Response to submissions

Mesa H Proposal

(Revision to Mesa J Iron Ore Development)

Assessment No. 2121

EPBC 2017/8017

RTIO-HSE-0336259

Robe River Mining Co. Pty. Ltd.

September 2019

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Document status					
Rev	Author	Reviewer/s	Date	Approved for Issue	
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A	M Brand / ELA	Study team, technical specialists	August 2019		
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(Revision to Mesa J Iron Ore Development)

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Summary of Public Submissions

This document forms a summary of public submissions and advice received regarding the Public Environmental Review document for the Mesa H Proposal (Revision to the Mesa J Iron Ore Development) (the Revised Proposal) proposed by Robe River Mining Co. Pty. Ltd. (the Proponent).

The two-week public review period for the Proposal commenced on 8 April 2019 and ended on 24 April 2019. Five submissions were received from the following: the Department of Water and Environmental Regulation (DWER) (three submissions from various internal departments); the Department of Biodiversity, Conservation and Attractions (DBCA); and the Wilderness Society of Western Australia.

The principle issues raised in the submissions and advice received included environmental issues as well as issues focussed on questions of fact and technical aspects of the Proposal.

The key issues raised in the submissions related to:

- Potential impacts to vegetation, including riparian vegetation of the Robe River, and conservation significant flora.
- Suitability and connectivity of troglofauna habitat outside the proposed mining areas and potential impacts to troglofauna.
- Potential impacts to stygofauna and Blind Cave Eel habitat as a result of groundwater drawdown.
- Potential impacts to Short Range Endemic invertebrates.
- Abstraction of groundwater and associated cumulative impacts from groundwater drawdown.
- Volume and water quality of the proposed surplus water discharge to Jimmawurrada Creek.
- Potential geochemical impacts related to the proposed waste fines storage facility, waste rock and waste fines material characterisation.
- Proposed environmental offsets for disturbance to subterranean fauna habitat.
- Closure aspects including groundwater recovery, monitoring of riparian vegetation and potential seepage from the proposed waste fines storage facility.

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

- Flora and Vegetation;
- Subterranean Fauna;
- Terrestrial Fauna;
- Inland Waters; and
- Air Quality.

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Flora and Vegetation

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1	DWER	There are some uncertainties about the information provided in the final ERD regarding the effects of groundwater drawdown on the Robe River riparian vegetation. The ERD states that there are greater uncertainties in the accuracy of prediction of vegetation response to groundwater drawdown in the first 10-50m of the riparian zone near the southern bank of the Robe River and adjacent Mesa H. **This should be quantified and triggers and threshold levels set as the area of concern is dominated by the obligate phreatophyte – *Melaleuca argentea*. Detailed maps should be provided for sections of the Robe River demarcating significant vegetation and different drawdown zones and predicted impacts to these units.**	**Noted – Clarification provided and EMP Updated.** The presence of *Melaleuca argentea* is generally representative of regions within the river where groundwater remains relatively consistently shallower than 5 m deep. Typically within these zones, more mature and dominant populations of this species are present. In areas where less mature, young and relatively uneven age distributions within *Melaleuca argentea* populations occur, it is likely that groundwater depth is more variable and less consistently occurring within a < 5 m range. These latter zones (areas subject to more variable groundwater depths) represent areas of increasing uncertainty, both due to groundwater depths approaching levels which may not support *Melaleuca argentea* populations and increasing likelihood that these communities occur outside of preferential flow paths within the alluvium (along with other hydrological support mechanisms/factors). The areas possessing more consistent groundwater availability as discussed above are not always situated in the middle of the river. This is mainly due to the braided nature of the river and as a result of the populations' position in relation to the water table; the current and changing characteristics of the bed profile; the distribution of low lying areas within the alluvials; and other factors. Where vegetation is dominated by mature populations of *Melaleuca argentea*, the risk is considered to be higher due to the inherent significance of such vegetation; however, the uncertainty is lower due to larger and more mature root systems, and likely proximity to preferential flow paths within the alluvium. The opposite is true for the alternative scenario. It is therefore difficult to quantify the risk and thus the risk remains uncertain given the number of factors which are likely influencing the distribution of this species, including hydrological support mechanisms and fluvial conditions. This distribution may change following large streamflow events due to changes in river bed morphology, hence the overall approach is to remain consistent with existing riparian monitoring regimes. This includes trigger and threshold criteria based on statistically significant differences in foliage cover of phreatophytic overstorey riparian tree species from the baseline

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			period mean as measured by the mean vegetation index. However due to the elevated environmental value which is broadly based on the presence of mature stands of *Melaleuca argentea*, the management proposed will be commensurate with the determined value and likely risk. The revised management approach provided in the EMP proposes "zone" scale trigger criteria which assesses vegetation index change over the entire management zone, but also has the capability with the remote sensing and analysis method to assess "stand" scale decline – this could be applied specifically to the mature *Melaleuca argentea* stands as a management response, should trigger values be reached. The methods proposed to monitor the riparian vegetation include remote sensing ('Worldview') imagery, which captures vegetation index and changes to vegetation index. This imagery is georeferenced and can be overlaid with the mapped locations of mature *Melaleuca argentea* to determine if changes relate to those particular stands. The imagery is also of sufficient spatial resolution to enable review of individual trees for interrogating trends in conjunction with the on-ground mapping. In addition, riparian vegetation transects are also undertaken to provide an on-ground verification of the remote sensing data. The monitoring design consists of 23 sites within the Robe River system and its associated tributaries, including Jimmawurrada Creek and includes floristic data, population structure and crown condition. Leaf water potential measurements are also undertaken as part of this monitoring program to provide ecophysiology information and provide improved confidence of the monitoring data. This monitoring, combined with groundwater level monitoring and remote sensing imagery is considered to provide sufficient information to determine any changes or risk of change to the *Melaleuca argentea* populations in the Robe River, including the more mature *Melaleuca argentea* stands (C1AA). A new Map provided in Attachment 1 (Figure 1) provides an overlay of Figure 6-11 from the ERD (Predicted groundwater drawdown zones) with Figure 6-5 from the ERD (Significant vegetation mapping). The predicted impacts to riparian vegetation within these zones is provided in Table 6-22 of the ERD.

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2	DWER	**Detailed maps should be provided for Jimmawurrada Creek indicating current impacts from Mesa J (including impacts from the Southern Cutback Borefield).**	**Noted – additional information provided** A new figure is provided in Attachment 1 (Figure 2) which shows the current groundwater levels in the Development Envelope and immediate surrounds as a result of the extended dry period and groundwater abstraction for Mesa J and the Coastal Water Supply Project (CWSP) operations. Limited historical quantitative vegetation monitoring or detailed long-term baseline information is available for Jimmawurrada Creek in the immediate vicinity of Mesa J to enable accurate differentiation between various stressors and augmentation, including groundwater drawdown, periodic discharge, and natural climatic variables. Quantitative riparian vegetation monitoring has been undertaken further upstream in Jimmawurrada Creek and Bungaroo Creek since 2012, as part of the Coastal Water Supply Project. However, riparian vegetation health information is available in the form of detailed riparian vegetation mapping which provides a snapshot of the current baseline. The riparian vegetation mapping, and an assessment of the current condition of the riparian vegetation along Jimmawurrada Creek is provided in Astron (2016a & 2016b) and Rio Tinto (2018a) which were included in Appendix 9 of the ERD. In addition, further baseline monitoring of wet and dry season riparian survey transects, combined with Leaf Water Potential measurements have been undertaken biannually by Astron since 2016 along both Jimmawurrada Creek and the Robe River to provide a current baseline of the health of the riparian systems, within the modelled extent of the groundwater drawdown associated with the Revised Proposal (Astron 2016c, 2018c). Results indicate that crown condition scores for groundwater dependent tree species have remained relatively stable over time since the Astron monitoring commenced 2016. Leaf water potential of trees at two sites (MHT23w and MHT24w) of the four monitored for water status along Jimmawurrada Creek were noticeably lower (indicating stress) in 2018 compared to 2017; this was believed to be a result of the protracted dry

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			period, combined with cumulative groundwater drawdown associated with the Mesa J and CWSP operations leading up to the 2018 sampling period. Remote sensing of the entire monitoring area indicated a general decline in the condition of groundwater dependent vegetation canopy potentially as a result of the combined dry conditions and cumulative groundwater abstraction leading up to 2018.
3	DWER	The magnitude of drawdown on the Robe River is predicted to be 0.5-1m and temporary. **The term temporary should be defined and a timeframe should be provided as part of these predictions**.	**Noted – clarification provided** Groundwater drawdown as a result of mining activities is predicted to be less than 1 m in the Robe River at the peak of dewatering (worst case scenario modelled uncertainty run #2; Rio Tinto 2019). The localised and temporary peak drawdown period is mostly associated with the mining of Mesa H Pit 7 below 120 mRL (below the alluvium water level in the Robe River). Peak groundwater abstraction from Mesa H of approximately 3 GL/a (~7.1 ML/day) is estimated to occur several years later in the mine life (current estimate around 2033 – 2034), which, based on the model, does not translate to additional water level decline in the Robe River alluvium. Following cessation of dewatering in Pit 7 and backfilling, the recovery of water levels in the pools will be dependent on rainfall and stream flows. Furthermore, the first major rainfall event is expected to fully recharge the Robe River alluvial aquifer and seep into the adjacent CID aquifer to gradually recharge the CID aquifer. In the Robe Valley, statistically "small" streamflow events typically occur 1 in 2 years, whilst larger events typically occur 1 in 5 years. Therefore, peak drawdown is expected to last a minimum of 2 and maximum of 5 years.
4	DWER	The ERD has provided calculated areas of approved, current and proposed clearing across Mesa J, Mesa K, Mesa A, Mesa H using figures derived from Beard mapping. This does not provide enough context for assessment of potential impact on significant vegetation units in a regional context. **Cumulative impact figures should be provided for significant vegetation units, any impacts to these units (direct and indirect) across each mesa should be quantified. This should include relevant riparian**	**Noted – clarification and additional information provided.** *General vegetation* Detailed mapping at the scale undertaken for the Proposed Change Area of the specific vegetation units is not readily available, or is not available with consistent naming conventions to compare with other project areas in the Robe Valley and / or the Pilbara region. Vegetation mapping has been undertaken on a project by project basis, often by different consultants and over numerous timescales dating back to the 1980's. Any potential exercise to compare the different vegetation mapping to develop a

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		vegetation area, the proposed and/or current loss on each mesa and cumulative impacts to these vegetation units. This data should also include any other available datasets.	consolidated set of vegetation types across all projects would be difficult, particularly given that some of the mapping is based on historical data which pre-dates the *Environmental Protection Act 1986* (EP Act) and current EPA mapping guidelines. Therefore, vegetation units and associated naming conventions mapped are not consistent across Mesa J, Mesa K, Mesa A and Mesa H; the use of disparate mapping datasets for the purpose of cumulative impact assessment is not readily feasible. Identification and assessment of potential cumulative impacts to vegetation, therefore, requires broader scale vegetation mapping which is consistent across all project areas. In the Robe Valley, Beard (1975a, 1975b) is the most comprehensive and regionally comparable dataset available for the purposes of undertaking a cumulative impact assessment. **Significant Vegetation** The significant regional vegetation units which have been mapped within the Development Envelope are described in Section 6.4.5 of the ERD and include: • riparian vegetation communities; and • AprTwTsr - considered analogous to the *Triodia pisoliticola assemblages of mesas of the West Pilbara PEC* (formerly *Triodia sp. Robe River*). The remaining vegetation units were considered to be of either low local significance or negligible local significance. The significant vegetation in the Proposed Change area is depicted in Figure 6-5 and described in Table 6-6 of the ERD. Further details on the significant vegetation communities in the Development Envelope are summarised below. *Riparian vegetation communities* Rio Tinto (2017) completed detailed mapping of significant riparian vegetation between Mesa B and 13 km upstream of the Mesa H Proposal. Approximately 5,688 ha of significant riparian vegetation or “Riverine” habitats (containing *Melaleuca argentea* stands) in the Robe River were mapped. Of this, approximately 14 ha has been cleared, and a further 5.5 ha is proposed to be cleared as a result of implementing the Mesa A Hub (3.5 ha) and Mesa H Proposals (2 ha). This represents 0.09% of this

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			mapped extent within the Robe Valley. Furthermore; mapping work conducted by Astron and unpublished mapping work by Rio Tinto have detected consistent representations of similarly and often equally significant vegetation units occurring 25 km's upstream of the 13 km point in the Robe River as noted above, with obligate phreatic vegetation sporadically present for another 10km's on from this point as well. *Mesa plateaus and slopes* An analysis of the extent of the plateau habitats of Mesa's J, K, H, A, B & C indicates a cumulative aerial extent of approximately 4,563 ha. Of this, approximately 1,960 ha's has been cleared (~43%), including mining operations and clearing for exploration activities. Most of these vegetation units comprise a mix of scattered low trees of *Eucalyptus leucophloia*; *Corymbia hamersleyana*; scattered / shrubland of Acacia's (*A. inaequilatera; A. bivenosa; A. ancistrocarpa; A. arida, A. tumida*) over *Triodia wiseana* hummock grassland, which are widespread and common vegetation communities throughout the Pilbara. Limited significant vegetation associations have been mapped associated with the Mesa Plateaus, with most of the more significant vegetation and flora communities being associated with the Mesa slopes around the periphery of the Mesa landforms. In some instances, very small portions of these more significant vegetation communities intersect the mapped mesa plateau landform, of which 6 ha of AprTwTsr (considered analogous to the *Triodia pisoliticola assemblages of mesas of the West Pilbara PEC*) is proposed to be cleared at Mesa H.
5	DWER	**The proponent should consider incorporating any areas of the PEC not proposed for direct clearing for the mine pits into the mining exclusion zone.**	**Noted – clarification provided and EMP updated.** Areas of the mapped unit AprTwTsr considered analogous to the Triodia sp. Robe River PEC are predominantly located within the MEZ. Approximately 6 ha is proposed to be directly disturbed outside of the MEZ due to the Proposal (haul road and mine pits). The remaining areas of the PEC outside of the MEZ are not proposed to be cleared. These areas are proposed to be protected, however the MEZ is not currently proposed to be amended to include this as discussed below. The intent of the MEZ is to quarantine parts of the orebody (confirmed resource) from direct impacts as a result of excavation for mining. There

