

Response to submissions

Greater Paraburdoo Iron Ore Hub Proposal Assessment No. 2189 EPBC 2018/8341

Hamersley Iron Pty Limited

April 2021

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Disclaimer and Limitation

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Greater Paraburdoo Iron Ore Hub

Assessment No. 2189

CMS 17501

Summary of Public Submissions

This document forms a summary of public submissions and advice received regarding the Public Environmental Review document for the Greater Paraburdoo Iron Ore Hub Proposal (The Proposal) proposed by Hamersley Iron Pty. Limited (The Proponent).

The public review period for the proposal commenced on 13 May 2020 for a period of 2 weeks, ending on 27 May 2020. A total of 8 submissions were received from the Department of Jobs, Tourism, Science and Innovation (JTSI), Shire of Ashburton, Department of Water and Environmental Regulation (DWER); the Department of Biodiversity, Conservation and Attractions (DBCA); the Department of Mines Industry Regulation and Safety (DMIRS); Department of Planning, Lands and Heritage (DPLH), the Commonwealth Department of Agriculture, Water and the Environment (DAWE) and the Yinhawangka Aboriginal Corporation (YWAC).

The submissions and Proponent responses have been divided into two parts:

Part A to address the agency submissions; and

Part B to address the YWAC submission.

The structure of the table is different in each part, to reflect the different approaches applied by the agencies and YWAC in their submissions.

The principle issues raised in the submissions and advice received included environmental and social issues as well as issues focussed on questions of fact and technical aspects of the proposal. Although not all the issues raised in the submissions are environmental, the Proponent has addressed all issues, comments and questions, as they are relevant to the Proposal.

The key issues raised in the submissions include:

- Potential impacts to conservation significant flora Aluta quadrata;
- Potential impacts to riparian vegetation in Seven Mile Creek as a result of groundwater drawdown;
- Potential impacts to troglofauna and troglofaunal habitat at Western Range;
- Potential impacts to conservation significant fauna *Macroderma gigas* (Ghost bat) and *Rhinonicteris aurantia* (Pilbara leaf-nosed bat);
- Potential impacts to Short Range Endemic invertebrates at Western Range;
- Proposed environmental offsets for impacts to *Aluta quadrata* and habitat for Matters of National Environmental Significance (MNES);

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- Closure aspects including risks associated with acid mine drainage and pit lakes; and
- Ongoing consultation and engagement with YWAC on matters relating to the environmental management of the Proposal.

The issues were raised with respect to the following environmental factors:

- Flora and Vegetation
- Subterranean Fauna
- Terrestrial Fauna
- Inland Waters
- Air Quality
- Social Surroundings

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PART A.1: THE PROPOSAL – GENERAL COMMENTS

No.	Submitter	Submission and/or issue	Response to comment
1	JTSI	This Department advises that the proposal is subject to the <i>Iron Ore</i> (<i>Hamersley Range</i>) Agreement Act 1968 (Paraburdoo State Agreement) which is the third schedule of the <i>Iron Ore (Hamersley Range) Agreement Act 1963</i> (Hamersley State Agreement). The Department notes that Section 1.4.1 of the ERD states that Mineral Lease 4SA is held pursuant to the Paraburdoo State Agreement.	Noted.
		Lease 4SA is held pursuant to <i>the Iron Ore (Hamersley Range)</i> Agreement Act 1963 (Hamersley State Agreement).	
2	Shire of Ashburton	 Whilst the proposal appears to be consistent with the Shire's strategic aims and objectives as they apply to future economic development and growth, there is some concern it may not be consistent with: The Shire's stated goal of protecting and maintaining environmental, heritage and natural values given the significant amount of native vegetation clearing required to accommodate the project. The large amount of groundwater proposed to be discharged into natural creeks and streams and the potential impacts on numerous sites of Aboriginal heritage significance. The Shire is concerned that with a potential increase in the workforce population it may adversely affect the Paraburdoo potable water supply. The town amenity could be disadvantaged with less available water for both the town's parks and gardens as well as residential home gardens. The town water supply currently has experienced shortages in the past and the proposed increase in population will further exacerbate this potential problem. The dewatering activities contained within the proposal of up to 1.7 GL/a into Pirraburdu Creek and up to 0.8 GL/a into Seven Mile Creek has the potential to become a breeding site for mosquitos creating public health risk. 	The extent of clearing and groundwater discharge to creeks are outlined in the Environmental Review Document (ERD) and are undergoing formal environmental assessment to gauge the significance and acceptability of the resulting residual impacts. The ERD describes the known environmental, heritage and natural values potentially impacted by the Proposal and the predicted impact on these values. Clearing of native vegetation to support the development of the proposal is designed to avoid the significant environmental and heritage values, and where unable to be completely avoided, is proposed to be offset in accordance with the framework provided by the WA Environmental Offsets Policy (GoWA 2011), the WA Environmental Offsets Guidelines (GoWA 2014) while ensuring that the type and scale of the offsets proposed for MNES are appropriate and consistent with the EPBC Act Environmental Offsets Policy (Australian Government 2012). Surplus water is proposed to be managed via discharge to disused pit voids where feasible, with the remaining limited surplus discharged to surface water systems. So as not to impact surrounding land users, the Proponent has committed to managing surplus water entirely within the Development Envelope. The proposed discharge of up to 1.7 GL/a into Pirraburdu Creek and 0.8 GL/a into Seven Mile Creek represents the respective volumes that can be discharged into those systems where the discharge will remain within the Development Envelope. It does not necessarily represent the volume of water that will be discharged into those systems (i.e. these figures represent maximum potential volumes, which are

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			expected to be discharged intermittently). Rio Tinto acknowledges the heritage and cultural significance of Pirraburdu and Seven Mile creeks and surrounding sites. Discharge to Seven Mile Creek currently occurs for the existing operation via the existing licensed discharge point at Joe's Crossing, which is proposed to continue to be used as the discharge outlet for this Proposal (ERD Figure 8-9). As discharge volumes will be relatively low and discharge locations becoming breeding grounds for mosquitoes is considered very low. The distance between the nearest discharge point to the Paraburdoo Townsite, Joe's Crossing, is approximately 8 km, which provides some buffer with respect to mosquito dispersal.
			The Proposal will sustain production from the Greater Paraburdoo Hub at approximately 25 Mtpa and the Proponent expects Paraburdoo town will continue to support the Greater Paraburdoo Hub workforce for the life of the Proposal. Therefore, the population of Paraburdoo Town and potable water demand are expected to remain similar to current levels. There is no risk to the town potable water supply, which will continue to be supplied via the Northern Borefield, with back-up supply via the Southern Borefield if required.
3	DWER	Prescribed premises	Noted.
		 Some elements of the proposal will trigger the following prescribed premises category definitions and thresholds of the Environmental Projection Regulations 1987: Category 5: Processing or beneficiation of metallic or non-metallic ore: premises on which: a. metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or b. tailings from metallic or non-metallic ore are reprocessed; or c. tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam. Category 6: Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore. 	Appropriate approvals will be sought under Part V of the EP Act, including amendments to the existing Licence (L5275/1972/12) to incorporate additional relevant aspects of the Proposal. Categories 5 and 6 (along with categories 12, 52, 64 and 73) are included in the current licence, these will need to be updated to address the changes sought under the Proposal. The Proponent acknowledges Part V approvals cannot be issued pending approval of the Proposal under Part IV of the EP Act.

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4	DWER	Part V matters	Noted.
		The proposal will require additional in-pit tailings storage and dewatering.	
		Emissions such as dust and noise associated with construction and operation of the above categories are best managed through a Part V licence.	
		Dewatering is planned to occur throughout the operational life of the mine. A surplus water discharge point will be located at Pirraburdu Creek, Seven Mile Creek and Six Mile Creek at Western Range. Surplus water discharge will remain within the development envelope. This dewatering aspect of the proposal can also be managed under a works approval and licence.	
		The ERD indicates that pit 4W (below water table pit) will be used as an in-pit TSF. The proposed TSF lies between Seven Mile Creek and Pirraburdu Creek, and approximately 4 km downstream of Ratty Springs.	
		Seepage from the TSF to groundwater is expected during operations and post-closure. During mining operations, a portion of seepage will be captured by groundwater abstraction bores to allow mining below water table. Based on conclusions in the ERD, dewatering borefields at 4E and 4W pits will maintain a hydraulic gradient towards the pits during operations.	
		The operational 'life' of a Part V licence for this site is likely to end soon after the cessation of dewatering. At this time, it is likely that the licence will be surrendered. Hence the ability to manage post-closure impacts through a Part V licence may cease.	
		It is recommended that potential post-closure risks be considered by the EPA, or alternatively, deferred to the Department of Mines, Industry Regulation and Safety (DMIRS), where appropriate. It is recommended that any potential risk to stygofauna in the area is considered as part of a Part IV assessment.	

PART A.2: FLORA AND VEGETATION

No.	Submitter	Submission and/or issue	Response to comment
5	DWER Flora and vegetation surveys Western Range mining area is represented by a desktop stud Technical Guidance requires a field survey to verify the conc the desktop study. DWER notes the proponent's commitmen further survey.	<u>Flora and vegetation surveys</u> Western Range mining area is represented by a desktop study. EPA Technical Guidance requires a field survey to verify the conclusions of the desktop study. DWER notes the proponent's commitment to do further survey.	In the Draft ERD, Figure 5-1 previously showed only the desktop survey completed by Astron (2018a) over the Western Range portion of the Development Envelope. The desktop survey was based on previous field surveys including two 2-phase detailed Level 2 surveys (Biota 2012a and 2012b), multiple Level 1 (reconnaissance) surveys to support NVCP applications (Biota 2003 and Astron 2013), targeted Priority Flora searches and systematic searches designed to map all <i>Aluta</i> populations and habitat. The desktop survey was designed to review and collate all previous work completed at Western Range and in the surrounding area, and to update and align the conservation values of significant results recorded in the area. ERD Figure 5-1 was subsequently updated to show the survey boundaries of all flora and vegetation surveys undertaken at Western Range.
			The field surveys used to inform the desktop survey cover the entire Western Range Conceptual Footprint except for approximately 24 ha proposed for relatively low impact and temporary topsoil/subsoil stockpiles at the western end of the proposed footprint. At the western end of the Development Envelope, in areas not subject to a field survey, vegetation mapping completed by Biota (2012a & 2012b) was extrapolated by Astron (2018a) using aerial imagery. No fires have occurred in Western Range for over 10 years and no other significant disturbance has occurred in that time, as such no significant change to vegetation characteristics are expected to have occurred. Given the stable conditions and number of surveys conducted in the area historically, along with the detailed surveys conducted over the remainder of the Development Envelope, the Proponent is confident the key flora and vegetation values have been adequately identified at Western Range.
			Notwithstanding, the Proponent has completed an additional single season detailed flora and vegetation survey in underrepresented vegetation communities and areas not previously surveyed at Western Range. A summary survey report is provided in Appendix 1 (Biologic 2020a) and the final survey report will be provided to EPAS once available.
			A total of 58 sites were sampled (quadrats, relevés and mapping points), of which 52 were quadrats. A total of 242 vascular flora taxa

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			from 40 families and 99 genera were recorded from the study area. One threatened flora and one priority flora taxon were recorded:
			- Aluta quadrata (T) – 17 individuals from two point locations;
			 Goodenia sp. East Pilbara (A.A. Mitchell PRP 727) (P3) – approximately 100 individuals from one point location.
			Both observed conservation significant flora taxa were recorded from known locations from previous surveys within the Western Range area. No new locations of conservation significant flora taxa were recorded during the survey (Biologic 2020a).
			A total of 12 vegetation types were recorded and mapped within the previously unsurveyed portion of the study area. The vegetation types are consistent with those recorded from previous surveys at Western Range and are not considered to be significant from a regional perspective. Additionally, the majority of the vegetation types recorded from the study area are not of local significance, with the exception of the those that support populations of the threatened taxon <i>Aluta quadrata</i> (Biologic 2020a).
			Additionally, in response to comments received from DBCA on the Draft ERD, the Proponent has undertaken a targeted search for <i>Hibiscus campanulatus</i> (P1) in the Western Range area of the Development Envelope (Rio Tinto 2020a). The survey recorded an additional 1,092 individuals in the Pirraburdu Creek area, increasing the total known individuals in the Development Envelope by 12.7% to 9,694. The new <i>H. campanulatus</i> records will not be impacted by the Proposal. The survey did not record any <i>H. campanulatus</i> individuals at Western Range. The survey report is provided in Appendix 2 .
			With the completion of these additional surveys the Proponent considers that the vegetation and significant flora species present within the Development Envelope and the likely impacts from the Proposal have been identified and that the requirements of the approved Environmental Scoping Document (ESD) and the EPA's Environmental Factor Guideline and Technical Guidance for Flora and Vegetation has been met.
6	DWER	<u>Cumulative impacts</u> Channar mining operation immediately adjacent to the proposal has not been included in the calculation of cumulative impacts.	The Proponent considers cumulative impact assessment need only take into account the Proposal and reasonably foreseeable projects in the vicinity of the Proposal, which may cumulatively have an effect on relevant environmental values and systems. The impact of the existing

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		Include Channar flora and vegetation impact in calculation of cumulative impact.	operations at Paraburdoo, Eastern Range and Channar are considered to have already been accounted for through previous assessments and approvals, and their impacts included in regional baseline datasets. As an example, justification for the 2012 listing of <i>Aluta quadrata</i> as Endangered under the <i>Wildlife Conservation Act 1950</i> (now <i>Biodiversity Conservation Act 2016</i>) included consideration of historical impacts.
			There is no meaningful way to know the nature or extent of environmental values that may have occurred at Channar prior to the commencement of mining operations. For example, pre-mining information on <i>Aluta quadrata</i> at Channar is not available as the impact assessment standards, taxonomic classification and the conservation significance status of the species was different or did not exist at the time of approval.
			The Channar population of <i>Aluta quadrata</i> is located outside of the Development Envelope and has been historically impacted by mining operations are Channar. However, areas containing a significant proportion of the Channar population have been excised from the Channar Ministerial Statement (MS 16) approval area. <i>A. quadrata</i> individuals remaining inside the boundary of MS 16 are protected by internal clearing exclusion zones. Therefore, no further impacts to <i>A. quadrata</i> are proposed as a result of mining or mine closure activities at Channar and no future cumulative impacts are predicted.
			No impacts to <i>Aluta quadrata</i> are predicted beyond the proposed impact to the Western Range population as detailed in the ERD. There will be no impact to the Paraburdoo population as a result of the Proposal or any other foreseeable project.
7	DWER	<u>Aluta quadrata</u> The proposal impacts and management of <i>Aluta quadrata</i> , both at a meta-population and species occupancy scale has not been presented, analysed and mitigated in a way that provides confidence in the estimated outcomes. Page xi of the ERD states that 18.1% of the Western Range population of <i>Aluta quadrata</i> (which is a loss of 12.6% of the total population) may be cleared. In addition, the ERD states that 'the proposed loss of	The Proponent completed 'area of occupancy' calculations across all three <i>A. quadrata</i> meta-populations using methodology consistent with the approach prescribed by the International Union for Conservation of Nature (IUCN). Figure 5-10 in the ERD shows <i>A. quadrata</i> to have an area of occupancy at the three meta-populations of 32 km ² . It also shows that implementation of the Proposal will not result in a reduction in the area of occupancy of the species. The comment appears to infer that the Western Range population is the only population of the three yet to be impacted by mining. The
		vegetation is not expected to cause a loss of biological diversity at the local or regional scale'. However, Aluta quadrata is restricted to the	central Pirraburdu population also remains unaffected by mining and will not be impacted by this Proposal. The Channar population is

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		banded ironstone formation range that extends east and west of Paraburdoo. Within this range there are three genetically distinct meta- populations (i.e. Channar, Western Range and Paraburdoo) occurring within a 35-kilometre radius, with minimal gene flow between populations, with the Western Range population being the population not currently impacted by mining. The ERD should further address the risk to the ecological integrity of the meta-population of the Western Range of <i>Aluta quadrata</i> , as well as the risk to total species viability by	located outside of the Development Envelope and whilst this population has been historically impacted by mining operations, areas containing a significant proportion of the remaining Channar population have been excised from the Channar Ministerial Statement (MS 16). <i>A. quadrata</i> individuals remaining inside the boundary of MS 16 are protected by internal clearing exclusion zones. No further impacts to <i>A. quadrata</i> are proposed as a result of mining or mine closure activities at Channar.
		impacting a genetically distinct meta-population and the potential loss of 12.6% of the remaining population.	A genetic assessment of the three genetically distinct <i>Aluta quadrata</i> populations at Greater Paraburdoo (DBCA 2019) found the diversity is highest at the larger Western Range and Channar populations, and lowest at the smaller Paraburdoo population. Within the Western Range population, individuals showed a gradual change in genetic variation from the eastern to the western ends; rather than discrete genetic clusters or widespread homogeneity within this population. However, the levels of differentiation within the Western Ranges population are considered by DBCA (2019) to be very low when compared to the overall levels of differentiation between the three. As such, the Western Range population. Results from the most recent genetic work undertaken by DBCA indicate all three meta populations of <i>Aluta quadrata</i> appear to have relatively moderate levels of genetic diversity when compared to other species from small or isolated populations (R. Binks pers comm).
			Changes made to the design of the conceptual footprint at Western Range and the implementation of Mining Exclusion Zones were made to ensure that the Western Range <i>A. quadrata</i> population will not be significantly fragmented, and as a result there will be no significant impact to the genetic diversity or ecological integrity of the Western Range meta-population.
			The Proponent also collected <i>A. quadrata</i> seed in 2018 from all three meta-populations (total 1.3 kg) that was sent to DBCA, including to its Threatened Flora Seed Centre (TFSC) (322 g). Storage and management of the seed by the TFSC will help preserve the genetic diversity of the species.
8	DWER	ERD - Groundwater Dependent Vegetation There is a lack of information and uncertainty around some of the hydrological regimes and assumptions of aquifer connectivity and how	The Proponent has completed two-dimensional hydrogeological simulations to assess the influence of soil properties on water-level decline within the alluvial aquifer in Seven Mile Creek as a result of dewatering in the underlying Wittenoom Formation (Rio Tinto 2020b).

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		this may affect groundwater dependent vegetation. Page 84 of the ERD states that 'Vegetation units outside of riparian zones are not expected to be significantly impacted by changes to hydrological regimes.' However, page 85 of the ERD states that 'there is uncertainty as to the expected vertical and lateral extent of drawdown in the alluvial aquifer'. This should be further investigated and clarified before assumptions are made on the level of impacts. The ERD should include potential indirect impacts to vegetation outside of the development envelope to address cumulative impacts at a local and regional context. This information should be provided in a tabular format.	Specifically, the work examined the processes of the hydraulic connectivity of the aquifers along Seven Mile Creek and in the Wittenoom Formation where they are connected and disconnected due to groundwater pumping (dewatering) in the Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek alluvial aquifer is predicted to be limited to a few hundred metres, and under all simulations will remain within the Development Envelope, and hence no impact to vegetation occurring outside the Development Envelope is expected. Further details around the modelling are presented in Appendix 3 .
9	DWER	<u>Environmental management plan (EMP) – Aluta quadrata</u>	The Proponent has revised the draft EMP (Rio Tinto 2020c), including:
		The environmental criteria for <i>Aluta quadrata</i> in the buffer area of the mining exclusion zone states that the trigger for management actions would be dependent on disturbance to the species either reaching 80 percent (%) of the mapped Western Range population or in direct disturbance (within 15m) of the mapped population. The current proposed monitoring regime to inform trigger levels for this environmental criteria is unclear due to the reasons below: The EMP states that buffer area will be surveyed however, the intensity and frequency of proposed targeted survey is unknown. The monitoring regime should be clarified. Table 2-1 in the EMP proposes to use annual land clearing reconciliation against conceptual footprint utilising GIS layers for trigger criteria and compliance assessment. This is not at an adequate frequency or scale for monitoring loss individual species.	 Clearer trigger criteria and management targets to demonstrate intended purpose. Further justification regarding monitoring rationale and choice of indicators, based on predicted and potential impacts (direct and indirect) to the <i>Aluta quadrata</i> population at Western Range (Tables 1-1 and 1-2). Additional details of proposed monitoring parameters and data collection methods (Table 2-1 and 2-2, EMP Appendix 3), including on-ground surveys, aerial image capture and camera logging. Suitability of other survey techniques will also be tested, including high resolution imagery (1-2 cm) captured by Remotely Piloted Aircraft, to estimate and map change in the <i>Aluta quadrata</i> monitoring program to demonstrate survey intensity and coverage, including sites within the buffer and Mining Exclusion Zone at Western Range, as well as reference sites (Paraburdoo population) (Figure 2.1 and EMP. Appendix 3).
		changes to hydrological flows as a form of monitoring. This should not be used as an appropriate tool and should not be used as a data collection method. In summary, the revised EMP lacks information and detail in relation to	The Proponent will continue to liaise with DWER and address any further comments regarding the EMP throughout the assessment process. The revised draft EMP is provided in Appendix 4 .
		on ground survey and contains coarse scale proposed monitoring and actions such as image capture (satellite and aerial imagery). These monitoring techniques may be inadequate to provide details for appropriate management should species decline occur.	

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		The EMP should be revised to provide clearer objectives and rationale for monitoring. In line with this methodology should be targeted to address specific objectives and undertaken at a finer scale and at a higher frequency than currently proposed.	
10	DWER	EMP – groundwater dependent vegetation The EMP states that 'the level of impact and management for riparian vegetation of Seven Mile creek is low'. The EMP predicts that over a 16 year dewatering time period, the groundwater levels in the dewatered aquifer will be lowered by up to approximately 160 m with the assumption that groundwater levels will recover following cessation of dewatering. More evidence should be provided on how this will occur and how the groundwater dependent vegetation will persist during dewatering. It is unclear how much baseline data has been collected to inform the triggers and thresholds for groundwater dependent vegetation. The EMP proposes to monitor riparian vegetation annually using satellite imagery to inform on changes in condition. It is unclear from Table 2-5 if this monitoring will be used as a trigger to initiate on-ground assessment of vegetation condition. If so, this is inappropriate as field investigations should be used to inform trigger levels.	The geology underlying Seven Mile Creek is best displayed in the cross-section presented in ERD Figure 7-6. It shows the south dipping stratigraphy of the Hamersley Group from the Brockman Iron Formation in the south to the Marra Mamba Formation in the north, with weathered bedrock and overlying alluvial sediments at the surface. While dewatering of the 4EE deposit will result in drawdown of up to 160 m in the aquifer in the Brockman Iron Formation, it is the dewatering in the Wittenoom Formation, that is required for geotechnical stability of the northern 4EE pit wall, and the hydraulic connectivity between the Wittenoom Formation and the overlying sediments that is predicted to result in drawdown in the alluvial aquifer in Seven Mile Creek. Subsequently, it is predicted in the ERD that up to 27 ha of groundwater dependent riparian vegetation (GDV's) to the north of the Mt McRae Shale may potentially be impacted. As presented in Appendix 3 and discussed above in the response to comment #8, the Proponent has undertaken two-dimensional hydraulic modelling to address uncertainty regarding the longitudinal extent of drawdown in the alluvial aquifer in Seven Mile Creek and potential associated impacts to GDV's associated with groundwater dewatering in the underlying Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek and under all simulations will remain within the Development Envelope, and hence no impact to riparian vegetation occurring outside the Development Envelope is expected. GDV's will continue to be supported by rainfall driven surface water flow events which will recharge the alluvial aquifer and vadose zone of Seven Mile Creek. As such, it not expected that groundwater dwater flow events which will recharge the alluvial aquifers. The 4EE pit lake water quality modelling presented in ERD Appendix 5-5, predicts the pit lake will fill to within 5 m of its final stable level in under 50 years of white 88% of inflow is predicted to be prundwater
			residual impact. Following the cessation of dewatering, significant flow events will also recharge the underlying fractured rock aquifers. The 4EE pit lake water quality modelling presented in ERD Appendix 5-5, predicts the pit lake will fill to within 5 m of its final stable level in under 50 years, of which 88% of inflow is predicted to be groundwater recharge (SRK 2018).

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			Remote sensing baseline data has been collected since 2018 and will continue to be collected until commencement of operational activities (Table A-9 of EMP). Trigger and threshold criteria have been assigned a 'draft' status and will be updated to 'final' once baseline data collection has been completed. Note that as the Proposal includes multiple mining areas relevant to the EMP, implementation of the Proposal across the Development Envelope will occur at different times. For example, operations at Western Range are scheduled to commence in 2023 while dewatering at 4EE is proposed to commence in 2026 (Section 2 of EMP, Table 2-7 and Table 2-8 of EMP).
			Both on-ground monitoring and remote sensing will inform the trigger and threshold criteria for Ratty Spring and Doggers Gorge including reference sites, and this monitoring informs vegetation values for MNES fauna (Table 2-7 of EMP). Remote sensing will inform early response and trigger criteria for the groundwater dependent riparian vegetation (GDV's) outside the Development Envelope for Seven Mile Creek (including reference sites) with on-ground monitoring initiated should early response criteria and/ or trigger criteria indicate decline due to Proposal (if appropriate) (Table 2-8 of EMP). The use of remote sensing for GDV's including the initiation of on-ground monitoring should trigger criteria be exceeded and due to Proposal, has been discussed with DWER during the development of the RTIO conceptual framework for development of EMPs, ('Inland Waters criteria') and is considered appropriate is this situation.
11	DWER	EMP – Table 2-5 Early Warning Criteria Environmental criteria: Sets a MSAVI value of 0.32. As discussed on page 53: "based on baseline data from 2017 and 2018 an MSAVI value of 0.30 generally represents an advanced state of canopy decline, while values between 0.35 and 0.39 represents early stages of canopy decline". The current 5th percentile MSAVI value along Seven Mile Creek is 0.40 and the lowest MSAVI across all the reference sites is 0.38 (graph A-1 page 54). While is it understood that the MSAVI value of 0.32 is an initial draft trigger it doesn't represent the level of conservatism appropriate for a trigger level criterion. DWER recommends setting an interim MSAVI value of 0.37 subject to collection of ongoing baseline data. Trigger criterion: Trigger criterion 1 and 2 appear to be the same.	The Proponent has updated the Early Warning Criteria (note change of title to: <i>Early Response Criteria</i>). The Early Response Criteria now exclude a Modified Soil Adjusted Vegetation Index (MSAVI) value and instead takes into account significant trends to ensure early detection of potential localised trend of decline (EMP Appendix 3, Table 2-8). Further, the trigger and threshold criterion have been updated in the EMP to align with the current 5 th percentile to ensure appropriate level of conservatism (EMP Appendix 3, Table 2-8). The threshold criterion has been updated for exceedances within a more frequent timeframe (two consecutive monitoring events) (EMP Appendix 3, Table 2-8).

No.	Submitter	Submission and/or issue	Response to comment
		Threshold criterion: Allows for exceedances below the MSAVI over four consecutive monitoring events which in the current framework is four years. DWER recommends that this is changed to over two years or four consecutive monitoring events (whichever is the least).	
12	DBCA	or four consecutive monitoring events (whichever is the least). <u>Threatened flora – Aluta quadrata (ranked endangered)</u> It is understood that the development envelope contains approximately 72 per cent of the total known population of <i>A. quadrata</i> , which is listed as threatened flora under the BC Act, ranked endangered. As outlined in the ERD, <i>A. quadrata</i> is only known from the proponent's active mining tenure, with three genetically distinct meta-populations existing within a 35 kilometre radius. Two of the three meta-populations occur within the development envelope of this proposal and the species has historically been subject to reductions in habitat (steep range slopes) and total known population resulting from ongoing mining activities across its distribution. It is noted that the proposal will result in direct impacts on the Western Range meta-population of <i>A. quadrata</i> , with "17.4% direct and 19.0% total (direct and potential indirect) loss of individuals in the Development Envelope" (page 90). This impact is equivalent to a loss of 13.7 per cent of the total known population based on direct clearing of up to 5179 individuals and an assumption that 50 per cent of individuals, inthe ERD also provides limited information on cumulative impacts of historic, current and proposed mining activities occurring across the three meta-populations. In the absence of a comprehensive assessment of cumulative impacts (as required under the approved Environmental Scoping Document), it is difficult to determine the implications of this proposal for the long-term viability of the species. It is acknowledged that the conceptual footprint of the proposal has been designed to avoid and minimise direct impacts on <i>A. quadrata</i> (e.g. through sterilisation of two mining areas), and that the ERD includes a commitment of 13.7 per cent of the total known population formation. However, the removal of 13.7 per cent of the total known population.	 <u>Threatened flora – Aluta quadrata (ranked endangered)</u> The Channar population of <i>A. quadrata</i> has been historically impacted by mining operations at Channar. The exact extent of the impact to this population is unknown as impacts occurred before the taxonomic classification and conservation significance status of the species was understood. No impacts to <i>A. quadrata</i> are proposed beyond the predicted impact to the Western Range population as detailed in the ERD. There will be no impact to the Pirraburdu population as a result of the Proposal. A significant portion of the Channar population has been excised from the Channar Ministerial Statement Development Envelope (MS 16). <i>A. quadrata</i> individuals remaining inside the boundary of MS 16 are protected by internal clearing exclusion zones and as such no further impacts to <i>A. quadrata</i> are proposed as a result of mining or mine closure activities at Channar. As no further impacts to A. <i>quadrata</i> are proposed at Channar and the Pirraburdu population will not be impacted under this Proposal, there are no cumulative impacts to be assessed as part of this Proposal (also refer to comment #6 response). <u>Offsets:</u> The Proponent agrees to consult with DBCA on the development of an Offset Strategy, including possible management and conservation offset measures aimed at mitigating residual impacts of the Proposal on <i>A. quadrata</i>.
		cumulative impacts of mining activities across the species' distribution. It is therefore considered important that specific limit(s) on direct and	

No.	Submitter	Submission and/or issue	Response to comment
		indirect impacts of this and other proposals are conditioned to ensure the long-term viability of the species.	
		Offsets:	
		The value of the proposed offset for this significant residual impact on <i>A. quadrata</i> has been calculated by the proponent based on the area and value of native vegetation to be cleared in areas where the species occurs. The calculation method used also discounts any overlapping areas of high value habitat for Matters of National Environmental Significance that may receive protection under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> . Based on the proponent's calculation, the indicative area of vegetation clearing to be offset in relation to <i>A. quadrata</i> is three hectares, amounting to a total offset value for this vegetation of \$4926.	
		DBCA is of the view that the proposed offset is not directly applicable to addressing the significant biodiversity conservation value being impacted (i.e. 13.7 per cent removal of the total known population of an endangered flora species). It would therefore appear that this offset may not align with the WA Environmental Offsets Policy (2011) and WA Environmental Offsets Guidelines (2014), which requires offsets to be "relevant and proportionate to the significance of the environmental value being impacted" (page 12).	
		It is currently unclear but considered unlikely that the proposed cash payment offset would provide adequate level of counterbalancing benefits to conservation outcomes for <i>A. quadrata</i> . Noting the requirement for the proponent to seek authorisation to take individuals of <i>A. quadrata</i> under section 40 of the BC Act and the ability of the Minister for Environment (or delegate) to impose conditions under section 41 of the Act, DBCA respectfully requests the opportunity to be involved in further discussion regarding consideration of alternative offset options.	
		Recommendation:	
		That a condition(s) of approval is applied requiring a clear limit for impacts of the proposal (direct and indirect) on the threatened flora species <u>Aluta quadrata</u> .	
		Recommendation:	
		That DBCA is provided with the opportunity to comment on possible management and conservation offset measures aimed at mitigating the	

No.	Submitter	Submission and/or issue	Response to comment
		residual impacts of the proposal on the BC Act listed threatened flora species <u>A. quadrata</u> .	

