 2021	<i>LOM WMS Vegetation Risk Assessment Consequence Memo</i> , Perth: Astron.
Astron, 2021a	<i>Vegetation Classification Methodology Memo</i> , Perth: Astron.
Astron, 2021b	Surface Water Flows – Memo, August 2021, Perth: Astron.
Biologic, 2018	<i>Appendix 26 - Roy Hill Level 1 Targeted Vertebrate Fauna Assessment Updated. Unpublished report prepared for Roy Hill Iron Ore Pty Ltd</i> , Perth: Biologic.
Biologic, 2020	<i>Appendix 31 - Roy Hill Mine and Southern Borefields Targeted Fauna Survey. Unpublished report prepared for Roy Hill Iron Ore Pty Ltd</i> , Perth: Biologic.
Biologic, 2021.	<i>Rhagodia sp Hamersley Memo</i> . s.l.:s.n.
Blyth, J., 1996.	<i>Night Parrot (Pezoporus Occidentalis) Interim Recovery Plan for Western Australia.</i> , Australia: Department of Conservation and Land Management.

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Document number	Title
Davis, R. A. & Metcalf, B. M., 2008	The Night Parrot (<i>Pezoporus occidentalis</i>) in northern Western Australia: a recent sighting from the Pilbara region. <i>CSIRO Publishing</i> , pp. 233-236.
Department of Environment and Energy, 2020	<i>National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds</i> . Australia: s.n.
Department of Parks and Wildlife, 2014	<i>Cane Toad Strategy for Western Australia</i> . Perth: DPAW.
Department of Sustainability, Environment, Water, Population and Communities, 2012	<i>Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses</i> . Australia: s.n.
FMG, 2015	<i>Public Environmental Review Christmas Creek Iron Ore Mine Expansion</i> , Perth, Western Australia: FMG.
GHD, 2019b	<i>Roy Hill Life of Mine Water Management Strategy - Groundwater Change Assessment</i> , Perth: GHD.
GHD, 2020	<i>Appendix 3 - Groundwater Model Sensitivity and Uncertainty Analysis</i> , Perth: GHDa.
GHD, 2020b	<i>Appendix 3- Roy Hill Regional Groundwater Model Transport Simulations Report</i> , Perth, Western Australia: GHD.
GHD, 2021	<i>Surface water hydraulic structure vegetation impacts</i> , Perth: GHD.
GHD, 2021a	Roy Hill Section 38 Referral Hydraulic Structures (Rev 3). Appendix 6 – Surface Water Diversion Assessment. s.l.:s.n.
Jones, M., 2000	Road upgrade, road mortality and remedial measures: impacts on a population of eastern quolls and Tasmanian devils.. <i>Wildlife Research</i> , Volume 27, pp. 286-296.
Molloy, S., Davis, R., Dunlop, J. & van Etten, E., 2015	<i>Spatial Modelling for the Northern Quoll in the Pilbara: Informing the Management of a Unique and Isolated Population of an Endangered and Iconic Species.</i> , Western Australia: Edith Cowan University and Department of Parks and Wildlife.
Roy Hill, 2009a	<i>Roy Hill Iron ore Mining Project, Stage 1 Public Environmental Review</i> , Perth, Western Australia: Roy Hill.
Roy Hill, 2009b	<i>Roy Hill Vertebrate Fauna Management Plan for the Roy Hill Rail Corridor (100RH-3000-EN-REP-2009)</i> . Perth: Roy Hill.
Roy Hill, 2010	<i>Roy Hill Fauna Trapping and Translocation Program Guide (100RH-0000-EN-GUI-2010)</i> . Perth: Roy Hill.
Roy Hill, 2017.	<i>Weed Management Plan Revision 0 (OP-PLN-00145)</i> , Perth: Roy Hill.
Roy Hill, 2018c.	<i>Roy Hill Bilby Fauna Survey Work Instruction</i> . Perth: Roy Hill.
Roy Hill, 2018d.	<i>Weed Management Procedure OP-PRO-00010</i> . Perth: Roy Hill
Roy Hill, 2019a.	<i>Mine Revised Proposal Referral (OP-APP-00049)</i> . Perth: Roy Hill.
Roy Hill, 2019b.	<i>AMD Management Plan (OP-PLN-00287)</i> . Perth: Roy Hill.
Roy Hill, 2020a.	<i>Roy Hill Iron Ore Pty Ltd - Revised Proposal for the Roy Hill Iron Ore Mine - Environmental Review Document</i> , Perth, Western Australia: Roy Hill.
Roy Hill, 2020b	<i>Appendix 41 - Vegetation Management Plan</i> , Perth, Western Australia: Roy Hill.
Roy Hill, 2020c	<i>Appendix 4 - MAR Operations Data Review</i> , Perth, Western Australia: Roy Hill.
Roy Hill, 2020d	<i>Appendix 43 - Rehabilitation Success Report</i> . Perth: Roy Hill.
Roy Hill, 2020e	<i>Appendix 41- Water Management Plan - Mine</i> , Perth: Roy Hill.