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			are many areas of cultural and ecological significance that are outside the orebody that will not be disturbed either by mining or clearing. These areas are not included in a MEZ as the intent of the MEZ (i.e. Mining Exclusion Zone rather than a "Clearing Exclusion Zone" or "Exclusion Zone") is to provide specific clarity around the "no go" areas for mine planning and does not address the broader environment. The MEZ also allows for some level of vegetation clearing associated with the Proposal to allow for environmental monitoring requirements, vehicle access, key infrastructure and to meet closure requirements. Expanding the MEZ for the purpose of including additional areas of the PEC would extend the MEZ off the target orebody proposed for mining and would therefore be inconsistent with the intent of a MEZ and would also be inconsistent with the MEZ approach in place at Mesa A, B, C and Mesa K. However, the Proponent commits to ensuring no additional disturbance to this vegetation and will include these areas into the EMP as "clearing avoidance areas"; these areas will also be reflected in the Rio Tinto Approvals Request database as "exclusion areas".
6	DWER	**Direct, indirect and cumulative impacts on both the number of individual plants of priority flora species and the known populations in the Robe Valley should be provided. This includes species that may be indirectly impacted by altered hydrology (surface water flow, groundwater drawdown).**	**Noted – clarification provided** Please refer to Table 6-15 and Table 6-18 of the ERD which provide a quantitative assessment at both a local and regional scale (including known populations in the Robe Valley) of the numbers and proportions of individuals of conservation significant flora that may be impacted by the Proposal. Of the significant flora that occur in the Development Envelope, *Rhynchosia bungarensis* (P4) has the potential to be indirectly impacted by altered hydrology as it occurs primarily within the Major drainage habitat of the Robe River (Figure 3 in Attachment 1). However, these potential impacts are expected to be minimal as described below. **Distribution** *Rhynchosia bungarensis* occurs over a range of 600km, occurring all across the Pilbara to the Cape Range. Habitats utilised by this species do not indicate a dependence on shallow groundwater, or specificity to mesic hydrological regimes supported by groundwater.

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			Discharge The volume of the Revised Proposal's intermittent discharge is estimated as being slightly lower than the current Mesa J operations, resulting in a discharge footprint which will be the same as, or less than the existing Mesa J operations discharge footprint. Most of the discharge is likely to occur post wet-season where storage capacity at the operations is exceeded. Hence the Revised Proposal is not expected to result in new or additional indirect impacts on Priority flora as a result of discharge. **Groundwater drawdown** Groundwater drawdown in the Robe River is modelled to be <1 m and associated with the mining of Mesa H Pit 7 below 120 mRL, estimated for development several years later in the mine life. Whilst drawdown may result in reduced periods of saturation in the alluvial aquifer, *Rhynchosia bungarensis* is not known to be groundwater dependent. Groundwater drawdown may result in a temporal reduction of soil moisture and potentially reduced numbers of this species in localized sections of the Robe River within the Development Envelope, similar to the changes naturally experienced during extended dry periods when ground water levels are naturally reduced.
7	DWER	It is unclear from the information provided what proportion of the predicted impacts from groundwater drawdown have already been approved for Mesa J under Ministerial Statement 208 and what proportion relates to the proposed change area for Mesa H. **A table should be provided clearly showing separate figures for Mesa J, Mesa H as well as the cumulative total.**	**Noted – clarification provided.** It is difficult to separate the calculated water balance between the existing Mesa J Operations and the Mesa H Proposal as the water is derived from the same aquifer. Hence for the Mesa H Proposal, it was considered more appropriate to assess cumulative impacts holistically from a hydrogeological context for the entire Revised Proposal. However, Table 5-5 of the ERD provides details of the Revised Proposal operational water balance forecast which also includes a breakdown of the current Mesa J operations water balance. Mesa J operates under Ministerial Statement MS208 granted in 1991, and the borefield licensed under RIWI Act 5C licence GWL 107678-13. The Mesa J groundwater licence allows up to 30 GL/a to be abstracted from the combination of:

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			• Southern Cutback borefield; • Pannawonica Town Water Supply; and • operational dewatering. Mesa J has been operating pursuant to the requirements of MS208 and requirements under its approved environmental management plan, as evidenced within the 2018 Annual Environmental Compliance Report, and its Part V water licensing requirements with respect to management of groundwater. The focus of the Mesa J approval in 1991 was centred on avoiding significant impact to environmental receptors which may be reliant on groundwater, rather than defining specific groundwater level triggers. Hence the current Mesa J EMP monitoring focusses on key pools, aquatic fauna assemblages and riparian vegetation. The long-term (1991-2018) Robe River monitoring dataset indicates that extreme natural events (e.g. tropical cyclones and extended dry spells), rather than mining activities, are considered to be the main driver for setting the broader pool morphology, riparian condition and resultant pool ecological assemblages, which are subsequently controlled by habitat and water quality (Streamtec 2018). Currently drawdown on the Robe River as a result of current operations is negligible.
8	DWER	The discharge of surplus dewater has the potential to change the quality of surface water in Jimmawurrada Creek, West Creek and ultimately the Robe River. **The Environmental Management Plan should be revised to include water quality and plant health management in this area.**	**Noted – clarification provided. Requirement already covered in the draft Mesa J Hub EMP** The potential for the discharge of surplus dewater to change the quality of surface water is acknowledged in the ERD. Water quality from the existing Mesa J discharge outlets are monitored and managed under the provisions of Part V licencing, with water quality in the pools monitored via the Mesa J EMP. These same discharge points are proposed to be utilised for the Revised Proposal and will continue to be monitored for water quality and volumes. The Revised Proposal's intermittent discharge volume is estimated as being lower than the volume discharged from the Mesa J operations, resulting in a wetting footprint which will be the same as, or less than the current Mesa J operations. The water quality is also expected to be similar to the existing Mesa J operations discharge water quality. Most of the surplus water discharge is likely to occur post wet-season where storage capacity at the operations is exceeded. West Creek is a smaller drainage line between Mesa J and H – discharge for the Revised Proposal

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			is not proposed in this location, however the option of this location has been retained in case required. The extent of the wetting front associated with discharge currently dissipates once it reaches the coarse alluvial gravels of the Robe River. The draft Mesa J Hub EMP focusses on key environmental values to be monitored and managed for the Revised Proposal, hence the monitoring program focusses on water quality in key semi-permanent and permanent pools. Site Specific Trigger Values (SSTV's) and thresholds are currently being developed for these pools based on an analysis of the recent and historical water quality data collected. At present, ANZECC water quality triggers and thresholds are used as default criteria for the existing monitoring undertaken in the pools for the Mesa J operations. The EMP also includes a Riparian vegetation monitoring program which involves monitoring of overstorey canopy via worldview imagery; and riparian transects, which incorporate both understorey and overstorey vegetation monitoring in the Robe River and Jimmawurrada Creek. The understory monitoring includes species diversity and mean abundance of species between site types, heights and weeds.
9	DWER	**A series of separate detailed maps demarcating significant vegetation and significant flora in different drawdown zones should be provided. Areas of significant vegetation to be affected in each drawdown zone should also be provided in a tabular form.**	**Noted – new maps provided.** Mapped riverine areas potentially affected by the Revised Proposal are presented in Table 6-9 of the ERD. Vegetation mapping, including riparian areas, is presented in the ERD in Figure 6-3 (Overview and Maps 1-3). Further detailed mapping of the riparian zones is presented in Figure 6-5 which provides context regarding overall riparian vegetation significance, and detailed riparian mapping is presented Figure 6-6 (Overview and Maps 1-3). Additional detailed quantitative estimations of riparian vegetation (including significance of the vegetation) in groundwater drawdown zones for Jimmawurrada Creek are presented in tabular form in Table 6-19, and descriptions of impacts presented in Table 6-20. Quantitative estimations for the Robe River are provided in Table 6-21 and qualitative descriptors are provided in Table 6-22. A new map, Figure 1, illustrates significant vegetation including significant riparian communities relative to the modelled groundwater drawdown zones.

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			A new map (Figure 3, Attachment 1) has been created which displays significant flora species in relation to areas predicted to be subject to groundwater drawdown. The water table at the Mesa H Landform is currently > 20m deep and hence groundwater is currently not within the root zone of significant flora species located on top of, or along the margins of the Mesa landform. Flora species in the mapped riparian zone of Jimmawurrada Creek comprise sparse numbers of Priority 3 flora: *Triodia pisoliticola* which were surveyed in 2016 when water table levels were ~4 mbgl. Given depth of the groundwater at the time of surveying and that the majority of records of this species occur along the Mesa landform margins, it unlikely that their presence is specifically related to, or likely to be affected by regional groundwater levels; the distribution of this species does not show any degree of correlation to patterns of groundwater depth across rocky habitats it occupies. These species are classified as xerophytes or vadophytes and are plastic in their water use, including opportunistically utilising small fractured rock aquifer sources. Flora species in the Robe River riparian zone comprise the Priority 4 Species: *Rhynchosia bungarensis*. The predicted peak groundwater drawdown in the Robe River is < 1 m, which is well within the natural levels of seasonal groundwater fluctuation (~2 - 3m) experienced in the Robe River. Whilst it is possible that population numbers may be reduced during extended dry periods or during maximum groundwater drawdown, their presence is still expected to persist. Whilst this species occurs in riverine and creek habitats it is not known to be restricted to shallow groundwater sections of these habitats.
10	DWER	**The proponent should provide an analysis of direct and cumulative impacts on the Triodia pisoliticola assemblages of mesas of the West Pilbara PEC as mapped by the DBCA, using all available information.**	**Noted. Additional clarification provided.** It is understood that the Priority 3 flora species *Triodia sp. Robe River* (M.E Trudgen et al. MET 12367) has recently been formally described as *Triodia pisoliticola* Trudgen & M.D.Barrett (Barrett and Trudgen 2018). The PEC '*Triodia* sp. Robe River assemblages of mesas of the West Pilbara' is now known as '*Triodia pisoliticola* assemblages of mesas of the West Pilbara'.

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			In Section 6.6.1.2 of the ERD it is stated that the DBCA have mapped an additional 360 ha of the *Triodia* sp. Robe River assemblages of the West Pilbara PEC, which lies outside the Development Envelope. A more recent DBCA TEC/PEC database search (5/09/2019) has identified 165 occurrences of the PEC occurring within the Pilbara bioregion. These occurrences extend over a range of approximately 130 km, extending from Mesa G/F area in the north to the FMG Eliwana Project area in the southwest. None of the occurrences recorded by DBCA occur within the Development Envelope. API has also conducted mapping which delineates additional areas (36,900 ha) considered analogous to this PEC within the West Pilbara (API 2011). Further to this, vegetation mapping undertaken recently for FMG's Eliwana Iron Ore Project in the West Pilbara identified 596.1 ha of the PEC within and in the vicinity of the Eliwana Project, of which 41.4 ha of the PEC is expected to be directly impacted. The ERD for the project (FMG 2018) describes how a greater area of this PEC has been mapped by other surveys in the area, indicating that the community is likely to be more widespread in the area than indicated by publicly available surveys. The EPA concluded in its recent assessment report for the project that given the increase in the known extent of this PEC, the relatively low direct impacts, and the potential for this PEC to occur outside the surveyed area, the impacts to this community can be managed to meet the EPA's objectives for this factor, subject to limitation of direct impacts to that currently predicted for the project, and management of indirect impacts through the preparation and implementation of the Flora and Vegetation Management Plan required by the EPA's recommended conditions. Clearing of 6 ha of AprTwTsr for the Proposed Change constitutes 0.04% of the current mapped extent of *Triodia pisoliticola assemblages of the West Pilbara* PEC within the region. In light of the reported extent and likely additional unmapped areas of this community in the West Pilbara, this loss is not considered locally or regionally significant. Given the very small area of clearing of the PEC associated with the Proposed Change and the widespread extent of this PEC in the West Pilbara, the Proposed Change will not change the scale of cumulative impacts in the region.

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11	DWER	**Weed mapping should be provided, including areas prone to weed invasion.** The ERD states that vehicle, earth moving activities and surplus water discharge may increase weeds in the proposed change area. Some areas may experience a decline in native vegetation cover as a result of hydrological change, making them vulnerable to weed invasion.	**Noted. Additional clarification provided.** Weed mapping of the Development Envelope is provided in Figure 6-9 in the ERD. This is based on a comprehensive dataset including historically mapped weeds across the Development Envelope and weeds mapped during the recent Level 2 surveys undertaken specifically for the Mesa H Proposal. Weeds are also recorded via riparian vegetation transect monitoring undertaken as part of the baseline and ongoing riparian vegetation monitoring. Current mine operations are subject to ongoing weed management practices to mitigate the introduction and spread of weed species within the region. In terms of hydrological change, the intermittent discharge from the Revised Proposal will be via the same licenced discharge outlets with discharge volumes estimated as being slightly lower than the current Mesa J operations - resulting in a discharge footprint which will be the same as, or less than the existing Mesa J operations discharge footprint. Most of the discharge is likely to occur post wet-season where storage capacity at the operations is exceeded. Discharge footprints within the creek profile typically occur in the lower coarse cobbled zones of the creek/river where weed infestation is uncommon due to unstable/changing nature of such substrates. Hence the Revised Proposal is not expected to result in new or additional impacts on weed invasion as a result of discharge.
12	DWER	**Areas that are proposed for surface water discharge should be monitored for weeds, especially Tamarisk. Tamarisk** (Tamarix aphylla) is listed as a Weed of National Significance and has been found along a tributary to Robe River outside of the Development Envelope (North of Mesa H). **Mapping should be completed for this and monitoring and contingency actions included within the Environmental Management Plan.**	**Noted – EMP updated** The Proposed Change does not alter the existing discharge footprint of the existing Mesa J operations. The volume of surplus discharge for the Revised Proposal is estimated to be a reduction in relation to the current Mesa J discharge volumes. The location of the mapped occurrence of Tamarisk is outside the Development Envelope and given that the proposed discharge will be into Jimmawurrada Creek, the location of the wetting footprint is not modelled to coincide with the mapped location of the Tamarisk.