PART A.3: SUBTERRANEAN FAUNA

No.	Submitter	Submission and/or issue	Response to comment
No. 13	Submitter DWER	Submission and/or issue Troglofauna sampling and habitat connectivity The information below is outstanding from the draft ERD and should be provided to reduce uncertainty, determine the level of confidence in the predictions and enable a more informed assessment: 1. The majority of troglofauna sampling in the Western Range portion of the proposal is limited to boreholes within the proposed pit areas (Figure 7-1(1)), which may limit the assessment for troglofauna in this area. See also comments on the predicted habitat modelling below. 2. Biologic stated [23 April 2020] that the Marra Mamba formation north of the proposed pits is 'very likely' to have troglofauna in areas outside of the Western Range area, due to unavailability of boreholes suitable for sampling (age and type), limited access and locations outside of the targeted geology (Brockman formation). Further drilling has occurred, but no sampling has been undertaken to verify the habitat prospectivity in these areas.	 Response to comment In response to an outstanding comment on the Draft ERD, the Proponent has updated Figure 7-5 – Stygofauna habitat suitability taxa recorded, to also show predicted groundwater drawdown con (Appendix 5). 1. The Proponent provides the following breakdown of troglofauna samples collected inside and outside of the conceptual footprint ac the Development Envelope: Western Range: (255 samples, 200 inside, 55 outside footp A limited number of drill holes suitable for sampling were available outside the conceptual footprint, due to the age of historical drill holes; many of which have been rehabilitated Paraburdoo: (103 samples with 38 inside, 65 outside). The number of drill holes inside the conceptual footprint was constrained by the existing mining operations. Eastern Range: (72 samples, with 25 inside, 47 outside). Overall areas impacted by the Proposal are minor compare remaining habitat.
		3. The habitat assessment (Section 6, A7_1) refers to modelling within specific pits (e.g. 4W, 4E, 11W), but the pit area names are not included in the figures (Figure 6.1a-c, A7_1) illustrating species distributions or habitat, making it difficult to interpret the information in the habitat assessment.	The Proponent also presented in the ERD and ERD Appendix 7-1, a habitat suitability assessment involving 3D habitat modelling based on drill-hole logging data to assess the extent, thickness and connectivity
		4. The presence of fractures, shear zones and faults (Section 7.4.1) that intersect troglofauna habitat potentially interrupting habitat connectivity from east, where habitat is shallower, to west. Based on the current sampling undertaken, the assemblage of species in the eastern and western pits appear to be dissimilar, with the majority of species known only from one range (see Table 7-6), supporting the assumption that the faults and fractures may act as a barrier to species	boundary of the habitat model extends to a radius of 300 m around all existing drill holes as this distance provides a spatial indication of the area of high confidence habitat modelling, and in many areas provides an assessment of habitat suitability beyond the Proposal footprint. Further information on the methodology used in the habitat modelling is provided below (refer to comment #14 and Appendix 6).

No.	Submitter	Submission and/or issue	Response to comment
		dispersal. A figure illustrating the locations of the fractures and faults in relation to troglofauna species and all relevant pits labelled (e.g. 42E/47E) should be provided (e.g. Figure 7-2).	2. Rather than being an outstanding item from the Draft ERD, this item was discussed at the meeting between the Proponent, Biologic and DWER on 23 April 2020. The band of Marra Mamba Iron Formation
		5. The locations of bores sampled for stygofauna as illustrated in Figure 7-1 (ERD) do not appear to align with the areas of mapped groundwater drawdown in Western Range e.g. (Figure 8-1). As per the environmental scoping document (ESD), sampling should be undertaken in all areas of impact.	(MMIF) north of the proposed pits at Western Range has not been drilled to date, therefore sampling in this area is not possible. However, sampling in a similar band of MMIF further to the east at 27W confirmed the presence of troglofauna and the modelled high to medium certain suitability of the MMIF. The figures presented in Appendix 7 below four locations where the Brockman Ison
		6. Appendix 8.2 (pg. 27) states one of the survey limitations as "very dry wet season 2018-2019 – during the current survey groundwater levels were at an almost historic low, having been through an extended dry period since the last flow event in Seven-Mile Creek in 2017 (RTIO 2019). This may have temporarily reduced the potential wider occurrence of the target fauna or concentrated the fauna into patchier areas remaining saturated despite the low groundwater levels." Considering very few stygofauna specimens and species were collected in Western Range, where there will be groundwater drawdown of up to 30m (ng. 32) it is recommended that another round	Formation (BIF) is contiguous with MMIF at Western Range. At the two locations furthest west and east, the habitat modelling clearly shows highly connected high/ medium certain suitable habitats. Therefore, it is reasonable to expect that the remainder of the MMIF geology north of Western Range should provide the same level of high/ medium certain habitat suitability for troglofauna. Where the MMIF is contiguous with the BIF in the two central areas of Western Range, despite the MMIF being beyond the habitat modelling boundaries, connected suitable habitats are also likely to occur.
		of sampling is conducted after reasonable rainfall.	3. Figures 7-2, 7-3, 7-4 and 7-5 have been updated to include pit names (Appendix 5).
		7. A groundwater management plan, including the specific measures to manage groundwater drawdown impacts to stygofauna habitat, should be provided, where appropriate.	4. 3D habitat modelling including the full stratigraphy, faults, dykes, and modelled high certain and medium certain habitat AWT has been provided in the Greater Paraburdoo subterranean habitat modelling memo (Biologic 2020b) (Appendix 6).
			The inference that "the faults and fractures may act as a barrier to species dispersal" is not supported by the Greater Paraburdoo 3D habitat modelling memo (Biologic 2020b) and does not follow logically from the species distributions detected from Western Range. Refer to ERD Appendix 7-1 (Biologic 2019) Greater Paraburdoo Subterranean Fauna Survey Report, Table 5.6: Nine (9) troglofauna taxa collected from Western Range were only known from singletons, and thus cannot be used to infer habitat barriers because their actual distribution throughout their native range is not established. Six (6) other non-singleton taxa were collected at WR, and these were all found more widely throughout the range, or widely elsewhere within the Development Envelope. The wider distributions of these six taxa suggest that faults and fractures at Western Range do not act as habitat barriers. More detail about way in which habitat connectivity is assessed from the available information is provided in the Greater

No.	Submitter	Submission and/or issue	Response to comment
			Paraburdoo subterranean habitat modelling memo (Biologic 2020b) (Appendix 6).
			5. The Proponent has updated Figure 7-5 – Stygofauna habitat suitability and taxa recorded, to also show predicted groundwater drawdown contours (Appendix 5).
			6. Regarding the recommendation for additional stygofauna sampling at Western Range: Stygofauna sampling was undertaken at Western Range as much as possible, within the constraints of the location, depth, and availability of water bores and drill holes intercepting groundwater at the time of baseline sampling (refer Biologic 2019). At the time of baseline sampling, there very few water bores and drill holes intercepting the water table in Western Range (i.e. the range itself), and in the area surrounding Western Range.
			As per ERD Table 7-10, only six BWT samples were able to be collected from the Western Range area at the time of baseline sampling. Due to the significant depth to groundwater beneath Western Range, most of the drill holes did not intercept the water table (i.e. BWT sampling not possible in most drill holes).
			The surface level at Western Range ranges from approximately 400 mRL on the foothills to 568 mRL at the highest point. Groundwater levels beneath Western Range within the Wittenoom, Brockman Iron and Wyloo Formations range from 319.5 mRL in the north to 317 mRL in the south (Rio Tinto 2018a). Therefore, the depth to groundwater beneath Western Range is approximately 80 m to 250 m. There is a low likelihood that significant stygofauna populations would occur in groundwater at 80 m below ground level (mbgl) to 250 mbgl beneath the surface of Western Range (refer to Halse and Pearson 2014. <i>Troglofauna in the vadose zone comparison of scraping and trapping results and sampling adequacy</i> . Subterranean Biology 13: 17–34 [2014]).
			7. The Proponent will include groundwater management in the GWOS which is required to be provided as part of the Groundwater licencing requirements under the RiWI Act. The Proponent is seeking approval for BWT mining including groundwater drawdown and potential impacts to stygofauna habitat, however where relevant, will include consideration of management of groundwater drawdown impacts to conservation significant stygofauna habitat.

No.	Submitter	Submission and/or issue	Response to comment
14	DWER	 <u>Habitat prospectivity modelling</u> The modelled subterranean fauna habitat prospectivity (i.e. low to high certainty) approach requires refinement of the criteria and categories used to be meaningful for environmental impact assessment. The model uses drilling log data and diamond core drill holes to determine general suitability for subterranean fauna. The criteria used to determine the suitability of habitat includes presence of geomorphological characteristics known to form habitat for subterranean fauna (e.g. vugs and cavities), permeability, the geological formation or stratigraphic unit, as well as being based on "personal experience" and "previous studies in similar geological contexts throughout the Hamersley Ranges / Pilbara region" (Section 4.7., A7_1). The model methodology should specify the previous studies used and what datasets were used to determine the categories. The model categorises potential habitat into High, Medium (Certain), Medium (Uncertain) and Low prospectivity, represented as three-dimensional modelling showing the depth of available habitat in the proposal area (for examples see Figures 6.1a-c and Appendix 4 of A7_1). High and Medium (Certain) categories are based on geologies known to frequently and sometimes support subterranean fauna, respectively, and Low is attributed to geologies 'that very rarely support subterranean fauna'. However, the Medium (Uncertain) category is based on a lack of data, rather than knowledge that it is unsuitable habitat (see Page 38, A7_1). Appendix A7_1 states that "low and medium (uncertain) habitat units were not modelled or mapped as these were not considered significant habitat for subterranean fauna." However, the habitat prospectivity model should be appropriately tested, including sampling of 'medium uncertain' and 'low prospectivity habitat, to validate the categories and ranking used and the abitat prospectivity model should be appropriately tested, including sampling of 'medium uncertain' habitat should al	Additional detail regarding the 3D habitat modelling approach and methodology has been provided in the Greater Paraburdoo subterranean habitat modelling memo (Biologic 2020b) (Appendix 6). The habitat memo details the links from assessment of prospective suitability in 2D surface geology, through the habitat modelling methodology, including additional details and examples of the drill log coding, frameworks for assessment of habitat suitability, extent, thickness, and connectivity, and details concerning the impact scenarios used. Additional context images linking the high/ medium certain habitat zones to the surface geology and the underlying regional stratigraphy model (in 3D) have been provided with the habitat memo (Biologic 2020b) (Appendix 6). As agreed in the meeting between the Proponent, Biologic and DWER on 23 April 2020, a peer review of the habitat modelling methodology is currently underway, including a review from a specialist in subterranean fauna and separate review from a specialist in geological / hydrogeological modelling.

No.	Submitter	Submission and/or issue	Response to comment
		As advised at a meeting with the proponent and Biologic [23 April 2020], if the subterranean fauna habitat modelling method proposed is intended to be used for future assessments, it should be peer-reviewed and a report provided to the EPA detailing the methods and data used.	
		A memo or addendum with any additional information that they discussed at the meeting should be provided with the response to submissions.	

PART A.4: TERRESTRIAL FAUNA

No.	Submitter	Submission and/or issue	Response to comment
15	DAWE	The Department understands that two confirmed diurnal roosts, two potential diurnal roosts and one nocturnal foraging cave for the Ghost Bat (<i>Macroderma gigas</i>) (vulnerable) will be removed. The Department notes the statement "Any removal of roost caves is considered significant under the Conservation Advice, however these caves were not identified as priorities for protection by Bat Call (2020a) and therefore, their removal is not expected to result in a decline in the local population". Please clarify why the conclusion was reached that these caves were not identified as a priority for the Ghost Bat and that their removal is not expected to result in impacts or in the decline of the local population of the species.	Following the identification of several Ghost Bat roosts at Western Range in 2018 (Astron 2018b), the Proponent commissioned a Ghost Bat Contextual Study which included a desktop study and targeted field search inside and outside of the Development Envelope (Astron 2019). The study identified a total of 18 caves at Western Range as being utilised by Ghost Bats. A number of these caves were targeted for further acoustic monitoring to measure levels of Ghost Bat activity and to assess the relative importance of identified caves (Bat Call 2020a). To persist in an area, the Ghost Bat requires a group of caves/shelters that provide diurnal and nocturnal sites and a gully or gorge system that opens onto a plain or riparian line that provides good foraging opportunities. The persistence of the species in the Pilbara is believed to depend on the availability of diurnal roosts that have stable temperature and humidity (TSSC 2016).
		The caves to be removed under the Proposal are Caves 1, 3, 4, 5 and 13 (refer to Figure 10-3 and Figure 10-5 in the ERD). Data from acoustic monitoring, absence of scat middens and lack of sightings from follow up cave inspections all indicate that the impacted caves are infrequently used by Ghost Bats (Astron 2019, Bat Call 2020a). Data from the acoustic monitoring also indicated that when the caves were used it was for nocturnal visits rather than roosting, with the	

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			exception of Cave 13 where data suggests a single Ghost Bat roosted there on only four occasions out of a possible 34 monitoring nights.
			The study (Bat Call 2020a) concluded these caves are of lesser importance (relative to the other Ghost Bat caves in the Development Envelope), as each was assessed to be either near a 'primary' (most important) cave grouping or midway between two primary cave groupings that are separated by less than 5 km. This is explored in Section 10.6.4 of the ERD, with the important (or primary) groupings described as (Group 1) Caves 6, 18, 16 and 17; (Group 2) Caves 11 and 2; and (Group 3) Caves 15 and 12 (refer to Figure 10-3 in the ERD). The ERD notes that the three important groupings of caves were identified for the species based on detected usage and activity; with these cave systems having demonstrated regular and consistent usage by Ghost Bats.
			In contrast to the caves in the three groups, the studies indicate Caves 1, 3, 4 and 13 were used occasionally (rather than regularly and consistently) for diurnal roosting, and Cave 5 a nocturnal feed cave with low usage. Therefore, these caves have been described as of lesser importance relative to the primary groupings.
			The patterns, types and frequency of usage suggests the caves in the important groupings as combined systems represent better habitat and suitable alternatives to the only occasionally used individual caves of 'lesser importance' - 1, 3, 4, 13 and 5. In contrast, other caves in the Development Envelope that otherwise have similar characteristics to these five on their own are of elevated importance due to proximity to the most significant caves (e.g. Caves 16 and 17 are more important because they are close to the confirmed maternal roost Cave 6 and potential maternal roost Cave 18).
			As caves 1, 3, 4, 13 and 5 show some of the least use by Ghost Bats out of all the monitored caves in the Western Range area their loss is not expected to result in the decline of the local population.
16	DWER	<u>SRE surveys</u> With reference to Figure 6-4 in the ERD, the majority of the targeted survey locations appear to be in what has been deemed by the proponent as 'low' to 'moderate' suitability for short-range endemic (SRE) invertebrate species. There appears to be very few survey locations within 'highly' suitable habitat and only ~ two survey locations	The Proponent has committed to undertaking, at Western Range, an additional terrestrial fauna survey in areas that have not previously been subject to detailed surveys. The Proponent will also supplement the existing SRE survey coverage at Western Range with an additional survey that will include sampling in habitat types where previous survey coverage was of lower intensity.

	in the enticipated pit leastion. Noting that the area within the	
	conceptual pit location mainly consists of 'high' and 'moderate' suitability habitat for SRE species. Without comprehensive survey and identification of specimens within these locations, this will limit the assessment on impacts to SRE's.	The Proponent has provided in Appendix 8 a strategy document that details the areas to be surveyed, timing of surveys and how significant environmental values will be managed with respect to the Proposal, should they be identified.
	DWER notes that for the Western Range component of the proposal that the proponent has committed to undertaking further SRE invertebrate surveys in areas that have not previously surveyed.	
17 DWER	EMP – bats	Pilbara Leaf-nosed Bat
	The potential significant residual impacts for the proposal may be underestimated for the ghost bat and the Pilbara leaf-nosed bat. These additional potential significant residual impacts could be reduced following appropriate management as discussed below.	Multiple surveys have confirmed that the population of Pilbara Leaf- nosed Bats at the Ratty Springs roost is between 400 – 600 individuals and is permanently inhabited.
	following appropriate management, as discussed below. The management-based provisions and the management targets appear to be aimed at establishing baseline information (e.g. estimating the bat populations and cave utilisation [Appendix A3, Table 2-2 and Table 2-3]), rather than measuring significant changes in the bat populations and what caused those changes. The management actions (e.g. undertake monitoring) are proposed to occur during mining, this is an inappropriate time to establish a baseline. The EMP should include outcome-based provisions aimed at maintaining the populations and cave use for both bat species. The EMP should include triggers and thresholds, determined from population baselines prior to the commencement of mining, for both the management of impacts to the bat roosts and associated bat populations. The EMP should state the actions that will be taken in the event that changes in bat roost activity are recorded. Monitoring should be undertaken in conjunction with a staged approached to mining (e.g. blasting activities), to identify any changes in the use of bat roosts as a result of the proposal activities. The EMP contains outcome-based provisions for maintaining the structural integrity of the bat roosts, which is appropriate. The triggers and threshold for maintaining the structural integrity of the caves with bat roosts have been based on pre-determined mining restriction zones. However, the geotechnical assessments have not been completed (Appendix 3, pg. 17). The mining restrictions zones (and the	Due to the well-established baseline population, the Proponent has revised the draft EMP to included outcome-based provisions for the Pilbara Leaf-nosed Ratty Springs roost population. Justification and rationale for choice of provision has been updated in Table 1-2 of the EMP. The proposed trigger and threshold criteria include a Lower Call Limit (LCL), which will be based on long-term nightly call count data (Table 2-6 of the EMP). Criteria have been developed in consultation with Bat Call WA and are based on monitoring data from the several other Pilbara Leaf-nosed bat maternity roosts (Category 1) in the Pilbara. Currently available data for the Ratty Springs roost suggests an LCL of 2,000 calls per night (Bat Call WA, in prep). However, the final LCL value will be refined based on additional data collected over the full baseline period (indicatively until 2022/23). Continuous acoustic monitoring is the preferred method for monitoring the population at the Ratty Springs roost. With current technology, real time monitoring of the data is not yet feasible, so data collection and analysis will be undertaken quarterly. Trigger and threshold values will be retrospectively analysed against recent mine activity, blasting, drilling etc. and against environmental data such as rainfall and humidity to identify potential causes. At its nearest point, the closest deposit (14-16W) is approximately 400 m from the Ratty Springs roost, on the opposite side of Pirraburdu Creek. As such, the roost site does not share the same geology with

No.	Submitter	Submission and/or issue	Response to comment
		triggers and thresholds) should be updated and provided to DWER for review once all of the geotechnical assessments are complete.	such as drilling and blasting. Based on this, vibration monitoring is not proposed. A 250 m Mining Exclusion Zone buffer has been applied around the Ratty Springs roost to mitigate impacts (both indirect and indirect) and threatening processes for the life of the mine. Annual visual inspections and continuous temperature and humidity monitoring is also proposed to be undertaken at the Ratty Springs roost to monitor for any potential effects from blasting and vibration. Visual inspections will assess for any external structural damage. Internal temperature and humidity will be measured, and results analysed against ambient conditions, to identify potential changes in internal cave structure.
			Ghost Bat
			The Proponent has investigated the suitability of outcome-based provisions for the Ghost bat population within the Development Envelope.
			Data from the acoustic monitoring, VHF studies and scat analysis undertaken within Western Range over the last 3 years, all indicate that the Ghost Bat population consists of approximately 10 resident individuals.
			Further, the baseline data already collected shows that the Ghost Bats are highly transitory within the Western Range area with no identifiable seasonal pattern and do not show roost site fidelity, even with the most suitable caves. This combined with the small population size (n=10) means any changes in the population would be difficult to attribute to impacts from the development due to low statistical power. As such, any population trigger and threshold would be an arbitrary value rather than being statistically robust, as the already collected baseline data shows that natural variation in the population would invariably trigger threshold values.
			Taking this into consideration, the draft EMP has been revised to include an updated management-based provision for the Ghost Bat population (Table 2-4).
			The proposed management target is to:
			• Ensure no significant long-term decline in Ghost Bat usage of high value habitat in the Development Envelope, attributable to the Proposal.

No.	Submitter	Submission and/or issue	Response to comment
	A C C C N N tt V ((a T N N	Acoustic monitoring will be conducted at roosts within the Development Envelope, and at four regional roosts (locations to be confirmed). Collected data will be analysed to assess the management target and to indicate how Ghost Bats use caves within the Greater Paraburdoo region (e.g. diurnal versus maternal caves at Western Range vs other regional caves). Should data suggest criteria (trigger and threshold) are appropriate, the EMP will be updated according to the adaptive management process outlined in the Rio Tinto conceptual framework for the development of Environmental Management Plans (EMP Appendix 1).	
			The Proponent will also conduct geotechnical assessments prior to blasting activities within 300m of a significant cave entrance. The results of which will be used to refine appropriate mining restrictions zones, including triggers and thresholds, which will be provided to DWER for review.
18	DWER	Ghost bat The proponent has determined that the significant residual impact to the ghost bat will be the removal of two confirmed diurnal roosts, two potential diurnal roosts and one nocturnal foraging cave (ERD, Table ES3). However, the confidence in this conclusion is low as the proponent previously stated "The proponent expects ghost bats may vacate caves in the vicinity of mining operations for the duration of the mining activity but will return post-mining" (Proponent Response March 2020). The proponent should provide evidence to support the conclusion that if the ghost bats were to abandon roost sites they would return post mining.	There are numerous examples where Ghost Bats have either continued to occupy caves during nearby mining activities or have recolonised caves following the cessation of mining activities. Examples include multiple roosts at West Angelas (one as close as 70 m from mining activity) and the historically mined Robe Valley Mesa's. As described in comment #17, geotechnical assessments will be undertaken to ensure the structural integrity of these caves are maintained during mining and blasting activities to ensure that the caves remain suitable for roosting. Details of these and other examples are provided in Appendix 9 (Bat Call, 2020b).
			The Proponent has committed to retaining 13 of the 18 Ghost Bat roosts identified within the Development Envelope. Of the 13 retained roosts, only four (Cave 6, 16, 17 & 18) are within 300 m of the conceptual footprint. The remaining roosts, as shown in ERD Figure 10-3 are located well away from the conceptual footprint and consist of two potential maternity roosts (Cave 11 & 15), one confirmed diurnal roost (Cave 14) and six potential diurnal roosts (Cave 2, 7, 8, 9, 10 & 12). These caves provide alternative roosting sites for Ghost Bats should they vacate caves 6, 16, 17 & 18 during mining operations. As presented in Appendix 9 , it is reasonable to expect that Ghost Bats may return to caves 6, 16, 17 & 18 following the cessation of mining.

No.	Submitter	Submission and/or issue	Response to comment
19	DWER	 <u>Section 6.3.5</u> Text has been provided on the potential SRE taxa that has been found at Western Range and Paraburdoo and Eastern Range. Further assessment of impacts to SREs is required. Provide a table listing all taxa and include the following information: Sample locations found. If they have been found inside and/or outside disturbance areas. Types of habitat. Survey recorded. Species information and status. 	A table listing all SRE taxa is provided in Appendix 10 .
20	DBCA	Threatened fauna (ranked vulnerable) – Macroderma gigas (ghost bat)and Rhinonicteris (Pilbara leaf-nosed bat)Based on the information provided for review it is understood that the development envelope for this proposal supports populations of two species of threatened bat; the Pilbara leaf-nosed bat and the ghost bat, both listed under the Biodiversity Conservation Act 2016 (BC Act), ranked vulnerable. The persistence of both species in the Pilbara is understood to be dependent on the ongoing availability of suitable diurnal roosts (TSSC 2016a; TSSC 2016b).It has been confirmed by the proponent that the development envelope for the proposal contains a Priority 1 diurnal/maternity roost, several other caves and semi-permanent pools that support a permanent colony of approximately 400 to 600 Pilbara leaf-nosed bat individuals (i.e. the Ratty Springs roost). The development envelope also contains 18 caves that support an inferred local ghost bat population of approximately 10 individuals. The ghost bat caves include a confirmed and potential maternity roost(s) and a confirmed diurnal roost.The development envelope also encompasses critical foraging, roosting, and breeding habitat for these bat species, 342 hectares of which has been identified for removal because of the proposal. This includes the direct removal of five ghost bat roosts (i.e. two confirmed diurnal roosts, two potential diurnal roosts and one nocturnal roost).It is recognised that the Environmental Review Document (ERD) includes a commitment to "avoid direct impacts to the remaining 13 Chort Bet acver/creation in the Development	Pilbara Leaf-nosed BatMultiple surveys have confirmed that the population of Pilbara Leaf- nosed Bats at the Ratty Springs roost is between 400 – 600 individuals and is permanently inhabited.Due to the well-established baseline population, the Proponent has revised the draft EMP to included outcome-based provisions for the Pilbara Leaf-nosed Ratty Springs roost population. Justification and rationale for choice of provision has been updated in Table 1-2.The proposed trigger and threshold criteria include a Lower Call Limit (LCL), which will be based on long-term nightly call count data (Table 2-6 of the EMP). Criteria have been developed in consultation with Bat Call WA, and are based on monitoring data from the several other Pilbara Leaf-nosed bat maternity roosts (Category 1) in the Pilbara. Currently available data for the Ratty Springs roost suggests an LCL of 2,000 calls per night (Bat Call WA, in prep). However, the final LCL value will be refined based on additional data collected over the full baseline period (indicatively until 2022/23).Continuous acoustic monitoring is the preferred method for monitoring the population at the Ratty Springs roost. With current technology real time monitoring of the data is not yet feasible, so data collection and analysis will be undertaken quarterly. Trigger and threshold values will be retrospectively analysed against recent mine activity, blasting, drilling etc. and against environmental data such as rainfall and humidity to identify potential causes.

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		including through the implementation of 100 metre zones around caves that restrict mining activities and commits to having "no impact to the Pilbara Leaf-nosed Bat roost or semi-permanent pools at Ratty Springs" (page 306). It is also acknowledged that the ERD contains proposed measures to monitor, manage and mitigate, potential direct and indirect impacts from the proposal on threatened bat species (refer to advice under Item No. 3 below). However, given the proposed removal of critical habitat and the potential for indirect impacts (e.g. light, noise, vibration, etc.) on these populations existing in close proximity to the proposed mining activities over the project life, it would appear appropriate to set specific (and if possible quantitative) limits of impacts on bat populations in the area (both direct and indirect) to facilitate an adaptive management approach that ensures the persistence of these populations. Mining restriction/exclusion zones, and trigger and threshold impact limits on parameters such as peak particle velocity based on site-specific geotechnical assessments of individual caves could then assist in ensuring proposed impact limits on roost habitats can be identified and achieved. The Department of Biodiversity, Conservation and Attractions (DBCA) is of the understanding that the proponent has committed to undertaking geotechnical assessments of roost habitat (i.e. in response to DBCA comments on the draft ERD for this proposal), but these investigations are yet to be undertaken. It is therefore recommended that these investigations are completed as soon as possible and used to inform any condition(s) of approval designed to maintain the structural integrity of roost habitat. Recommendation: That a condition(s) of approval is applied requiring a clear limit for impacts (direct and indirect) on the threatened Pilbara leaf-nosed bat (<i>Rhinonicteris aurantia</i> (Pilbara)) and ghost bat (<i>Macroderma gigas</i>), including individuals, local population and habitat (roosting and foraging), as a	At its nearest point, the closest deposit (14-16W) is approximately 400 m from the Ratty Springs roost, on the opposite side of Pirraburdu Creek. As such, the roost site does not share the same geology with the proposed mine area which will limit vibrations from mine operations such as drilling and blasting. Based on this, vibration monitoring is not being proposed. A 250 m Mining Exclusion Zone has been applied around the Ratty Springs roost to mitigate impacts (both indirect and indirect) and threatening processes for the life of the mine. Annual visual inspections and continuous temperature and humidity monitoring is also proposed to be undertaken at the Ratty Springs roost to monitor for any potential effects from blasting and vibration. Visual inspections will assess external structural damage. Temperature and humidity will be analysed against ambient conditions and timing and mine and pit development/blasting data in adjacent pits to identify potential changes in internal cave structure. Ghost Bat The Proponent has investigated the suitability of outcome-based provisions for the Ghost bat population within the Development Envelope. Data from the acoustic monitoring, VHF studies and scat analysis undertaken within Western Range over the last 3 years, all indicate that the Ghost Bat population consists of approximately 10 resident individuals. Further, the baseline data already collected shows that the Ghost Bats are highly transitory within the Western Range area with no identifiable seasonal pattern and do not show roost site fidelity, even with the most suitable caves. This combined with the small population size (n=10) means any changes in the population would be difficult to attribute to impacts from the development due to low statistical power. As such, any population trigger and threshold would be an arbitrary value rather than being statistically robust, as the already collected baseline data shows that natural variation in the population would invariably trigger threshold values. Taking this into
			The proposed management larger is to.

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			• Ensure no significant long-term decline in Ghost bat usage of high value habitat in the Development Envelope, attributable to the Proposal.
			Acoustic monitoring will be conducted at roosts within the Development Envelope, and at four regional roosts (locations to be confirmed). Collected data will be analysed to assess the management target and to indicate how Ghost bats use caves within the Greater Paraburdoo region (e.g. diurnal versus maternal caves at Western Range versus other regional caves). Should data suggest criteria (trigger and threshold) are appropriate, the EMP will be updated according to the adaptive management process outlined in the Rio Tinto conceptual framework for the development of Environmental Management Plans (EMP Appendix 1).
			The Proponent will also conduct geotechnical assessments for all known roost caves prior to prior to blasting activities. The results of which will be used to refine appropriate mining restrictions zones, including triggers and thresholds, which will be provided to DWER for review.