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Roy Hill, 2021	<i>Draft Impact Reconciliation Procedure, s.l.: s.n.</i>
Roy Hill, 2021a	<i>Roy Hill Water Management Plan (OP-PLN-00300), Perth: Roy Hill.</i>
Roy Hill, 2021b	<i>Roy Hill Revised Proposal – Request for Change via s43a of the EP Act, Perth, Western Australia: Roy Hill.</i>
Roy Hill, 2021c	<i>Roy Hill Vegetation Management Plan (OP-PLN-344). Perth: Roy Hill.</i>
Roy Hill, 2021d	<i>Roy Hill Impact Reconciliation Procedure (OP-PRO-01559) (Revised Appendix 45). Perth: Roy Hill.</i>
Roy Hill, 2021e	<i>Vertebrate Fauna Management Plan. Perth: Roy Hill.</i>
Roy Hill, 2021f	<i>Roy Hill Mine Vertebrate Fauna Management Plan (OP-PLN-00324). Perth: Roy Hill.</i>
Roy Hill, 2021g	<i>Weed Management Plan Revision 1 (OP-PLN-00145), Perth: Roy Hill.</i>
Roy Hill, 2021i	<i>Figure 2-3 - Conceptual Mine Layout, Perth: Roy Hill.</i>
Roy Hill, 2021j	<i>Figure 2-4 - Roy Hill Conceptual Borefield Layout. Perth: Roy Hill.</i>
Roy Hill, 2021k	<i>Figure 2-5: Buffle Grass Records within the Revised Development Envelope. Perth: Roy Hill.</i>
Roy Hill, 2021l	<i>Figure 2-6 Ghost Bat Cave & Overhangs, Perth: Roy Hill.</i>
Roy Hill, 2021m	<i>Figure 2-7 - Ghost Bat Cave Exclusion Zone, Perth: Roy Hill.</i>
Roy Hill, 2021n	<i>Figure 4-16 - Vegetation of Other Significance. Perth: Roy Hill.</i>
Roy Hill, 2021o	<i>Figure 5 - VT 30 and Narbung Land System Extent. Perth: Roy Hill.</i>
Roy Hill, 2021p	<i>Greenhouse Gas Management Plan. Perth: Roy hill.</i>
Stantec, 2020	<i>Groundwater and Surface Water Monitoring Review. Unpublished report prepared for Roy Hill Holdings Pty Ltd.</i>
Strategen , 2020	<i>Appendix 8 - Consolidated Flora and Vegetation Report. s.l.:s.n.</i>
Strategen, 2018b	<i>Appendix 30 - Roy Hill Night Parrot Survey, Unpublished report prepared for Roy Hill Holdings Pty Ltd, Perth: Strategen.</i>
Woinarski, J., Burbridge, A. & Harrison, P., 2014	<i>The Action Plan for Australian Mammals 2012, Collingwood, Victoria: CSIRO Publishing.</i>

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7 Appendices

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Appendix 1 - WMS Vegetation Risk Assessment

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Appendix 2 Vegetation Classification Methodology Memo

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Appendix 3 LOM WMS Vegetation Risk Assessment Consequence Memo

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Appendix 4 Roy Hill Section 38 Referral Hydraulic Structures

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Appendix 5 Roy Hill Water Management Plan (OP-PLN-00300)

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Appendix 6 Roy Hill Revised Proposal – Request for Change via s43a of the EP Act

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Appendix 7 Roy Hill Vegetation Management Plan (OP-PLN-00344)

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Appendix 8 Draft Impact Reconciliation Procedure

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Appendix 9 Greenhouse Gas Management Plan

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Appendix 10 Roy Hill Mine Vertebrate Fauna Management Plan (OP-PLN-00324)

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Appendix 11 Weed Management Plan Revision 2 (OP-PLN-00145)

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Appendix 12 Roy Hill Project Conceptual Hydrogeological Cross Section

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Appendix 13 Figure 1a - Conceptual Hydrogeological Section

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Appendix 14 Figure 2 - Conceptual effect of Roy Hill water management on aquifer water balance

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Appendix 15 Figure 2-3 - Conceptual Mine Layout

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Appendix 16 Figure 2-4 - Roy Hill Conceptual Borefield Layout

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Appendix 17 . Figure 2-5: Bufflel Grass Records within the Revised Development Envelope

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Appendix 18 Figure 2-6 Ghost Bat Cave & Overhangs

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Appendix 19 Figure 2-7 - Ghost Bat Cave Exclusion Zone

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Appendix 20 Figure 3 - Groundwater drawdown cumulative effects – location plan

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Appendix 21 Figure 4 - Groundwater and Surface Water Risk Areas

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Appendix 22 Figure 4-12 Vegetation Units across the Revised Development Envelope

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Appendix 23 Figure 4-16 - Vegetation of Other Significance. Perth: Roy Hill.

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Appendix 24 *Figure 5 - VT 30 and Narbung Land System Extent.* Perth: Roy Hill.

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Appendix 25 Figure 6 - Astron Vegetation Classification Map

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Appendix 26 Figure 7 - Heritage Management Areas

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Appendix 27 Figure 8 - Map of Ethnobotanic Survey

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Appendix 28 *Rhagodia sp Hamersley Memo. s.l.:s.n*

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Appendix 29 Roy Hill Mine Annual Aquifer Review Aug 2019 to Jul 2020

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Appendix 30 Surface water hydraulic structure vegetation impacts

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Appendix 31 Astron LOM WMS Vegetation Risk Assessment Addendum Maps

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Appendix 32 Appendix 8 - Consolidated Flora and Vegetation Report.

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Appendix 33 Weed Management Procedure OP-PRO-00010.

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Appendix 34 . Surface Water Flows – Memo, August 2021.

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