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			However, given the significance of this weed, additional mapping, monitoring and eradication (if present) is proposed in the revised EMP to undertake these activities within the Development Envelope.
13	Wilderness Society	Evidence shows that land clearing, such as is proposed in the Mesa H area, causes major consequences for the environment, such as land degradation, increased salinity and declining water quality, habitat loss and fragmentation, and climate changes. In dry areas such as the Pilbara, clearing of vegetation causes more water to enter the groundwater and groundwater levels to rise. This change dissolves the salt in the previously unsaturated part of the soil, causing salt levels to rise in both soil and groundwater. Gradually, low lying areas of valley floor, such as the Robe Valley, becoming fully saturated, causing salt to seep into rivers and water supplies, resulting in water flows that vary in salinity levels. These potential changes in salinity and declining water quality threaten the current ecosystems of the Robe River and the mesas. The Phase 1 field surveys were conducted in 23 – 30 October 2014 and 24 September – 4 October 2015. The Phase 2 surveys were conducted in 27 April – 14 May 2016 and 19 – 22 July 2016. Seasonal conditions for both Phase 1 surveys were considered dry, with below average rainfall in the months preceding. Seasonal conditions for the first Phase 2 survey were also considered poor, with below mean rainfall recorded both 12 weeks and 12 months prior to the survey. Ten currently listed priority flora species such as T. sp. Pannawonica (B.M. Anderson & M.D. Barrett BMA 89) P 1, E. australis var. glabra P2, S. weeliwolli P2 and E. surreyana P3 have been previously recorded within, or near, the survey area, so it is possible that the survey missed these species due to the below average seasonal conditions. The Targeted Riparian Vegetation Survey had some limitations, such as:	**Not applicable to the Proposal. Additional clarification provided.** **Salinity** Land salinisation as a result of clearing is a major environmental issue in the south west of Western Australia. It is not considered a potential issue in the West Pilbara which has very low cover of vegetation, little soil and irregular, but major flooding which prevents salt accumulation in alluvial aquifers. Regional groundwater levels are not currently showing rising trends within the West Pilbara. Further detail is provided below. The climate of the Pilbara region of WA is classified as arid tropical with two distinct seasons: a hot, wet summer (October – April) and a mild, dry winter (May – September) (Bureau of Meteorology [BOM] 2018). On average, the area within which the Development Envelope is located experiences 37 rain days per year, with average rainfall of approximately 365 mm per year (from Pannawonica and Yalleen weather stations from 1930 to present). The Pilbara generally comprises sparse vegetation with the majority of the vegetation associated with drainage lines and major rivers. Dryland and arid-land salinity is associated with developed soils, most common in the Pilbara within low lying clay-loam areas where water accumulates for prolonged periods and is subject to excessive evaporation. In the case of the Revised Proposal, most of the proposed clearing (up to 2,200 ha) will occur on elevated topography with poorly developed soils, limited vegetation and near surface rock. Infiltration and groundwater mobilisation is through rock and gravel profiles and aquifers where measured salinity levels are low (typically around 64 mg/L). The identified throughflow through the alluvial aquifer within the Mesa H area does not allow the development of salt storages or groundwater related salinity. Tributaries feeding the Robe River from the Mesa H catchments comprise sand and gravels with limited deep-rooted vegetation. These areas fall

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		• Flora and vegetation data collected as part of this study came from a single phase of work and as such were not seasonally sampled. • Rainfall/seasonal conditions and flowering/fruiting conditions were suboptimal. At the time of the survey; the more significant of these communities, namely the Mature Melaleuca argentea dominated Closed Forest (C1AAa) & Mature Melaleuca argentea dominated Open Forest (C1AAb) vegetation types, were relatively dry, so the understorey appeared relatively devoid of the accompanying mesic species diversity thought to be normally supported. **The Wilderness Society recommends that a detailed vegetation and flora survey should be conducted in the study area during or soon after the wet season when rainfall is average, to ensure that other priority species in the area are considered in the proposal.** **The Wilderness society recommends that the Riverine Habitat which is significant for the conservation listed species should be avoided by the proponent. Any development should ensure that the riparian vegetation and the wetlands experience minimal impact, with significant pools shielded from any impact.** **For the dewatering, The Wilderness Society recommends that the ecological water requirements should be taken into consideration and there should be quantified information on the relationship between the health of a GDE and groundwater depth.**	within mining avoidance areas and with very limited clearing proposed. Areas associated with clearing for mine pit development will result in the topsoil and subsoil being completely removed. In these cases, aquifers will be subject to in-pit sump accumulation within bedrock/CID, direct infiltration and mine dewatering. These scenarios are not applicable to the processes required for dryland salinity to develop. Furthermore, other clearing areas such as access roads and laydowns will all be compacted which will prevent the infiltration of rain water. Runoff will be discharged into non-cleared areas. **Surveys** The vegetation and flora surveys were conducted in accordance with EPA guidelines (EPA 2016a, b). The Pilbara has experienced several years of below-average rainfall, with the 2019 wet-season being a particularly dry wet-season. Given the Pilbara's extremes in climatic conditions ranging from cyclones to extended dry periods, it is difficult to predict (and not considered feasible nor practical to continue to await) a return to 'average' rainfall conditions. The Development Envelope and the Proposed Change Area have also been subject to numerous baseline vegetation and flora surveys undertaken since 1991 as shown in Figure 6-1 of the ERD, which span a broader time period and a broader range of climatic conditions. The data from all of these surveys have been collated in the ERD, analysed, and used to inform the assessment, and address any potential climatic perturbations e.g. Figure 6-2 shows the spread of flora and vegetation sampling locations dating back to 2006. **Riparian Vegetation and Groundwater Dependant Ecosystems** Riparian vegetation mapping was undertaken as a two phase survey by Astron (2016a, b) as part of the broader vegetation mapping for the Development Envelope. In addition to the Astron mapping, a Rio Tinto botanist conducted a "Targeted Survey" of Riparian vegetation and subsequently further refined the mapping within the riparian zones of the Robe River and Jimmawurrada Creek (Rio Tinto 2018a; 2018b). Technical guidance from the EPA on survey techniques prescribes a 'Targeted survey' for this type of investigation, and as such, does not require seasonal sampling. Seasonal sampling may be a relevant task for

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			some surveys, however, given that the habitats being targeted for this Proposal are known for their low degree of seasonal variation due to groundwater access through dry periods, seasonal sampling was not considered necessary. While understorey diversity was low, this is more likely a product of the coarse cobbled riverbed materials which dominate the Robe River. Conditions at the time of the Jimmawurrada creek survey were observed to be adequate at the time of survey within the riparian habitats surveyed, with surface water expressions common throughout. Furthermore, direct impacts to Riverine habitat are being avoided as far as possible. Clearing of less than 2 ha of sub-regionally and locally significant GDE vegetation is proposed (Melaleuca dominated communities), mostly for widening of an existing access road; some of which is regrowth. The proposed clearing is also potentially required for additional hydrogeological investigations and to support contingency environmental management options or investigations (e.g. a pipeline to supply supplementary water to key pools along the Robe River), should monitoring indicate the requirement to implement. The remainder of the Proposed Change has intentionally avoided the location of infrastructure in these areas. Significant pools have also been a key focus and consequently the Proposed Change has been designed to avoid or minimise impacts to these pools through the following key mitigation measures: • No direct impacts on pools as a result of clearing. • Hydrogeological modelling has been and will continue to be undertaken to facilitate understanding of current and future abstraction requirements. • Groundwater abstraction will be minimised to that required to access the below water table resource and meet water supply requirements. • The Proponent will abstract groundwater within the existing licence limits regulated under the RIWI Act and monitor groundwater levels to ensure impact remains within the predicted range of impact. • If groundwater drawdown is greater than anticipated in the Robe River alluvial aquifer as a result of dewatering, proposed contingency mitigation options include: o providing abstracted water directly back into the permanent pools of the Robe River

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			o avoiding mining below the 120 m RL in the northern-most Mesa H pit, particularly during extended drought periods. Quantified information regarding the health of the riparian systems and predicted impacts in relation to drawdown and groundwater levels (to support riparian ecological water requirements) is provided in Tables 6-20 – 6-22 of the ERD with the extent illustrated in Figure 6-11. This is based on observations and monitoring of existing riparian health in the upper Robe Valley in relation to groundwater depths. Not all communities and hydrological settings are equal and thus not all GDE's are equivalent. Ecological water requirements were considered, however many variables are difficult to quantify, including: multiple groundwater sources; influence of surface water flows; associated subsurface geology and structural features; and variable root depths. Groundwater is highly dynamic in the area and more broadly across the Pilbara which influences the degree of arid adaptation, including highly dynamic water requirements, and often opportunistic water use patterns and communities. Hence a risk-based approach is adopted for estimating the degree of reliance of species and communities on groundwater of varying depths, and developing impact predictions. Aquatic fauna ecosystems and pools of the Robe River have been subject to a long term biophysical and ecological monitoring study by Streamtec since 1991, prior to groundwater abstraction commencing for the existing Mesa J operations. These long-term surveys are an integrated, long-term assessment of environmental parameters including aquatic fauna (i.e. aquatic macroinvertebrates and fish), channel/pool morphology, riparian/bank condition, weeds, water flows and water quality. Statistical and qualitative analyses of data from this monitoring program have concluded that there have been no statistically significant or qualitatively detectable changes to the aquatic ecology of the Robe River pools (Appendix 11 of the ERD - Streamtec 2017). This assessment is consistent with previous analyses since 1991 where extreme natural events (e.g. tropical cyclones and extended dry periods) determine the structure of pool morphology, riparian condition and consequently the pool ecological assemblages.

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14	Wilderness Society	**Rehabilitation** Restoration for large open pits should be planned and prepared for throughout the life of the mine, rather than relying on recovering a biodiverse system through seeding or planting. Although there are rehabilitation examples like the ongoing BHP Yarrie mine in the Pilbara (Grant, & Koch, 2007), or the Huntly mine pits rehabilitation programme in south-western Australia (Alcoa, 2003), research in the last two decades has shown little success (Young, 2017). **The Wilderness Society recommends that the impacts of large-scale land clearing for Mesa H be given greater consideration in light of the impacts of land clearing on soil erosion, water loss, habitat loss and climate change, with further research being done into how large-scale land clearing will affect the Development Envelope and the broader environment.** **The Wilderness Society recommends that the Mesa H proposal consider the end of the mine's life through environmental management such as further pre-mining surveys, mining monitoring, and planning for the restoration process.**	**Noted – additional context provided.** The Proposed Change has been designed to avoid or minimise direct impact to sensitive receptors. Clearing will be kept to the minimum required to safely operate and the majority of the clearing is proposed to be undertaken on the Mesa plateau landform which has limited soil cover. The Development Envelope has been extensively surveyed in accordance with published State and Commonwealth guidance and in accordance with the environmental scoping requirements as set out in the approved Environmental Scoping Document for the Proposal (Appendix 2 of the ERD). The impacts of vegetation clearing associated with the Proposed Change are articulated in Section 6 to Section 12 of the ERD, which considers impacts of land clearing to flora and vegetation, terrestrial fauna and MNES fauna (including habitat loss), aquatic fauna, subterranean fauna, landforms, air quality, social surroundings and inland waters. In addition, Section 14 discusses the proposal holistically and provides context in relation to cumulative impacts at a local and regional scale. As discussed in Section 13 of the ERD the clearing of: • up to 1,986 ha of native vegetation in Good to Excellent condition; • up to 2 ha of Riverine riparian vegetation; and • of 6 ha of vegetation analogous to the *Triodia sp. Robe River* (now *Triodia pisoliticola assemblages of mesas of the West Pilbara)* PEC is considered a significant residual impact and therefore offsets are proposed in the form of contribution into EPA's Pilbara offset fund which manages further research programs to support biodiversity in the Pilbara. Ongoing environmental monitoring and management throughout the life of the operations is proposed and set out in the draft Environmental Management Plan (Appendix 6 of the ERD). Additional environmental monitoring and management will also form part of the work requirements included in the Closure Plan (Appendix 7 of the ERD), which includes details of proposed rehabilitation and associated completion criteria, in accordance with the DMP & EPA Guidelines for Preparing Mine Closure Plans (DMP and EPA 2015).