PART A.5: INLAND WATERS

No.	Submitter	Submission and/or issue	Response to comment
21	DWER	 Section 8.7 ERD – groundwater and surface water monitoring Current and proposed surface and groundwater monitoring locations not clearly identified. Suggested changes: All surface and groundwater monitoring locations (current and proposed) in both the Eastern and Western Range operations should be depicted on a map of the development envelope. All groundwater monitoring locations should indicate the target aquifer being monitored. The map should also show existing and proposed operations to clearly indicate the spatial relationship between the monitoring locations, impact areas and sensitive receptors. The map must be included in the response to submissions. 	The Proponent has developed a draft EMP that outlines the management for the environmental objective for Inland waters, taking into account monitoring for surface and groundwater locations in relating to environmental values, that is, riparian vegetation at Seven Mile Creek and Pools (Ratty Springs and Doggers Gorge). Refer to Table 2-7 and Table 2-8 of the revised draft EMP for proposed monitoring and Figure 2-3 and Figure 2-4. Details of the groundwater monitoring bores, including depth and target aquifer, is provided in Appendix 3 (Table A 4) of the revised draft EMP.

No.	Submitter	Submission and/or issue	Response to comment
22	DWER	Section 8.7 ERD – groundwater and surface water monitoring Listing of proposed parameters to be analysed at each monitoring location not provided. Suggested changes: A listing of the proposed parameters to be analysed for each site should be provided within the response to submissions document.	In the revised draft EMP the Proponent has proposed monitoring of pools located within Western Range and Eastern Range, including physiochemical and hydrochemical sampling. Table 2-7 of the revised draft EMP includes a list of the physiochemical and hydrochemical sampling parameters proposed to be analysed.
23	DWER	Section 7.5.5 ERD – final landforms Uncertainty on final landform from 4W pit post mining. Suggested changes: There is still uncertainty on what type of landform the 4W pit will form post mining (i.e. in-pit waste fines storage facility or a pit lake). This uncertainty will need to be cleared and used to inform appropriate management within future iterations of the Mine Closure Plan (MCP).	The Proponent is evaluating the option to utilise the 4W pit for in-pit storage of waste fines. An assessment of potential impacts associated with this option are presented in Section 8.5.2 of the ERD. Should the Proponent not proceed with in-pit waste fines storage at 4W, a pit lake will form at closure. As described in the Paraburdoo MCP (Rio Tinto 2019a) Section 20.1.3, the majority of potentially acid forming (PAF) exposures on the 4W pit wall will be covered by inert waste at closure. From a conceptual assessment of the final pit wall exposures, and results from recent pit lake modelling work, it is anticipated that the 4W pit lake will not become acidic. Recent conceptual pit lake modelling has been undertaken with the intent to provide an indication of likely salinity levels post-closure. Modelling indicates that the pit lake will be characterised with increasing TDS over time. The current understanding, based on analysis of data collected to date and preliminary hydrogeological modelling, is that the 4W pit will act as a groundwater sink and is not expected to have a degrading effect on regional groundwater quality. However, if groundwater levels around the pit recover further that predicted levels, a potential flowthrough pit lake cannot be excluded. Further commentary on the potential environmental risk associated with a flowthrough pit lake is presented in the response to comment #26.
24	DWER	<u>Section 20.1.2 MCP – AMD Management and Pit Lakes</u> Groundwater contamination risks from potentially acid forming (PAF) material exposures. PAF material exposure of up to 20 metres is	Optimisation of the proposed 4EE pit design as presented in the ERD included the assessment of opportunities to minimise the potential exposure of PAF material, taking into account: pit geometries (geotechnical stability); the potential for ore sterilization; and the further

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		expected in the 4EE pit at the completion of mining. This presents a risk of surface and groundwater contamination through acid mine drainage (AMD) flux from the exposed wall rock. No measures to address the risk posed by this material have been proposed, other than to state that the AMD risk from this exposure is considered to be low.	exposure of underlying geological units. Should ongoing modelling and monitoring suggest adverse changes to pit lake water quality, the Proponent has a number of remediation measures that will need to be considered in consultation with relevant stakeholders. These remediation measures include partially covering of PAF exposures with inert mineral waste and optimising the pit lake conditions (e.g. increasing the rate of pit lake formation).
		The proponent is to discuss additional measures to prevent contamination from occurring in the first place, such as (but not limited to) minimising PAF material exposure and pre-treatment of wall rock with carbonate material. Provide this information in the response to submissions.	PAF material will remain exposed on the 4EE pit wall above the pit lake; ongoing solute release from sulfidic lithologies on walls, benches and in the form of talus that are exposed above the pit lake surface has been conservatively incorporated into the 4EE pit water quality modelling covering a 1000-year period (see Section 5.4 in Appendix 15 : SRK [2018]). Modelling indicates the risk of developing a low-pH lake is low (i.e. surface water is expected to remain circum-neutral, though evaporation will likely cause increasing salinity over time). Additional pit lake modelling will be undertaken to confirm the predicted pit lake water quality closer to closure and based on the outcomes of the modelling and level of risk, will determine the requirement for implementation of alternate management strategies.
			The 4EE pit is considered to act as a groundwater sink, therefore, the risk of groundwater contamination associated with the pit lake is inherently low. However, further work will be undertaken in subsequent studies to inform whether density-driven flow modelling is required to assess the likelihood of groundwater contamination occurring post-closure.
			Additional investigations and research and development projects have been undertaken both internally and in partnership with universities over the last ten years to review strategies such as chemical treatments and cover technologies. As an example, field and laboratory experiments were also conducted at the Tom Price mine in two temporary pit lakes where spoilt hay was used as a bulk source of carbon addition to water with the aim to investigate whether biological processes would start to remediate pit lake water quality. These investigations will continue to be pursued in order to support alternate management strategy options, should they be required.
25	DWER	Section 20.3 MCP - AMD Management and Pit Lakes	Refer to response to comment #24 above. 4EE pit lake water quality modelling undertaken to date does not indicate the formation of an acidic pit lake. The proponent will

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		The proponent states that 'additional pit lake water quality modelling is planned to determine if leaving a pit lake is an acceptable	periodically review and update the pit lake model to verify this assumption and will include the results in future iterations of the MCP.
		environmental outcome', but does not discuss other viable alternatives.	Additionally, formation of an acidic pit lake at 4W is considered highly unlikely as post-closure exposures of black shale in the 4W pit are
		The proponent is to discuss other viable remediation measures for	minor and subsequently will not have capacity to render the system acidic.
		relevant pits, including partial in pit waste placement, if a pit lake final landform is not deemed to be an acceptable final outcome. This information is to be included within the response to submissions.	Should ongoing modelling and monitoring suggest adverse changes to pit lake water quality, the Proponent will consider remediation measures which may include partial covering of PAF exposure with the placement of inert mineral waste and optimising the pit lake conditions (e.g. increasing the rate of pit lake formation).
26	DWER	Section 20.3 MCP - AMD Management and Pit Lakes	The potential for groundwater through flow is an uncertainty inherent to
	In regard to the 4W pit final landform, the proponent states that 'if groundwater levels around the pit recover further than predicted, a potential throughflow pit lake cannot be excluded'. No measures have been proposed on managing the potential contamination if this eventuates. Suggested changes: The proponent is to propose and discuss measures to manage the potentially saline and acidic throughflow water to avoid detrimental impacts on downstream receptors, including the Seven Mile and Pirraburdu Creeks. DWER recommends the response to submissions document includes this discussion. DWER also expects that future iterations of the MCP will include this information.	In regard to the 4W pit final landform, the proponent states that 'if groundwater levels around the pit recover further than predicted, a potential throughflow pit lake cannot be excluded'. No measures have been proposed on managing the potential contamination if this eventuates.	pit lake modelling, however this outcome is considered highly unlikely at 4W. Under either a pit lake or an in-pit waste fines storage closure scenario, measures will be taken to minimise surface water inflows into the 4W pit. This will include the implementation of flood protection landforms to prevent interception of Pirraburdu Creek flows during flood events.
		Additionally, the 4W pit has been classified as posing a low-moderate AMD risk based on historic exposures of black shale. Black shale exposures in the 4W pit cover approximately 2,900 m ² , making up less than 1% of the pit catchment area. Based on the sulfur values of drill holes from this area it is likely that these exposures represented hot black shale. However, based upon the exposure timeframe (greater than 23 years), it is likely they now represent cold black shale. Additionally, based on the current design for the 4W_03 waste dump, waste will be backfilled to 413 mRL resulting in much of the exposure being covered (Rio Tinto 2019a, Section 10.4.2.1 and Figure 17).	
			Therefore, the risk of acidic groundwater throughfow is considered negligible as the current and post-closure exposures of black shale in the 4W pit are minor and subsequently do not have capacity to render the system acidic.
			Further information on the final landform for the 4W pit and mitigation and management measures to address potential environmental risks will be presented in future iterations of the Paraburdoo MCP.

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27	DWER	Section 8.4.2 ERD - Alteration to existing surface water catchments, surface water flow paths and sheet flows Landbridges – the use of appropriately engineered structures has not been discussed to minimise disturbances to surface water flow. Discussions have been limited to potential ponding upstream of the landbridges and the resultant reduction in flow, rather than how to minimise these alterations. Suggested changes: The proponent it to propose and discuss ways to minimise disruption to natural surface water flow paths and impacts on downstream ephemeral pools. These measures can include the use of engineered structures such as culverts. DWER recommends the ERD is updated to include this discussion.	The proposed 42EE and 47E landbridges are expected to affect catchment areas and southward flows to the 42E (Eastern Range) pools; the removal of valley fill at closure is proposed to minimize impacts on local surface water flows post-mining. However, based on the steep topography, and also considering mining in the 42EE and 47E pits is expected to be of short duration, the construction of engineered structures to mitigate those impacts during operations is not deemed practicable. Eastern Range is dominated by low-erodibility waste. As a result, the 42EE and 47E landbridges are considered to present a low erosion risk. In addition, the waste rock associated with the 27W landbridge is also classified as low-erodibility. However, it is acknowledged that high velocities of surface water runoff in areas where built landforms intersect natural landscape could result in scouring and erosion. During operations (and upon closure), surface water management measures will be undertaken to capture and minimise sediment runoff to undisturbed areas and drainage lines where practicable. Measures to be considered include bunding and other drainage features such as silt traps, sediment basins and vegetated buffer strips. Current rehabilitation designs for the 42EE, 47E and 27W landbridges consider material characteristics, flood plain mapping and surface water flows and velocities. These designs will continue to be refined during closure studies to better inform rehabilitation designs and surface water control measures at closure.
28	DWER	Fig 2.4 / Section 2.4 ERD - Alteration to existing surface water catchments, surface water flow paths and sheet flowsA landbridge between pits 24W and 20W is shown in Figure 2.4. However, there is no mention of this landbridge or its potential impacts anywhere in the ERD.Suggested changes: The proponent is to discuss the potential impacts of the landbridge on existing surface water flow paths, and the potential effects of any ponding. DWER recommends the response to submissions document includes this discussion.	The landbridge proposed for the 20W-27W mining area is a 2 km east- west haul road linking the two pits. The proposed landbridge will intercept a small catchment, less than 5 ha in area, resulting in some ponding on the north side of the landbridge and reduced downstream flows. The figure shown in Appendix 11 has been modified from ERD Appendix 8-3, Figure 8-12, and shows the local change in hydrology in the Paraburdoo area. Inset A in the Appendix 11 figure shows increased ponding at the lowest point in the landscape upstream and in the middle of the east-west landbridge. At this point, surface water ponding following a 1 in 5 year rainfall event is not expected to extend more than 50 metres upstream. In the area immediately downstream of the landbridge peak flow depths from a 1 in 5 year rainfall event are reduced from 0.28 m to 0.07 m. At 500 m downstream of the landbridge, as run-off from unaffected catchments joins the tributary,

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			the impact to peak flow depths is minor, reducing from 0.72 m to 0.55 m for a 1 in 5 year rainfall event.
			Therefore, the Proponent predicts the 20W-27W landbridge will have only a minor and localised impact to surface water flows in the 20W- 27W area.
29	DWER	Section 8.5.1 ERD - Alteration to existing surface water catchments, surface water flow paths and sheet flows No measures specified on mitigating against the impacts of sediment laden runoff on downstream pools and aquatic fauna. Suggested changes: The proponent is expected to propose and discuss sediment control measures to minimise these impacts, including but not limited to, sediment basins and vegetated buffer strips. DWER does not consider downplaying the potential effects by highlighting the conservation significance (or lack thereof) of the affected fauna is an appropriate way of addressing these impacts. DWER recommends the response to submission document includes this information.	Surface water management features implemented during mining and at closure will be designed to reduce adverse impacts on the natural function and environmental value of watercourses, water quality and sheet flow downstream of the mining area. Table 8.6 within the ERD states that water management structures will be constructed where practicable in key risk areas to minimise discharge of sediment laden runoff from the site. Measures to be considered include bunding and other drainage features such as silt traps, sediment basins and vegetated buffer strips.
30	DWER	Section 6.3.2 ERD - Alteration to existing surface water catchments, surface water flow paths and sheet flows Paraburdoo processing plant has been discharging dewater into the Seven Mile Creek over a number of years, which is ponding against the Joe's Crossing haul road, resulting in an artificial all year-round riverine ecosystem. Formation of artificial pools goes against the objective of minimising changes to the local hydrological regime in Seven Mile creek as a result of surplus water discharge.	The proposed intermittent discharge of up to 1.7 GL/a of surplus dewatering water will occur via the proposed discharge points shown on ERD Figures 8-9 and 8-10. None of the proposed discharge points are located upstream of haul road crossings, as is currently the case with the existing Paraburdoo Plant discharge point (i.e. the management approach has been to design the proposal to avoid and minimise the creation of artificial ecosystems by managing surplus water in-pit where feasible).
		Suggested changes: The proponent must detail within the response to submissions any proposed measures to minimise the creation or worsening of similar	Additionally, as the proposed discharge volume is relatively small and the duration intermittent throughout the life of the Proposal, surplus discharge will not result in the formation of new artificial year-round riverine ecosystems.
		artificial ecosystems from the proposed additional 1.7 GL/year discharge. The measured identified in the response to submissions are to be included as essential rehabilitation activities in future iterations of the MCP.	A key objective of the Paraburdoo Mine Closure Plan is that surface water flows in Seven Mile and Pirraburdu Creeks are maintained. This will include removal of the existing Joe's Crossing haul road and the reinstatement of natural flows where surface water ponding is currently occurring.
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31	DWER	 7. A8 <u>1</u> - Groundwater modelling – 4EE ground water flow balance Confidence classification of 4EE groundwater model restricted by lack of accurate flow data from the Seven Mile Creek (SMC). Recharge from the SMC is the biggest component inflow component into the modelled water balance. Suggested changes: The proponent is to consider gauging the creek flows to allow for the refining of the model inputs, given the expected life of mine. The proponent has identified that an additional 5GL/a of groundwater will be required to support this proposal. DWER therefore considers that this information can be deferred and provided in support of a 5C Licence under the <i>Rights in Water and Irrigation Act 1914</i> (RiWI Act). 	The Proponent is continuing to refine the groundwater model for 4EE dewatering and will provide updated information with the future application for a groundwater licence amendment under the RiWI Act. With respect to gauging the creek flows in Seven Mile Creek, the Proponent has loggers installed at several locations along Seven Mile Creek. However, as the system is very dynamic and has a highly mobile and permeable streambed, accurately calculating the streamflow for flow events from this data is problematic. Supporting groundwater monitoring data from several groundwater monitoring bores screened in both the Seven Mile Creek alluvial aquifer and the deeper aquifers allow for reasonable estimates of groundwater recharge from the alluvial aquifer to be made.
32	DWER	 5.5.2 & 8.4.2 ERD - Groundwater modelling – 4EE groundwater model Uncertainty in the interconnection between the SMC Alluvial aquifer and underlying Wittenoom Formation within the 4E groundwater model domain. Suggested changes: More hydrogeological investigations (such as drilling and pump testing) are recommended to clear the uncertainty in the hydraulic connection between the two aquifers. The model can then be updated accordingly. As above, the DWER considers that this information can be supplied by the proponent at the time of application under the RiWI Act. 	While acknowledging that uncertainty remains, the Proponent has undertaken two-dimensional hydraulic simulations of the predicted longitudinal extent of drawdown in the Seven Mile Creek alluvial aquifer as a result of dewatering in the underlying Wittenoom Formation. Specifically, the work examined the processes of the hydraulic connectedness of the aquifers along Seven Mile Creek and in the Wittenoom Formation from connection to disconnection due to groundwater pumping (dewatering) in the Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek alluvial aquifer is predicted to be limited to a few hundred metres, and under all simulations will remain within the Development Envelope (refer to Part A.2 comment #8 and Appendix 3). The Proponent is continuing to refine the groundwater model for 4EE dewatering and will provide updated information with the future application for a groundwater licence amendment under the RiWI Act.
33	DWER	Appendix 4 3 - Groundwater dependent vegetation Groundwater dependent vegetation supported by inlands waters has been adequately identified in Appendix 4_3.	Noted.

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34	DWER	<u>Appendix 8-7 – Pools</u> Pools supported by inland waters appear to have been adequately identified in Appendix 8_7 through representative sampling.	Noted.
35	DWER	<u>Section 8 – Surface water discharge</u> One of the proposed surface water discharge points is into Pirraburdo Creek tributary. The wetting extent for this discharge point appears to encompass Ratty Springs and other downstream pools with the potential to impact on their hydrological regime (water level and quality). These residual impacts have not been adequately considered in the ERD. DWER notes that this may be due to unclear figures such as figure 8-9. Suggested changes: Consideration of the potential significant impacts of this action should be further considered by the proponent within the response to submissions, or this information made clear by providing a response along with updated figures.	The Proponent has updated ERD Figure 8-9 (see Appendix 12). The figure shows the tributary into which surplus water from 36W dewatering will be discharged joining Pirraburdu Creek downstream of the main Ratty Springs pool. Discharge may intersect a series of ephemeral to semi-permanent pools downstream of Ratty Spring, however based upon known groundwater quality at Western Range (ERD Section 8.3.4), any changes to surface water quality are expected to be within the range of natural variation, noting that the natural water quality of pools in Pirraburdu Creek south of Ratty Spring will be highly variable due to their ephemeral to semi-permanent nature. Additionally, the duration of discharge will be short (approximately 1-2 years) and the predicted volume very small (approximately 0.5 GL/a), particularly when compared to natural flows. Therefore, surface water discharge from 36W dewatering is not expected to have a significant impact on surface water quality in Pirraburdu Creek or a significant long-term negative impact on the health of riparian vegetation.
36	DWER	Section 8 - Drawdown Impacts on groundwater dependent vegetation As identified in the ERD an area of riparian vegetation along Seven Mile Creek of approximately 2 km in length has a very high likelihood of experiencing significant impacts from this proposal through drawdown and also cessation of dewatering discharge. Current condition is observed to be moderate due to augmentation through dewater discharge, and various impacts due to mining infrastructure and weed impacts. Normalized difference vegetation index (NDVI) analysis shows that vegetation in this area was likely to be highly persistent groundwater dependent vegetation prior to augmentation occurring and this state may not return under the current proposal. Comment: This has not been identified as a residual impact and may require further consideration to determine if this risk is significant, and whether additional information should be included within the response to submissions.	The impact to riparian vegetation located north of the Mount McRae Shale in Seven Mile Creek was acknowledged as a residual impact in the ERD; however, due to reasons outlined in the ERD, this impact was assessed as not significant and therefore not included in proposed offset calculations. The assessment of potential indirect impacts from dewatering drawdown and discharge on riparian vegetation is addressed in ERD Section 5 Flora and Vegetation. As discussed in the ERD, the zones mapped as at highest risk of impact from changes to groundwater levels occur within the 2 km stretch in Seven Mile Creek referred to, covering 27 ha of GDE vegetation conservatively predicted to be affected by drawdown in the alluvial aquifer associated with dewatering of the underlying Wittenoom Formation aquifer (refer to comment #10 above and ERD Figure 5-6). As the vegetation in these high-risk zones are in Degraded and Poor condition (due to historical impacts including in relation to receiving mine process water discharge and weed infestation) and occur in a highly modified landscape, the residual impacts in reference to this Proposal have

No.	Submitter	Submission and/or issue	Response to comment
			been assessed as not significant relative to the current state of vegetation.
			Significant flow events will continue to periodically recharge the alluvial aquifer and vadose zone that has been demonstrated to support the riparian vegetation in Seven Mile Creek south of the Mount McRae Shale. An area that is subject to drawdown from existing dewatering of the Brockman Iron Formation aquifer.
			Furthermore, as the flow path of Seven Mile Creek will not be permanently impacted by the Proposal, the Proponent expects the natural hydrological regime to resume post the cessation of dewatering and surplus water discharge activities, where surface water flow events will support the long term recovery of the system and drive the recovery in groundwater levels in the underlying Brockman Iron and Wittenoom Formation aquifers. As such, the Proponent expects implementation of the Proposal will not have a significant effect on riparian vegetation in Seven Mile Creek
37	DWER	Section 8 - Drawdown Impacts on groundwater dependent vegetation There is acknowledged uncertainty with regards to how far north drawdown impacts along Seven Mile Creek will propagate once active dewatering of the Wittenoom Formation commences. Suggested changes: DWER recommends the proponent implement management actions to monitor groundwater drawdown impacts, and in particular ensure drawdown impacts do not extend north of the current augmented section toward Kelly's Pool. This information should be included within the draft environmental management plan (EMP).	The revised draft EMP includes (Table 2-8) <i>Early Response Criteria</i> for groundwater monitoring bores along Seven Mile Creek within and outside the Development Envelope (Figure 2-4, Table A-6) to ensure trends in groundwater levels are detected at an early stage. Additionally, the Proponent has presented two-dimensional hydraulic simulations of the predicted longitudinal extent of drawdown in the Seven Mile Creek alluvial aquifer as a result of dewatering in the underlying Wittenoom Formation (Appendix 3). Specifically, the work examined the processes of the hydraulic connectedness of the aquifers along Seven Mile Creek and in the Wittenoom Formation from connection to disconnection due to groundwater pumping (dewatering)
			in the Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek alluvial aquifer is predicted to be limited to a few hundred metres, and under all simulations will remain within the Development Envelope.
38	DWER	<u>Section 8 – Groundwater drawdown impacts of pools</u> The proponent states in the ERD that "groundwater monitoring will be undertaken at Paraburdoo and Ratty Springs to ensure that the	Provisions have been made in the revised draft EMP for groundwater monitoring at Ratty Springs and Seven Mile Creek, including early response actions for changes in groundwater levels (Table 2-7 and Table 2-8)
		changes in groundwater levels are as predicted".	

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		Suggested changes:	
		These monitoring actions are to be incorporated into the EMP.	
39	DWER	EMP – Table 2-4 Early Warning criterion:	Provisions have been made in the revised draft EMP for groundwater monitoring at Ratty Springs and Seven Mile Creek, including early
		Environmental criteria: Sets a groundwater trigger for wet season levels. Recommend a dry season minimum based on historical levels should also be set.	response actions for changes in groundwater levels (Table 2-7 and Table 2-8).
		Response action: Recommend an action to proceed to trigger level actions if investigation suggests that exceedance is due to proposal.	
40	DWER	EMP - Table 2-4	Trigger criterion in the revised draft EMP have been updated to include dry-season events with monitoring data assessed on a quarterly basis.
		levels. Recommend a dry season minimum based on historical levels should also be set.	Monitoring has been updated to also encompass continuous logger monitoring of surface water levels assessed on a quarterly basis.
		Monitoring: Proposed monitoring is "Bi-annual photographic monitoring of surface water level at Ratty Springs and Doggers Gorge". It is unlikely that this method or frequency of monitoring will appropriately capture the variability of surface water levels. It is recommended that a more quantitative and frequent measure is implemented such as a surface water logger capturing daily readings and downloaded bi- annually.	Trigger and threshold criterion have been updated in the revised draft EMP to align with the current 5 th percentile to ensure appropriate level of conservatism (Table 2-7).
			The threshold criterion has been updated for exceedances within a more frequent timeframe (two consecutive monitoring events) (Table 2-7).
		Environmental criteria sets a modified soil-adjusted vegetation index (MSAVI) value of 0.32. As discussed on page 53: "based on baseline data from 2017 and 2018 an MSAVI value of 0.30 generally represents an advanced state of canopy decline, while values between 0.35 and 0.39 represents early stages of canopy decline". The current 5th percentile MSAVI value along Seven Mile Creek is 0.40 and the lowest MSAVI across all the reference sites is 0.38 (graph A-1 page 54). While is it understood that the MSAVI value of 0.32 is an initial draft trigger it doesn't represent the level of conservatism appropriate for a trigger level criterion. Recommend setting an interim MSAVI value of 0.37 subject to collection of ongoing baseline data. Threshold criterion: Include a dry season trigger.	
41	DMIRS	ESD Requirement 47	In response to comments received from DWER on the Draft ERD, the
			Proponent added the following documents to the ERD appendices to

No.	Submitter	Submission and/or issue	Response to comment
No.	Submitter	Submission and/or issue The statements made in sections 8.4.3 and 8.5.2 of the environmental review document (ERD) are general and do not allow an assessment of the potential risk from waste rock dumps and waste fines storage facilities. Whilst a summary of the static and kinetic geochemical characterisation has been presented in each mine closure plan (MCP), technical reports are absent, which are required to support the tabulated data and statements made. General results and the implications of metals / metalloid leachate assessment is provided, however, the laboratory method(s) employed are not discussed which has a bearing on the applicability of the results, nor are tabulated results presented to enable review. The summary of physical waste characterisation is very limited is not supported with the relevant technical reports. The Rio Tinto Iron Ore (RTIO) assigned classes of erosion potential have not been specified and raise concerns around operational materials management, including encapsulation / capping and placement of these materials in landforms that may be impacted by probable maximum floods. Geochemistry and physical parameters of the waste fines are "chemically inert" is the depth of the information presented. The presence of a saline plume under the Paraburdoo waste fines storage facility indicates that although metalliferous drainage may not be a concern, saline drainage is. The MCP does not provide a comparison of drainage quality and the beneficial use of the receiving groundwater. The action required to meet the above noted deficiencies is: Provision of RTIO technical memorandums tabulating relevant analytical data, methodologies, definitions of classifications, location / database data is stored. These are required as appendices to each MCP.	 Response to comment support the information contained in the MCP's and conclusions presented in the ERD: The Rio Tinto Iron Ore (WA) Spontaneous Combustion and ARD (SCARD) Management Plan for Operations added to ERD Appendix 5. Paraburdoo 4EE Pit Water Quality Modelling – Project Memorandum (SRK 2018) added to ERD Appendix 5. Greater Paraburdoo AMD and geochemical risk assessment summary to support the 2020 Greater Paraburdoo Iron Ore Hub Proposal Environmental Review Document (Rio Tinto 2020d) added to ERD Appendix 5. This report describes the geochemical analysis methods used on drill samples. Memorandum: Characterisation of erosion potential of mineral wastes for use in developing rehabilitated landform designs, Western Range, Paraburdoo and Eastern Range (LandLoch 2020) added to ERD Appendix 5. This report describes the site-specific erodibility measures, the parameters used in modelling and provides conclusions regarding suitable landform designs. The Proponent has since made the following updates to the Greater Paraburdoo AMD and geochemical risk assessment summary to support the 2020 Greater Paraburdoo Iron Ore Hub Proposal Environmental Review Document (Rio Tinto 2020d) (Appendix 13): Updated Appendix A – Summary of Geochemical Test Work Methodologies has been embedded in the pdf. Appendix C – Geochemical Sample Locations. Four figures showing geochemical sample locations and test methodologies across the Greater Paraburdoo area have been presented. The Proponent has also appended new geochemical characterisation reports for Western Range:
			 Western Range Sample Geochemical Assessment. (Environmental Geochemistry International 2020) (Appendix 14). Western Range – Geochemical Characterisation of Waste Rock and Tailings. (SRK Consulting 2020) (Appendix 15).

No.	Submitter	Submission and/or issue	Response to comment
42	DMIRS	ESD Requirement 48 The statements made in sections 8.4.3, 8.5.2 and 8.6 of the ERD, applicable to presence of potentially acid forming (PAF) materials, are general and do not allow an assessment of the potential risk from waste rock dumps and waste fines storage facilities.	Refer to response to comment #41 above.
		The comments and required action are as per the above line.	

PART A.6: AIR QUALITY (GREENHOUSE GAS EMISSIONS)

No.	Submitter	Submission and/or issue	Response to comment
43	DWER	<u>Greenhouse gas emissions</u> DWER has reviewed section 11 of the Environmental Review Document (ERD) and considers that the proponent should prepare a greenhouse gas management plan which includes: Estimated emissions	A Greenhouse Gas Management Plan (GHG MP) (Rio Tinto, 2021a) for the Proposal is provided in Appendix 16 and has been developed with consideration to the WA Greenhouse Gas Emissions Policy for Major Projects and the WA EPA Greenhouse Gas Management Plan section of the Environmental Factor Guideline: Greenhouse Gas Emissions.
		 estimate scope 1, 2 and 3 emissions (annual and total) over the life of the project – annual emissions should reflect all operations sustaining production at Greater Paraburdoo e.g. if Channar and/or Eastern Ridge is sustaining Greater Paraburdoo at the same time as Western Range and/or 4EE the total annual emissions from all relevant operations need to be provided for that 	A breakdown of estimated scope 1 and 2 emissions (annual and total) over the life of the Proposal for all operations sustaining Greater Paraburdoo is provided in Table 4 of the GHG MP. Scope 3 emissions relating to processing of iron ore from the Greater Paraburdoo Operation are discussed in Section 3 of the GHG MP. A figure showing a breakdown of estimated emissions (scope 1 and 2 combined) by mining area is provided in Appendix 17 .
		 year(s) the estimated emissions should also be separated out by source projected emissions intensity (emissions per unit of 	The Proponent is making a commitment for the Proposal to implement initiatives that either avoid, reduce or offset Scope 1 GHG emissions to progressively achieve a 26% reduction in GHG emissions by 2030, when compared to the forecast baseline estimate for the Proposal. For details see Section 4.1.2 of the GHG MP.
	 production) for the proposal and benchmarking against other comparable projects. Emissions Reduction Regular (every five years) interim and long-term targets that reflect an incremental reduction in emissions over 	The GHG MP (Section 4.2) includes reasonable and practicable emissions reduction and abatement initiatives, complimented by mitigation measure (each included as management provisions), to achieve the emission reduction target (Table 9 of the GHG MP).	

No.	Submitter	Submission and/or issue	Response to comment
		the life of the project. It is preferred that this is presented in a graph. Mitigation measures	Section 4.1.2 of the GHG MP addresses reporting. The Proponent wil report progress against the target on a five-yearly basis, commencing five years after the issuing of a Ministerial Statement, as well as actua
		• Outline the mitigation measures to be implemented and demonstrate that all reasonable and practicable measures have been applied to avoid, reduce and offset the proposal's scope 1 and/or scope 2 emissions over the life of the proposal.	performance in the 2030 target year. Reporting will be via the Ministerial Statement Compliance Assessment Report.
		 Provide the timeframe for the implementation of each measure. 	
		 Describe how and by how much these strategies will reduce emissions over the life of the proposal. 	
		 Provide evidence that the proposed measures are capable of achieving the stated reductions. 	
		Additional abatement	
		• Outline the mitigation measures to be implemented and demonstrate that all reasonable and practicable measures have been applied to avoid, reduce and offset the proposal's scope 1 and/or scope 2 emissions over the life of the proposal.	
		 Provide the timeframe for the implementation of each measure. 	
		 Describe how and by how much these strategies will reduce emissions over the life of the proposal. 	
		 Provide evidence that the proposed measures are capable of achieving the stated reductions. 	
		Public Reporting	
		 Outline the reporting requirements for periodically reporting against the interim targets. 	
		 Annual reporting is preferred, however where this is not possible reporting should ideally be aligned with the five year milestones set out in Article 4 of the Paris Agreement (e.g. 2025, 2030). 	

PART A.7: SOCIAL SURROUNDINGS

No.	Submitter	Submission and/or issue	Response to comment
44	DPLH	The Department has reviewed the environmental review document and is confident that Aboriginal heritage matters have been appropriately dealt with by the Proponent under section 9. Social Surroundings on pages 248-268. The Department acknowledges that multiple heritage surveys have been undertaken by the Proponent and consultation with the Yinhwangka People continues. It should also be noted that any potential impacts to Aboriginal sites or heritage places from the Proposal can be addressed through the mechanism in the provisions of the <i>Aboriginal Heritage Act 1972</i> .	Noted.

PART A.8: OFFSETS

No.	Submitter	Submission and/or issue	Response to comment
45	DAWE	The Department notes the following statement – "Consistent with recent decisions regarding mining in the Pilbara, the Proponent anticipates that if the Proposed Action is approved, then it is likely that a condition would be applied that requires the preparation of an Offset Strategy within six months of approval". The Department is in agreement with the approach of the development and implementation of an Offset Strategy. However, the Department is likely to require the approval of the Offset Strategy prior to the commencement of the action.	The Proponent will develop, during the assessment stage and in consultation with DAWE, an Offsets Strategy that is consistent with the Department's EPBC Act Environmental Offsets Policy. The Proponent notes DAWE's comment regarding the potential requirement for offsets for impacts to moderate value habitat and the likely offset rate to be applied.
		The Department considers a draft Offset Strategy could be developed during the assessment stage and submitted to the Department for consideration with a view that the implementation of the Offset Strategy could form a condition of approval. This approach avoids the Offset Strategy being considered in the Post Approval stage which could delay the commencement of the action. Further discussions would	

No.	Submitter	Submission and/or issue	Response to comment
		need to be undertaken with the Department to discuss the requirements of the Offset Strategy.	
		The Department notes the proposed financial contribution of \$3,000 per hectare of critical habitat (342 ha high value habitat) for Ghost Bat, Pilbara Leaf-nosed Bat (<i>Rhinonicteris aurantia</i> (Pilbara form)) (vulnerable), Northern Quoll (<i>Dasyurus hallucatus</i>) (endangered) and the Olive Python (Pilbara subspecies) (<i>Liasis olivaceus barroni</i>) (vulnerable). However, as previously discussed the Department is likely to require a financial contribution for clearing of moderate value habitat e.g. Drainage lines (70 ha) and Rocky Hill Habitat (1,000 ha) at a figure of \$821 per hectare. The Department notes that the figure of \$821 per ha has been indicated in the draft Environment Review Document (ERD) for clearing of good to excellent vegetation. The Department considers that the figure of \$821 per ha is likely to be acceptable for moderate value habitat.	
46	DWER	Offsets RISM table DWER and DAWE have requested the proponent explain why impacts to critical ghost bat roost caves have not been considered as significant, and therefore the proponent's calculation of significant residual impacts (SRI's) for the ghost bat remains uncertain. This work should be provided at the Response to Submissions stage of the assessment for further consideration of the SRI's for the ghost bat. Consideration of significant residual impacts to subterranean fauna has not been included in the RISM table. Table 12-1 should be updated to include information on this factor.	Section 10 of the ERD addresses significance of impact on MNES species including Ghost Bats and Ghost Bat caves. The ERD (Section 10.8.3) acknowledges any removal of roost caves is considered significant under the Conservation Advice for Ghost Bats (TSSC 2016), and states '(t)he direct loss of up 335 ha of high value, or critical, Gorge/Gully and Breakaway potential roosting and/or foraging habitat located within the conceptual footprint and the removal of two confirmed diurnal, two potential diurnal and one feed cave represents a significant impact and will be required to be offset'. This is reiterated in Section 12.3.3 of the ERD. The loss of the caves is incorporated the RISM table within the 342 ha of high value fauna habitat and forms part of the proposed offset of that high value habitat included in Section 12.4 of the ERD. However, an amendment to the RISM table is included as Appendix 18 below to include specific reference to the removal of the caves (refer to Terrestrial Fauna part of table – Significant Residual Impact column). The five caves to be removed all occur in Gorge/Gully (i.e. high value) habitat (Figure 6-2 of the ERD). Also refer to response in comment #15 above regarding cave groupings and related relative importance of caves. The RISM table (Appendix 18) has also been updated to include the other factors not addressed in the version provided in the ERD (i.e. Subterranean Fauna, Inland Waters and Social Surrounds) although no significant residual impacts to these factors were identified in the impact assessment (Section 7 of the ERD).

No.	Submitter	Submission and/or issue	Response to comment
47	DWER	Proposed offset contribution The proposed offset contribution to the Pilbara Environmental Offsets Fund (PEOF) can only be used for areas within the Pilbara bioregion, in this case the Hamersley sub-region. No offset fund is available within the Ashburton sub-region of the Gascoyne bioregion.	A breakdown of environmental values by IBRA sub-region is provided in Appendix 19. As described in the ERD, the Proponent acknowledges that the PEOF is currently under review by DAWE and requires the endorsement of the Commonwealth Minister for Environment as an acceptable mechanism for delivering MNES offset outcomes in the Pilbara bioregion. As also discussed in the ERD the Proponent anticipates it will need to develop an Offset Strategy to address EPBC Act approval requirements. Given the Proposal occupies part of the two bioregions, the Proponent proposes the Offset Strategy, developed in consultation with DWER, will, if required, address offsets for Significant Residual Impacts across both the Hamersley sub-region of the Pilbara bioregion and the Ashburton sub- region of the Gascoyne bioregion. However, if the PEOF receives endorsement before the Offset Strategy is due to be delivered, the strategy may then need only address the Ashburton sub-region - as the Proponent expects contributions to the PEOF will apply to Significant Residual Impacts in the Hamersley sub-region.
48	DWER	 Environmental values by IBRA subregion The proponent should provide a breakdown per bioregion, noting the contributions to the PEOF can only be proposed for SRIs in the Hamersley area and that a separate offset may be required for SRI's in the Ashburton sub-region of the Gascoyne bioregion. Information of each subregion is required on the following: Flora and vegetation in good to excellent condition Terrestrial fauna habitat types Aluta quadrata Critical habitat for Matters of National Environmental Significance (MNES) Bat caves in each region Data for any other relevant environmental value. 	A breakdown of environmental values by IBRA sub-region is provided in Appendix 19. Refer to comment #47 regarding the proposed approach to offsets with respect to the separate bioregions.

PART A.9: ENVIRONMENTAL MANAGEMENT PLAN

No.	Submitter	Submission and/or issue	Response to comment
49	DAWE	The Department notes a draft Environment Management Plan (EMP) has been provided as part of the draft ERD. The Department has not undertaken a comprehensive review of the EMP, however would like to provide the following initial comments. Further comments are likely to be provided during the assessment phase. The EMP (Table 1-1) refers to the clearing of high value habitat for the Ghost Bat, Pilbara Leaf-nosed Bat, Northern Quoll and the Olive Python. The EMP should also reference that moderate value habitat will also require clearing. The Department notes typographical error Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), Environmental should be Environment. The Department notes that further, surplus water quality monitoring will be undertaken at surface water fed pools within the Development Envelope (Western Range Gorges 10 and 7 and the Eastern Range Pool (ERP4) and at Ratty Springs and Doggers Gorge to support the trigger and threshold monitoring and criteria. Early warning, trigger and threshold criteria will be updated as required with the consideration to additional baseline data and adaptive management. Please clarify the timing of the further surplus water quality monitoring. The Department notes that potential risks to MNES fauna species through general activities resulting in increased presence of introduced flora and fauna, noise, dust, light and fauna interactions will be managed through internal procedures and have been outlined in Table A9. The Department would like to provide the following comments in relation to Table A9.	 The Proponent has updated the draft EMP (Rio Tinto 2020c; Appendix 4), including: Proposed and potential impacts (direct and indirect) to moderate value habitat (Riverine habitats) for MNES fauna species (Tables 1-1 and 1-2). Correction of the typographical error. Further details regarding the timing of water quality monitoring (Table 2-7) and definition of baseline phase (Section 2). A revised approach to the assessment and management of impacts from threatening processes. The approach to management of threatening processes (introduced flora and fauna, noise, dust, light and fauna interactions) has been revised and updated. This has resulted in the removal of Table A9 from the draft EMP. Impacts from threatening processes have instead been more clearly addressed throughout the draft EMP, including assessment of impacts to environmental factors though the source-pathway- receptor conceptual model (as per the Rio Tinto conceptual framework for the development of threatening process and the potential impacts to MNES fauna is now provided in Table 1-2 and Appendix 2 of the draft EMP. The threatening processes determined to require management, based on the conceptual framework, are described in Table 1-2 and the proposed management is included in the relevant provisions tables (Table 2-3 and 24 for Ghost bat, and Tables 2-5 and 2-6 for Pilbara Leaf-nosed Bat). The Proponent will continue to liaise with DAWE and address any further comments regarding the EMP throughout the assessment process.

No.	Submitter	Submission and/or issue	Response to comment
		Timing for the reporting of feral animal sightings, and audit of feral animal sightings and fauna encounters has not been specified. Please include.	
		No management measures have been outlined to control impacts from fire, although this has been indicated in the ERD. Please include.	

PART B.1: YINHAWANGKA ABORIGINAL CORPORATION SUBMISSION

No.	Submission section	Submission and/or issue	Response to comment
1	Executive Summary	The Yinhawangka People have native title to the Ranges and a consultative relationship through agreements with the Proponent. Yinhawangka and Rio Tinto have cultural heritage, environmental management and engagement processes and relationships. Yinhawangka ask for conditions that ensure Yinhawangka People actively participate in the monitoring of the outcomes based criteria and the management of trigger and contingency actions that protect the waters, and the threatened flora and fauna of the Ranges.	The Proponent values its strong relationship with the Yinhawangka People and YWAC, and the established framework for ongoing engagement and consultation including in respect of environmental management. The Proponent supports the Yinhawangka People's input and participation in environmental monitoring and management on Yinhawangka Country and will actively work with YWAC to investigate opportunities to facilitate this and to ensure that the engagement framework in place remains appropriate.
2	Executive Summary	YWAC asks for conditions that would dedicate offsets funding to the Hamersley sub-region and, if possible to an important place for Yinhawangka known as Nyimili.	The Proponent supports the allocation of offsets funding to actions that will provide for on-ground improvement, rehabilitation and conservation of environmental values on Yinhawangka Country. The Proponent also commits to commencing discussions around the importance of Niyimili with YWAC.
			Clearing is proposed to be offset in accordance with the framework provided by the WA Environmental Offsets Policy (GoWA 2011) and the WA Environmental Offsets Guidelines (GoWA 2014). Hence DWER is the decision-making authority with respect to the allocation of offsets funding under the Pilbara Environmental Offsets Fund (PEOF). It should be noted, however, that third parties have an opportunity to apply for funding for specific projects with each grant round under the PEOF.
			The Proponent will prepare and submit to DAWE for their approval, an Offsets Strategy for impacts to MNES habitat, ensuring that the type and scale of the offsets proposed for MNES are appropriate and consistent with the EPBC Act Environmental Offsets Policy (Australian Government 2012). Alternatively, subject to approval from DAWE, offsets may be payable into the PEOF. The Proponent will incorporate YWAC's comments in the preparation of the Offsets Strategy as far as possible.
3	Section 2 – Rio Tinto and Yinhawangka's Relationship	Stakeholder Consultation Register (Table 3-1 of the ERD). YWAC have provided a table setting out supplementary information regarding consultation between the Proponent, YWAC and the Yinhawangka People in respect of the Proposal, including	An updated Stakeholder Consultation Register which includes supplementary information regarding consultation between the Proponent, YWAC and the Yinhawangka People in respect of the Proposal is attached as Appendix 20 .

No.	Submission section Submission and/or issue		Response to comment	
		environmental issues raised by Yinhawangka representatives during consultation.		
4	Section 3 – Rio Tinto's Environmental Management and Aboriginal Engagement	Consultation – YWAC acknowledges that consultation has taken place between the Proponent and the Yinhawangka People in respect of the Proposal. This consultation has focused on cultural heritage and land access by Yinhawangka People, but has also included consultation about water, flora and fauna impacts, and an ethno-botanical survey to identify plants which are significant to the Yinhawangka People. YWAC notes that the ERD states that 'consultation with key stakeholders (including the Yinhawangka People) will continue throughout the assessment phase of the Proposal', but expresses concern there is no specific commitment in the ERD to ongoing consultation and incorporation of Yinhawangka Peoples perspectives in the operational, rehabilitation and closure phases of the Proposal. Annexure D reflects the joint environmental management approach sought by YWAC.	The Proponent, YWAC and the Yinhawangka People have an established framework for ongoing engagement and consultation throughout the planning, construction, operation and closure of the Proponent's operations. As detailed in Appendix 20 , the Proponent has engaged and consulted with YWAC and the Yinhawangka People prior to Referral of the Proposal to the EPA and during the preparation of the Environmental Review Document (ERD). The Proponent notes that between April 2018 and February 2019 the Proponent made a number of attempts to undertake a Cultural Values survey on-country with YWAC to identify areas and environmental features of cultural significance to help inform the Proposal design and the preparation of the ERD. As these consultations did not proceed as planned, the Proponent instead made a firm commitment in the ERD to continue to consult with key stakeholders (including the Yinhawangka People) throughout the assessment phase of the Proposal. The Proponent is continuing to engage with YWAC to coordinate a Cultural Values survey in respect of the Proposal.	
5	Section 5 – Recommendations sought of the EPA	 YWAC asks that the EPA make the following recommendations to the Minister for Environment: 1. Throughout the planning, operation, rehabilitation and closure of the Proposal, YWAC is invited by the Proponent to participate, and is appropriately funded by the Proponent to participate, in the 	As stated above, the Proponent commits to developing, in consultation with the Yinhawangka People, a Social, Cultural and Heritage Management Plan to minimise and manage impacts to social, cultural and heritage values within and surrounding the Development Envelope, during operations, through to closure and rehabilitation including provision of a framework for future	

No.	Submission section	Submission and/or issue	Response to comment
		monitoring and management of the criteria established in the approval.	consultation and engagement of the Yinhawangka People in heritage and environmental management and monitoring activities.
6	Section 5 – Recommendations sought of the EPA	2. The Proponent fund the employment of an environmental scientist with YWAC, and an appropriate level of on-costs, so that Yinhawangka Rangers can be genuinely engaged in the protection of endangered and threatened species and ecosystems on Yinhawangka country.	The proponent has committed to providing additional support to YWAC to enable the Corporation to have an appropriate level of technical expertise in Heritage, Environmental management and GIS support.
7	Section 5 – Recommendations sought of the EPA	3. The YWAC be consulted by the Proponent over the life of the Proposal, in the monitoring and management of environmental and Aboriginal heritage impacts of the Proposal, and ways to avoid or mitigate such impacts, including without limitation, through YWAC, input into all environmental management plans and studies and through assistance to YWAC with implementation of the Yinhawangka Healthy Country Plan.	The Proponent has committed to increased engagement and consultation, particularly in respect of the avoidance, mitigation and management of any cultural heritage impacts as a result of the Proponent's operations. The Proponent will continue to engage with YWAC and the Yinhawangka People, including engagement and consultation with YWAC and the Yinhawangka People about proposed developments on Yinhawangka country, environmental and cultural heritage management and regular reviews and updates to Cultural Heritage Management Plans.
			The Proponent also commits to developing, in consultation with the Yinhawangka People, a Social, Cultural and Heritage Management Plan to minimise and manage impacts to social, cultural and heritage values within and surrounding the Development Envelope, during operations, through to closure and rehabilitation, including provision of a framework for future consultation and engagement of the Yinhawangka People in heritage and environmental management and monitoring activities. This approach will help support the implementation of the Yinhawangka Healthy Country Plan.
8	Section 5 – Recommendations sought of the EPA	4. Offsets funding is provided by the Proponent and used to contribute to the protection and rehabilitation of environments for species threatened by development in the Ranges, within the Hamersley sub-region and with the Proponent to use its best efforts to support YWAC in securing Nyimili as a sanctuary for species threatened in the Ranges.	The Proponent supports the allocation of offsets funding to actions that will provide for on-ground improvement, rehabilitation and conservation of environmental values on Yinhawangka Country. The Proponent commits to commencing discussions around the importance of Niyimili with YWAC. Refer also to Part B.1 comment #2.
9	Section 5 – Recommendations sought of the EPA	5. The Proponent, jointly with YWAC, is to provide six monthly reports to the CEO reporting on compliance with these conditions.	The Proponent considers that YWAC recommendations 1, 2, 3 and 5 can be appropriately managed through the engagement and consultation framework developed between the parties.

No.	Submission section	bmission section Submission and/or issue	Response to comment	
			The Proponent commits to working with YWAC to ensure updates on the above commitments are provided at appropriate intervals and in a suitable format for Yinhawangka People.	
10	Annexure B	In 2019, YWAC was provided with a draft version of the Environmental Review Document for its review. YWAC provided comments on the draft ERD, which are reproduced in YWAC's submission. These comments related to: Efficient use of water resources including prioritisation of water use for production and maximising water recycling; Ongoing protection of <i>Gardagarli</i> (Ratty Spring) in collaboration with the Yinhawangka People; and Ongoing protection of <i>Garrabagarrangu</i> (Red Ochre Quarry) and maintenance of access to the site for Yinhawangka People during and post-mining; and Desire for a safe, stable and self-sustaining landscape post- closure.	 The Proponent confirms that YWAC provided comments on the Draft ERD in a letter dated 29 November 2019. The Proponent informed the EPA of these comments in a letter dated 5 December 2019, and provided a response to YWAC on 6 December 2019, which included a copy of the Proponent's letter to the EPA. The Proponent confirms the comments provided by YWAC on the Draft ERD are addressed in the Final ERD. The Proponent confirms that water generated by dewatering activities will be utilised in the first instance to meet operational water demands. The proposed water management scheme is outlined in Section 8.4.1 of the ERD. Commitments to the ongoing protection of <i>Gardagarli</i> (Ratty Spring) and <i>Garrabagarrangu</i> (Red Ochre Quarry), and to ongoing engagement with YWAC and the Yinhawangka People are outlined in Section 9 of the ERD. Closure objectives which include the development of safe and stable landforms, the generation of self-sustaining vegetation and preservation of cultural heritage values where possible are outlined in the mine closure plans for Eastern Range, Paraburdoo and Western Range (ERD Appendices 5-1 – 5-3). The Proponent will engage regularly with YWAC on closure plans and studies to ensure their views are considered and incorporated as planning progresses. 	
11	Annexure E – 3.1 Proponent Communication and documentation	As with all regulatory environmental approval documents, the technical nature of the ERD and supporting appendices and reports do not facilitate understanding of the proposal, impacts or remediation actions for a non-technical audience being solely aimed at technical regulatory staff. The process therefore is not inclusive of many Aboriginal people.	The Proponent understands the importance of ensuring that all stakeholders have an understanding of the key environmental aspects of the proposal. In addition to providing the referral and environmental review documents to YWAC for review and comment, engagement and consultation for this Proposal has also included presentations tailored to YWAC and the Yinhawangka People, attendance of technical specialists at meetings, on country meetings at key locations with YWAC and Yinhawangka representatives and 3D visualisations of predicted impacts. This information was intended to assist with understanding the	

No.	Submission section Submission and/or issue		Response to comment
			technical work which was undertaken to underpin the ERD and is detailed in Appendix 20 .
			The Proponent will continue to work with YWAC and the Yinhawangka People to ensure that technical information is presented in an appropriate manner and is inclusive of Yinhawangka People.
12	Annexure E – 3.2 Rehabilitation, Closure and Biodiversity	The ERD is primarily focused on short term impacts and does not adequately address the long term, 20+ year, outcomes on the Country.	The ERD describes and assesses the significance of the environmental impacts that have the potential to occur during construction, operation and through to closure of the Proposal.
			This includes the assessment of potential long-term environmental impacts. For example, options for closure landform designs are informed by surface water modelling that considers the potential impacts to final landforms from 1:100, 1:1,000 and 1:2,000 year rainfall events. In addition, the long-term erosion potential of final landforms is assessed by modelling which considers a 100-year climate scenario, where rare rainfall events up to 1:1,000 years for the Greater Paraburdoo area may be considered (Landloch, 2020). Similarly, for pit lake water quality modelling, hypothetical conditions extended up to 500 years post-closure for the 4W assessment (RTIO, 2019b) and up to 1,000 years for the 4EE pit lake model, including a climate change scenario, was also considered [SRK, 2018].
			The Proponent will continue to engage with YWAC to discuss long term outcomes on the Country.
13	Annexure E – 3.2 Rehabilitation, Closure and Biodiversity	The Closure plans referred to as Appendix 6 reference Eastern ridge only. The ERD and draft Ministerial condition (MC) references to rehabilitation and closure are generic and broad	Additional closure information is provided in the Paraburdoo Mine Closure Plan (ERD Appendix 5-2) and Western Range Mine Closure Plan (ERD Appendix 5-3).
		sweeping, and undefined.	Additionally, the level of detail contained in closure plans will increase as the finalisation of closure of closure criteria and final landform outcomes are developed in more detail as the operations progress towards closure. The Proponent will undertake further detailed closure studies and will continue to engage and consult with YWAC and the Yinhawangka People to support closure planning and closure outcomes on Yinhawangka Country, including post-closure access and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes.

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14	Annexure E – 3.2 Rehabilitation, Closure and Biodiversity	There are opportunities for sustainable outcomes, improving ecological value and delivering improved long-term opportunities for Yinhawangka and other local people while also supporting improvement of biodiversity and ecological habitats.	The proponent has allocated funding and created an operating budget for the Yinhawangka Rangers to participate in environmental management and monitoring programs in Paraburdoo.	
		Opportunities to add value to Country could be improved - for example including design and construction of specific high value habitats for priority and threatened species in rehabilitation and as part of closure. Degraded land represents an opportunity for rehabilitation, or an excuse for not rehabilitating. Clearly the former adds more value to the environment than the latter. There are opportunities for specific commitments to engage and involve Yinhawangka people, and Yinhawangka rangers, in monitoring or management of impacts from the Proposal. Reliance on "high tech" experimental methods such as UAV monitoring for structural integrity of Ghost bat caves and remote sensing techniques for monitoring dewatering impacts on vegetation communities – is no substitute for Yinhawangka boots on the ground. The proposed MSAVI methodology has documented limitations in assessing changes in vegetation amount / cover, a key requirement for detecting changes in vegetation associated with dewatering.	The Proponent commits to developing, in consultation with the Yinhawangka people, a Social, Cultural and Heritage Management Plan (SCHMP) to minimise and manage impacts to social, cultural and heritage values within and surrounding the Development Envelope, during operations, through to closure and rehabilitation, including provision of a framework for future consultation and engagement of the Yinhawangka People in heritage and environmental management and monitoring activities. The Proponent commits to incorporating relevant training components/modules into environmental management and monitoring programs that involve the Yinhawangka Rangers; thus, ensuring that appropriate experience, learning and development opportunities are provided.	
		There are opportunities across all aspects of the Proposal for engaging and involving Yinhawangka people to provide long term and sustainable ecological and economic opportunities for Yinhawangka People and Yinhawangka Country.		
15	Annexure E – 3.2 Rehabilitation, Closure and Biodiversity	It is noted that post mining landscape will include large pits and some pit lakes, however the rehabilitation/closure of these features is stated as "bunding to prevent access". A compliance driven approach without any effort at seeking a sustainable outcome as bunding requires on-going maintenance and is at best a low level control to prevention of access to what are stated as "geotechnically unstable" pits, waste dumps and land bridges. Design for rehabilitation and closure could deliver landscape that incorporates habitat suitable for threatened species, recreational areas, areas suitable for horticulture and other commercial	Under the Mines Safety and Inspection Regulations 1995 precautions must be taken to prevent inadvertent access to abandoned open pits. The construction of an abandonment bund is the current industry preferred method to minimise potential risk to public safety [DoIR 1997]. Conceptual-level abandonment bund locations have therefore been proposed as part of the closure planning process. The Proponent is currently undertaking studies into the closure of Eastern Range, which includes finalisation of closure criteria and development of detailed designs for final landforms. The Proponent will continue to engage and consult with YWAC and the	

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	operations. The Yinhawangka People should be directly involved Y in this work. ir		Yinhawangka People throughout these studies, including on matters relating to post-closure access and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes.
			The Proponent will engage and consult with YWAC and the Yinhawangka People in the same manner with respect to the closure of the Paraburdoo and Western Range mines. As these operations span a substantial timeframe (approx. 20 years) finalisation of closure criteria and final landform outcomes will be developed in more detail as these operations progress towards closure.
16	Annexure E – 3.3 Biodiversity	The ERD, EMP and MC all acknowledge significant impacts on threatened species, including MNES. There is a cultural impact of these losses on Yinhawangka people. The strong connection to Country through hunting, cultural and spiritual practices are reliant upon high biodiversity and "good Country".	The Proponent acknowledges the strong connection the Yinhawangka People have to Country including biodiversity and has detailed in the ERD the measures taken in the design of the Proposal to avoid and minimise impacts to the environment, including Threatened flora and critical habitat for MNES.
		Better engagement, understanding by the Proponent and involvement of Yinhawangka people in ongoing monitoring and management activities to minimise biodiversity impacts are essential. Financial offsets do not benefit Yinhawangka Country. Positive activities to improve the landscape, including outside the Development Envelope, in rehabilitation and closure are recommended. For example, actively engaging in restoration activities with inclusion of Yinhawangka people would deliver	The Proponent will continue to engage and consult with YWAC and the Yinhawangka People throughout the life of the Proposal, including in respect of environmental management, closure planning and rehabilitation.
			The Proponent supports the allocation of offsets funding to actions that will provide for on-ground improvement, rehabilitation and conservation of environmental values on Yinhawangka Country.
		improved ecological value. Such activity would also inform and allow the development of rehabilitation techniques that so far in the Pilbara are yet to demonstrate any ability to deliver self-sustaining outcomes. For example – undertaking remediation of degraded areas or current rehabilitation sites to establish Aluta quadrata, remediation of habitat suitable for Northern Quoll or Pilbara leaf- nosed bat would be a better outcome than reverting to "pastoral use".	Progressive rehabilitation will be undertaken within cleared areas to restore vegetation that is self-sustaining and compatible with the post-closure land use, which is required to be agreed upon based on stakeholder consultation and input. The Proponent recognises that YWAC is a key stakeholder in this process and proposes ongoing engagement with YWAC during the operations phase through to closure via regular forums. Current rehabilitation practices align with regulator expectations, consider broader industry standards and practice, and consider the learnings of ongoing research and development projects. and the Proponent will engage with YWAC with regards to opportunities for involvement in the rehabilitation processes in order to support improved ecological outcomes.
17	Annexure E – 3.3 Biodiversity	Fauna surveys conducted for the ERD were unable to sample any ephemeral water bodies, and many permanent areas were	Since publication of the ERD the Proponent completed, in June 2020, a post-wet season aquatic fauna survey at Greater

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		surveyed when "dry" after a succession of dry seasons which is a limitation on the documentation and assessment of these features.	Paraburdoo. This was the second phase of the survey, following the dry season survey completed in September 2019, and included sampling of potential impact sites and reference locations both inside and outside of the Development Envelope, including sites in Seven Mile, Pirraburdu and Turee Creeks, and persistent pools at Western Range and Eastern Range.
			The survey recorded a diverse range of aquatic fauna, including 378 invertebrate taxa, five freshwater fish species, one species of turtle and one species of frog.
			The sites of the highest ecological significance were all reference sites with persistent water located in Seven Mile Creek, Pirraburdu Creek and Dogger's Gorge. These sites generally recorded a high macroinvertebrate diversity, high richness of hyporheos fauna, high Pilbara endemic taxa richness, and the greatest diversity and abundance of fish (Biologic 2020c). These sites will not be impacted by the Proposal.
			A total of 15 taxa recorded during the survey were of scientific interest or conservation significance, including two listed species. The Pilbara pin damselfly, <i>Eurysticta coolawanyah</i> (Vulnerable IUCN Redlist) and the Fortescue grunter, <i>Leiopotherapon aheneus</i> (DBCA Priority 4 species and IUCN Near Threatened) were recorded at reference sites. Both species are known from outside the Greater Paraburdoo area (Biologic 2020c).
			The final survey report is provided in Appendix 21.
18	Annexure E – 3.4 Water quality	Extensive studies and detailed information on surface and groundwater impacts arising from the Proposal are available. It is well documented that ephemeral water bodies have significant heritage and are interwoven in Aboriginal culture, and these areas also have high ecological value.	As shown in Appendix 20 , the Proponent has, and is continuing to, engage and consult with YWAC and Yinhawangka People to define the cultural and environmental values associated with water bodies on the land the subject of the Proposal, and to avoid, mitigate and manage impacts to significant sites as a result of the Proposal
		Potential impacts on Ratty Springs, Seven Mile creek are significant and may go beyond dewatering. Sedimentation, erosion, contamination with waste rock and spoil, and clearing will all have impacts. It is recommended that Yinhawangka Rangers are engaged to actively control and manage Ratty Springs with the support of Hamersley Iron. Ongoing monitoring of Ratty Springs, Dogger Gorge, Seven Mile creek and the associated ephemeral water bodies should also be undertaken. Data from such work can	Section 8 and 9 of the ERD, provides information to support that there will be no impact to Gardagarli (Ratty Spring) as a result of the Proposal. Additionally, the Proponent is continuing to engage with YWAC around the design of the 14-16W pit specifically, such that impacts to visual amenity from Gardagarli and Pirraburdu Creek are minimised. The Proponent is also undertaking further

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		improve the understanding of the value of such areas and inform the rehabilitation and closure design for the permanent and ephemeral water bodies post mining.	consultation with YWAC with respect to culturally significant water holes within the Development Envelope. Ongoing monitoring of significant water features, including Gardagarli, Seven Mile Creek and Dogger's Gorge is proposed in the Draft EMP (Appendix 4), and YWAC involvement is proposed as described below.