Subterranean Fauna

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15	DBCA	The proponent has demonstrated with acceptable certainty that remnant habitats for the majority of subterranean fauna species identified at Mesa H will remain following mining. However, there is ongoing uncertainty in relation to the viability and connectivity of inferred habitat underlying and adjacent to the areas (Robe Pisolite ore bodies) that are proposed to be mined or altered through dewatering.	**Noted – additional clarification provided.** **Troglofauna habitat** The proposed troglofauna habitat to be retained via the MEZ is considered 'core' CID habitat with the connectivity defined through analysis of extensive geological data, including surface geology (2D) and downhole drillhole data (3D). Following definition of the habitat, troglofauna records were assessed in relation to the geological analysis to validate these habitats. The 'inferred' habitat (medium prospectivity habitat) is not included in the habitat calculations for the purposes of the impact assessment, that is, a conservative approach has been taken recognising that there are less data to demonstrate the suitability of 'inferred' habitat. The calculation of 50% habitat retention relates to the retention of core (above water table) troglofauna habitat *on the Mesa H landform only*, based on permanent changes to habitat as a result of mine pit excavation. Habitat retention focused on connectivity within the MEZ, rather than the pit floor due to the complexities of sampling in an operating mine pit, as experienced at the Mesa A operations. In addition, the troglofauna sampling results from the Mesa A operation have provided a greater level of confidence of troglofauna persistence in the retained habitat behind the mesa escarpment (in the MEZ) than beneath the pit floor. This information was used to guide the design of the proposed MEZ at Mesa H. The design of the MEZ and troglofauna habitat calculated to be retained at Mesa H (>50%) conservatively considers only the core (above water table) CID habitat of the Mesa H landform retained behind the mesa escarpment and does not include any troglofauna habitat that may still be viable beneath the pit floor. Representative troglofauna Orders occur within the MEZ and across Mesa H supporting continuity of habitat i.e. this is known habitat (not inferred) (Table 7-10 of the ERD). The combination of surface geology habitat mapping, above water table CID thickness data, and stratigraphic cross-sections (Figures 5-11 to Figure 5-14 in Section 5.4.5 of the ERD), all indicate continuity and connectivity of AWT troglofauna habitats across the

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			extent mapped within the Proposed Change Area. Therefore, it is unlikely that the habitat requirements for one species are unique and restricted. This is also illustrated by the troglofauna catch rate for the proposed MEZ relative to the rest of Mesa H – demonstrating that the MEZ provides *known* rather than *inferred* habitat (refer to Appendix 1 of the draft EMP). **Stygofauna habitat** Groundwater levels and habitat were determined based on surface (2D) geological mapping and downhole (3D) drillhole and borehole data, as described in Section 7.5.1.2, summarised in Table 7-18 and mapped in Figure 7-12 of the ERD. These aquifer habitat extents show a strong spatial correlation with the stygofauna record locations (Biota 2019a). Additional 3D mapping was completed using 'Leapfrog' software, based on downhole drilling information; current and future modelled groundwater levels; and assuming depths >40m below ground level being less likely to support viable habitat. Clay-rich basal units were also conservatively excluded from the modelled habitat. These outputs were then used to create the model of habitat as shown in both operational and closure phases in Figure 7-16 of the ERD. The stygofauna habitat shows a strong spatial correlation with stygofauna record locations, with 129 of the 133 known stygofauna locations falling within units mapped as High prospectivity habitat. Approximately 97% occur throughout the CID and alluvial aquifers, supporting the understanding of the connectivity and continuity of these habitats i.e. these hydrological units provide *known habitat* (rather than inferred). The available thickness of saturated habitat and limitations of the modelling have been categorised and displayed as the relative 'prospectivity' of these habitats in the maps. The stygofauna sampling results indicate that there are limited stygofauna occurring within the CID at Mesa H, with the majority of the records occurring in the south east, in the Jimmawurrada - Bungaroo area of the CID aquifer (Figure 7-14 of the ERD). Stygofauna habitat is generally widespread within the Proposed Change Area and broader Study Area. Whilst habitat in the Mesa H (Proposed Change) area will be reduced as a result of groundwater abstraction, a substantive area and volume of interconnected saturated habitat will remain within the broader Jimmawurrada – Bungaroo CID aquifer (Figure 7-16 of the ERD), and within the overlying Jimmawurrada-Bungaroo Creek alluvial aquifer, which forms a tributary into the broader Robe River alluvial aquifer, providing additional connection pathways for these habitats. The EPA acknowledges that habitat may be used as a surrogate for inferring

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			distributional boundaries of potentially restricted taxa (EPA 2016c and 2016d). Where a habitat type that supports a species is continuous then the extent of that habitat may be used to infer the likely presence of that species in the same habitat. The widespread nature of the alluvial and CID habitat and the confirmation that at least 10 (~63%) of the species recorded in the drawdown impact area also occur in reference sites or the wider Pilbara region indicate that there is unlikely to be significant barriers to dispersal across these areas as presented in Figure 7-13 of the ERD and Biota (2019a). It is expected that even with reduced saturated thickness of the known alluvial aquifer habitat as a result of groundwater drawdown, seasonal rainfall and larger cyclonic events will continue to enable connectivity along the alluvial aquifer and also periodically recharge and reset the water table levels within the known habitat.
16	Wilderness Society	Three Priority One, Priority Ecological Communities (PECs) relevant to subterranean fauna are within and overlap the development envelope, drawdown extent, and Robe Valley deposits. These are: • Stygofaunal Community of the Bungaroo Aquifer • Subterranean invertebrate communities of mesas in the Robe Valley region • Subterranean invertebrate community of pisolitic hills in the Pilbara The Department of Parks and Wildlife acknowledges that the greatest threat to these three community types is mining, with the Stygofaunal Community of the Bungaroo Aquifer being under additional threat due to groundwater drawdown (Department of Parks and Wildlife, 2019). As 29 stygofauna species found during survey are considered to be potential short-range endemic (SRE) fauna, with 11 of those 29 being singletons, these fauna are highly dependent on the aforementioned PECs. Additionally, it is unclear from the Biota report how greatly the SRE fauna directly outside of the development envelope would be impacted by the loss of the aforementioned PECs.	**Noted – additional clarification provided** The Biota report (Biota 2019a) and the ERD outline the maximum modelled extent of cumulative groundwater drawdown as a result of the Revised Proposal as shown in Figures 7-15, 7-16 & 7-17 of the ERD. These figures display the groundwater drawdown extent relative to the Development Envelope, and the impact assessment has been undertaken on the full extent of the modelled groundwater drawdown rather than just within the Development Envelope. Tables 7-19 & 7-20 of the ERD indicate the species likely to be impacted as a result, and their known range extent beyond the area subject to groundwater drawdown. The Proponent disagrees with the statement regarding the risk to the three PEC's as discussed below. **Troglofauna** The Priority 1 PEC, the *Subterranean invertebrate community of pisolitic hills in the Pilbara*, occurs across the majority of Mesa H while the Priority 1 PEC, the *Subterranean invertebrate community of mesas in the Robe Valley region*, occurs across the Mesa J Iron Ore Development, with the buffer partially overlapping with the Proposed Change Area (Figure 7-1 of the ERD). Over 50% (by volume) of the core habitat within the Mesa H Landform is proposed for retention and protection via a MEZ (this is conservatively excluding potential viable habitat retained below the pit floor

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		The Wilderness Society recommends that the PEC Priority 1 status of the three aforementioned communities be reconsidered for declaration as a threatened ecological community (TEC) on the basis that ecological communities that are presumed to be at risk of becoming totally destroyed, as the Mesa H proposal has the potential to do, are to be listed as threatened (Department of Parks and Wildlife, 2019). **The Wilderness Society also recommends that a recovery plan is created to stop the decline and support the recovery of each of the three ecological communities to maximise their chance of long-term survival. An Interim Recovery Plan for conserving the PECs the aforementioned troglobitic taxa are part of be put in place (Department of Parks and Wildlife, 2019). The Interim Recovery Plan should later be developed into a Recovery Plan.**	or below waste dumps). Troglofauna monitoring results from Mesa A, which has been in operation for over 10 years, with a 50% habitat retention strategy as proposed for Mesa H, do not indicate a statistical change in the troglofauna population or troglofauna orders represented (Section 7.4.2.2 of the ERD). Furthermore, an independent analysis of downhole troglofauna habitat temperature and humidity monitoring in the MEZ retained at Mesa A has not detected any statistically significant changes since mining commenced, including within retained MEZ habitat adjacent to completed mine pits (Rio Tinto 2018c). From a surface area extent, approximately 85% of the Mesa H landform habitat will be retained (Table 7-9 of the ERD). If habitat below the pit floors is conservatively excluded as viable habitat, then the troglofauna habitat extent retained across the Mesa H landform via the MEZ and ex-pit would remain at 50% by area. Taking into account the remaining troglofauna habitat occurring within the Jimmawurrada CID within the Proposed Change Area, this translates to approximately 70% of the spatial extent of habitat remaining following completion of the Proposed Change. Cumulative impacts to the two troglofauna PECs in the Robe Valley were also assessed in Biota 2019a and presented in Section 7.4.3.3 and Table 7-13 of the ERD. The calculation for the remaining extent took into account other foreseeable proposals in the area (the Mesa A Hub Revised Proposal) as well as existing approved developments (Mesa A, Warramboo, Mesa J, Mesa K and historical Middle Robe Mining). The two PEC's align with the broader scale geological mapping of the CID mesa formations, with the main distinction being based on perceived landform differences ('mesa' versus 'hills'). However, both represent troglobitic communities of elevated CID landform habitats along the Robe River palaeodrainage. The *Subterranean invertebrate community of pisolitic hills in the Pilbara* PEC is described at Warramboo and Mesa H localities as both were considered to represent 'hills' rather than 'mesas'. The *Subterranean invertebrate communities of mesas in the Robe Valley* PEC is described at eight mesas in the Robe Valley. The incremental impact of the proposal on the *Subterranean invertebrate communities of mesas in the Robe Valley region* PEC is very minor at 0.07% of its original extent. The incremental loss of habitat from the *Subterranean invertebrate community of pisolitic hills in the Pilbara* PEC is 7.97% of its original extent, noting that this PEC is described only at the Warramboo and

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			Mesa H localities. Over 72% of the original extent of this PEC, at 7,164.2 ha, would remain taking into account other existing and foreseeable Proposals, including the Mesa H Proposal. Given both of these PEC's effectively represent the same types of troglobitic communities within elevated CID landforms along the Robe River paleochannel, it is reasonable to consider them together resulting in an estimated incremental cumulative impact of 3.4% for both troglofauna PEC's combined. Given that both cumulatively and from an individual mesa formation perspective a minimum of 50% of troglofauna habitat is proposed to be retained and protected, representing an impact to only 3.4% of the combined PEC's, the Proponent does not consider that the development of the Mesa H Proposal would result in a significant detrimental impact to troglofauna ecosystems such that these ecosystems would require reclassification from Priority to "Threatened". The troglofauna monitoring at Mesa A (which has been independently peer reviewed) does not indicate that there is a decline in troglofauna species or populations in the retained habitat (MEZ). **Stygofauna** The Mesa H assessment considered worst case scenarios for cumulative impacts resulting from a combination of groundwater abstraction and climatic factors (worst case dry climate scenario). The impact assessment describes the peak period of impact which does not represent the base case i.e. the groundwater drawdown peak will not occur for the duration of the Proposal. Even at the peak of groundwater abstraction, the cumulative drawdown does not fully desaturate stygofauna habitats as displayed in Figures 7-15, 7-16 & 7-17 of the ERD (and in response No. 21). Broader connected stygofauna habitat extends beyond the Development Envelope and areas subject to groundwater drawdown from the Proposal as shown in Figures 7-13, 7-15 & 7-16 of the ERD and as described in the response to No.15. The Bungaroo - Jimmawurrada CID aquifer, alluvial aquifer and the Robe River alluvial aquifers are extensive. Groundwater drawdown as a result of the Proposal forms a small percentage of the total aquifer capacity, when taking into consideration the upstream Jimmawurrada- Bungaroo Creek alluvial aquifers and the lower and upper Robe River. Refer to Attachment 2. Groundwater levels are expected to recover from rainfall recharge of the aquifer and cyclonic events as discussed in item 42.

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Troglofauna			
17	DWER	Thirty-three troglofauna species have been recorded from the 'proposed change area'. Of these, ten species have been recorded from the Mesa H mine pit areas (Table 7-4). Nine of the ten species have also been recorded at locations outside of the proposed pit areas or within the MEZ (see Table 7-11). One species (Japygidae sp. 'DJA011') is currently only known from the area of impact. Japygidae sp. 'DJA011' was recorded from a borehole between Mesa H and Mesa J (borehole DD13MEH0007). The habitat in the borehole extends outside of the impact area, suggesting that Japygidae sp. 'DJA011' is likely to occur more widely. However, this habitat may be subject to cumulative impacts associated with the existing impact at Mesa J. In addition, six troglofauna species that have distributions outside of the Mesa H proposal area, may be at risk of cumulative impacts (?Nocticola sp. 'West Pilbara Complex', Ptilidae sp. 1/'CP003', Ptilidae sp. 'Robe Valley'/'CP002', Armadillidae sp. 'ISA056/ISA057', Hubbardiidae sp. 'SCH011', Hubbardiidae sp. 'SCH015/SCH016'), have been recorded outside of the proposal area. This suggests that habitats in the Robe Valley have been historically connected. However, as stated in the ERD, these species "are considered to still only have relatively restricted distributions in the Robe Valley, most of which are potentially subject to potential impacts from other proposals" (Page 208, Table 7-4). This is discussed further in the cumulative impacts section below.	**Noted. Additional information provided.** Based on the understanding that these six troglofauna species (?Nocticola sp. 'West Pilbara Complex', Ptilidae sp. 1/'CP003', Ptilidae sp. 'Robe Valley'/'CP002', Armadillidae sp. 'ISA056/ISA057', Hubbardiidae sp. 'SCH011', Hubbardiidae sp. 'SCH015/SCH016'), may have a restricted distribution in the Robe Valley, and that their broader distribution in the Robe Valley could not necessarily be relied upon to ensure their preservation (due to the potential for cumulative impacts from other Proposals) the assessment conservatively treated these records as SRE's and as key receptors for the impact assessment. As the ERD focussed on Mesa H, additional information in relation to these species (some of which is in addition to information presented in Figure 7-5 and Table 7-4) is provided below: • Hubbardiidae sp. 'SCH011 is protected by the 'MEZ'[1] to the north of Mesa J • Hubbardiidae sp. 'SCH015/SCH016' is protected by the Mesa H MEZ • ?Nocticola sp. 'West Pilbara Complex' is protected by the Mesa H MEZ • Ptilidae sp. 1/'CP003' is protected by the Mesa H MEZ • Ptilidae sp. 'Robe Valley'/'CP002' has been recorded at Middle Robe in remnant areas. This area would require new approvals prior to undertaking further mining in this historically mined area. • Armadillidae sp. 'ISA056/ISA057' is protected by the Mesa C MEZ. Notwithstanding the protection provided to these species through delineation of MEZs, these species have demonstrated wider distributions in at least the Robe River valley with ranges between 2 - 115 km and are

[1] The extent of the Mesa J pit is managed via MS208 which excludes mining of the northern escarpment adjacent to the Robe River. This effectively forms a Mining Exclusion Zone.