PART B.2: YINHAWANGKA ABORIGINAL CORPORATION SUBMISSION - ANNEXURE E – SECTION 5 TABLE

No.	Document reference	Page / Table #	Section	Comment	Response to comments
1	CMS17501	Page 1	1	Assessment set as PER noting potential significant effects in relation to: clearing of native vegetation stygofauna and troglofauna impacts terrestrial fauna including Matters of National Significance Surface and groundwater impacts Impacts on Indigenous heritage values	Noted.
2	GPO Hub Draft Ministerial Statement Feb 2020	Page 4	5-5 (5) (e)	"prevent, control or abate the environmental harm" be amended to "prevent, control and abate the environmental harm". This amendment is requested to ensure that environmental harm is remediated.	Suggested wording of the Ministerial condition is noted. The Proponent understands the draft wording is consistent with that usually applied to this common condition. The Proponent notes the EPA can recommend conditions, including considering suggestions such as the one provided by YWAC and to make changes to the Proponent's draft conditions, in its assessment report to the Minister for the Environment. The Minister can further change and set conditions when issuing the implementation decision.

No.	Document reference	Page / Table #	Section	Comment	Response to comments
3	GPO Hub Draft Ministerial Statement Feb 2020	Page 5	6 Flora and Vegetation – Aluta quadrata	YWAC believes that commitment to provide <i>Aluta</i> <i>quadrata</i> habitat in the rehabilitation plan equal or exceeding the areas to be directly impacted by the proposal should be a condition of approval.	Noted. As discussed in the ERD, the Proponent aims to rehabilitate disturbed areas to be safe, stable and non- polluting landscapes vegetated with native species of local provenance. The establishment of <i>A. quadrata</i> as part of the native species mix will be a focus of rehabilitation research. As discussed in the ERD, the Proponent is undertaking additional research to improve knowledge of the ecology and biology of <i>A. quadrata</i> by investigating its water-use characteristics as well as the characteristics of the niche habitats in which the species' is found. The outcomes of this research will help inform future rehabilitation strategies for <i>A. quadrata</i> . As discussed in the Western Range Mine Closure Plan (MCP; Rio Tinto 2019b), propagation studies to date indicate the species cannot be readily grown from cuttings and seed germination trials have been conducted with limited success. However, as indicated in the ERD there is also preliminary evidence the species can grow in disturbed areas, having been observed in windrows at the Channar minesite. The research will build on the work done and knowledge gained to date and inform rehabilitation success will evolve and continue to be refined in the mine closure plans that will be reviewed and updated throughout the mine's life. Offsets will apply with respect to the acknowledged
					Offsets will apply with respect to the acknowledged significant residual impact of the Proposal to <i>Aluta</i> <i>quadrata</i> habitat and individuals, and the EPA and Minister for the Environment is to determine acceptability of both the impact and offsets in the assessment and approval decision process.
4	GPO Hub Draft Ministerial Statement Feb 2020	Page 5	7 Terrestrial Fauna – Ghost Bat and Pilbara Leaf-nosed bat	YWAC strongly supports the condition to maintain structural integrity of Ghost bat roosts in the Development Envelope and the Pilbara leaf-nosed bat maternal roost at Ratty Springs. YWAC recommends that the proponent be required to utilise knowledge gained in Condition 7-2 to incorporate Ghost bat and	Comment is noted and the Proponent supports the involvement of YWAC and the Yinhawangka People in proposed future environmental management and monitoring activities.

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				Pilbara Leaf-nosed bat roosting habitats in the rehabilitation and closure plans	
5	GPO Hub Draft Ministerial Statement Feb 2020	Page 5		The Proponent should be required to demonstrate how the use of UAV for survey of roost structural integrity will ensure that roosts are maintained and managed as per Condition 7-1 through documented evidence for use elsewhere. If this cannot be provided geotechnical survey and inspections on a regular basis must be conducted.	The draft EMP has been updated to more clearly describe the suite of monitoring to assess cave structure and integrity (see EMP Tables 2-4 and 2-6, and Appendix 3). Importantly, external cave assessments (visual or UAV) are not intended for use in isolation. This data is one indicator of change and will be considered with reference to the vibration monitoring, blast management plans and internal cave assessments (temperature and humidity) to determine exceedances of the trigger. Geotechnical assessments will be conducted on all caves prior to the commencement of works and subsequent assessments may be conducted should triggers be reached.
6	GPO Hub Draft Ministerial Statement Feb 2020	Page 6	8 Inland Waters – Riparian Vegetation	YWAC believes the environmental outcomes stated in condition 8 should be strengthened and broadened to ensure that there are "no impacts to Ratty Springs and the associated Riparian vegetation as a result of impacts from the Proposal". Similarly Condition 8-1 (2) should be broadened to "no adverse impact to the riparian vegetation of Seven Mile Creek outside Development Envelope as a result of the Proposal". Both areas, Ratty Springs in particular, are areas of high ecological and heritage significance. Impacts from the Proposal on these areas extend beyond dewatering. Weeds, sedimentation, clearing, unauthorised access, discharge of contaminants are a few examples of potential impacts from the Proposal. To fully protect and ensure environmental outcomes are achieved, broader and stronger conditions are required.	The Proponent acknowledges the cultural significance of Gardagarli and associated riparian vegetation to the Yinhawangka People and hence one of the key commitments in developing the Proposal is to avoid impacts to this area. The suggested Ministerial condition wording is noted. As indicated above, the EPA and Minister for the Environment may review, recommend and amend the draft and final conditions in the assessment and decision stages of the approval process.

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7	GPO Hub Draft Ministerial Statement Feb 2020	Page 6	9 Rehabilitation and Decommissioning	Condition 9-1 should be strengthened to include specific requirements for management and inclusion of habitat for threatened species such as <i>Aluta quadrata</i> , Pilbara leaf-nosed bat, in the rehabilitation and mine closure plan. Rio Tinto / HI do not have a demonstrated Operational track record of delivering ecologically sustainable rehabilitation in the Pilbara. Without strong conditions it is likely that a degraded landscape that does not meet even pastoral land use criteria will be left. Yinhawangka people have a strong relationship with country and rely on ecologically vibrant and diverse landscape culturally, spiritually and for hunting, foods, and medicines. The proponent and the Ministerial Conditions should commit to delivering strongly diverse and robust ecological outcomes in rehabilitation and closure that support Yinhawangka people.	Suggested wording of Ministerial conditions is noted. The Proponent acknowledges the strong connection the Yinhawangka People have to Country, including biodiversity. While the Proponent is yet to close a mine in the Pilbara, it has utilised opportunities for progressive rehabilitation over the years to build knowledge on how to achieve successful rehabilitation outcome and the Proponent is committed to ensuring that rehabilitation is completed to achieve revegetated areas that are ecologically self-sustainable and landforms that are safe and stable. A closure objective reflecting this is anticipated in the Rehabilitation and Decommissioning condition of approval. The Proponent is anticipating specific objectives relating to acceptable environmental outcomes for conservation significant species which will be prescribed in relevant conditions and these will apply to all phases of the operation including decommissioning and closure. To support the ecological outcomes and joint environmental approach sought by YWAC, the Proponent supports the participation of the Yinhawangka People in future rehabilitation and closure activities on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this.

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8	GPO Hub Draft Ministerial Statement Feb 2020	Page 6	10 Offsets	Contributions made as offsets should be directed to improving ecological value in the area immediately adjacent to the Development envelope. The proposed valuations to be used in the development of the Impact reconciliation proposal do not represent the true value of the areas that will be cleared and destroyed by this Proposal.	The Proponent supports the allocation of offsets funding to actions that will provide for on-ground improvement, rehabilitation and conservation of ecological values on Yinhawangka Country. Refer also to Part B.1 comment #2.
				Construction of riparian vegetation habitat for example, cannot be achieved for \$1500 per hectare and a value of \$3000 per hectare for critical habitat for Ghost bat, Pilbara leaf-nosed bat, Northern quoll and Pilbara olive python is grossly underestimated. It is proposed that the proponent should have to replace destroyed habitat elsewhere and manage to a self-sustaining state, including the populations of threatened species, in suitable areas adjacent the Development envelope Such areas should also be included in rehabilitation and closure design.	
9	Environmental Management Plan Rio Tinto 16/03/2020	Pages 2-3	Summary – Summary Table 1	Management targets as stated cannot be verified as realistic or achievable as there is no documented management plan that states how these will be delivered.	Relevant provisions to address and assess the management targets listed in the summary table are provided in the body of the draft EMP (see Section 2 and Appendix 3).
10	Environmental Management Plan Rio Tinto 16/03/2020	Table 1-2, Page 12	Environmental value: Riparian vegetation of Seven Mile creek	MSAVI has a documented limitation in its ability to sensitivity to changes in vegetation amount / cover and is not an appropriate method of determining dewatering impacts on riparian vegetation Jiang, Z., Huete, A.R., Li, J., and J. Qi. 2007. Interpretation of the modified soil- adjusted vegetation index isolines in red-NIR reflectance space. Journal of Applied Remote Sensing doi:10.1117/1.2709702	Vegetation indices (VI) calculated from remotely sensed spectral data are commonly used to measure the cover and/or condition of vegetation (Jackson and Huete 1991). The modified soil adjusted vegetation index (MSAVI) was developed to minimise the influence of reflectance from soil in the VI (Qi et al 1994). This may be particularly important for areas where vegetation is sparse (Bonneau et al 1999, Campbell et al 2020), such as many vegetation types in the Pilbara. Several VI's were compared for monitoring riparian tree health with data from a nearby project of the Proponent's, and

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					MSAVI was found to be the most reliable of the indices tested (Astron 2017).
					The Proponent believes that the paper referred to in the comment above, Jiang et al 2007, also supports the use of MSAVI for measuring changes in cover and condition of riparian vegetation. Jiang et al (2007) state that "vegetation indices (VIs) derived from satellite remote sensing data are one of the primary sources of information for operational monitoring of the Earth's vegetation cover" and that "In order to reduce the soil background effect, Huete (1988) proposed using a soil-adjustment factor, L, to account for first-order, vegetation-soil background backscattering, and soil variation, and obtained a soil-adjusted vegetation indices (SAVI)". This paper tested several vegetation index (SAVI)". This paper tested several vegetation indices against ground measured vegetation cover and leaf area index. Jiang et al (2007) concluded that in comparison to other indices, MSAVI resulted in "more flexibility and better agreement with vegetation biophysical isolines, and further reducing soil background influences. We found MSAVI isolines to closely approximate field-measured and modelled canopy biophysical isolines over differing canopy structures and a wide range vegetation fraction, LAI, and soil conditions, indicating the robust nature of the MSAVI".
					Furthermore, the Proponent proposes to undertake on- ground, field monitoring of creeks and pools to complement the remote sensing monitoring program. This includes surface water and groundwater levels and vegetation species composition (including weeds), cover, structure and condition, as described in the EMP. The Proponent will seek to engage with the Yinhawangka People to identify opportunities to support their participation in environmental monitoring and management activities on Yinhawangka Country including, where appropriate, what training and support

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					is required by YWAC and the Yinhawangka Rangers in respect of this work.
11	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-1, Page 15	Environmental value: Threatened flora Aluta quadrata	Aluta quadrata management – overreliance on annual reconciliation of disturbance rather than active management and monitoring. Yinhawangka rangers - training program and engagement of YWAC to conduct routine surveys and assessments for Aluta quadrate health. Mapping could include soil types, landscape / landform mapping, collection of seeds and participation in rehabilitation trials.	The draft EMP has been updated to include additional details of the proposed monitoring for <i>Aluta quadrata</i> , including an indicative on ground monitoring program (see Tables 2-1 and 2-2, Figure 2-1 and Appendix 3). The Proponent will seek to engage with the Yinhawangka People to identify opportunities to support their participation in environmental monitoring and management activities on Yinhawangka Country including, where appropriate, what training and support is required by YWAC and the Yinhawangka Rangers in respect of this work.
12	Environmental Management Plan Rio Tinto 16/03/2020	Table 1-2*, Page 23		 "the riparian vegetation (GDE) within the area of modelled dewatering extent has been degraded (at some areas) as a result from existing operations." Appear contrary to state that areas have been degraded by existing operations, but the Western Ridge proposal will "not result in significant residual impact" Uncertainty exists of impact to the alluvial aquifer in Seven Mile Creek north of the Mt McRae Shale and includes the limited understanding of the hydraulic connectivity between the Wittenoom formation and the alluvial aquifer, If there has been degradation from previous and current mining activities, opportunities to improve these areas, 	Riparian vegetation in Seven Mile Creek, north of the Mt McRae Shale barrier, that is within the area of modelled groundwater drawdown has been degraded as a result of surplus water discharge from the Paraburdoo Processing Plant over a significant period of time, which has resulted in the creation of a permanent water body in what is naturally an ephemeral system. This has resulted in changes to vegetation composition and the proliferation of weeds species such as Buffel Grass (<i>Cenchrus spp.</i>). As stated in the ERD, vegetation units that are within the area of modelled groundwater drawdown from dewatering of the 4EE deposit may experience a decline in their structure and abundance, however as the current value of this riparian vegetation has been

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				address existing impacts and eliminate possibilities of impact going forward exist. This approach would return the area post-mining to a state with higher ecological and environmental value, and consequently cultural value.	degraded to an extent by existing operations, and the system will continue to receive surplus water discharge and will also be recharged by natural flow events, it is not expected that the impact to riparian vegetation from the proposed dewatering activities will result in a significant residual impact compared to the current altered baseline.
					To address the uncertainty around the longitudinal extent of drawdown to be expected in the Seven Mile Creek alluvial aquifer, the Proponent has completed two-dimensional hydrogeological simulations to assess the influence of soil properties on water-level decline within the alluvial aquifer (Rio Tinto 2020b). Specifically, the work examined the processes of the hydraulic connectivity of the aquifers along Seven Mile Creek and in the Wittenoom Formation where they are connected and disconnected due to proposed groundwater pumping (dewatering) in the Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek alluvial aquifer is predicted to be limited to a few hundred metres, and under all simulations will remain within the Development Envelope, and hence no impact to vegetation occurring outside the Development Envelope is expected. Further details around the modelling are presented in Appendix 3.
					The scope of this assessment is limited to impacts associated with additional proposed activities. However, the Proponent notes that at closure, discharge from Paraburdoo Processing Plant will cease and the Joe's Crossing haul road will be removed to ensure surface water flows in Seven Mile Creek are maintained (a key objective of the Paraburdoo MCP). This will result in the affected section of Seven Mile Creek returning to a more natural ephemeral state. The Proponent will seek to engage with the Yinhawangka People to identify opportunities to support their participation in environmental monitoring and

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					management activities on Yinhawangka Country including, where appropriate, what training and support is required by YWAC and the Yinhawangka Rangers in respect of this work.
13	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-1, Page 15	EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained. Key Environmental values: Threatened species, Aluta quadrata.	Trigger level actions could be more specific in their details of how the proposed remediation action that will reduce impacts on A. quadrata. Assessment of the effectiveness of proposed threshold actions, such as "implement revised pit development method" are difficult to assess. More detailed documentation of the actions and how they will remediate the impact would assist understanding. Monitoring – more active on-site assessments would be preferred to annual reconciliation via GIS	The draft EMP has been updated to include additional details of the proposed monitoring for <i>Aluta quadrata</i> , including an indicative on ground monitoring program (see Tables 2-1 and 2-2, Figure 2-1 and Appendix 3). Baseline data for <i>Aluta quadrata</i> will be collected between 2020/21 and 2023/24, and a research program to increase knowledge of the species functioning will be conducted. These data will increase understanding of the species, prior to the commencement of works, and inform any appropriate additional trigger level actions.
14	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-1, Page 15	Objective: The Proponent will minimize indirect impacts from the Proposal, as far as practicable, to the Mapped Western Range Aluta quadrata population	Monitoring of impacts on A. quadrata: Deposition monitoring – Details of the quantitative method proposed to determine if there are impacts from drill blast spillage, sedimentation, and dust. sedimentation and dust would assist understanding. Hydraulic monitoring methodology is not detailed nor are the triggers for initiating this monitoring. Can these be explained? Is there opportunity for Community feedback on water flows, sedimentation etc to initiate hydraulic investigations?	The draft EMP has been updated to include additional details of the proposed monitoring for <i>Aluta quadrata</i> , including an indicative on ground monitoring program (see Tables 2-1 and 2-2, and Figure 2-1). A detailed description of the proposed <i>A. quadrata</i> monitoring program, including baseline data collection and proposed analyses is provided in EMP Appendix 3. The Proponent will seek to provide opportunities for feedback and participation in environmental management and monitoring programs for Yinhawangka People, including through the ranger program.

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15	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-1, Page 16	Objective: The Proponent will improve knowledge of the ecology and biology of Aluta quadrata, to assist with minimisation of impacts	 Weed surveys and control measures, vegetation surveys could be conducted by YWAC. No detail of the research beyond "investigate the niche habitat characteristics of Aluta quadrata". Details would assist understanding. Is the monitoring proposed here the same as that committed to under minimisation of decline in condition and prevention of direct impacts on the A. quadrata population? Lost opportunity to contribute to rehabilitation techniques for 	The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this. The Proponent will work with YWAC and the Yinhawangka people to develop a Social and Cultural Heritage Management Plan to detail these activities. The Proponent will undertake a research program in partnership with DBCA to improve knowledge of the ecology and biology of <i>Aluta quadrata</i> . The program will include a study of plant water-use and the characteristics of the niche habitats in which the species is found. This research will be undertaken in addition to the other management and monitoring provisions relating to <i>Aluta quadrata</i> outlined in Table 2-1 of the Draft EMP. Results of this research will be shared with YWAC.
16	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-2, Page 17	Outcome: The Proponent shall <u>maintain the</u> <u>structural</u> integrity of all retained Ghost bat roosts in the Development Envelope, including the establishment of mining restriction zones surrounding caves within 300 m of mine pit (Caves 6, 16,17 and 18).	The use of UAV for inspections of sites and bat habitat. Providing documentation or reference to demonstrate this technique is effective for identifying structural damage of bat roosts would improve confidence in the methodology. It is unclear when the trigger criteria actions will be "warranted". Monitoring of cave microclimate blast vibration levels and conducting structural damage inspections. Criteria for temperature and humidity change to trigger actions could be specified. Definition of "decline in structural integrity" would improve confidence in this approach. Visual or UAV inspection twice yearly seems unlikely to detect and changes in structural integrity until significant impact has occurred.	The draft EMP has been updated to more clearly describe the suite of monitoring to assess cave structure and integrity (see Tables 2-4 and 2-6, and Appendix 3). External cave assessments (visual or UAV) are not intended for use in isolation. This data is one indicator of change and will be considered with reference to the vibration monitoring, blast management plans and internal cave assessments (temperature and humidity) to determine exceedances of the trigger. Baseline data will be recorded between 2020/21 and 2023/24. This information will be considered through the adaptive management process, as described in the Framework for the Development of Rio Tinto Environmental Management Plans (EMP Appendix 1), to determine the suitability of additional criteria (trigger and threshold), including for microclimate characteristics (temperature and humidity).

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					Geotechnical assessments will be conducted on all caves prior to the commencement of works. And subsequent assessments may be conducted should triggers be exceeded.
					"significant damage" is provided as a footnote to Tables 2-4 and 2-6.
17	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-2, Page 18	Objective: The Proponent shall improve knowledge of the Ghost bat population and utilisation of high value habitat on Western Range in the Greater Paraburdoo Development Envelope	Ongoing monitoring and utilisation of roosts is an activity that could be undertaken by YWAC rangers and provide detailed information on use of roots, and Ghost bat ecology. Bi-annual monitoring seems unlikely to provide level of detail required to meet this Objective.	The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this. The Proponent will work with YWAC and the Yinhawangka people to develop a Social and Cultural Heritage Management Plan to detail these activities. Clarification has been included in the updated draft EMP (see Table 2-3 and Appendix 3), where acoustic bat monitoring is on-going with bi-annual analysis.
18	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-3, Page 19	Outcome: The Proponent will maintain the structural integrity of the Pilbara Leaf- nosed bat permanent maternal roost (Ratty Springs)	Ongoing monitoring of Ratty Springs, use of roosts, structural integrity of vegetation and roosts is an activity that could be undertaken by YWAC rangers. Trigger level actions could be developed as improvements and not as dependencies on trigger levels breached.	The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this. The Proponent will work with YWAC and the Yinhawangka people to develop a Social and Cultural Heritage Management Plan to detail these activities. Trigger level actions and the results from these actions (particularly the investigation steps) will be considered through the adaptive management process, as described in the Framework for the Development of Rio Tinto Environmental Management Plans (EMP Appendix 1).

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19	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-3, Page 20	Objective: The Proponent shall improve knowledge of the Pilbara Leaf-nosed bat population and utilisation of maternity roost near Ratty Springs Western Range in the Greater Paraburdoo Development Envelope	Ongoing monitoring and utilisation of roosts is an activity that could be undertaken by YWAC rangers and provide detailed information on leaf-nosed bat ecology. Biannual acoustic monitoring seems unlikely to provide data sufficient for achieving the objective.	The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this. The Proponent will work with YWAC and the Yinhawangka people to develop a Social and Cultural Heritage Management Plan to detail these activities. Clarification has been included in the updated draft EMP (see Table 2-3 and Appendix 3), where acoustic bat monitoring is on-going with bi-annual analysis.
20	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-4	Outcome: The Proponent will ensure no adverse impact on significant pools, Ratty Springs, Doggers Gorge associated Riparian vegetation as a result of dewatering for the Proposal.	Photographic monitoring of surface levels at Ratty Springs and Doggers Gorge does not seems to provide detailed scientific information on the water levels or flows at these sites. Quantitative methods such as those documented in Water Resources Assessment Manual – BOM Australia could be used to assess impacts on water bodies. Vegetation assessments of both sites could be improved in quality and frequency	The Draft EMP has been updated to reflect both proposed monitoring and management of Ratty Springs and Doggers Gorge in terms of groundwater and surface water levels, water quality sampling, and both remote sensing and on-ground monitoring of the riparian vegetation (overstorey, understorey and weed species) associated with these locations.

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21	Environmental Management Plan Rio Tinto 16/03/2020	Table 2-4	Outcome: The Proponent shall ensure there are no adverse impacts to the riparian vegetation of Seven Mile Creek, outside of the Development Envelope as a result of dewatering for the Proposal	Monitoring could be improved by ensuring appropriate and adequate non-impacted and reference sites are included in the assessments. There is an overreliance on MSAVI which is a technique that appears to have documented limitations in the determination of vegetation changes over time.	The draft EMP has been updated to also include reference capture areas for remote sensing (refer to Figure 2-3 of the draft EMP). Vegetation indices (VI) calculated from remotely sensed spectral data are commonly used to measure the cover and/or condition of vegetation (Jackson and Huete 1991). The modified soil adjusted vegetation index (MSAVI) was developed to minimise the influence of reflectance from soil in the VI (Qi et al 1994). This may be particularly important for areas where vegetation is sparse (Bonneau et al 1999, Campbell et al 2020), such as many vegetation types in the Pilbara. Several VI's were compared for monitoring riparian tree health with data from a nearby project of the Proponent's, and MSAVI was found to be the most reliable of the indices tested (Astron 2017).
22	Environmental Review Document	Page 264	9.5.3 Closure	Stated closure criteria "post-mining land use assumes that the site will be rehabilitated to create a safe, stable and non- polluting landscape revegetated with native species to the extent practicable, to be consistent with the identified environmental and cultural heritage outcomes and ensure the site is compatible with the current surrounding land use" is broad and open to interpretation. Clear and specific closure criteria together with detailed commitments would assist understanding and build confidence in the ability of the proponent to deliver the stated outcomes.	Noted. The Proponent is currently undertaking studies into the closure of Eastern Range, which includes finalisation of closure criteria and development of detailed designs for final landforms. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People throughout these studies, including on matters relating to post-closure access; heritage management; and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes. The Proponent will engage and consult with YWAC and the Yinhawangka People in the same manner with respect to the closure of the Paraburdoo and Western Range mines. As these operations span a substantial timeframe (approx. 20 years) finalisation of closure criteria and final landform outcomes will be developed in more detail as these operations progress towards closure.

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23	A5_1 Eastern Range Closure plan	Page 1	Purpose	The document refers to "support an environmental approvalat 42EE and 47E at Eastern range" but has no reference to Western Range.	Mine Closure Plans for Paraburdoo and Western Range were also submitted as ERD Appendices 5-2 and 5-3 respectively.
				The focus of the closure plan is delivering a stable landscape. Including consideration of closure outcomes that deliver value to the Yinhawangka people as Traditional owners is suggested. The opportunities to deliver high value ecological landscapes, landscapes suitable for horticulture, pastoral or tourist activities are opportunities to demonstrate leadership in mining and mine closure.	The Proponent is currently undertaking studies into the closure of Eastern Range, which includes finalisation of closure criteria and development of detailed designs for final landforms. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People throughout these studies, including on matters relating to post-closure access; heritage management; and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes. The stated closure criteria represent a minimum standard to which the Proponent is committed to achieving.
					The Proponent will engage and consult with YWAC and the Yinhawangka People in the same manner with respect to the closure of the Paraburdoo and Western Range mines. As these operations span a substantial timeframe (approx. 20 years) finalisation of closure criteria and final landform outcomes will be developed in more detail as these operations progress towards closure.
24	A5_1 Eastern Range Closure plan	Page 87	19.4.1	The closure strategy will leave pits, waste dumps and mining are with geotechnically unstable areas. (e.g. PUPEZ – unstable pit edge zone)	Closure objectives include: the development of a final landform that is stable and considers hydrological factors; and that public health and safety hazards have been appropriately managed. Meeting both of these objectives requires consideration of the interaction between waste dumps and potentially unstable pit edge zones (PUPEZ) in closure landform designs. It is acknowledged that two existing landbridges at Eastern Range are rated as a high instability hazard, however these landforms are not part of the GPO Part IV assessment.
				Several waste dumps and land bridges are acknowledged as having a "high stability hazard" rating.	
				Delivering a stable, ecologically self-sustaining landscape would seem to be a preferred minimum goal.	
				An improved outcome would be to deliver value added landscape that has high ecological, tourist, horticultural or pastoral potential.	
				Leaving a landscape with acknowledged geotechnical instabilities and as pastoral only land use does not	

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				maximise the opportunities for value adding through closure.	These landforms will be further investigated during closure studies to determine if amendments to their closure design criteria are required to achieve a safe and stable closure landform.
					All rehabilitation designs for waste dumps and landbridges have taken the PUPEZ into consideration, however the toe of some waste dumps and landbridges have minor intersections within the PUPEZ. This will continue to be assessed throughout mine life and via closure studies to determine if material from individual landforms requires removal or whether it can be left in- situ.
					Closure designs will also consider post-mining land use which will be a subject of stakeholder consultation and input during the closure PFS.
					The Proponent will submit updated mine closure plans for each site following completion of each closure study phase.
25	A5_1 Eastern Range Closure plan	Page 109	Site access	The proposed access at closure to mined areas is restricted to that required for traditional owner access to heritage sites and for post closure monitoring. The proponent should be encouraged to consider how value adding during closure and rehabilitation might deliver a more sustainable and less costly outcome post mining that may facilitate relinquishment.	Under the Mines Safety and Inspection Regulations 1995 precautions must be taken to prevent inadvertent access to hazardous areas such as abandoned open pits as these areas are generally not amenable to long- term stability and may be subject to rock falls and wall collapse post-closure.
					The construction of an abandonment bund is the current industry-preferred method to prevent inadvertent access to abandoned open pits. Conceptual-level abandonment bund locations have therefore been proposed in the mine closure plans.
					The maintenance of safe access routes to traditional owner sites and post-closure monitoring sites is a key closure outcome to be achieved and is captured in the Closure Risk Assessment (Appendix D of the Mine Closure Plans)

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					The Proponent is currently undertaking studies into the closure of Eastern Range, which includes finalisation of closure criteria and development of detailed designs for final landforms. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People throughout these studies, including on matters relating to post-closure access; heritage management; and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes.
					The Proponent will engage and consult with YWAC and the Yinhawangka People in the same manner with respect to the closure of the Paraburdoo and Western Range mines. As these operations span a substantial timeframe (approx. 20 years) finalisation of closure criteria and final landform outcomes will be developed in more detail as these operations progress towards closure.
26	A5_1 Eastern Range Closure plan	Page 111	19.5.3	Pit management for Eastern ridge, and assumed for Western ridge, is simply "constructing an earthen safety bund which is 2m high and 5m wide at the base. Such an approach is compliance only. Elsewhere in the Pilbara there are examples of where this type of bunding has failed to deliver an acceptable and sustainable safety outcome.	The construction of an abandonment bund is the current industry preferred method to prevent inadvertent access to abandoned open pits as defined by the <i>Safety Bund</i> <i>Walls Around Open Pit Mines Guideline</i> [DoIR 1997].
					Conceptual-level abandonment bund locations have therefore been proposed, adopting the minimum dimensions recommended [DoIR 1997].
				Earthen bunds as described quickly consolidate and erode, become vegetated and blend into the landscape rendering them ineffective as barriers to pits especially to 4WDs and trail bikes.	In subsequent closure studies the design, location and layout of abandonment bunds or other approaches to ensure public safety will be reviewed and refined in consultation with key stakeholders (refer to Section 20 of the Eastern Range Closure Plan [Rio Tinto 2019c], tasks ER32, ER35, ER49, ER50 - the aim of task ER35 is to determine construction methodology for abandonment bunds). After completion of closure works, there will be a period of monitoring and maintenance to confirm that the closure landform is performing as expected and objectives (e.g. public health and safety hazards have
				Continual inspection and maintenance of earthen bunding and signage is required to ensure integrity is maintained.	
				The proponent is encouraged to address the real hazard of open pits, geotechnically unstable and dangerous landforms.	
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					been appropriately managed) have been achieved prior to relinquishment.
27	A5_1 Eastern Range Closure plan	Page 112	Fig 40	Bunding proposed in Fig 40 attempts to "fence off" a large area leaving many pits and voids within that area effectively uncontrolled.	Noted. A conceptual level layout for the abandonment bund has been proposed. In subsequent closure studies the design, location and layout of abandonment bunds will be reviewed and refined. The final closure landform will be designed to ensure that public health and safety hazards have been appropriately managed in order to achieve relinquishment.
28	A5_1 Eastern Range Closure plan	Page 119	19.10	The proponent acknowledges that for Eastern Ridge closure activities will result in "catchment areas are reduced for several minor local creeks, including creeks and gorges hosting pools of environmental and heritage significance". Detailed analysis and remediation to prevent any impacts by closure activities, water flows and the post mining landform on areas of ecological or heritage significance is suggested.	Noted. The proposed 42EE and 47E landbridges will impact catchment areas and southward flows to the 42E (Eastern Range) pools – but these impacts will be temporary as valley fill is proposed to be removed at closure (refer to Figure 48 of the Eastern Range MCP [Rio Tinto 2019c]). Closure designs are intended to meet the stated objectives of a final landform that is stable and considers hydrological factors as well as preserving cultural heritage values where possible.
29	A5_1 Eastern Range Closure plan	Figure 45, Page 121	Local Hydrology – Eastern range	Rio Tinto states that post mining landscape in eastern range (and in Western range) will leave large ephemeral surface water storages in the voids and pits that do not intersect the water table. As ephemeral water is a key ecological factor of significance in the Pilbara landscape the development of these features to ensure they are stable and self- sustaining represents an opportunity to value add ecologically and possibly in other ways.	Above water table pits may hold water, however this ponding at the base of pit voids is deemed to have a low to very low likelihood of persistence across a dry season, and potentially may not represent a stable ecologically self-sustaining landscape. One of the key outcomes of closure is to ensure that public health and safety hazards have been appropriately managed in order to achieve relinquishment. It is possible that surface water may collect at the base of pit voids, where pit geology and geometries may not be amenable to long-term stability and would be associated with hazardous post-closure conditions including rock falls and wall collapse; as

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					these locations are classified within the PUPEZ, access into these areas represent a potential risk to public safety, and hence precautions must be undertaken to prevent inadvertent access in accordance with the requirements of the Mines Safety and Inspection Regulations 1995.
30	A5_1 Eastern Range Closure plan	Page 138	Section 25 Closure Monitoring	The planned requirement for pre and post closure monitoring of ecological, hydrological and heritage factors represent strong opportunity for engagement with Yinhawangka and the development of Yinhawangka land management business.	Noted and agreed. The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this.
31	A5_1 Eastern Range Closure plan	Page 140	Section 26 Post Closure Maintenance	Post closure maintenance activities could be managed locally by Yinhawangka and Paraburdoo residents.	Noted and agreed. The Proponent supports the Yinhawangka People's participation in environmental monitoring and management on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this.
32			Offset Fund	Management of weeds, feral, grazing pressures Restoration of species and habitats. Protection of high value habitats	Noted.
33			Viability of the Proposal	Hamersley Iron claim the proposed extension is the "only viable option to sustain iron ore production" but no alternatives or analysis of options considered is presented. Rio Tinto Iron Ore (RTIO) see the proposed expansion	Currently approved operations at Paraburdoo, Eastern Range and Channar are nearing the end of their mine life. The Proposal will allow continuation of production from the Greater Paraburdoo Hub of the existing rate of approximately 25 Mtpa beyond 2022, utilising the
				of operations to Western Ridge as key to sustaining production from the Paraburdoo and Eastern Ridge operations for up to 20 years, and essential for the survival of the Paraburdoo township.	existing available intrastructure.
				It is unclear from the ERD when the operations at Paraburdoo and Eastern ridge would cease or become unviable if the expansion did not proceed.	

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34	Environmental Review Document		Communication of Impacts	Consideration of audience, including language requirements, should be made. Modern communication methods such as infographics, and the avoidance of technical jargon may significantly improve understanding, participation, and engagement in the process.	Noted and agreed. The Proponent understands the importance of ensuring that all stakeholders have an understanding of the key environmental aspects of the proposal. The Proponent has engaged and consulted with YWAC and the Yinhawangka People prior to Referral of the Proposal to the EPA and during the preparation of the Environmental Review Document (ERD). Consultation has included presentations tailored to YWAC and the Yinhawangka People, attendance of technical specialists at meetings, on country meetings at key locations with YWAC and Yinhawangka representatives and 3D visual representations of potential impacts resulting from the Proposal. This information was intended to assist with understanding the technical work which was undertaken to underpin the ERD and is detailed in Appendix 20 . The Proponent will continue to work with YWAC and the Yinhawangka People to ensure that technical information is presented in a manner that is inclusive of the Yinhawangka People.
35	Environmental Review Document	Section 5.3, Page 37	Vegetation	Detailed vegetation survey and mapping information is provided from a purely Western scientific perspective. There is no reference or recognition of plants or vegetation areas of significance to Yinhawangka people.	The Proponent acknowledges the connection between ecological values and Aboriginal cultural heritage for the Yinhawangka People The Proponent has engaged and consulted with YWAC and the Yinhawangka People prior to Referral of the Proposal to the EPA and during the preparation of the Environmental Review Document (ERD). As detailed in Appendix 20 , the Proponent notes that between April 2018 and February 2019 the Proponent made a number of attempts to engage YWAC to undertake a Cultural Values survey on-country for the purpose of identifying areas and environmental features (including vegetation, flora and fauna) of cultural significance to the Yinhawangka People to help inform the Proposal design and the preparation of the ERD.

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					While these consultations did not proceed as planned, the Proponent is committed to ongoing consultation and engagement with YWAC with respect to the identification of cultural values on Yinhawangka Country.
36	Environmental Review Document	Section 5	Clearing of Native Vegetation	ERD documents "completely Degraded" – "Poor" condition of vegetation around existing RTIO operations. RTIO could be asked to demonstrate how they intend to prevent similar degradation around proposed Western operations and what evidence they have that proposed management will: a. improved vegetation condition around / in existing operational areas b. prevent degradation and improve vegetation conditions in the proposed expansion area.	As shown in ERD Figure 5-5, areas classified as 'Completely Degraded' refers to areas that have already been cleared as part of existing mining operations and is the EPA-accepted standard for mapping 'cleared areas' in a vegetation survey. Areas classified as 'Poor' and 'Degraded' condition are predominantly riverine and riparian zones that have been classified as such due to the presence of weed species (such as Buffel Grass), degradation by cattle, and in the case of Seven Mile Creek, vegetation augmentation as a result of surface water discharge. ERD Figure 5-5 also shows areas of 'very good' to 'excellent' condition vegetation adjacent to the existing Eastern Range operations, demonstrating that edge effects from existing mining operations have not had a significant impact on local vegetation condition. As outlined in the ERD, the Proponent has proposed measures to minimise impacts to vegetation outside of the conceptual footprint, including construction of water management structures where practicable to minimise discharge of sediment laden run-off (e.g. banks, sediment traps, catch-bunds), on-going weed management and progressive rehabilitation. The EPA will assess the extent of impact in its report and recommendations to the Minister for the Environment.
37	Environmental Review Document	Section 5	Clearing of Native Vegetation	Given the large disturbance footprint - approx. 50% of the Development envelope, and the poor condition of vegetation around existing operations, documented evidence of RTIO's ability to restore Country to a sustainable state that reflects excellent – very good	Progressive rehabilitation will be undertaken within cleared areas to restore vegetation that is self- sustaining and compatible with the post-closure land use. Current rehabilitation practices align with regulator expectations, consider broader industry standards and

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				condition of the areas documented in the Eastern region of the Development Envelope could be requested.	practice and take into account the learnings of ongoing research and development projects.
					Documented evidence of rehabilitation progress and monitoring results are provided to various agencies through the annual environmental reporting to JTSI; Annual Environmental Report tenement reports to DMIRS; and annual ministerial statement compliance reports to DWER.
					The Proponent acknowledges that rehabilitation success has been variable, with some poor rehabilitation outcomes observed in historical mining areas. However, through ongoing research and rehabilitation trials, significant improvements have been made by the Proponent in waste characterisation, landform design and construction methodologies that has led to reduced erosion rates, improved waste dump stability and vegetation outcomes in more recent rehabilitation areas.
					The Proponent also undertakes progressive rehabilitation activities across its Pilbara mine operations. Progressive rehabilitation provides iterative learnings that inform future rehabilitation practices, and reduces the areas requiring rehabilitation at the end of mine life. These refinements will result in improved rehabilitation outcomes for the Proposal.
38	Environmental Review Document	Page 84 and 93	Introduction/spread of weeds	The presence of weed species is noted strongly associated with disturbed areas, drainage lines and alluvial (run-on) flats.	Weed management at Greater Paraburdoo will continue to be undertaken in accordance with the Rio Tinto Iron Ore (WA) Pilbara Weed Management Strategy. The
		Proposed management references existing weed management plans to prevent introduction and spread of weeds.	Plan (WAP) is prepared for each site, prescribing the agreed approach to managing existing and potential weed issues. Within each WAP, management levels, or		
				Details of the measures that are in place to eliminate these weeds and prevent the spread, together with evidence that these measures are successful could be provided. Weed surveys are not a proactive action that will restore Country and eliminate weeds, active land	objectives are assigned to Weed Management Areas for individual or groups of weed species. The management levels provide a basis for determining required management actions and evaluating management success. A weed risk assessment procedure is

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				care management activities such as weed spraying, manual removal and revegetation are required. Are these in place and what success has been achieved?	provided to guide the allocation of management levels which may include prevention and weed control and eradication measures such as manual removal and herbicide application.
					As detailed in the Mine Closure Plans (ERD Appendices 5-1, 5-2 & 5-3), in areas of the Development Envelope where mining activity has been completed, regular reviews are undertaken to assess the potential to undertake progressive rehabilitation. Where rehabilitation is undertaken, monitoring is implemented to evaluate the success of the rehabilitation and includes monitoring of weed presence. The Proponent understands the importance of managing the environment for YWAC, including weed management, and is keen to discuss ways to support the Yinhawangka People's participation in environmental monitoring and management activities on Yinhawangka Country including, where appropriate, what training and support is required by YWAC and the Yinhawangka Rangers in respect of this work.
39	Environmental Review Document	Section 5.5 Page 84-86, 89, 93- 95.	Impacts on GDE as a result of groundwater drawdown from mine dewatering.	What evidence is there that the proposed management will deliver no significant long-term impact? For example, what evidence of successful management is there from other RTIO operations or other mining operations in the Pilbara?	The Proponent predicts that riparian vegetation units in Seven Mile Creek, north of the Mt McRae Shale barrier, that is within the area of modelled groundwater drawdown, may experience a decline in their structure and abundance, but that this is not expected to result in a significant residual impact. This assessment is based upon the knowledge that the current value of this riparian vegetation has been impacted by surplus water discharge from existing operations and that the system will continue to receive surplus water discharge and will also continue to be recharged by natural flow events.
					To address the uncertainty around the longitudinal extent of drawdown to be expected in the Seven Mile Creek alluvial aquifer, the Proponent has completed two-dimensional hydrogeological simulations to assess the influence of soil properties on water-level decline within the alluvial aquifer (Rio Tinto 2020b, Appendix 3).

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					Specifically, the work examined the processes of the hydraulic connectivity of the aquifers along Seven Mile Creek and in the Wittenoom Formation where they are connected and disconnected due to proposed groundwater pumping (dewatering) in the Wittenoom Formation. The simulations showed that the longitudinal propagation of drawdown in the Seven Mile Creek alluvial aquifer is predicted to be limited to a few hundred metres, and under all simulations will remain within the Development Envelope, and hence no impact to riparian vegetation occurring outside the Development Envelope is expected. Further details around the modelling are presented in Appendix 3.
					At closure, discharge from Paraburdoo Processing Plant will cease and the Joe's Crossing haul road will be removed to ensure surface water flows in Seven Mile Creek are maintained (a key objective of the Paraburdoo MCP). This will result in the affected section of Seven Mile Creek returning to a more natural ephemeral state.
40	Environmental Review Document	Section 5.5 Page 89, 93.	Impacts on riparian vegetation as a result of surplus water discharge to surface water systems	Surplus water will be at times, discharged to creek lines resulting in alteration of the local vegetation. What evidence is there that the proposed management will deliver no significant long-term impact? For example, what evidence of successful management is there from other RTIO operations or other mining operations in the Pilbara?	As the predicted volumes of surplus water will be relatively small and intermittent over the life of the Proposal and riparian vegetation is adapted to intermittent inundation, the Proponent predicts that any impacts to riparian vegetation health resulting from surface water discharge will be minor and temporary. Additionally, to minimise the extent of any impact to riparian systems and surrounding land users, the Proponent has committed to managing discharge such that it does not extend beyond the Development Envelope.
41	Environmental Review Document	Section 5.6, Page 96, 97	Closure and Rehabilitation	Specific evidence demonstrating that the proposed rehabilitation outcomes can be delivered could be provided. Remembering that the total disturbance footprint is more than 8400 ha, viable, large scale rehabilitation methodologies that can be evidenced as delivering the required outcomes would greatly assist	Please refer to Part B.2 comment #37. The Proponent acknowledges that rehabilitation success has been variable, with some poor rehabilitation outcomes observed in historical mining areas. However, through ongoing research and

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				building confidence in the proponent's ability to deliver stated outcomes. The RTIO ERD notes that rehabilitation practices historically have had poor outcomes.	rehabilitation trials, significant improvements have been made by the Proponent in waste characterisation, landform design and construction methodologies that has led to reduced erosion rates, improved waste dump stability and vegetation outcomes in more recent rehabilitation areas. These refinements will result in improved rehabilitation outcomes for the Proposal.
					Disturbed areas will be rehabilitated progressively as mining activities are completed
42	Environmental Review Document	Page 136, 139- 141	Loss of fauna habitat	Evidence of proposed rehabilitation methodology success could be provided. Commitment to development of specific habitats e.g. breakaway or gully habitats and habitats specifically required for breeding, roosting/ nesting of priority or other listed species could improve the ecological outcomes of the proposed rehabilitation approaches will lead to restoration of habitats and provide diversity of fauna currently recorded in the Development Envelope?	The Proponent has considered the retention of fauna habitat in the Proposal design, for example the design has been modified to avoid impact to key habitats such as Ghost Bat roosts and imposed both mining exclusion and restriction zones to ensure that sufficient high value fauna habitat remains to support viable populations of local fauna post-mining. Appendix 5 of the ERD includes the Greater Paraburdoo Progressive Rehabilitation summary (Rio Tinto 2019d), which outlines work undertaken to date in existing mining areas, as a guide of future success. Significant improvements have been made in mineral waste characterisation and landform placement and design, leading to reduced erosion rates and improved stability when compared to historical rehabilitation projects. Also as indicated in the rehabilitation summary and in the closure plans provided with the ERD, complete restoration of habitats is not possible due to landform changes resulting from mining activities – e.g. mine voids and waste dumps. As such, reinstating complex landforms such as gorges, gullies and breakaways is not considered to be feasible. Rather the Proponent has designed the Proposal to avoid where feasible or minimise impact to high value fauna habitat. The Proponent also aims to meet the requirement to install safe and stable landforms with rehabilitated vegetation that is self-sustaining and

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					assemblages can then be expected to partially re- inhabit these areas over time, which may include conservation significant species where microhabitats allow it.
					The ERD outlines the expected impact on significant species and the Proponent's conclusion is that the EPA objective for terrestrial fauna, that biological diversity and ecological integrity are maintained, can be met.
43	Environmental Review Document	Page 137, 141	Loss of individual fauna	Loss of individual fauna during operations is acknowledged. Are the only options speed restrictions and fencing to manage this impact?	Measures proposed to mitigate and manage impacts to terrestrial fauna are detailed in Section 6, 10, 12 and 13 of the ERD.
					As discussed in the ERD, most vehicle movements will also occur during daylight hours, which will avoid interaction with nocturnal species. The Proponent will avoid the use of barbed wire fencing, as far as practicable, noting the requirement for pastoralists, whose leases intersect the Development Envelope, to use barbed wire in stock fences. Where barbed wire fencing is required for legislative compliance, reflectors will be attached to make fencing more visible and to reduce the risk of fauna injury or mortality due to entanglement with fencing.
					The Proponent will implement the following management measures:
					 progressive clearing and progressive rehabilitation of disturbed areas to allow fauna to migrate away from clearing activities or machinery movements; implement vehicle speed limits on all access roads; roadkill will be removed from trafficable areas; and awareness training to identify conservation significant fauna and habitat, relevant management measures, personnel/contractor responsibilities, and incident reporting requirements (i.e. reporting of fauna observations and/or incidents).

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					Any impact on fauna populations from collisions with vehicles and machinery and entanglement with fencing is not expected to occur at a scale that will endanger their viability.
44	Environmental Review Document	Page 224, 228, 235, 238, 246	Aquatic fauna	Surveys are currently in progress with final report expected in mid-2020. The Biologic survey assessed several dry locations, and this could be improved by future assessments after rain. What mitigation strategies are in place should rare or endangered species found in future surveys?	Since publication of the ERD the Proponent completed, in June 2020, a post-wet season aquatic fauna survey at Greater Paraburdoo. This was the second phase of the survey, following the dry season survey completed in September 2019, and included sampling of potential impacts sites and reference locations both inside and outside of the Development Envelope, including Seven Mile, Pirraburdu and Turee Creeks' and persistent pools at Western Range and Eastern Range.
					Refer to Part B.1 comment #17 for a brief summary of results. The final survey report is provided in Appendix 21 .
45	Environmental Review Document	Page 138, 141	Habitat fragmentation and barriers to fauna movement	Measures to maintain linkage of habitats and facilitate fauna movement are "expected" to ensure populations are connected. Population mapping has not been presented. Inclusion of this information together with a methodology or proposal that demonstrates how this will be fauna population fragmentation will monitored and what corrective actions will be employed should the "expected" outcome not be realised could improve the management plan.	The Proponent is uncertain what population mapping is being requested to be presented beyond that provided in the ERD. The ERD describes, and depicts with figures, results of fauna surveys undertaken in line with EPA guidance to gauge the local fauna assemblage, particularly key species. Fauna behaviour (e.g. mobility) and characteristics of fauna populations (e.g. typically low densities across large areas of rough terrain) mean surveying and monitoring has inherent limitations with respect to providing a full fauna census. Retention and connectivity of areas of different habitat, particularly key / high value habitat types, such as gorges, gullies and rocky areas is recognised as important to local population survival and a proxy indicator of the health of that population. That is, based on current knowledge of fauna species' behaviours and requirements for survival (e.g. scale, type, diversity, connectivity of habitat), the attributes of retained habitat within the Development Envelope provide an indication of the confidence by which fauna populations will be maintained. Monitoring once the Proposal is being

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					implemented is however useful, and the updated draft EMP (Appendix 4) provides details of proposed monitoring for key species (e.g. visual inspections and acoustic monitoring of significant bat roosts) to assess performance against the environmental outcomes specified in the EMP.
46	Environmental Review Document	Page 138, 141- 142	Habitat degradation associated with construction activity and/or increased human activity, including transmission of weeds, dust, and increased abundance of introduced fauna species.	Monitoring of feral species is together with regional management plans to control, reduce and eliminate feral species would significantly improve ecological outcomes in the Development Envelope and adjacent areas.	Noted. The Proponent has committed to undertaking feral animal control in the Development Envelope and is open to coordinating such activity with any regional efforts.
47	Environmental Review Document	Page 166- 167, 169- 170, 186- 187, 192	Loss of subterranean fauna individuals.	Loss of individuals and little-known species in proposed mining area management is confirmed. What action plan to confirm that these species occur elsewhere or will persist is proposed?	Due to their cryptic nature and location of habitat below the surface, evaluating the presence and loss of stygofauna individuals can be difficult. An estimate of potential impact to the species' can be made from understanding the extent and connectivity of habitat the species (and related assemblage) is known to occupy, and how much viable (thick, connected and saturated) habitat will remain unaffected by the Proposal. With respect to the two key Bathynellidae species currently considered restricted to the Seven Mile Creek alluvial aquifer, that alluvial habitat is continuous and connected both north and south of the Paraburdoo Range, extending outside the zone of influence of groundwater drawdown, as such the species are expected to persist in these unaffected areas. The Seven Mile Creek habitat is complex, with the presence of hydraulic barriers along its length separating sections of alluvials, acting as leaky 'buckets' – i.e. the viable habitat

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					sections potentially may be separated during dry periods, however, during ephemeral flows and flooding, the sections should 'overflow' and re-connect, allowing periodic opportunities for dispersal of stygofauna, including into areas influenced by drawdown once dewatering ceases, as it naturally would prior to mining activities.
48	Environmental Review Document	Page 166, 168- 169, 185- 186	Temporary reduction or degradation of habitat due to mining related activities.	No evidence that the management actions have been successful elsewhere. The risk that seepage from mining waste, hydrocarbon spills etc will impact the groundwater is recognised. What actions are proposed to manage impacts, quantify, or monitor and ensure there are no adverse impact subterranean fauna.	It is unclear what management actions are being referred to. No management actions specific to subterranean fauna are proposed beyond broader best- practice measures regarding minimising groundwater drawdown; hydrocarbon storage and spills; contaminants in waste dumps; and waste fines storage facilities (WFSFs). As discussed in the ERD, some solute migration is expected from the WFSFs however seepage is expected to remain localised and not at a scale or concentration that would significantly affect the ecological integrity of subterranean fauna habitat remaining at closure. Monitoring of groundwater quality from the network of existing and future bores will remain ongoing throughout the life of the Proposal.
49	Environmental Review Document	Page 224- 225, 234- 235	Alteration to groundwater aquifers due to abstraction of groundwater.	What evidence available from similar operations in the Pilbara to demonstrate that on cessation of dewatering groundwater levels and water quality will return to pre- mining standards?	The Proponent does not indicate that on cessation of dewatering, groundwater levels and water quality within the mining area will return to pre-mining levels. For example, at 4EE, pit lake water quality modelling predicts the pit lake will fill to within 5 m of its final stable level within 50 years, with the final stable level reached in approximately 100 years (SRK 2018). During which time the modelled pH is circum-neutral (i.e. close to pH 7.6 for the various scenarios). After this time, relatively stable pH conditions between pH 7.6 and pH 7.7 are modelled throughout the 1000-year model run. The TDS levels are predicted to range from 900 to 2500 mg/L across various scenarios throughout the first 100 years. With respect to 4W, should this pit not be utilised as a WFSF, a pit lake will form at closure. From a

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					conceptual assessment of the final pit wall exposures, and results from recent pit lake modelling work, it is anticipated that the 4W pit lake will not become acidic (i.e. pH will remain circa neutral). Modelling indicates that the pit lake will be characterised with increasing salinity over time. The current understanding, based on analysis of data collected to date and preliminary hydrogeological modelling, is that the 4W pit will act as a groundwater sink and is not expected to have a degrading effect on regional groundwater quality.
					Additional pit lake modelling will be undertaken to confirm the predicted pit lake water quality closer to closure.
					Water monitoring during closure will focus on confirming groundwater recovery, pit lake modelling predictions and identification of any AMD issues; this program will be developed prior to decommissioning.
50	Environmental Review Document	Page 228, 235	Alteration to hydrological regimes of surface water systems from discharge of surplus dewatering water.	Can Hamersley Iron provide evidence that the minimal impacts and long-term effects have been demonstrated at other similar operations in the Pilbara? What value adding activities for the surplus water been considered? Have Yinhawangka people been consulted on any of these?	As the predicted volumes of surplus water will be relatively small and intermittent over the life of the Proposal and riparian vegetation is adapted to intermittent inundation, the Proponent predicts that any impacts to riparian vegetation health resulting from surface water discharge will be minor and temporary. Additionally, to minimise the extent of any impact to riparian systems and surrounding land users, the Proponent has committed to managing discharge such that it does not extend beyond the Development Envelope.
					Although the Proponent removed aquifer reinjection from the scope of this Proposal via a s 43A application, it is an option that remains under consideration and may be utilised in the future for surplus water management, subject to appropriate trials and approvals. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People in respect of water management on Yinhawangka County.

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51	Environmental Review Document	Page 229, 238	Alteration to groundwater aquifers from discharge of surplus dewatering water to disused mine pits and via aquifer reinjection.	Can Hamersley Iron provide evidence that the minimal impacts and long-term effects have been demonstrated at other similar operations in the Pilbara? What value adding activities for the surplus water been considered? Have Yinhawangka people been consulted on any of these?	The ERD outlines the evaluation undertaken of options for management of surplus water, in line with the DWER water management hierarchy (Section 8.4.1). Although the Proponent removed aquifer reinjection from the scope of this Proposal via a s 43A application, it is an option that remains under consideration and may be utilised in the future for surplus water management, subject to appropriate trials and approvals. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People in respect of water management on Yinhawangka County.
52	Environmental Review Document	Page 229- 230, 238- 239.	Alteration to existing surface water catchments, surface water flow paths and sheet flows.	Which ephemeral pools will be lost or negatively impacted? What actions will be taken to replace or mitigate for the loss of important ephemeral water features?	Ephemeral pools present within the Development Envelope and predicted impacts to these pools from the Proposal are outlined in ERD Appendices 8-4 and 8-5. Further to this, waterholes are subject to ongoing consultation between the Proponent and Yinhawangka People, which will focus on the cultural values associated with these places. Management strategies will be discussed with the Yinhawangka People and built into the SCHMP and a Cultural Heritage Management Plan, in agreement between the Proponent and the Yinhawangka People.
53	Environmental Review Document	Table 8-6, Page 245.	Changes to surface and groundwater quality.	How will the results of water quality monitoring be communicated to local people? What will the pH of 4EE pit be at Closure? After 20 years? After 100 years? What will the TDS and water quality of pit lakes be over the next 100 years? What management actions are proposed to ensure that safe and non-polluting pit lakes, surface, and groundwater legacies do not occur?	Current predictions of the long-term 4EE pit lake water quality are provided in the technical report Paraburdoo 4EE Pit Water Quality Modelling [SRK 2018] which was included as ERD Appendix 5-5. Modelling predictions indicate rapid filling to a stable level in under 50 years, during which time the modelled pH is circum-neutral (i.e. close to pH 7.6 for the various scenarios). After this time, relatively stable pH conditions between pH 7.6 and pH 7.7 are modelled throughout the 1000-year model run. The TDS levels are predicted to range from 900 to 2500 mg/L across various scenarios throughout the first 100 years. Additional pit lake modelling will be

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					undertaken to confirm the predicted pit lake water quality closer to closure.
					Water monitoring during closure will focus on confirming groundwater recovery, pit lake modelling predictions and identification of any AMD issues; this program will be developed prior to decommissioning.
54	Environmental Review Document	Table 8-6, Page 245.	Changes to surface and groundwater quality.	What uses does Hamersley Iron envisage for the pit lakes at and post Closure of mining operations? Have / will Yinhawangka people be consulted on these uses and outcomes?	One of the key objectives of the mine closure plans is to ensure that public health and safety hazards have been managed in accordance with the requirements of the Mines Safety and Inspection Regulations 1995, and appropriate outcomes have been achieved prior to relinquishment.
					Pit void geology and geometries may not be amenable to long-term stability and would be associated with hazardous post-closure conditions including rock falls and wall collapse; access into these areas represent a potential risk to public safety, and hence precautions must be taken to prevent inadvertent access.
					The Proponent currently does not anticipate being able to facilitate access to pit lakes due to safety concerns, but this approach will be evaluated and confirmed throughout the life of the operation in consultation with stakeholders.
					As the Proposal progresses towards closure, the Proponent will undertake further detailed closure studies to develop the closure criteria and final landform outcomes in more detail. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People about closure planning and to understand their aspirations in respect to closure outcomes on Yinhawangka Country. Consultation that has been undertaken to date with YWAC and the Yinhawangka People in respect to pit lakes is detailed in Appendix 20 .

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55	Environmental Review Document	Page 259- 261	Disturbance of sites of cultural heritage significance.	With approx. 45 known heritage sites impacted by the proposal, and impacts to rock shelters, pools, catchments and other areas of significance to local people what proactive value adding opportunities have been discussed with Yinhawangka people to house, manage and oversee cultural artefacts and materials?	The Proponent acknowledges the significance of the cultural heritage sites in the vicinity of the Proposal and therefore will continue to engage and consult with YWAC and the Yinhawangka People in relation to the identification and management of cultural values, artefacts and materials on Yinhawangka Country. Consultation, including surveys, are ongoing in respect of places of cultural significance which may be impacted by the Proposal to inform management and mitigation options. Consultation is also ongoing in respect of cultural artefacts and materials held on behalf of Yinhawangka People, including repatriation and permanent storage options.
					The Proponent commits to developing, in consultation with the Yinhawangka people, a Social, Cultural and Heritage Management Plan to minimise impacts to social, cultural and heritage values within and surrounding the Development Envelope, including provision of a framework for future consultation and YHW involvement in heritage and environmental management and monitoring activities.
56	Environmental Review Document	Page 259, 261	Changes to local landforms which may result in altered visual landscape within the region.	Photomontages presented are too small to effectively be used to assess visual impacts. Can RTIO provide models or more effective visualisations so that Yinhawangka people can understand the post mining landscape and landforms. Can RTIO demonstrate how the rehabilitation of landforms will be reshaped to be compatible with surrounding landscape? Are there examples from other RTIO operations? What evidence does Hamersley Iron have that the landforms will be safe, stable, and self- sustaining ecosystems?	The Proponent recognises that visualisations are a valuable way to communicate changes to the landscape as a result of mining activities. As noted in Appendix 20, this was the intent of the engagement and consultation with YWAC and the Yinhawangka People about visual impacts as a result of the Proposal, including by providing 3D visualisations from known sites of significance and by providing ongoing access to a 3D mapping program. The Proponent has previously provided these materials to YWAC but can provide additional copies of this information if required and is open to feedback on ensuring that the information is presented clearly and able to be understood by all YWAC and the Yinhawangka People.
					The Proponent is committed to ensuring that rehabilitation is completed to achieve revegetated areas

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					that are ecologically self-sustainable and landforms that are safe and stable.
					A closure objective reflecting this is anticipated in the Rehabilitation and Decommissioning condition of approval.
					See also responses to comments Part B.2 #37 and #41.
57	Environmental Review Document	Page 259, 261 Table 9-2.	Changes to local landforms which may result in altered visual landscape within the region.	Hamersley Iron suggests that pit will be restricted access areas at closure. How will bunding prevent access? Will these areas be safe? Why will the pit areas not be rehabilitated properly to the "safe, non-polluting" state RTIO states it will deliver for rehabilitation areas?	Under the Mines Safety and Inspection Regulations 1995 precautions must be taken to prevent inadvertent access to hazardous areas such as abandoned open pits as these areas are generally not amenable to long- term stability and may be subject to rock falls and wall collapse post-closure.
					The construction of an abandonment bund is the current industry-preferred method to prevent inadvertent access to abandoned open pits. Conceptual-level abandonment bund locations have therefore been proposed in the mine closure plans.
					In-pit areas, including pit walls, pit floors, in-pit waste dumps and landbridges, are not generally planned to be rehabilitated as:
					 they are composed of hard rock; often contain surfaces at steep angles that would be unsuitable for establishing vegetation; and stabilisation of waste dumps within pit shells would provide minimal value as any erosion would be contained within the confines of the pit.
					In-pit rehabilitation is considered for circumstances where:
					 rehabilitation is required to manage geochemical risks; backfill is near or at ground level; pits drain externally; and where there are specific visual amenity concerns or specific requirements.