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			therefore highly likely to occur in other locations within the Robe Valley which have not yet been sampled. The direct impact of the proposed mine pits (~752 ha of troglofauna habitat extent, of a total of ~2,497 ha contained in the broader Development Envelope) on these six taxa is not considered to be significant at the species level (<10% of known distribution with a High degree of certainty) (Biota 2019a).
18	DBCA	DBCA does not consider that the loss of habitat for the troglofaunal species and communities at Mesa H (estimated as being up to 50%) can currently be determined with an adequate degree of certainty. On this basis, DBCA is of the view that a precautionary approach should be taken with respect to the protection of known habitat of these species, potentially involving further survey and a staged approach to approval of habitat reduction through mining, until specific habitat characteristics and impacts are adequately determined.	**Noted – additional clarification provided** The troglofauna habitat definition at Mesa H is based on geological information from extensive drilling data and is well defined. The proposed troglofauna habitat to be retained via the MEZ is considered 'core' CID habitat with the connectivity defined through analysis of geological data, including surface geology (2D) and downhole drillhole data (3D). The calculation of 50% habitat retention relates to the retention of core (above water table) troglofauna habitat on the Mesa H landform only, based on permanent changes to habitat as a result of mine pit excavation. The calculation does not include additional, substantial AWT viable habitat to the south east of Mesa H / south of Mesa J as depicted in Figure 7-3 of the ERD. Figure 4 in Attachment 1 has been included to display the extent of the Mesa H Landform used to calculate the retention of > 50% viable troglofauna habitat for clarity. Drilling across the Mesa H Landform is currently completed to 50m spacing and additional drilling/habitat characterization in this area is unlikely to yield any information that would alter the assessment of the continuity and volume of habitat. Similar drill spacing has been considered adequate for habitat characterization for other proposals. The retained habitat calculation conservatively excludes habitat also shown to host records of troglofauna (Basal Pisolite - TPB and basement – Wittenoom Dolomite) – which occurs in the central gully of Mesa H. However, due to limited geological and troglofauna sampling data available in these units (and to ensure consistency of habitat calculations with Mesa A, B & C), these lithologies were excluded from the retained habitat calculations. The 50% habitat retention also excludes potentially viable MEZ habitat located below proposed waste dumps.

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			The Proponent has taken a precautionary approach in relation to singleton troglofauna species. The proposed Mesa H pit has been re-designed numerous times during mine planning stages in order to avoid singleton troglofauna species as far as practicable, to the exclusion of resources. Only one singleton species is currently known from the proposed Mesa H pit area; based on other species found in the same location which are also found elsewhere in Mesa H, and given the contiguous nature of the habitat, it is not considered likely to be restricted to that location. As described in Biota 2019a, there is a high probability that the apparent isolation of the record site is actually an artefact of ecological sampling effects. Troglofauna capture rates are noted to vary markedly between sampling events; Table 7-14 in the ERD provides detail of the overall capture rates at Mesa H and in the areas proposed as a MEZ. The range of capture rates and overall capture rate for the MEZ can be skewed by a single sampling event as was observed in the Phase 6 sampling (as discussed in Section 7.4.4.1 of the ERD). However, combined with connected CID habitat and the representation of all Orders and the majority of taxa within the MEZ (Table 7-11 of the ERD), the information suggests that the MEZ supports a suitable and representative habitat for troglofauna. Hence a risk-based approach has been adopted in line with EPA (2016c; 2016d), which bases this assessment on multiple lines of evidence including: consideration of animal abundance; an understanding of 3D troglofauna habitats; and troglofauna assemblage distribution, which is described in detail in Section 7.4.4.1 of the ERD. Further subterranean fauna surveys are ongoing, and are proposed to be continued for the life of the mine as outlined in the draft Mesa J Hub EMP (Appendix 6 of the ERD). Based on the above conservative approach and lines of evidence in accordance with EPA guidance (2016c; 2016d), a staged approach is not considered reasonable or practical and has not been applied elsewhere (e.g. Mesa A).
19	DBCA	DBCA notes that: • Over 80% (27 of 33 species) of the troglofauna species recorded from the development envelope are known only to occur at Mesa H; and	**Agree.** Additional troglofauna and stygofauna sampling and monitoring for the Proposal (including within and adjacent to the Proposal) is currently ongoing

No.	Submitter	Submission and/or issue	Response to comment
		• The ore bodies within mesa landforms affected by this proposal are some of the only ones in the Robe Valley that have been subject to extensive pre-mining troglofauna and stygofauna survey work. On this basis, DBCA recommends that the proponent commits to a program of additional subterranean fauna sampling within the adjacent and inferred subterranean habitats at Mesa H as soon as practicable. Such a program could provide further certainty on the significance of impacts on Robe Valley troglofauna and stygofauna, and an understanding of subterranean fauna habitat requirements in and around ore bodies and aquifers to guide this and future decision-making.	and has been proposed to continue throughout the life of the mine as detailed in the draft Mesa J Hub EMP (Appendix 6 of the ERD). Other 'inferred habitat' areas were conservatively excluded from the Mesa H habitat retention calculations (as detailed in No. 18), however are proposed to be sampled as part of the EMP monitoring program in order to further enhance the understanding of subterranean fauna habitat extents.
Stygofauna			
20	DWER	The distribution of widespread stygofauna species recorded from the proposal area (e.g. *Nedsia* sp. 'AMM001' (Mesa I, east to Mesa N), *Nedsia* sp. 'AMM026' (to Mesa N), *Pilbaracandona* sp. 'BOS526'), and widespread species in the Pilbara (e.g. *Diacyclops humphreysi*, *Stygoridgewayia trispinosa*, *Haptolana yarraloola*, *Areacandona triangulum*, *Ophisternon candidum*) suggests that there is groundwater connectivity between the aquifers associated with the Jimmawurrada Creek and Robe River. The hydrogeological information provided suggests that at pre-mining groundwater levels there are no barriers to dispersal for stygofauna species. However, the proponent has not addressed whether artificial barriers to dispersal may be created as a result of groundwater drawdown associated with the proposal during mining.	**Noted. Additional clarification provided.** Groundwater drawdown in the catchment as a result of implementing the Proposal, together with consideration of cumulative groundwater drawdown impacts and climatic considerations is not anticipated to completely dewater the alluvial aquifer. However, narrow, localised sections of the shallower, outer margin sections of the Jimmawurrada Creek alluvial channel, mostly in the direct vicinity of the Southern Cutback Borefield and downgradient from the Coastal Water Supply Project, have or will be dewatered (Figure 5 in Attachment 1). However, as discussed in Section 7.5.3.1 of the ERD, based on data from groundwater bores and drillholes, the Jimmawurrada Creek Alluvial Aquifer is understood to be up to 40 m deep in the centre of the channel (thalweg). Hydrological modelling indicates a continuous saturated layer of alluvium material extending from the lower Bungaroo area to the Robe River will be maintained for all predicted groundwater drawdown scenarios. The cumulative modelled drawdown of 9 m (14 mbgl), would retain a significant portion of saturated habitat. Moreover, an extended dry period (H3 'Uncertainty run 2' (Rio Tinto 2019), could result in a water table lowering of up to ~18 mbgl, which, based on the Jimmawurrada Alluvial Aquifer channel

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			thalweg depth, would still enable retention of connected saturated alluvial aquifer habitat, albeit reduced. Geological information derived from downhole drillhole data, mapping, aerial photography and structural geological assessment, combined with hydrogeological information from pump testing and monitoring data do not indicate any known or significant geological features which may create barriers to dispersal. There is no evidence of extensive clay layers within the alluvium which could cause artificial barriers. Due to the sedimentary age of the alluvium (Quaternary) and CID (Cenozoic) no dykes, sill or faults intersect or cross-cut these formations. The basal CID which exists between the alluvium and the CID contains a higher clay content and is considered to be a zone comprising lower hydraulic conductivity, however, evidence from pump test and monitoring data show that this unit still maintains sufficient porosity interconnecting aquifers, and would not act as an impermeable barrier to flow. It is possible that smaller-scale clay lenses and reduced groundwater levels may create temporary, localised disconnections between rainfall recharge events, however the physical characteristics of the alluvial aquifer will remain intact such that the system can maintain its broader connectivity, particularly after rainfall events. Further information is provided in response No. 21.
21	DWER	The ERD states that 16 stygofauna species have been recorded from the predicted cumulative groundwater drawdown area, of which seven are currently only known from the impact area (Table 7-20, ERD). Six species were recorded in the areas around Jimmawurrada Creek: • Hydrobiidae sp.2 and *Parastenocaris* sp. 'B28' were recorded from bore JW023 where approximately 5m of saturated calcrete is predicted to be retained following groundwater drawdown; • *Pilbaracandona* sp. 'BOS526', *Candoninae* sp. 'BOS541', and *Haptolana* sp. 'B01' were recorded from bore JW024, on the periphery of the groundwater drawdown area, where approximately 5 - 17m of	**Noted. Additional information provided.** Figure 7-17 of the ERD is a schematic diagram showing boreholes and known geology where sufficient data is available relative to the long section. Site BC186 is located along the southern margin of Bungaroo Creek, along the outer margin of the channel, away from the thalweg (Figure 5 in Attachment 1). i.e. the long section is not aligned with the deepest part of the channel for its entire length. Hence the shallower section towards Bungaroo, (Point "C" on the long section) represents the shallower outer channel margin rather than necessarily representing a shallower alluvial profile. Due to limited downhole drillhole information in the centre (thalweg) of the creekline in this area, a conservative approach was adopted. This approach shows only the thickness of saturated alluvium known from recent hydrogeological data. However, a small number of historical resource

No.	Submitter	Submission and/or issue	Response to comment
		saturated alluvium is predicted to be retained. The continuous connection along Jimmawurrada Creek indicates that areas of greater saturated habitat will remain and may provide refugial habitat for these species; • Paramelitidae sp. 'AMP037' was recorded from bore BC186 on the periphery of the groundwater drawdown where approximately 5m of saturated alluvium is predicted to be retained following groundwater drawdown. The Bungaroo Aquifer associated with Jimmawurrada Creek extends approximately 50 km outside of the groundwater drawdown area, but the percentage of habitat remaining appears to be reduced to the southeast, due to a shallower volume of saturated alluvium (see Figure 7-17). Therefore, groundwater drawdown may be more significant in areas furthest from the mine and limited habitat may remain for species in these areas (e.g. Paramelitidae sp. 'AMP037'). **The proponent should identify areas of significant volumes of groundwater drawdown, including 100%, which may prevent stygofauna species from dispersal to refuge habitat around Jimmawurrada Creek and discuss the suitability of the remaining vertical habitat.**	drillholes through the centre of the channel in this area indicate that the thalweg is deeper (refer to H3 report, Rio Tinto 2019). Geological modelling using 'Leapfrog' software within the footprint of the Proposal's cumulative groundwater drawdown extent estimates that volumetrically, approximately 64% of saturated Jimmawurrada Alluvial Aquifer habitat would be retained. Even during an extended dry period, and taking into account seasonal water table lows, approximately 44% of this saturated alluvial aquifer habitat is estimated to remain (including 'dry climate' scenarios). If the continuous habitat in the Robe River (within the Development Envelope) is taken into consideration, this then provides a minimum of 68% of connected, saturated alluvial habitat in the worst case scenarios (Attachment 2). In addition, if the habitat of the upstream Robe River is included where stygofauna records were also found, then in the order of 80% of available, connected saturated habitat would be retained in a worst case scenario (Attachment 2). Refer to Figure 5 in Attachment 1 for saturated model extents in Jimmawurrada Creek. These calculations include the habitat extent for where physical and eDNA records of the Blind Cave Eel were located. Whilst it is anticipated that the saturated zone of the alluvial aquifers may experience periods of reduced habitat availability or may potentially experience periods of disconnection of localised areas of the saturated habitat to support stygofauna species, the aquifers are periodically topped up and water levels effectively 'reset' following major rainfall (generally cyclone derived) and subsequent streamflow events. As discussed in No. 3, statistically "small" streamflow events occur in the Robe Valley in 1 in 2 years, whilst larger events occur 1 in 5 years. Any disconnection that may occur between aquifers will therefore be temporary.
22	DWER	Paramelitidae sp. 'AMP003' was recorded from within the mine pit area, adjacent to Mesa J, where substantial impacts from groundwater drawdown are predicted, up to 21m of drawdown. **The proponent should provide the percentage and suitability of saturated habitat within and adjacent to the mine pit area that will remain during and following drawdown, and discuss whether the amount of**	**Noted. Additional context provided.** Less than 20% of the Mesa H CID orebody occurs below the water table and hence limited stygofauna habitat currently exists or will be impacted below Mesa H. Suitable habitat and degree of connectivity was modelled and presented in Section 7.5.3.1 and Figure 7-16 of the ERD and is also described in No. 15. **Groundwater habitats**