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					The Proponent is currently undertaking studies into the closure of Eastern Range, which includes finalisation of closure criteria and development of detailed designs for final landforms. The Proponent will continue to engage and consult with YWAC and the Yinhawangka People throughout these studies, including on matters relating to post-closure access; heritage management; and opportunities for direct involvement in the delivery of rehabilitation and closure outcomes.
					The Proponent will engage and consult with YWAC and the Yinhawangka People in the same manner with respect to the closure of the Paraburdoo and Western Range mines. As these operations span a substantial timeframe (approx. 20 years) finalisation of closure criteria and final landform outcomes will be developed in more detail as these operations progress towards closure.
58	Environmental Review Document	Page 259- 260, 263- 264.	Changes to the physical and biological attributes of the environment which may impact the values associated with significant heritage sites	Hamersley Iron to provide models or more effective visualisations so that Yinhawangka people can understand the post mining landscape and landforms and the impacts and effects during mining development and operations.	The Proponent recognises that visualisations are a valuable way to communicate changes to the landscape as a result of mining activities. As noted in Appendix 20 , this was the intent of the engagement and consultation with YWAC and the Yinhawangka People about visual impacts as a result of the Proposal, including by providing 3D visualisations from known sites of significance and by providing ongoing access to a 3D mapping program. The Proponent has previously provided these materials to YWAC but can provide additional copies of this information if required and is open to feedback on ensuring that the information is presented clearly and able to be understood by all YWAC and the Yinhawangka People.
59	Environmental Review Document	Table 10-12, Page 331.	Matters of National Environmental Significance (MNES): Removal of habitat	The loss of high value habitat for Olive python, Northern Quoll, Ghost and Pilbara Leaf-nosed bats are documented impacts of the development.	In addition to State based offsets, the Proponent will also prepare and submit to the Commonwealth (DAWE) for their approval, an Offsets Strategy for impacts to MNES habitat. The Offsets Strategy will be developed in

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				Hamersley Iron has not proposed, apart from cash offsets, any specific offsets or value add actions to address these losses. Can these be considered?	consultation with DAWE and in accordance with the EPBC Act Environmental Offsets Policy.
60	Environmental Review Document	Table 10-12, Page 331.	MNES: Loss of, or injury to, individuals as a result of vehicle and machinery	What management will be put in place to ensure that fauna injured through mining activities are rehabilitated or humanely euthanised? What specific actions will be included in rehabilitation to ensure reinstatement of habitat and suitable breeding	Rio Tinto has developed a Wildlife Interaction Guideline that is applicable across its Pilbara Operations and includes advice and guidance on the care of sick, injured and orphaned wildlife, and contact information for wildlife carers.
			movement or interactions with infrastructure.	areas for the species of concern listed under MNES and impacted by this proposal?	Regarding the rehabilitation of habitat for MNES species, due to the significant changes to landforms that result from mining activities (e.g. creation of mine voids and waste dumps), reinstating complex landforms such as gorges, gullies and breakaways is not considered to be feasible. Rather the Proponent has designed the Proposal to avoid where feasible or minimise impact to high value fauna habitat. The Proponent also aims to meet the requirement to install safe and stable landforms with rehabilitated vegetation that is self- sustaining and compatible with the post-mining land use. Fauna assemblages can then be expected to partially re-inhabit these areas over time, which may include conservation significant species where microhabitats allow it.
61	Environmental Review Document	Table 10-12, Page 332.	MNES: Alteration of habitat as a result of groundwater drawdown and/or surplus water discharge.	Will any monitoring of these impacts be undertaken during operations and at closure to ensure impacts are minimised?	Management provisions, including monitoring, for MNES riparian habitats (pools and vegetation) are provided under the inland waters value in the draft EMP (see Table 2-7 and Appendix 3).
62	Environmental Review Document	Table 10-12, Page 332.	MNES: Disturbance to, or degradation of, potential habitat as	What is the evidence that a 100m blasting "no go" zone around bat caves will ensure that there are no detrimental impacts on roosting, breeding and bat distribution?	One hundred metre mining restriction zones have been demonstrated to be effective in maintaining Ghost Bat occupancy in caves adjacent to mining activity elsewhere in the Pilbara. As described in ERD Section 10.8.3, monitoring at West Angelas has demonstrated evidence of Ghost Bat activity in caves as close as 70 m

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			a result of noise and vibration.	Will there be any monitoring during construction and operations to ensure that this is the case?	and 90 m from active mine pits. The data suggest there has been no impact on the use of caves adjacent to mining activities from the species (Rio Tinto 2018b), and that mining restriction zones are expected to effectively avoid physical impacts to roosts. A 250 m mining exclusion zone will be applied around the Pilbara Leaf- nosed Bat roost at Ratty Springs. The Proponent is committed to completing geotechnical assessments of remaining caves and will amend mining restriction zones as required based on these assessments. The geotechnical assessments will also be used for the development of appropriate peak particle velocity (PPV) thresholds to be included in the EMP to ensure the structural integrity of caves will be maintained. Monitoring of bats and bats caves will occur during both construction and operation. The EMP provides details of monitoring such as Ghost Bat roost acoustic monitoring and visual inspections. A Blast Management Plan will be implemented to manage vibration from blasting to ensure the structural integrity of significant caves is maintained throughout the life of the Proposal.
63	Environmental Review Document	Table 10-12, Page 332.	MNES: Indirect impact: Habitat degradation associated with construction activity and/or increased human activity, including transmission of weeds, dust, and increased abundance of introduced fauna species	How will Hamersley Iron measure the success of the proposed weed and feral animal control programs? Will the proposed management improve the overall condition of the Country?	Weed management at Greater Paraburdoo will continue to be undertaken in accordance with the Rio Tinto Iron Ore Pilbara Weed Management Strategy which specifies monitoring to be undertaken to evaluate the effectiveness of weed management activities. Weed monitoring includes the capture of Weed Record Points (WRP) in a geospatial point database. Changes in WRP data over time or between locations is used to measure the effectiveness of the weed management program. Trends in feral animal sightings and results of feral animal control measures will provide an indication as to the effectiveness of these measures.

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64	Environmental Review Document	Table 12-1	Offsets	Hamersley Iron states that "to date, rehabilitation success across Paraburdoo has been variable, with poor outcomes observed in some historical mining areas." Providing evidence to support the assertion that RTIO can deliver broad scale rehabilitation to more than 8400 ha and achieve safe, self-sustaining ecosystems would improve confidence in the ability to deliver closure and rehabilitation outcomes.	Documented evidence of rehabilitation progress and monitoring results are provided to various agencies through annual environmental reporting to JTSI and DMIRS; and annual Ministerial Statement (MS) compliance reports to DWER. The Proponent acknowledges that rehabilitation success has been variable, with some poor rehabilitation outcomes observed in historical mining areas. However, significant improvements have been made by the Proponent in waste characterisation, landform design and construction methodologies which has led to reduced erosion rates, improved waste dump stability and vegetation outcomes in more recent rehabilitation areas. The Proponent has an ongoing program of rehabilitation research and development initiatives and is currently partnering with industry and research organisations to advance knowledge in mine site rehabilitation methods. The Proponent also undertakes progressive rehabilitation activities across its Pilbara mine operations. Progressive rehabilitation provides iterative learnings that inform future rehabilitation provides iterative learnings that inform future rehabilitation at the end of mine life. These refinements will result in improved rehabilitation outcomes for the Proposal. To support the ecological outcomes and joint environmental approach sought by YWAC, the Proponent supports the participation of the Yinhawangka People in future rehabilitation and closure activities on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this.
65	Environmental Review Document	Page 353	Offsets	The permanent loss of 342 ha of breakaway, gorge and gully fauna habitat including denning, roosting and other important shelters for species of concern. Specific	Due to the significant changes to landforms that result from mining activities (e.g. creation of mine voids and waste dumps), reinstating complex landforms such as gorges, gullies and breakaways is not considered to be

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				efforts to replace this habitat could be made in the rehabilitation plans.	feasible. Rather the Proponent has designed the Proposal to avoid where feasible or minimise impact to high value fauna habitat. The Proponent also aims to meet the requirement to install safe and stable landforms with rehabilitated vegetation that is self- sustaining and compatible with the post-mining land use. Fauna assemblages can then be expected to partially re-inhabit these areas over time, which may include conservation significant species where microhabitats allow it.
66	Environmental Review Document	Page 352- 353	Offsets	The only offset proposed for acknowledged impacts caused including vegetation clearing loss of individuals and habitat for Ghost and Pilbara leaf nosed bats, Northern Quoll and Olive python are financial deposits to the Pilbara Fund. There are no specific actions outlined for the use of this money (estimated at \$3.7M) to offset the impacts to the ecology, flora, and fauna of the Yinhawangka people's country. How can this fund be directed to deliver specific ecological improvements on Yinhawangka country?	The Proponent supports the allocation of offsets funding to actions that will provide for on-ground improvement, rehabilitation and conservation of environmental values on Yinhawangka Country. Regarding offsets for impacts to MNES habitat, the Proponent will prepare and submit an Offsets Strategy to DAWE for their approval. The Offsets Strategy will be developed in consultation with DAWE and in accordance with the EPBC Act Environmental Offsets Policy. The Proponent will consider YWAC's comments in the preparation of the Offsets Strategy as far as possible.
67	Environmental Review Document		Offsets	Commitment to "explore" opportunities to involve Yinhawangka people in rehabilitation and restoration of their country should be quantified and agreed strategies and actions implemented.	Noted and agreed. The Proponent supports the Yinhawangka People's participation in rehabilitation and restoration activities on Yinhawangka Country and will work with YWAC to investigate opportunities to facilitate this. The Proponent commits to developing, in consultation with the Yinhawangka People a Social and Cultural Heritage Management Plan to detail strategies and actions for involvement.

*Written as Table 2-1 in submission but appears to mean Table 1-2 based on comment text

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APPENDICES

Appendix 1: Biologic Environmental Survey Pty Ltd (Biologic) 2020a. *Summary Report* – Western Range Single Season Detailed Flora and Vegetation Survey. Report prepared for Rio Tinto, August 2020

Appendix 2: Rio Tinto 2020a. *Hibiscus campanulatus targeted survey*. Western Range, Paraburdoo. 24 August 2020.

Appendix 3: Rio Tinto 2020b. Seven Mile Creek 2-D Modelling. Rio Tinto Internal Memorandum: 17 June 2020

Appendix 4: Rio Tinto 2020c. Environmental Management Plan, Greater Paraburdoo Iron Ore Hub. August 2020

Appendix 5: Updated Subterranean fauna Figures 7-2, 7-3, 7-4 and 7-5



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Appendix 6: Biologic Environmental Survey Pty Ltd (Biologic) 2020b. *Memorandum – Greater Paraburdoo Subterranean Habitat Assessment and Modelling*. Report prepared for Rio Tinto, August 2020

Appendix 7: Habitat modelling screenshots from Appendix 6



Figure 1: Surface geology and sampling sites for troglofauna at Western Range. Green dots represent troglofauna locations (Figure A-4, Biologic 2020b).



Figure 2: Surface geology and sampling sites for troglofaunal at Western Range. Note habitat connectivity between BrIF (Hb) and MMIF (Hm) (Figure A-6, Biologic 2020b).

Appendix 8: Biological Survey Management Strategy

This document has been provided electronically.

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Appendix 9: Bat Call 2020b. *Recolonisation of Hamersley Range caves by Ghost bats*. Report prepared for Rio Tinto, July 2020

ADDENUIX IV. AUVILIONAL SILLIINOIMALIO	Ap	pendix	10:	Additional	SRE	informatio
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Sample I	ocations	found					Inside /	
ID	Easti ngs	Northi ngs	Family	Name	Status	Abund ance	disturba nce area (Y/N)	Habita t type [#]
Western R	ange Two	o-Phase F	auna Survey (Biota 2011)	1	1	1	
Fa-2009- 6225	55501 4	74334 80	Atemnidae	<i>Oratemnus</i> sp.	SRE	5	N	Riverin e
Fa-2009- 2696	54574 6	74353 89	Olpiidae	<i>Euryolpium</i> sp.	SRE	1	N	Cleare d
Fa-2009- 5470	54713 7	74352 99	Nemesiidae	Aname sp.	SRE	1	Y	Low Hill
Fa-2009- 5784	55453 4	74322 19	Nemesiidae	Aname sp.	SRE	1	N	Cleare d
Fa-2009- 10613	55061 9	74363 61	Succineidae	<i>Lymnaea</i> sp.	SRE	3	N	Stony Plain
Fa-2009- 16395	55501 4	74334 80	Atemnidae	<i>Oratemnu</i> s sp.	SRE	1	N	Riverin e
Fa-2008- 451	54469 6	74376 15	Pachybolida e	Austrostrophus stictopygus	SRE	1	N	Rocky Hill
Fa-2009- 13915	54688 1	74359 83	Selenopida e	<i>N</i> . gen. 1 n. sp. 14	SRE	1	N	Gorge
Fa-2009- 15825	55495 9	74334 33	Atemnidae	Oratemnus sp.	SRE	2	N	Riverin e
Fa-2009- 16337	55276 1	74329 95	Olpiidae	Euryolpium sp.	SRE	1	N	Stony Plain
Fa-2009- 10890	55289 9	74337 79	Selenopida e	<i>N</i> . gen. 1 n. sp. 14	SRE		N	Rocky Hill
Fa-2011- 54390	55501 4	74334 80	Atemnidae	<i>Oratemnus</i> sp.	SRE	5	N	Riverin e
Fa-2011- 54392	54574 6	74353 89	Olpiidae	Euryolpium sp.	SRE	1	N	Cleare d
Fa-2011- 54393	54713 7	74352 99	Nemesiidae	Aname sp.	SRE	1	Y	Low Hill
Fa-2011- 54394	55453 4	74322 19	Nemesiidae	Aname sp.	SRE	1	N	Cleare d
Fa-2011- 54396	55061 9	74363 61	Succineidae	<i>Lymnaea</i> sp.	SRE	3	N	Stony Plain
Fa-2011- 54397	55501 4	74334 80	Atemnidae	<i>Oratemnus</i> sp.	SRE	1	N	Riverin e
Fa-2011- 54398	54469 6	74376 15	Pachybolida e	Austrostrophus stictopygus	SRE	1	N	Rocky Hill
Fa-2011- 54400	54688 1	74359 83	Selenopida e	<i>N</i> . gen. 1 n. sp. 14	SRE	1	N	Gorge

Fa-2011- 54401	55495 9	74334 33	Atemnidae	Oratemnus sp.	SRE	2	N	Riverin e
Fa-2011- 54402	55276 1	74329 95	Olpiidae	Euryolpium sp.	SRE	1	N	Stony Plain
Fa-2011- 54404	55289 9	74337 79	Selenopida e	<i>N</i> . gen. 1 n. sp. 14	SRE	7	N	Rocky Hill
Greater Pa	raburdoo	D Level 2	Fauna Survey,	April 2018 (Astron 20	18)			
Fa-2018- 59445*	56978 5	74294 60	Oryidae	<i>Orphnaeus</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59446*	56978 5	74294 60	Oryidae	<i>Orphnaeus</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59447	57193 7	74251 70	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Low Hill
Fa-2018- 59448	57361 3	74259 30	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59449	57625 1	74257 70	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Breaka way
Fa-2018- 59450	57390 9	74256 40	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59451	57062 5	74291 30	Olpiidae	<i>Austrohorus</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59452	57062 5	74291 30	Olpiidae	<i>Indolpium</i> 'long chela'	Potenti al	1	N	Gorge
Fa-2018- 59453	57625 1	74257 70	Olpiidae	<i>Indolpium</i> 'long chela'	Potenti al	1	N	Breaka way
Fa-2018- 59454	55498 0	74332 00	Olpiidae	<i>Indolpium</i> sp. indet.	Potenti al	1	N	Riverin e
Fa-2018- 59455	55498 0	74332 00	Olpiidae	<i>Indolpium</i> sp. indet.	Potenti al	1	N	Riverin e
Fa-2018- 59456	57390 9	74256 40	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Gorge
Fa-2018- 59457	57508 2	74265 00	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	1	Ν	Gorge
Fa-2018- 59458	57070 0	74290 40	Bothriembry ontidae	<i>Bothriembryon</i> 'Pilbara'	Potenti al	1	N	Gorge
Fa-2018- 59459	55546 8	74325 60	Armadillida e	Buddelundia '10ts'	Potenti al	4	N	Riverin e
Fa-2018- 59460	56997 9	74259 60	Armadillida e	Buddelundia '47TS'	Potenti al	1	N	Low Hill
Fa-2018- 59461	56997 9	74259 60	Armadillida e	Buddelundia '47TS'	Potenti al	2	N	Low Hill
Fa-2018- 59462	57572 7	74260 90	Armadillida e	Buddelundia '50'	Potenti al	1	N	Draina ge Line
Fa-2018- 59463	57572 7	74260 90	Armadillida e	Buddelundia '50'	Potenti al	1	N	Draina ge Line

Fa-2018- 59464	57361 3	74259 30	Armadillida e	Buddelundia '50'	Potenti al	4	N	Gorge
Fa-2018- 59465	55501 3	74335 00	Armadillida e	Buddelundia '50'	Potenti al	1	N	Riverin e
Fa-2018- 59466	57508 2	74265 00	Armadillida e	Buddelundia '50'	Potenti al	3	N	Gorge
Fa-2018- 59467	55498 0	74332 00	Armadillida e	Buddelundia '50'	Potenti al	5	N	Riverin e
Fa-2018- 59468	57625 1	74257 70	Armadillida e	Buddelundia '50'	Potenti al	2	N	Breaka way
Fa-2018- 59469	56128 5	74318 60	Armadillida e	Buddelundia '50'	Potenti al	2	N	Riverin e
Fa-2018- 59470	56180 2	74319 70	Armadillida e	Buddelundia '50'	Potenti al	3	N	Riverin e
Fa-2018- 59471	57390 9	74256 40	Armadillida e	Buddelundia '50'	Potenti al	2	N	Gorge
Fa-2018- 59472	56721 6	74301 00	Armadillida e	<i>Buddelundiinae</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59473*	57546 4	74262 20	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59474*	55645 2	74323 50	Selenopida e	<i>Selenopidae</i> sp. indet.	Potenti al	1	N	Breaka way
Fa-2018- 59475*	55645 2	74323 50	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	1	N	Breaka way
Fa-2018- 59476*	55645 2	74323 50	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	1	N	Breaka way
Fa-2018- 59477*	55691 6	74321 20	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	1	N	Breaka way
Fa-2018- 59478*	56978 5	74294 60	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	1	N	Gorge
Fa-2018- 59479*	57030 4	74291 30	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	3	N	Gorge
Fa-2018- 59480*	57520 9	74263 40	Selenopida e	<i>Selenopidae</i> sp. indet	Potenti al	1	N	Gorge
Fa-2018- 59481*	56978 5	74294 60	Olpiidae	<i>Austrohorus</i> sp. indet.	Potenti al	2	N	Gorge
Fa-2018- 59482*	57579 1	74262 50	Olpiidae	<i>Austrohorus</i> sp. indet.	Potenti al	2	N	Gorge
Fa-2018- 59483*	57546 4	74262 20	Olpiidae	<i>Indolpium</i> sp. indet.	Potenti al	2	N	Gorge
Fa-2018- 59484*	55645 2	74323 50	Olpiidae	<i>Indolpium</i> sp. indet.	Potenti al	1	N	Breaka way
Fa-2018- 59485*	55691 6	74321 20	Olpiidae	<i>Indolpium</i> sp. indet.	Potenti al	1	N	Breaka way
Fa-2018- 59486*	56997 9	74259 60	Buthidae	<i>Lychas</i> 'aitkeni complex'	Potenti al	1	N	Low Hill

Fa-2018- 59487*	56997 9	74259 60	Buthidae	<i>Lychas</i> 'aitkeni complex'	Potenti al	1	N	Low Hill
Fa-2018- 59488*	57193 7	74251 70	Buthidae	<i>Lychas</i> 'aitkeni complex'	Potenti al	1	N	Low Hill
Fa-2018- 59489*	55247 2	74340 70	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	1	Y	Rocky Hill
Fa-2018- 59490*	57572 7	74260 90	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	2	Ν	Draina ge Line
Fa-2018- 59491*	57193 7	74251 70	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	1	N	Low Hill
Fa-2018- 59492*	57193 7	74251 70	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	1	N	Low Hill
Fa-2018- 59493*	55500 1	74332 70	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	3	Ν	Riverin e
Fa-2018- 59494*	56978 5	74294 60	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	1	Ν	Gorge
Fa-2018- 59495*	57579 1	74262 50	Buthidae	<i>Lychas</i> 'bituberculatus complex'	Potenti al	2	Ν	Gorge
Fa-2018- 59496*	57572 7	74260 90	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	10	N	Draina ge Line
Fa-2018- 59497*	57572 7	74260 90	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Draina ge Line
Fa-2018- 59498*	57572 7	74260 90	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Draina ge Line
Fa-2018- 59499*	57546 4	74262 20	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	3	N	Gorge
Fa-2018- 59500*	55500 1	74332 70	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	7	N	Riverin e
Fa-2018- 59501*	55500 1	74332 70	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	5	N	Riverin e
Fa-2018- 59502*	56978 5	74294 60	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Gorge
Fa-2018- 59503*	57030 4	74291 30	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Gorge
Fa-2018- 59504*	57579 1	74262 50	Buthidae	<i>Lychas</i> 'hairy tail complex'	Potenti al	1	N	Gorge
Fa-2018- 59505*	57572 7	74260 90	Buthidae	<i>Lychas</i> sp. indet.	Potenti al	1	N	Draina ge Line
Fa-2018- 59506*	57193 7	74251 70	Buthidae	<i>Lychas</i> sp. indet.	Potenti al	1	N	Low Hill

Fa-2018- 59507*	57572 7	74260 90	Mecistocep halidae	<i>Mecistocephalus</i> sp. indet.	Potenti al	1	N	Draina ge Line
Fa-2018- 59508*	57546 4	74262 20	Mecistocep halidae	<i>Mecistocephalus</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59509*	56978 5	74294 60	Cryptopidae	Cryptops sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59510*	56997 9	74259 60	Trigoniulida e	Austrostrophus sp. indet.	Potenti al	1	N	Low Hill
Fa-2018- 59511*	56978 5	74294 60	Trigoniulida e	Austrostrophus sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59512*	57030 4	74291 30	Trigoniulida e	<i>Austrostrophus</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59513*	57520 9	74263 40	Trigoniulida e	Austrostrophus sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59514*	57520 9	74263 40	Trigoniulida e	Austrostrophus sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59515*	57030 4	74291 30	Bothriembry ontidae	<i>Bothriembryon</i> 'Pilbara'	Potenti al	1	N	Gorge
Fa-2018- 59516*	57579 1	74262 50	Nicoletiidae	<i>Trinemura</i> sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59517*	57030 4	74291 30	Armadillida e	Barrowdillo '4'	Potenti al	1	N	Gorge
Fa-2018- 59518*	55691 6	74321 20	Armadillida e	Buddelundia '10ts'	Potenti al	5	N	Breaka way
Fa-2018- 59519*	57572 7	74260 90	Armadillida e	Buddelundia '47TS'	Potenti al	2	N	Draina ge Line
Fa-2018- 59520*	56997 9	74259 60	Armadillida e	Buddelundia '47TS'	Potenti al	1	N	Low Hill
Fa-2018- 59521*	57193 7	74251 70	Armadillida e	Buddelundia '47TS'	Potenti al	1	N	Low Hill
Fa-2018- 59522*	57546 4	74262 20	Armadillida e	Buddelundia '47TS'	Potenti al	1	N	Gorge
Fa-2018- 59523*	56997 9	74259 60	Armadillida e	Buddelundia '50'	Potenti al	2	N	Low Hill
Fa-2018- 59524*	57546 4	74262 20	Armadillida e	Buddelundia '50'	Potenti al	11	N	Gorge
Fa-2018- 59525*	57546 4	74262 20	Armadillida e	Buddelundia '50'	Potenti al	4	N	Gorge
Fa-2018- 59526*	55681 9	74323 00	Armadillida e	Buddelundia '50'	Potenti al	9	N	Riverin e
Fa-2018- 59527*	55691 6	74321 20	Armadillida e	Buddelundia '50'	Potenti al	3	N	Breaka way
Fa-2018- 59528*	56978 5	74294 60	Armadillida e	Buddelundia '50'	Potenti al	6	N	Gorge
Fa-2018- 59529*	56978 5	74294 60	Armadillida e	Buddelundia '50'	Potenti al	3	N	Gorge

Fa-2018- 59530*	56978 5	74294 60	Armadillida e	Buddelundia '50'	Potenti al	3	N	Gorge
Fa-2018- 59531*	56978 5	74294 60	Armadillida e	Buddelundia '50'	Potenti al	11	N	Gorge
Fa-2018- 59532*	57030 4	74291 30	Armadillida e	Buddelundia '50'	Potenti al	1	N	Gorge
Fa-2018- 59533*	57520 9	74263 40	Armadillida e	Buddelundia '50'	Potenti al	6	N	Gorge
Fa-2018- 59534*	56978 5	74294 60	Armadillida e	Buddelundiinae sp. indet.	Potenti al	1	N	Gorge
Fa-2018- 59535*	55681 9	74323 00	Philosciidae	Philosciidae sp. indet.	Potenti al	5	N	Riverin e

Appendix 11: Local change in environmental hydrology - Paraburdoo



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Appendix 12: Updated ERD Figure 8-9: Proposed surplus water discharge locations 4EE & 36W and in-pit disposal options (11W & 14-16W)



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Appendix 13: Rio Tinto 2020d. Greater Paraburdoo AMD and geochemical risk assessment summary to support the 2020 Greater Paraburdoo Iron Ore Hub Proposal Environmental Review Document.

Appendix 14: Environmental Geochemistry International 2020. *Western Range Sample Geochemical Assessment.* Report prepared for Rio Tinto, July 2020

Appendix 15: SRK 2020. Western Range - Geochemical Characterisation of Waste Rock and Tailings. Report prepared for Rio Tinto, August 2020

Appendix 16: Rio Tinto 2021a. *Greenhouse Gas Management Plan, Greater Paraburdoo Iron Ore Hub Proposal.* January 2021.

Appendix 17: Breakdown of estimated emissions by mining area



Appendix 18: Revised Residual Impact Significance Model (RISM) Table

Existing environment/	En instrumental sous at		Mitigation		Significant residual
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
Environmental factor: Flo	ra and Vegetation	-	-		
 Context/key survey findings: The Development Envelope is comprised of the following flora and vegetation values: 28 local vegetation units, nine of which are locally conservation significant; No TEC's or PEC's; Seven recorded conservation significant flora species (one Threatened and six Priority flora); Four taxa recorded as range extensions; Presence of up to 28 introduced flora species with first recorded occurrence of the weed *<i>Ruellia</i> <i>simplex</i> (Mexican petunia) in Western Australia; Presence of 642 ha of riparian vegetation in Poor to Degraded condition; Direct impacts: 	 Clearing of 4,300 ha of native vegetation of which 156 ha comprise of moderate conservation value vegetation types. Direct removal of 2 ha of riparian vegetation in Good condition. Clearing of conservation significant flora species including: direct clearing of 5,179 individuals, and 467 individuals potentially impacted by indirect impacts of <i>Aluta quadrata</i> (T); direct clearing of 203 individuals, and 100 individuals potentially impacted by indirect impacts of <i>Hibiscus campanulatus</i> (P1); direct clearing of six individuals, and five individuals potentially impacted by indirect impacts of <i>Hibiscus campanulatus</i> (P1); direct clearing of six individuals potentially impacted, of Sida sp. Barlee Range (S. van Leeuwen 1642) (P3); 	 Avoidance The conceptual footprint of the Proposal avoids, as far as practical, impacts to <i>A. quadrata</i>. Avoidance measures include: Changing the location of four ramps required for pit access from locations that directly impacted <i>A. quadrata</i> to locations that directly impact any recorded individuals (see Figure 5-11; Figure 5-12). Sterilising two pods of ore to reduce direct and indirect impacts to A. quadrata and fragmentation of habitat. Ensuring no <i>A. quadrata</i> individuals will be directly impacted by the placement of waste dumps, landbridges, stockpiles or other infrastructure. Minimisation The Proponent proposes to minimise impacts to <i>A. quadrata</i> through the establishment of mining exclusion zones that will capture 79% of the <i>A</i>. 	Disturbed areas will be rehabilitated progressively as mining activities are completed. The conditions of the new Ministerial Statement shall require the Proponent to implement a Closure Plan in accordance with the DMP / EPA <i>Guidelines for</i> <i>Preparing Mine Closure</i> <i>Plans</i> . The Closure <i>Plans</i> . The Closure Plan includes the following Closure Objectives: Rehabilitated vegetation will be self-sustaining and compatible with the post closure land use. Closure activities will not result in direct impacts to mining exclusion zones at Western Range. Maintenance of a self- sustaining <i>Aluta</i> <i>quadrata</i> population post closure Weed species recorded within rehabilitation areas are present within	Can the environmental values be rehabilitated? Evidence? To date, rehabilitation success across Paraburdoo has been variable, with poor rehabilitation outcomes observed in some historical mining areas. However, significant improvements have been made by the Proponent in waste characterisation and landform design to reduce erosion rates and improve waste dump stability. These refinements will result in improved rehabilitation outcomes for the Proposal. Operator experience in undertaking rehabilitation? Rio Tinto conducts rehabilitation activities progressively at all its operations in the Pilbara. All rehabilitation is undertaken in accordance with the Rio Tinto Iron Ore Rehabilitation Handbook, which is reviewed and updated periodically to reflect changes in industry standards, reflect new knowledge obtained through research and development, and to adopt learnings from	 A significant residual impact following the consideration of the Residual Impacts Significance Model (RISM) has been identified for the following environmental aspects: clearing of native vegetation potential impacts to riparian vegetation direct and indirect impacts to threatened flora species <i>Aluta quadrata</i>. Extent clearing up to 4,300 ha native vegetation; clearing of 5,179 <i>Aluta quadrata</i> (T) individuals within 14.6 ha; and clearing of up to 2 ha of riparian vegetation in Good condition.