No.	Submitter	Submission and/or issue	Response to comment
		drawdown will isolate this area preventing stygofauna movement to refuge areas of lesser drawdown.	Given the location of the record of 'AMP003', it appears likely that this species occurs at least within the CID aquifer (Biota 2019a), which is connected with the broader upstream Jimmawurrada – Bungaroo CID aquifer (refer to Figure 7-12 and 7-16 of the ERD). Note that Mesa J retained CID saturated aquifer habitat was not modelled and shown in the maps, however is likely to provide some additional habitat). The degree of hydraulic connection between the CID aquifer and the wider alluvial aquifers of the locality is not well defined, but basement groundwater flow may also connect it with the Robe River aquifers to the north (Rio Tinto 2019). As described in Section 7.5.3.1 of the ERD, the EPA acknowledges that habitat may be used as a surrogate for inferring distributional boundaries of potentially restricted taxa (EPA 2016c and 2016d). Where a habitat type that supports a species is continuous then the extent of that habitat may be used to infer the likely presence of that species in the same habitat. The EPA also acknowledges that taxa with greater known distributions may act as surrogates to infer the distributions of poorly sampled species (EPA 2016c and 2016d). The retained saturated alluvial aquifer habitat is estimated to be approximately 44% in the Jimmawurrada – Bungaroo Creek aquifer, based on a worst case dry scenario during peak groundwater drawdown (2030 uncertainty Run #2) and the extent of the Mesa H Hydrogeological Model. The Jimmawurrada Creek alluvial aquifer habitat is in connection with the downstream alluvial aquifer of the Robe River, which, based on the extent of Mesa H hydrogeological model (within the Development Envelope) equates to approximately 68% of the connected Jimmawurrada – Robe River alluvial aquifer remaining saturated within the model domain (Attachment 2). This calculation excludes the upstream connected Robe River alluvial aquifer, and the underlying CID aquifer as depicted in Figure 7-16 of the ERD. **Assemblage distributions** One other stygofauna species was recorded from the same sampling site: *Nedsia* sp. 'AMM001' (Biota 2019b) which, at a broad level, is morphologically and ecologically similar to Paramelitidae sp. 'AMP003' (Biota 2019a). This species occurs widely in the locality, covering a minimum distribution of 501 km^2 based on Biota's (2019b) survey data alone. Hence the co-existence of these two species at the same location would support that Paramelitidae sp. 'AMP003' is less likely to be locally restricted in

<table>
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<tr><td></td><td></td><td></td><td>distribution, and may be more likely to follow a similar distribution pattern to the related, sympatric amphipod species (Biota 2019a). These observations also support the understanding of the hydraulic and geological connection of the CID aquifer beneath Mesa H with the wider Jimmawurrada – Bungaroo CID aquifer, which is also directly connected to the overlying Jimmawurrada alluvial aquifer, and the downstream Robe River alluvial aquifer: if this were not the case, it would be very unlikely that Nedsia sp. ‘AMM001’ from site RC13MEH0041 would have remained so genetically similar to other individuals in the wider locality (Biota 2019 a & b).

Distributions of closely-related taxa

Seventeen other Amphipoda species were recorded by Biota (2019b), including four other taxa belonging to the same family as Paramelitidae sp. ‘AMP003’, all in low frequencies of collection. Paramelitidae sp. ‘AMP035’, was recorded within the drawdown extent at a site adjacent to AMP003, but has been shown to also occur outside of this impact area (Table 7-20 of the ERD).

Based on data from other co-occurring species, related amphipod taxa and groundwater habitat information as described above, it appears unlikely that the amphipod species ‘AMP003’ would be truly restricted to the dewatering extent and more likely that the singleton species recorded is due to ecological sampling effects (Biota 2019a).</td></tr>
<tr><td>23</td><td>DWER</td><td>Clarification regarding the impacts to Pilbaracandona sp. ‘BOS526’ is required. Pilbaracandona sp. ‘BOS526’ is shown as also occurring outside of the area of groundwater drawdown in Figure 7-15 of the ERD and Figure 5.1 (Biota 2019a) and Table 7-1 (Biota 2019b), but is listed as one of the species ‘only known from the drawdown extent’ (Table 7-20).

The proponent should clarify the distribution of Pilbaracandona sp. ‘BOS526’ in relation to the impact areas.</td><td>Noted – error corrected

Pilbaracandona sp. ‘BOS526’ is known from reference sites <u>outside</u> the Proposal’s drawdown extent.

Table 7-20 and text in section 7.5.2.1 of the ERD should be amended to:

Table 7-20: Summary of Records of Impacted Stygofauna Key Receptors Relative to the Drawdown Extent (Reference Sites from Biota (2018a); Species Shaded Grey Known Only from the Drawdown Extent)
<table>
<tr><th>Species</th><th>Impact Sites</th><th>Predicted Drawdown (m)</th><th>Reference Sites; Wider Distribution</th></tr>
<tr><td></td><td>MB17MEH0015</td><td>1</td><td></td></tr>
</table>
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No.	Submitter	Submission and/or issue	Response to comment			
			*Ophisternon candidum**	JW021	3	RR1, 25, RRD2, Control, Cape Range.
				JW023	4	
				JW024	2	
				BC186	5	
			*Nedsia hurlberti**	JW011A	20	Mesa J, Bungaroo Creek headwaters, Barrow Island.
				JW021	3	
				JW023	4	
				JW024	2	
				JIMDD080	12	
				JIMDR094	4	
			*Nedsia sculptilis**	JW011A	20	Mesa J, Bungaroo Creek headwaters, Barrow Island.
				JW021	3	
				JIMDR094	4	
			Hydrobiidae sp. 2	JW023	4	-
			Areacandona sp. 'BOS1039'	BC186	5	31 (Mesa J, Middle Robe)
			Megastygonitocrella unispinosa	MB17MEH0015	1	Robe River valley.
			Candoninae sp. 'BOS541'	JW024	2	-
			Pilbaracandona sp. 'BOS526'	JW024	2	-
			Parastenocaris sp. 'B28'	JW023	4	-
			Haptolana sp. 'B01'	JW024	2	-
			Nedsia sp. 'AMM026'	RC13MEH0097	21	31

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<tr><th>No.</th><th>Submitter</th><th>Submission and/or issue</th><th>Response to comment</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Paramelitidae sp. ‘AMP003’</td><td>RC13MEH0041</td><td>21</td><td>-</td></tr>
<tr><td>Paramelitidae sp. ‘AMP035’</td><td>RC13MEH0007</td><td>22</td><td>RR1</td></tr>
<tr><td>Paramelitidae sp. ‘AMP037’</td><td>BC186</td><td>5</td><td>-</td></tr>
<tr><td>Wesniphargus sp. ‘AMN004’</td><td>JW024</td><td>2</td><td>25</td></tr>
<tr><td>Neoniphargidae sp. ‘B02’</td><td>JW021</td><td>3</td><td>31</td></tr>
</table>
* Formally listed as being of conservation significance

Ten of the 16 key species have also been recorded from reference sites outside of the drawdown extent (Table 7-20). Three of these ten more widely-known species, Ophisternon candidum, Nedsia hurlberti and Nedsia sculptilis, are all Threatened fauna ranked Vulnerable under Schedule 3 of the BC Act, and although all three are also known from outside the drawdown extent, they are provided specific consideration in recognition of their elevated conservation status.

This leaves six species which are currently known only from within the modelled extent of cumulative drawdown (Figure 7-15 of the ERD):
• the aquatic snail Hydrobiidae sp. 2;
• the ostracod; Candoninae sp. ‘BOS541’
• the copepod Parastenocaris sp. ‘B28’;
• the isopod Haptolana sp. ‘B01’; and
• two amphipod species: Paramelitidae sp. ‘AMP003’ and Paramelitidae sp. ‘AMP037’.
</td></tr>
<tr><td colspan="4">Blind Cave Eel</td></tr>
<tr><td>24</td><td>DWER</td><td>Based on the information provided in the ERD, the impacts to the MNES Blind Cave Eel are predicted to be local. There</td><td>Noted.</td></tr>
</table>

No.	Submitter	Submission and/or issue	Response to comment
		are multiple records of the species from the area, but this is likely due to the targeted survey effort in the Robe River Valley. The Blind Cave Eel is known to occur at Barrow Island, Cape Range, Bungaroo Creek, and is likely to occur elsewhere in the Pilbara. The proponent states that the impacts to the Blind Cave Eel, as a loss of habitat from groundwater drawdown, are predicted to be "temporary" as habitat is expected to be recharged following rainfall. However, the proponent has taken a precautionary approach, stating that there is a residual (temporal) significant impact and 'limited status of knowledge of this species and uncertainty regarding the risk'. Therefore, the proponent has proposed a research offset. **The proponent should refer to the EPA Offset Guideline and EPA Offsets Policy to determine whether offsets are required and the appropriate type of offset to apply. Where an offset is required, offset for loss of habitat of the Blind Cave Eel would be appropriate. However, Offsets are not appropriate to be applied where there is a level of uncertainty about a species. If an offset is not considered necessary, it is recommended that the proposed research plan is incorporated into a subterranean fauna management plan.**	The Proponent considered the EPA's Offset Guideline and Offsets Policy to determine where offsets would apply as discussed in detail in Chapter 13 of the ERD. The Proponent agrees that the proposed offset is not strictly in accordance with the EPA guidance and policy as described above, however, given that the Blind Cave Eel is listed under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and *Biodiversity Conservation Act* 2016 (BC Act) and also occurs as part of the Priority 1 PEC *Subterranean Fauna of the Bungaroo Aquifer,* and given the predicted temporal impacts to the habitat of the Blind Cave Eel as a result of groundwater drawdown, an offset was proposed. This offset was calculated based on the area of mapped riparian vegetation subject to the greatest degree of groundwater drawdown (over a 6.5 km stretch), which was in the order of ~300 ha. Given groundwater drawdown constitutes a *direct* impact to subterranean fauna habitat, and the difficulty of calculations based on 3D volumes, a calculation of $3,000 / ha for direct impacts to subterranean fauna habitat in this zone was proposed. The intent of the offset was to also meet EPBC Act offset requirements for the Blind Cave Eel. The Proponent is currently undertaking additional research into further understanding the 'area of occupancy' of the species. Ongoing monitoring work to support this outcome is also proposed in the draft EMP (Appendix 6 of the ERD).
25	Wilderness Society	Without more precisely assessing the population size distribution of the Blind Cave Eel and the relative impacts of mining processes and dewatering on the species, such as pollution of groundwater and threats to its major food source (shrimps) in and around the Mesa H sites, it is difficult to ascertain how great an impact the Mesa H proposal could have on this Vulnerable species. Additionally, Rio Tinto should report the existence of a threatened animal (the Blind Cave Eel) on the development site to the Environmental Minister, as per *The Biodiversity Conservation Act 2016* (WA). Under *The Biodiversity Conservation Act 2016* (WA), no action can be taken on a	**Noted – additional context provided.** The Proponent has undertaken an environmental impact assessment for the Mesa H Proposal, which is undergoing an assessment and approval process through both the WA State EP Act and Commonwealth EPBC Act. The Mesa H ERD comments on the population size and distribution and provides an assessment of potential impacts to the Blind Cave Eel as a result of mining processes (taking into account current and foreseeable impacts from other Projects), and consideration of potential for groundwater pollution. The known locations of the Blind Cave Eel records occur outside the existing Mesa J Operations Development Envelope which was approved under Ministerial Statement 208 in 1991.

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		listed threatened species. To obtain approval, an action must undergo an environmental assessment and approval process through the provisions of the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act*). It is recommended that this approval be re-assessed through an Environmental Impact Statement (EIS) specifically for the Blind Cave Eel (Department of the Environment and Energy, 2019).	Hydrogeological characterisation and modelling has been undertaken to understand the aquatic subterranean environment for the Blind Cave Eel, and potential cumulative impacts to this habitat as a result of mining and dewatering, including consideration of natural variables such as climatic stressors has been included in the H3 assessment in Appendix 8 of the ERD. Modelling of the alluvial aquifer habitat indicates that 68 % of the known extent of habitat in Jimmawurrada Creek – Robe River would be retained (i.e. the known extent based on location of physical specimens, conservatively excluding eDNA records). A new record of the Blind Cave Eel has been found at Martangkuna pool (Figure 5), north of Mesa H during a recent aquatic fauna sampling survey during September 2019. This brings the total number of specimens to five. eDNA surveys resulted in the detection of Blind Cave Eel DNA at seven locations (Figure 5), both along Jimmawurrada Creek and the Robe River, including at three sites within the drawdown extent and four locations outside of the drawdown extent along the Robe River (including upstream of the Revised Proposal (Figure 7-18 of the ERD). The results from the two eDNA methodologies produced consistent results in terms of both producing positive recordings from the same locations (Biota 2019a).
Cumulative impacts			
26	DWER	The level of existing impact to subterranean fauna species from the Mesa J proposal is unable to be determined. Subterranean Fauna was not identified as a key environmental factor at the time of assessment of the Mesa J proposal and limited survey has been undertaken in the existing operation area. The ERD states that 'very limited data is available for troglofauna populations and diversity at Mesa J with which to confidently context with Mesa H.' Therefore, it is difficult to quantify what the cumulative impact is on subterranean fauna species. However, the cumulative impact to potential stygofauna and troglofauna habitat may be able to be determined, as discussed below.	**Noted.** Sampling for subterranean fauna and delineation of the PEC was determined and applied after both the approval and commencement of mining operations at Mesa J, based on the extent of the mapped CID from 1:250K geological survey mapping (i.e. based on broad mapping of the CID geological formation). Therefore, the troglofauna habitat at Mesa J is considered 'inferred' and the classification of the PEC was based on the status of the habitat remaining after Mesa J implementation. Notwithstanding the timing of the PEC delineation, cumulative impacts to the two troglofauna PECs in the Robe Valley were also assessed in Biota 2019a and presented in Section 7.4.3.3 and Table 7-13 of the ERD, including from

No.	Submitter	Submission and/or issue	Response to comment
		The ERD has calculated the cumulative impact to the two troglofauna PECs from existing proposed developments in the Robe Valley (see 7.4.3.3). However, the cumulative impact from Mesa H and the existing Mesa J development has not been estimated. The ERD states that 52% of prospective habitat of the Mesa H landform will be retained (Table 7-9), but does not consider the cumulative loss of habitat from Mesa J. **Where geological information is available, the proponent should retrospectively estimate the proportion of habitat remaining following implementation of the revised proposal, including consideration of existing habitat loss from Mesa J.**	existing and foreseeable operations (which included Mesa J). Further quantitative information is provided above in response No. 16.
27	DWER	The predicted cumulative impacts from groundwater drawdown for the existing Mesa J and proposed Mesa H operations are presented in the ERD. **The proponent should also state the level, if any, and any observed existing impacts from the current altered hydrological regime to stygofauna habitat and habitat connectivity.**	**Noted.** The proponent has provided information relating to pre-mining water table levels and current water table levels. As subterranean fauna was not an environmental factor, or known about at the time of the Mesa J approval in the early 1990's, no baseline sampling exists with which to define current impacts of the Mesa J operation. Given that this data does not exist, and the Proposal relates to the assessment of the addition of the Mesa H deposit, the assessment was focussed on the current known baseline and the impacts of the additionality of Mesa H. An assessment was provided to holistically assess cumulative impacts from the inclusion of Mesa H, rather than attempt to retrospectively assess impacts of Mesa J, for which limited stygofauna data exists. Stygofauna have been monitored as part of the Coastal Water Supply Project (CWSP) and since 2012 with no discernible trends noted to date, and reported annually as part of the Groundwater licencing requirements.
Mitigation and Management			
28	DWER	To manage the impacts to troglofauna, the proponent has proposed the implementation of a mining exclusion zone	**Noted. Additional clarification provided.**

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		(MEZ), similar to that approved under Mesa A and Mesa A Hub proposals (Ministerial Statement 756). The proposed MEZ is a narrow band of habitat retained around the pit boundary, defined by the contours of the mesa escarpment (Figure 7-6). Although the MEZ implemented at Mesa A has been shown to continue to provide habitat to troglofauna during mining, there is the potential at Mesa H to retain larger areas of consolidated habitat. Retention of larger areas of consolidated habitat, rather than narrow areas along the edge as proposed, is preferable for the maintenance of ecological processes. Additional areas of prospective troglofauna habitat will remain in areas where mine pits are not proposed (see Figure 7-6). **The proponent should clarify whether these areas are likely to be mined at a later stage and consider inclusion of these areas into the MEZ to increase the amount of retained troglofauna habitat.**	The purpose of the MEZ is to quarantine parts of the orebody (confirmed resource) from impacts related to excavation for mining. There are many areas of ecological and cultural significance that are located outside the orebody that will not be disturbed by mining as they do not represent a resource for mining. These areas far exceed the extent of the MEZ and are not included in a MEZ as the intent of the MEZ is to provide specific clarity around the 'no-go' areas for mine pit development and hence does not encompass the broader environment. Expanding the MEZ for the purpose of including larger areas of consolidated troglofaunal habitat would extend the MEZ beyond the target orebody proposed for mining and would therefore be inconsistent with the intent of the MEZ as described above. This would also be inconsistent with the MEZ approach currently in place at Mesa A, and Mesa K, and proposed for the Mesa A Hub, which includes Mesa B and C.
29	DWER	The implementation of the proposed MEZ does not prohibit indirect impacts to troglofauna habitat associated with clearing within the MEZ. For example, Figure 7-5 illustrates the MEZ in relation to mine pit areas, but does not include other impact areas e.g waste dumps. However, Figure 2-3 (ERD) and Figure 1-5 (EMP) illustrate some overlap with waste dumps, stock piles and infrastructure within the MEZ. The EMP includes a management target of 'total clearing of native vegetation across the surface of the MEZ is less than 30% of the MEZ surface area'. The EMP states that the environmental outcomes for troglofauna are to 'ensure there is no irreversible impact as a result of the Project to the troglofauna habitat retained within the Mesa H MEZ'. Clearing of vegetation and placement of waste dumps and stockpiles within the MEZ boundary may indirectly impact troglofauna habitat through the reduced habitat quality (as discussed in section 7.4.3.2, and page 26 of the EMP), which may not meet the outcomes of the EMP.	**Noted. Additional clarification provided.** The Proposed Change has been designed to minimise clearing through placement of the WFSF in-pit at Mesa J and placement of the majority of mineral waste in mined-out pits wherever practicable, in order to minimise clearing in the MEZ. However, as described in Section 11.1, due to the limited availability of space, and constraints on locations due to avoidance of other ecological, heritage and amenity values, the Proposed Change will require placement of two of the mineral waste dumps on the periphery of Mesa H, which is within the area delineated as the MEZ. The placement of the dumps involves clearing of approximately 30 ha over high prospectivity habitat, representing approximately 6% of the modelled high prospectivity habitat within the MEZ. Disturbed areas will be rehabilitated once they are no longer required by the Proposed Change. The Proponent is currently undertaking further investigations into the re-colonisation of in-pit waste dumps/low grade stockpiles by subterranean fauna. Early results from Mesa A and Mesa K indicate that there is troglofauna utilisation of habitat in or below mineral waste dumps (Section 7.4.2 of ERD). It is, therefore, likely that troglofauna will utilise habitat in or

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		Therefore, the proponent should revise the MEZ to exclude those areas that will be indirectly impacted from other activities e.g. waste dumps and stock piles.	below the proposed waste dumps within the MEZ, although the extent of likely utilisation is not yet known. Studies of troglofauna utilisation of disturbed habitats are ongoing. A conservative approach was taken in the ERD to calculating the total volume of troglofaunal habitat to be retained which involved excluding the areas of habitat underlying waste dumps within the MEZ as there may be a reduction in quality of these areas of habitat. Notwithstanding that full loss has been included in the impact calculations, it is still considered beneficial to retain these areas of the orebody in the MEZ as there is likely to be some continued use of habitat below waste dumps. The inclusion of these areas within the MEZ will ensure protection of these areas from future mining.

Terrestrial Fauna

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30	DWER	Fauna surveys recorded 169 species, including six species of significance recorded within the Development Envelope of the revised proposal (Northern Quoll, Pilbara Olive Python, Pilbara Leaf-nosed Bat, Ghost Bat, Lined Soil-crevice Skink, Western Pebble Mound Mouse). Significant impacts have been predicted for the Northern Quoll and Ghost Bat. The local population of Northern Quoll recorded in the Development Envelope 'is considered a high-density population important for the long-term survival of the species" (page 538). Habitat critical to the survival of the species includes the breakaway, gorge and riverine habitats. The locations of Northern Quoll appear to be located within the MEZ, but it is difficult to confirm as the symbology used in Figure 8-6 is difficult to interpret. **A map of known locations of Northern Quoll in relation to the fauna habitats and conceptual mine layout should be provided (as has been provided for Ghost Bat and Pilbara Leaf-nosed Bat).**	**Noted. New maps provided.** The scale of Figure 8-6 of the ERD was intended to provide context of Northern Quoll records both within, and within the vicinity of, the Development Envelope. Figure 12-4 of the ERD was provided to show Northern Quoll sampling locations and records (including information to show sampling locations of 'null records') in relation to mapped fauna habitats and the proposed MEZ. Statistical analysis of the data was undertaken to establish where Northern Quoll records were found in relation to the mapped fauna habitats as described in Section 12.3.3 of the ERD. However new maps (Figures 6a and 6b) have been included to provide greater clarity of scale, and in order to display the recorded locations of the Northern Quoll in relation to fauna habitats, the conceptual mine layout, and the proposed MEZ. All of the known records of Northern Quoll surveyed at Mesa H on the mesa landform are located within the MEZ.
31	DWER	A diurnal (possible maternal) roost for Ghost Bat (Astron Cave 4) was recorded within the breakaways associated with the drainage line that bisects the mesa outcrops. This cave is located within the MEZ.	Comment moved to and addressed in No. 35
32	DWER	Four potential SRE species were recorded within the development envelope. Three of these species were recorded outside of the conceptual mine pit layout and are unlikely to be directly impacted by the proposal (Lychas 'sp. nov. 1', Lychas 'sp. nov. 2' and Buddelundia '61'). One potential SRE specimen ('Karaops feedtime') was recorded from the railway, north of the proposal area. The identification of this specimen could not be confirmed. However, it is unlikely that this species would be restricted to the linear	**Noted – additional clarification provided.** Seven potential SRE habitat types were identified by Astron (2017) differing in their prospectivity for SRE fauna. The most prospective habitats were Breakaway and Gorge habitats, followed by Rocky Hills, Riverine habitats and Drainage Line habitats. Drainage Line and Breakaway habitats in between the two Mesa outcrops were not specifically sampled for SRE species, however representative

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		railway footprint. All potential SRE species recorded are likely to outside of the areas of impact associated with the revised proposal. Limited SRE survey was undertaken in the breakaway and drainage line habitat between the two mesa outcrops at Mesa H. **The proponent should discuss whether this habitat would provide likely habitat for SRE invertebrate fauna, and if so, justification for limited sampling in this habitat should be provided.**	habitats were sampled elsewhere in the Development Envelope as described below. Whilst some portions of Drainage Line habitat are well-vegetated, the majority of the Drainage Line habitat within the survey area is open, exposed riverbeds with limited leaf litter. The Drainage Line habitat associated with the Low Hills and Slopes or Breakaway habitats have an elevated capacity to hold moisture and complex vegetation associations providing a more suitable environment for SRE species (Astron 2017). The Drainage Line habitat between the two Mesa outcrops is representative of this, together with the area sampled as Site SRE09 shown in the Astron (2017) report. Astron (2017) considered this habitat to have moderate suitability for SRE fauna but noted it appears that the species in SRE groups recorded from SRE09 are locally widespread. Astron (2017) identified the Breakaway habitat type as providing shelter for SRE fauna and diverse microhabitats for both habitat specialists and moisture-dependent SRE fauna. This habitat type was sampled as sites SRE08, RVM12, RVM16 and OPP37. The collected fauna comprised both widespread and potential SRE species. Similar results were acquired for arachnid fauna, with two of the collected species (*Indolpium* sp. indet. and *Beierolpium* 8/4) widespread and the third (spider *Karaops* sp. indet.) representing a potential SRE. Minimal disturbance is proposed to the central drainage line which bisects the Mesa H formation. The disturbance proposed is limited to the proposed haulage road, required for access (<2 ha) and environmental / hydrogeological monitoring and associated bores and access tracks; most of which are largely established in this area already.
33	DWER	The majority of the habitats found within the Development Envelope are widespread in the surrounding region. Therefore, it is unlikely that the proposal will result in the loss of any instances of critical fauna habitat, or result in substantial local or regional impacts to habitats, fauna assemblages or significant fauna. The comments under EPA Factor Flora and Vegetation regarding impacts to riverine and riparian vegetation from	**Noted. Additional information provided.** The potential impacts of mining and dewatering from the Revised Proposal on the pools along the Robe River are predicted to be localised, temporary in duration and relatively small, as the predicted groundwater drawdown of less than 1 m along the Robe River falls within the natural fluctuations observed within the water table levels of the Robe River (2 – 3 m). The pool at Yeera Bluff is considered to be one of the most important pools in the Development Envelope as it is the only permanent pool along the Robe

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		groundwater drawdown are also relevant to terrestrial fauna habitat. Riverine habitats provide refuge for vertebrate fauna species in the arid climate, often with higher diversity. The ERD states that 'the key impact to fauna habitat will be a small reduction in the length of time semi-permanent pools persist after rainfall recharge events and a reduction in the lateral extent of the pools' (page 353). **The proponent should identify the closest riverine habitat and pools in the Robe River system that will not be impacted by groundwater drawdown, available to fauna species during dry periods.**	River in the vicinity of the Proposed Change and has important environmental, Aboriginal cultural, and social values. Permanent and semi-permanent pools greater than 1 m depth are not expected to be significantly impacted (e.g. Gnieroora Pool at Yeera Bluff) and will continue to be available for fauna species to use. However shallower (less than 0.5 m) semi-permanent or seasonal pools, immediately to the north of Mesa H (e.g. Duck Pool), could potentially dry out more quickly during extended periods of drought / low rainfall, which may reduce available fauna habitat during these dry periods. These ecosystems are well adapted to the arid environment and extremes of rainfall events and water availability; however, a number of adjacent deeper semi-permanent and permanent pools will remain available to support terrestrial fauna within close proximity. The pools are expected to be fully replenished during large rainfall / cyclonic events. The following pools are located *outside* of the influence of the predicted groundwater drawdown cone of depression and will not be affected by drawdown associated with mining operations: • Medawandy pool (~6 km upstream) – semi-permanent to permanent pool • Kartariya pool (~3.5 km downstream) - semi-permanent pool In the event that surface water levels in pools of the Robe River reduce more than the predicted range as a result of mine dewatering from the Proposed Change, the impacts will be mitigated with an adaptive management approach that may include discharge of surplus abstracted groundwater from Mesa H dewatering directly into permanent pools; or avoidance of BWT mining below 120 m RL in the pit closest to the Robe River in order to avoid or mitigate the impact.
34	DWER	The management presented in the ERD is appropriate for the mitigation of impacts to Terrestrial Fauna. Appropriate management measures have been proposed in the ERD for preserving the values of restricted or otherwise important fauna habitats.	**Noted.**