Existing environment/	Fredering and the second			Significant residual	
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
 Clearing of native vegetation Loss of some individuals of Threated and Priority flora species Indirect impacts: Indirect impacts to conservation significant flora from edge effects within 30 m of the proposed clearing. Introduction/spread of weeds. Degradation/alteration of vegetation as a result of altered hydrological regimes. Impacts on riparian vegetation as a result of groundwater drawdown from mine dewatering. Impacts on riparian vegetation as a result of surplus water discharge to surface water systems. 	 direct clearing of 107 individuals of <i>Goodenia</i> sp. East Pilbara (A.A. Mitchell PRP 727) (P3); direct clearing of five individuals of <i>Grevillea saxicola</i> (P3); and direct clearing of 983 individuals of <i>Ptilotus</i> <i>trichocephalus</i> (P4). 	quadrata population at Western Range.The conceptual footprint of the Proposal minimises (where practicable) impacts to locally significant vegetation units and Aluta quadrata.The Proponent will take measures to minimise the threat of new weeds entering the development envelope and the abundance and distribution of existing weed species through continued implementation of the Iron Ore (WA) Pilbara Weed Management Strategy and includes key actions such as periodic spraying and equipment hygiene. This program will include surveying and spraying for *Ruellia simplex (Mexican petunia).Discharge to surface water systems will be minimised as discharge to dis-used pits will be used on site for processing and dust suppression to minimise discharge as far as practicable.	the local uncleared area.	ongoing rehabilitation projects. The Handbook addresses: soil resource management rehabilitation techniques local provenance species seeding practices records and data management ongoing monitoring. What us the type of vegetation being rehabilitated? A total of 28 vegetation units have been mapped in the Development Envelope. These are described in Section 5.3.2. Time lag Progressive rehabilitation will continue to be undertaken throughout the life of the Proposal where practicable, however the majority of the rehabilitation will be undertaken at closure. Credibility of the rehabilitation proposed (evidence of demonstrated success) Refer to Appendix 5 of the ERD for Eastern Range, Paraburdoo and Western Range Closure Plans.	Native vegetation is in Good to Excellent condition Riparian vegetation has local to regional conservation significance in the Pilbara region <i>Aluta quadrata</i> is a threatened flora species listed under the BC Act. Land tenure Not applicable. Time scale No temporary clearing.

Existing environment/	Environmental aspect			Significant residual	
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
		Discharge into Seven Mile Creek, Pirraburdu Creek and Six Mile Creek will be managed such that the discharge does not extend beyond the boundary of the Development Envelope.			
		Proposed regulatory mechanisms for ensuring mitigation.			
		The Proponent proposes that clearing be subject to a Ministerial Statement (MS). Schedule 1 of the MS shall authorise clearing of no more than 4,300 ha within the Development Envelope of 17,422 ha.			
Environmental factor: Terr	restrial Fauna				
Context/key survey findings: The Development Envelope is comprised of the following terrestrial fauna values:	Permanent loss of up to 342 ha of high value fauna habitat comprising: • Up to 335 ha Breakaway and Gorges/Gully	Avoidance Conceptual footprint within the Development Envelope was modified during the design phase to avoid direct impacts to high value fauna habitat and cave systems	Disturbed areas will be rehabilitated progressively as mining activities are completed. The conditions of the new Ministerial Statement shall require	See response as outlined for flora and vegetation.	A significant residual impact following the consideration of the RISM has been identified for the clearing of high value fauna habitat
 Eight habitat types. Presence of 	habitat; and	where practicable.	the Proponent to		Extent
significant cave features including cave systems,	 Up to 7 ha Riverine habitat. Permanent loss of 	The conceptual footprint has been modified where practicable to avoid impacts	Plan in accordance with the DMP / EPA Guidelines for		Clearing of up to 342 ha of high value fauna habitat.
surface water refuges and gorges.	approximately 1,070 ha of moderate value fauna	to nigh value tauna habitat. Including:	Preparing Mine Closure		Quality
 212 vertebrate species have been recorded; 68 reptile 	habitat comprising:	Modification of the 36W pit crest to provide an adequate	Plan includes a Closure Objective to ensure that vegetation on		Fauna habitat of high value to fauna species, including the

impactEnvironmental aspectAvoid and minimiseRehabilitationspecies, 110 bird species and 31 mammal species.• 70 ha of Drainage Line habitat; and • 1,000 ha of Rockystand-off for the protection of Cave 6 (potential Ghost Bat maternity roost)rehabilitated land i self-sustaining and compatible with the other the protection of cave 6 (potential Ghost Bat maternity roost)	Likely rehabilitation success impact post removal of two confirmed diurnal, two potential diurnal and area faced environ
species, 110 bird species and 31 mammal species.• 70 ha of Drainage Line habitat; and 1,000 ha of Rockystand-off for the protection of Cave 6 (potential Ghost Bat maternity roost)rehabilitated land i self-sustaining and compatible with the other the during the d	post removal of two confirmed diurnal, two potential diurnal
 rive introduced rauna species: House mouse, cat, dog/dingo, cattle and horse. Seven species of conservation significance has been recorded Northern Quoll, Pilbara Leafnosed Bat, Ghost Bat, Pilbara Olive Python, Grey Falcon, Common Sandpiper, Western Pebble- mound Mouse. 227 invertebrates for grossent et and moles to significant caves for grossent within east at digradation and/or increased with construction activity and/or increased with Range/Paraburdoo. Four potential SRE taxa present et 20 potential SRE taxa present within Range/Paraburdoo. Four potential SRE species, comprising 28 individuals were recorded at Western Range. Direct impacts: Clearing of fauna habitat Injury/mortality of 	he in Gorge/Gully habitat. Land tenure Not applicable. Time scale No temporary clearing.

Existing environment/	Environmental aspect			Significant residual	
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
 Existing environment/ impact Indirect impacts: Degradation/alteration of foraging and dispersal habitat as a result of altered hydrological regimes Habitat fragmentation and barriers to fauna movement. Habitat degradation associated with construction activity and/or increased human activity, including transmission of weeds, dust and increased abundance of introduced fauna species. Disturbance from light, noise and/or vibration, and possible displacement of fauna associated 	Environmental aspect	Avoid and minimise Discharge of surplus dewatering water to surface water systems will be minimised as discharge to dis-used pits will be utilised where practicable. The Proponent will undertake feral animal control within the Development envelope. The use of barbed wire fencing within the Development Envelope will be avoided as far as practicable. Where barbed wire fencing is required for legislative compliance, reflectors will be attached to make fencing more visible and to reduce the risk of fauna injury or mortality due to entanglement with fencing. The Proponent will implement the following management	Rehabilitation	Likely rehabilitation success	Significant residual impact
with construction activity and mining operations.		 dust suppression to minimise disturbance to fauna habitats; locate and construct water sources, domestic waste facilities, administration facilities and camps to minimise fauna (and feral animal) access, installation of speed limits, to reduce risk to fauna; 			

Existing environment/	Environmental aspect	Mitigation			Significant residual
impact		Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
		 roadkill will be removed from trafficable areas; and lights will be directed inwards towards mine activities to minimise lighting effects on fauna in adjacent area. Proposed regulatory mechanisms for ensuring mitigation. The Proponent proposes that clearing be subject to a Ministerial Statement (MS). Schedule 1 of the MS shall authorise clearing of no more than 4,300 ha within the Development Envelope of 17,422 ha. 			
Environmental factor: Sub	terranean Fauna	-		-	
Context/key survey findings: The Development Envelope is comprised of the following troglofauna values: • Extensive habitat including 'high certain' and 'medium certain' prospectivity habitat. • Thirty-five species and nine higher level indeterminate taxa - of which 41 were	 Removal troglofauna habitat: Up to 5% at Eastern Range; Up to 20% at Paraburdoo; and Up to 25% at Western Range. Temporary reduction and degradation of troglofauna habitat as a result of mining-related activities. 	Avoidance Avoidance of removal of subterranean fauna habitat is not possible for this Proposal; however, approximately 95% and 90% of existing troglofauna and stygofauna habitat, respectively, in the Development Envelope will remain intact. Avoidance of a reduction in stygofauna habitat through mine dewatering is not possible under this Proposal; however, approximately 98%,	The Closure Plans include a closure objective to ensure that the final landform is stable and considers hydrogeological factors, and that vegetation is self-sustaining. Progressive rehabilitation will be undertaken which will assist in re-establishing nutrient flows into the subterranean environment.	Can the environmental values be rehabilitated/Evidence? Based on limited sampling at the Proponent's Mesa A operation, there is evidence indicating subterranean fauna use of areas that have been previously disturbed. It may, therefore, be possible to re- instate subterranean fauna habitat at closure. However, this is not a well-established process. Backfilling of pit voids (to be undertaken as far as practicable) may facilitate re-	No significant residual impact following the consideration of the RISM has been identified in relation to Subterranean Fauna, therefore offsets are not proposed.

Existing environment/	Environmental aspect		Significant residual		
impact		Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
 uncertain, confirmed or potential SRE taxa. The Development Envelope is comprised of the following stygofauna values: 'High certain' and 'medium certain' habitat. Two potentially restricted, 'high' risk stygofauna taxa: Bathynellidae 'sp. WAM-BATH001' and Bathynellidae 'sp. GP2'. Direct impacts: removal of potential subterranean fauna habitat; loss of subterranean fauna individuals; and reduction in stygofauna habitat through mine dewatering. 	 Permanent and/or temporary loss of no more than: 35% of modelled stygofauna habitat at Paraburdoo; 3% of modelled stygofauna habitat at Western Range; and 1% of modelled stygofauna habitat at or Eastern Range. Removal of known Bathynellidae 'sp. WAM- BATH001' and Bathynellidae 'sp. GP2' individuals present. 	 75% and 99% of current modelled stygofauna habitat will not be affected by dewatering at Western Range, Paraburdoo and Eastern Range, respectively. Avoidance of loss of subterranean fauna individuals is not possible for this Proposal. Minimisation Impacts to subterranean fauna taxa and assemblages minimised through the continued availability of significant connected pre- mining habitat. Clearing will be minimised to only that required for implementation of the Proposal. Management controls will be implemented in respect of all ground disturbing activities to ensure the Proposal is developed in accordance with all regulatory approvals and that ground disturbance is minimised. Dewatering and abstraction for water supply will be minimised to that required to implement the Proposal. Water from mine dewatering will be used on site in the first 	Cessation of groundwater abstraction at BWT pits will enable recovery of groundwater levels and re-saturation of stygofauna habitat.	population of disturbed areas by troglofauna. Backfilling of BWT pit voids will facilitate recovery of groundwater levels which may enable recovery of stygofauna habitat. , Significant flow events will also continue to periodically recharge the Seven Mile Creek alluvial aquifer, replenishing stygofauna habitat and supporting stygofauna habitat connectivity. Operator experience in undertaking rehabilitation? The Proponent is experienced in the progressive backfill of pit voids and in progressive rehabilitation of mining areas in the Pilbara. What is the type of habitat that is being rehabilitated? Backfilling of pit voids may facilitate rehabilitation of subterranean fauna habitat. Time lag? Progressive backfilling, as far as practicable, and rehabilitation will be undertaken throughout the life of the Proposal where feasible, however the majority of rehabilitation will be undertaken at closure. Groundwater levels will recover over time - at the 4EE pit, the	

Existing environment/	Environmental aspect	Mitigation			Significant residual
impact		Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
		instance to minimise the requirement for additional groundwater abstraction for operational water supply. The Proponent will abstract groundwater within licence limits and monitor		majority of groundwater recovery (i.e. to within 5 m of final levels) is estimated to occur within 50 years with final stable level reached in approximately 100 years.	
		groundwater levels to ensure impact remains within the predicted range of drawdown.		rehabilitation proposed (evidence of demonstrated success)	
		Hydrocarbon management measures will minimise potential for contamination of troglofauna habitat.		The reinstatement of subterranean fauna habitat at closure is not a well- established process. The	
		Seepage from the 4W Waste Fine Storage Facility (WFSF) (if utilised) into stygofauna habitat is expected to be minimised through confinement to the cone of depression created by mine dewatering.		Proponent has, therefore, taken a conservative approach and has not included an assumption of successful rehabilitation of subterranean fauna habitat in the impact assessment conclusions.	
Environmental Factor: Inla	and Waters				
Context/key survey findings: The Development Envelope is comprised of the following Inland Waters values: • Seven Mile Creek – a shallow alluvial aquifer adjacent to the existing Paraburdoo mining area which supports	Increased dewatering of the Brockman Iron Formation and new dewatering of the Wittenoom Formation to facilitate mining of the 4EE pit. Minor dewatering is also required to facilitate mining of the 36W and 66W pits at Western Range.	Avoidance Avoidance of mine dewatering or abstraction for water supply is not possible for this Proposal; however, groundwater aquifers connected with Ratty Springs will not be impacted by dewatering. Avoidance of surface water discharge of all surplus	Groundwater levels are expected to recover following cessation of dewatering. No specific rehabilitation is proposed with respect to aquifers affected by drawdown. Waste landforms at closure will be rehabilitated to ensure they are stable based	Can the environmental values be rehabilitated/Evidence? Rehabilitation will be undertaken through partial pit backfill where practicable, waste landform stabilisation and construction based on waste material characteristics and capping of WFSFs. The Proponent has undertaken successful pit backfilling and	No significant residual impact following the consideration of the RISM has been identified in relation to Inland Waters, therefore offsets are not proposed.

Existing environment/		Environmental aspect	Mitigation			Significant residual
impact	Avoid and minimise		Rehabilitation	Likely rehabilitation success	impact	
rip an aq sty • Pii wh rip an aq	parian vegetation ad GDEs, and juatic and ygobotic fauna; and rraburdu Creek, nich supports parian vegetation ad GDEs, and juatic and	Dewatering to facilitate mining of 4EE will lower groundwater levels in the alluvial aquifer in Seven Mile Creek. A pit lake will form in 4EE. Surplus water from	dewatering water is not possible for this Proposal. Diversion of surface water flows in major creeks including Seven Mile Creek and Pirraburdu Creek will be avoided. Landforms will be constructed	on their waste material physical characteristics, which will minimise the potential for sedimentation in surface water runoff. Waste dumps will also be revegetated. All disturbed areas	waste landform rehabilitation at many of its operations. The Proponent has strong systems in place to manage WFSFs, which are assessed regularly using internal and external assurance processes. Operator experience in undertaking rehabilitation?	
sty ind Sp pe gr po im ha so fiv sp fiv sp co sig Pil EL co Fo Le ah	ygobotic fauna and cludes Ratty prings; a place of ersistent oundwater-fed pols that acts as uportant local fauna abitat. quatic fauna: 263 vertebrate taxa, one pecies of turtle, and re freshwater fish pecies, including two pecies of onservation gnificance, the lbara pin damselfly <i>urysticta</i> <i>polawanyah</i> , and portescue grunter, <i>biopotherapon</i> <i>teneus.</i>	Paraburdoo pits will be managed via a combination of discharge into disused pit voids and limited discharge to surface water systems, including discharge of up to 1.7 GL/a into Pirraburdu Creek, 0.8 GL/a into Seven Mile Creek, and from Western Range will into Six Mile Creek (0.4 GL/a) and Pirraburdu Creek (0.5 GL/a). PAF material will remain exposed in the pit wall (approximately 7%) at 4EE at closure. Disposal of waste fines will occur into the	to ensure separation between pit lakes and natural flows in Seven Mile Creek and Pirraburdu Creek. Minimisation Cumulative water balance modelling and hydrogeological modelling has been, and will continue to be, undertaken to facilitate understanding and effective management of current and future operational water demands and dewatering requirements, with a view to minimising groundwater abstraction for water supply. Abstraction from the 4EE dewatering borefield is expected to reduce demand from the Turee Creek and Chommer basefield	excluding the pit voids, will be rehabilitated to create a safe, stable and non-polluting landscape vegetated with native vegetation of local provenance. The pit lake that forms in the 4EE pit void is predicted to be a terminal sink (i.e. groundwater will flow continually towards the pit lake, confining potential impacts to the immediate vicinity of the pit void), water quality will have circum-neutral pH and TDS will steadily increase due to evapoconcentration.	See response as outlined for flora and vegetation. What is the nature of rehabilitation? The purpose of pit backfilling is to prevent the formation of pit lakes. Backfilling will be completed where practicable to appropriate levels to prevent the formation of pit lakes. One of the purposes of waste landform stabilisation and capping of WFSFs is reduce seepage of contaminants. Time lag Progressive rehabilitation will continue to be undertaken throughout the life of the Proposal where practicable,	
Ali gr du gr	teration to oundwater aquifers ie to abstraction of oundwater;	existing Paraburdoo WFSF, with an opportunity for in-pit storage in the 4W pit also being investigated	Only water that is surplus to operational requirements will be discharged.	4W (if utilised) WFSFs will be subject to inert waste capping used to reduce seepage.	nowever the majority of the rehabilitation will be undertaken at closure. Credibility of the rehabilitation proposed	
Alt hy	teration to drological regimes	Seepage is expected to	Discharge to surface water systems will be minimised	Water monitoring during closure will focus on		

Existing environment/	Environmental aspect	Mitigation			Significant residual
impact		Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
of surface water systems from discharge of surplus dewatering water; Alteration to groundwater aquifers from discharge of surplus dewatering water to disused mine pits; and Alteration to existing surface water catchments, surface water flow paths and sheet flows Indirect impacts: Reduction in quality of groundwater and surface water as a result of: surface water discharge; mineral waste dumps; waste fines storage; post closure formation of permanent and ephemeral pit lakes; increased sediments from infrastructure and drainage; and storage and handling of hazardous materials and waste.	create groundwater mounding under the pits. A number of ephemeral pools at Western Range and Eastern Range will be affected to varying degrees as a result of reduced catchment and sedimentation resulting from the Proposal.	 where practicable via alternative discharge methods including in-pit disposal and aquifer recharge (if viable). Surface water discharge will occur intermittently during the life of mine. Surface water discharge will be managed such that the wetting front does not extend beyond the Development Envelope. Surface water management during mining and closure will be designed to reduce where practicable adverse impacts on the natural function and environmental value of watercourses, water quality and sheet flow downstream for the mine area. Water management structures will be constructed where practicable in key risk areas to minimise discharge of sediment laden runoff from the site. A Mineral Waste Management Plan, and the Spontaneous Combustion and ARD (SCARD) Management Plan will be implemented to ensure waste material is adequately geochemically characterised and PAF material that poses 	confirming groundwater recovery levels, water quality, pit lake modelling predictions and identification of any AMD issues. A specific program of monitoring will be developed prior to decommissioning.	(evidence of demonstrated success) Refer to Appendix 5 of the ERD for Eastern Range, Paraburdoo and Western Range Closure Plans.	
Existing environment/	Enderson to be a set		Significant residual		
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impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
		an AMD risk is appropriately managed. This will involve encapsulation of potentially acid forming waste with inert material in waste dumps.			
		Groundwater monitoring across the Development Envelope will continue in accordance with the Greater Paraburdoo Groundwater Operating Strategy. Data will be reported annually within the Annual Aquifer Review.			
		Additional pit lake modelling will be undertaken to confirm the predicted pit lake water quality closer to closure.			
		Hydrocarbon storage facilities and all associated connections will be constructed within appropriately bunded areas			
Environmental Factor: So	cial Surrounds				
Context/key survey findings: The Development Envelope contains the following values relevant to social surrounds: • Entirely within the traditional lands of the Yinhawangka People, under the Yinhawangka Native Title Claim.	Clearing will directly impact up to 13 rock shelter sites and approximately 30 other sites, including artefact scatters, quarries and scarred trees, including the following registered heritage sites: • Site ID: 17006; PARA-A-02	Avoidance Impacts to SoSS; Gardagarli (Johnny's Gorge and Ratty Springs) and Garrabagarrangu (Red Ochre Quarry) will be avoided. An exclusion zone will be provided around Garrabagarrangu and a 200 m wide corridor to ensure the site can continue to be	Progressive backfilling will be implemented as far as practicable. Progressive rehabilitation with local native vegetation has been, and will continue to be, undertaken where practicable. Self-sustaining ecosystems are	See response as outlined for flora and vegetation.	No significant residual impact following the consideration of the RISM has been identified in relation to Social Surrounds, therefore offsets are not proposed.

Existing environment/	En inconstat consta		Mitigation			
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact	
 Rich and diverse heritage, archaeological and ethnographic features and sites including artefact scatters, quarries, rock shelters, ochre sources and scarred trees. Local water systems of are of high cultural significance, specifically the waterways and pools at Eastern Range and Western Range, which have associations with camping and ceremonial activities. Two Sites of Special Significance - Gardagarli (Johnny's Gorge & Ratty Springs) and Garrabagarrangu (Red ochre quarry). 	 (artefact/midden scatters); Site ID: 30489; PB10-05 (artefact/midden scatters and quarry); Site ID: 30490; PB10-06 (artefact/midden scatters); and Site ID: 30491; PB10-07 (artefact/midden scatters. Some sedimentation may occur in the upper catchment above Garrabagarrangu. Seven Mile Creek will be subject to drawdown from the dewatering of 4EE at Paraburdoo, which will impact riparian vegetation. Ephemeral pools in Western and Fastern 	accessed both during and on cessation of operations. The Proponent is committed to avoiding heritage sites, wherever practicable. The Proponent will avoid, as far as practicable, any sites of archaeological significance. Given historical landscape and riparian vegetation modification in Seven Mile Creek, proposed dewatering and discharge activities are unlikely to have any impact on cultural heritage associated with this watercourse. Minimisation Mitigation strategies such as salvaging of heritage sites that are subject to ss. 16 and 18 of the AH Act will be undertaken in consultation with the Yinhawangka People, and if appropriate, stored in the Keeping Place	intended to be re- established. The Closure Plans regarding operations within the Development Envelope consider the long-term access to heritage sites which will be further refined during life of mine, as well as how salvaged artefact material (as a result of direct impacts) will be managed.			
Water sources identified as being highly significant to the Yinhawangka People. Various locations within the vicinity of the Proposal that are publicly accessible and potentially have views of the	Range will receive reduced flows and increased sediment loadings to varying degrees.	currently housed at Paraburdoo Operations. An inventory of salvaged material is maintained and managed by Rio Tinto's Heritage Team (Rio Tinto 2018f). Consultation is ongoing with the Yinhawangka to discuss the timings and procedures of				

Existing environment/	Environmental concet		Significant residual		
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
Paraburdoo mine site (e.g. Paraburdoo town).		repatriating of cultural materials currently held by Bio Tinto and will be			
Direct impacts:		formalised over the coming			
 Disturbance of sites of cultural heritage significance. 		years once Yinhawangka have established their own Keeping Place facility.			
 Changes to local landforms which may result in altered visual landscape within the region. 		A Blast Management Plan for rock shelters will be developed. Where impacts from vibration are unavoidable, Rio Tinto will			
Indirect impacts:		apply to assess the significance of rock shelters			
Changes to the physical and biological attributes of the environment which may impact the values associated with cignificant		under s 16 of the AH Act. Rio Tinto will consult with Yinhawangka people about management of rock shelter sites that could be impacted by vibration.			
heritage sites		The Proposal has been designed to minimise impacts to pools and catchments where practicable.			
		The pit design of the 14-16W deposit has been modified to minimise physical and visual impacts to Pirraburdu Creek as per consultation with the Yinhawangka People.			
		The pit design of the 14-16W deposit has been modified to minimise the visual and physical impacts to Pirraburdu Creek as per consultation with the Yinhawangka People.			

Existing environment/	En ironmontol conoct		Significant residual		
impact	Environmental aspect	Avoid and minimise	Rehabilitation	Likely rehabilitation success	impact
		Mineral waste dumps will be designed to consider:			
		minimisation of dump height;			
		shaping of dumps to blend in with the surrounding natural topography;			
		construction to meet the requirements of the final rehabilitation design; and			
		drainage and erosion management features.			
		During closure the land will be reshaped to be compatible with the adjacent landscape to minimise long term visual impacts.			
		The Proposal has been designed to minimise impacts to pools and catchments where practicable.			
		Surface water management will be implemented to minimise disruption to natural flows, minimise erosion and prevent contamination of surface and groundwater where practicable			
		Dust management and implementation of a Blast Management Plan will minimise indirect impacts on sites of archaeological significance.			

Appendix 19: Environmental values by IBRA subregion

Table 1: Vegetation in Good to Excellent condition by IBRA subregion

	Extent	within Development E	nvelope	Proposed extent within Conceptual Footprint			
Vegetation condition	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	
Good – Excellent	9,558	2,906	12,464	1,890	2,410	4,300	

Table 2: Riparian vegetation in Good or better condition by IBRA subregion

	Extent	t within Development En	velope	Proposed extent within Conceptual Footprint			
Vegetation unit	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	
C2-A	0.4	0.0	0.4	0.0	0.0	0.0	
C2-AA-H	0.0	0.0	0.0	0.0	0.0	0.0	
С2-В	0.6	0.0	0.6	0.0	0.0	0.0	
C2-C	0.0	0.0	0.0	0.0	0.0	0.0	
С2-С-Н	0.0	0.0	0.0	0.0	0.0	0.0	
C2-C-MG	0.0	0.0	0.0	0.0	0.0	0.0	
D7-B	1.4	0.0	1.4	0.0	0.0	0.0	
D7-B-MG	0.1	0.0	0.1	0.0	0.0	0.0	
D7-C	1.2	0.0	1.2	0.0	0.0	0.0	
D8-A	20.3	2.8	23.0	0.0	0.0	0.0	
D8-B	0.7	0.1	0.8	0.4	0.0	0.4	
D8-B-MG	0.0	0.0	0.0	0.0	0.0	0.0	

	Extent	t within Development En	velope	Proposed extent within Conceptual Footprint			
Vegetation unit	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	
D8-C	5.4	0.0	5.4	0.0	0.0	0.0	
D8-C-MG	0.1	0.0	0.1	0.0	0.0	0.0	
D8-D	46.0	10.0	56.0	1.1	0.0	1.1	
D8-D-H	0.0	0.0	0.0	0.0	0.0	0.0	
D9	22.5	15.2	37.6	0.9	0.0	1.0	
TOTAL	98.8	28.0	126.9	3.0*	0.0	3.0*	

*Total rounded to match ERD (total extent within the Conceptual Footprint approximately 3 ha of riparian vegetation in Good condition)

Table 3: Terrestrial fauna habitat types by IBRA sub-region

	Extent within Development Envelope			Proposed extent within Conceptual Footprint		
Fauna habitat type	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)
Gorge/Gully	618	12	630	286	4	290
Riverine	131	0	131	7	0	7
Breakaway	290	1	291	45	0	45
Drainage Line	554	186	740	45	25	70
Rocky Hill	4,191	325	4,516	790	119	1,000
Low Hill	2,508	1,439	3,947	No value specified*	No value specified*	No value specified*
Stony Plain	2,394	1,122	3,516	No value specified*	No value specified*	No value specified*
Alluvial Plain	53	51	104	0	0	0

* As described in the ERD, the balance of clearing outside of high and moderate value MNES habitat will mostly occur in low value Stony Plain and Low Hill habitat type (up to approximately 2,888 ha combined total).

Table 4: Critical ba	hitat for MNES on	aciae by IRPA cut	ragion
Table 4. Chucai na	Ditat for Mines sp	ecies by IDRA Sul	negion

		Extent within Development Envelope			Proposed extent within Conceptual Footprint			
MNES species	Critical habitat	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	Hamersley subregion (ha)	Ashburton subregion (ha)	Total (ha)	
Northern Quoll,	Gorge/Gully	618	12	630	286	4	290	
Ghost Bat, Pilbara Leaf-nosed Bat	Breakaway	290	1	291	45	0	45	
Pilbara Olive	Gorge/Gully	618	12	630	286	4	290	
Python	Riverine	131	0	131	7	0	7	
	Breakaway	290	1	291	45	0	45	

Table 5: Aluta quadrata individuals by IBRA sub-region

	Extent within Development Envelope			Proposed extent within Conceptual Footprint		
Species	Hamersley subregion	Ashburton subregion	Total	Hamersley subregion	Ashburton subregion	Total (ha)
Aluta quadrata	20,485	9216	29,701	5,176	3	5,179

Table 6: Ghost Bat caves by IBRA sub-region

	Extent within Development Envelope			Proposed extent within Conceptual Footprint		
Туре	Hamersley subregion	Ashburton subregion	Total	Hamersley subregion	Ashburton subregion	Total
Ghost Bat caves	16	2	18	5	0	5

Appendix 20: Yinhawangka Aboriginal Corporation Consultation Register

This document has been provided electronically.

Greater Paraburdoo Iron Ore Hub Proposal Assessment No. 2189 EPBC 2018/8341 Response to submissions

Appendix 21: Biologic Environmental Survey Pty Ltd (Biologic) 2020c. *Greater Paraburdoo Iron Ore Hub: Aquatic Ecosystem Survey Report 2019-2020.* Report to Rio Tinto Iron Ore, October 2020.

This document has been provided electronically.

Appendix 22: Rio Tinto 2020f. Greater Paraburdoo Iron Ore Hub – Impact Reconciliation Procedure (Offsets). August 2020

This document has been provided electronically.

Greater Paraburdoo Iron Ore Hub Proposal Assessment No. 2189 EPBC 2018/8341 Response to submissions

Appendix 23: Rio Tinto 2021b. *Greater Paraburdoo Progressive Rehabilitation. March* 2021

This document has been provided electronically.