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35	DWER	The proponent has proposed the implementation of a mining exclusion zone (MEZ) – to manage the impacts to troglofauna - similar to that approved under Mesa A and Mesa A Hub proposals (Ministerial Statement 756). The designation of a MEZ around important habitat features would also be an appropriate avoidance method to mitigate some of the impacts of the revised proposal on terrestrial fauna. The proposed MEZ appears to include the Breakaway fauna habitat, which is important for Northern Quoll (Figure 8-6). The drainage line habitat between the two mesa outcrops appears to provide foraging habitat for the Ghost Bat, as evidenced by the multiple locations of night roosts recorded (Figure 8-7), and the Pilbara Leaf-nosed Bat was also recorded within this drainage line (Figure 8-8). A diurnal (possible maternal) roost for Ghost Bat (Astron Cave 4) was recorded within the breakaways associated with the drainage line that bisects the mesa outcrops. This cave is located within the MEZ. **The proponent should consider extending the MEZ to include the drainage line habitat to protect Ghost Bat foraging habitat associated with Astron Cave 4, and confirm inclusion of Astron Cave 1 in the MEZ (Figure 8-7).**	**Noted. Additional clarification provided.** The purpose of the MEZ is to quarantine parts of the orebody (confirmed resource) from impacts related to excavation for mining. There are many areas of cultural and ecological significance that are located outside the orebody that will not be disturbed either by mining or clearing. These areas are not included in a MEZ as the intent of the MEZ is to provide specific clarity around the 'no-go' areas for mine pit development and hence does not encompass the broader environment. Expanding the MEZ for the purpose of including areas of Drainage Line habitat would extend the MEZ off the target orebody proposed for mining and would therefore be inconsistent with the intent of the MEZ as described above and would also be inconsistent with the MEZ approach currently in place at Mesa A, and Mesa K, and proposed for the Mesa A Hub, which includes Mesa B and C. Clearing is proposed to be minimised in areas of Drainage Line habitat. Minimal disturbance is proposed to the central drainage line which bisects the Mesa H formation. The disturbance proposed is limited to the proposed haulage road, required for access (<2 ha) and environmental / hydrogeological monitoring and associated bores and access tracks; most of which are largely established in this area already. Both Astron Cave 4 and Astron Cave 1 (also known as MH16-34), which were considered to be diurnal roosts (with maternity roost potential) are located within the proposed MEZ as discussed in Section 8.6.3.2 of the ERD and shown in greater detail / clarity in Figure 8-14 of the ERD. Figure 8-14 also shows that all of the recorded nocturnal roosts are also located and protected by the proposed MEZ.

Inland Waters

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36	DWER	The modelling as presented predicts reversal of groundwater flow direction (southwards towards Coastal Water Supply (CWS)) instead of downstream towards Robe River across the model, from 2021 - however groundwater level contours have not been provided. Figures 5-23 and 5-24 only show drawdown contours. **Contour maps of predicted hydraulic heads should be provided for visual appreciation of the predicted potential reversal of groundwater flow direction and associated contamination impact to CWS borefield from WFSF and other mining activities.**	**Noted – additional clarity provided** The predicted reversal of groundwater flow direction is only expected by the end of mining, in the immediate, localized proximity of the model in-flow boundary. Hence, due to the localized nature of the groundwater flow, impact to the Coastal Water Supply borefield from seepage from WFSF's and other mining activities is not expected to occur. New Figures 7a and 7b are provided in Attachment 1 which provide the modelled groundwater contours and the direction of groundwater flow at end of mining.
37	DWER	Although the proponent considers waste fines to be benign (Section 5.3.3.1 and Appendix B of Appendix A8) and therefore not expected to result in contamination of the CWS Borefield (even if heads were reversed) **groundwater quality monitoring should be undertaken to justify these assumptions. Furthermore, a closure task has also been identified in the ERD to assess the potential for seepage from the WFSF into the aquifer. This should be updated in the mine closure plan as a commitment.**	**Agree.** The current groundwater monitoring program for Mesa J and the CWSP includes (and will continue to do so during life of mine for the Revised Proposal), numerous groundwater monitoring bores adjacent to the WFSF and along the valley, extending from the Robe River to upper Bungaroo, including the CWS borefield region. This monitoring will pick up any changes to groundwater quality as a result of the WFSF if they occur. The Southern Cutback Borefield is subject to groundwater monitoring and reporting under its approved groundwater licence requirements under the RiWI Act. The CWSP is also subject to groundwater quality monitoring and reporting under its approved Groundwater license requirements (RiWI Act). The CWSP is located ~6 km from the Southern Cutback Borefield. The Closure task commits an assessment of potential for seepage from the WFSF into the aquifer and this will be provided in the next closure plan updates.
38	DWER	Groundwater modelling predicts significant water level drawdowns along Jimmawurrada Creek as a result of the cumulative impacts from Mesa J dewatering, abstraction from SCB and the Coastal Water Supply borefields - to the extent of reversing groundwater flow direction. DWER considers this a significant impact, and recommends **the**	**Agree.** Due to the reduction in available mine pit dewatering volumes to meet the Revised Proposal site water demand from 2029-2030, the Southern Cutback Borefield will be optimised to meet demand, and hence discharge of surplus water will be limited during the period from ~2029 to 2037. However, discharge (or potentially other water management solution)

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		suggested strategy of optimising the discharge outlet locations on Jimmawurrada Creek further upstream in the area of greatest drawdown be adopted. This water management strategy should be described in the environmental management plan, and must adhere to the requirements of the site's Part V operating licence.	locations will be optimised to support ecological water requirements for the riparian and subterranean fauna ecosystems.
39	DWER	Of the six permanent pools studied in the impact zone by WRM (2017, ERD appendix A11 – Table 3) five have been identified as having a depth of 1.2 m or less at the end of the wet season. This indicates that many permanent pools in the study area are shallow and are likely to be impacted by a 1 m drawdown. This will in turn impact on permanency and pool morphology which is highly linked to biodiversity (Stream, 2017 – ERD appendix A11). **Impacts to permanent and semi-permanent pools within the drawdown area should be assessed individually. This should include consideration of the importance of maintaining pool permanence and pool depths thresholds to support the biodiversity of the pools.**	**Noted. Additional information provided.** Based on geological structures and formations, site investigations, aerial photography and pool characteristics, only one permanent pool has been identified in the study area (near Yeera Bluff) The remainder of pools are classified as semi-permanent to intermittent (temporary) and subject to drying out naturally during low rainfall periods and also subject to changing morphology (including depth) or location after significant rainfall events, due to realignment of alluvial gravels in large, high velocity stream-flow events. The long-term monitoring by Streamtec (2017) has observed these pool morphology changes following large stream-flow events, which effectively 're-set' the biodiversity. A survey was undertaken to determine the depth of nine pools located to the north of Mesa J and H along the Robe River. Table 5-3 in the ERD indicates the depths of each pool in June 2017 (mid dry-season), with depths varying between 2.4 and 4.1 m. Given the current drier period and lack of rainfall recharge, some of these pools have further reduced in size. However a drawdown of <1m is not expected on its own to dry out the pools but could potentially reduce their extent, and shallower pools may dry out as they currently do as noted above. The permanent pool near Yeera Bluff is not expected to dry out as a result. It should be noted that the predicted maximum drawdown as a result of the Proposed Change is 0.7 m, however, this has been rounded up to 1 m in the ERD. Given the difficulty of linking pool depth directly with mine-related groundwater drawdown compared to natural rainfall variation, combined with the changing morphology and location of the pools, a hydrogeological

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			monitoring program comprising paired bores has been proposed (Section 2.5.1 of the EMP) Paired bores once installed will be monitored continuously via data loggers and the information downloaded quarterly. The paired bores on either side of the Robe River will enable early detection of changes to water table levels in the Robe River proximal to the Revised Proposal when mine pit dewatering commences, relative to its paired alluvial bore on the other side of the Robe River. This information will be considered in the context of pit dewatering data and CID groundwater level monitoring. This is considered the most accurate way to determine a mine dewatering related change to water table levels in the pools as compared to natural seasonal pool water level fluctuations. If adverse changes to groundwater levels are detected, then appropriate mitigation measures will be undertaken to protect the pools, which will include: • Ceasing of dewatering below 120 m RL in the Mesa H Pit 7 during dry periods and resuming mining once a stream flow event occurs, if monitoring of semi-permanent and permanent pools of the Robe River shows a decline in pool water levels beyond that predicted in this impact assessment (i.e. up to 1 m beyond natural seasonal fluctuations) as a direct result of dewatering. Other mitigation measures may include: • Optimisation of the location of discharge points in Jimmawurrada Creek to provide periodic supplementary water in areas predicted to be affected by groundwater drawdown. • Targeted supplementary water (derived from Mesa H mine pit dewatering) directly to permanent pools to reduce the potential for impacts to the pool water levels.
40	DWER	**Water Balance** The water balance forecast provided by the proponent is unclear and is related to Mesa J (ERD Page 81). On page 103 (Figure 5-29) the cumulative Robe Valley water balance for 2020 shows 8GL of bore abstraction, 15GL of dewatering and 11GL of surplus. It is clear that if bore abstraction is	**Noted. Additional information provided.** Figure 5-29 of the ERD reflects the cumulative water balance for the entire Robe Valley, including Mesa J, Mesa H, Mesa A, B & C, Warramboo and the Coastal Water Supply. The surplus discharge indicated in the figure is mostly

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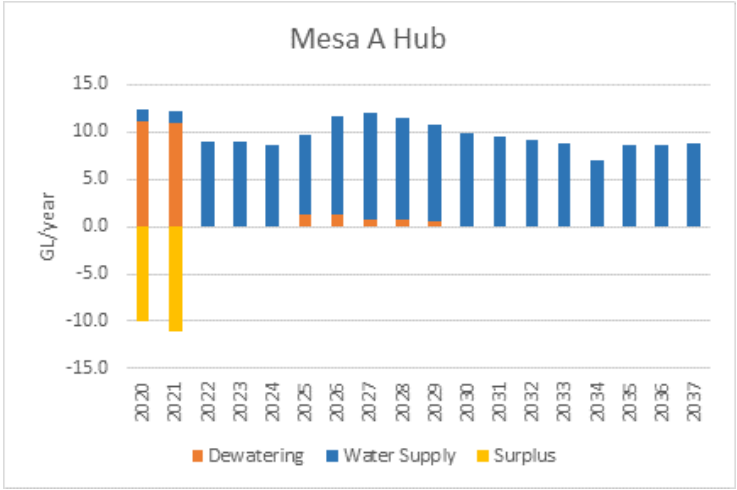
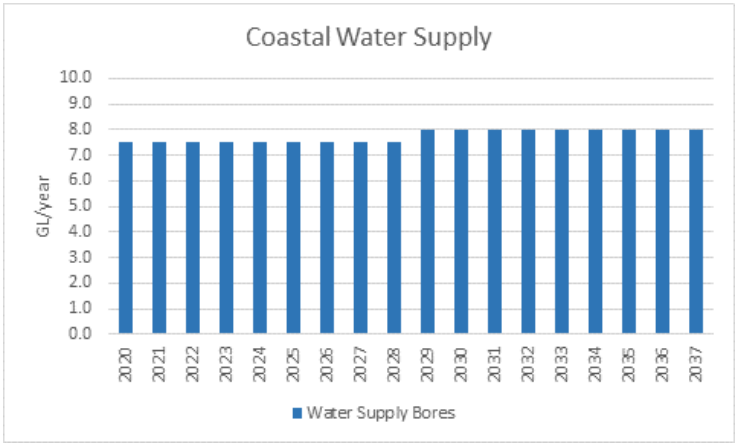
		avoided that year, the amount of water to be discharged would be reduced to 3GL instead of 11GL. The proposal should make clear the water balance components and the volumes for each stream - year by year.	associated with the below water table dewatering at Warramboo (~30 km from Mesa H). The below series of graphs show that surplus water is only generated when mine pit dewatering (or rainfall accumulated in pits) exceeds operational requirements. It should be noted that some groundwater abstraction for water supply is always required in addition to dewatering for ore processing requirements.  

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			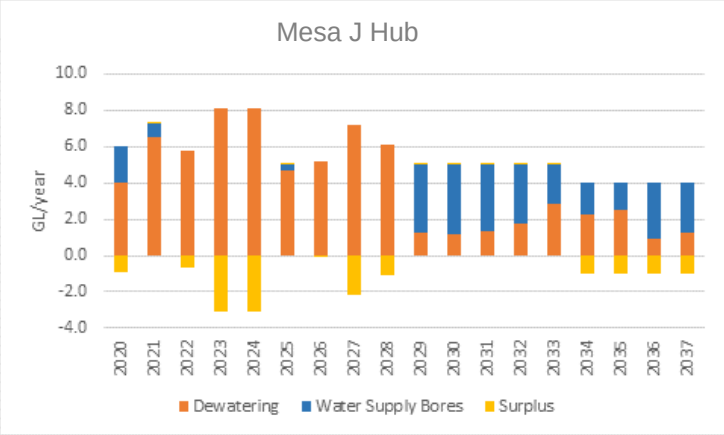
41	Wilderness Society	**Water Balance** Only 50% of the slurry wet volume (TSF decant water) is recovered and recycled on an annual basis. This is generally low by industry standards. As a water management mechanism on site, the proponent should increase the process water recovery, consequently reducing both seepage loss and groundwater abstraction from borefields.	**Noted. Additional information provided.** As stated in the submitted H3 Hydrogeological report, the current recovery rate is up to 50%. This volume, however, does not take into account the seepage which is intercepted from the TSF's and recovered from surrounding active below water table pits through sump pump systems. Depending on head difference between pit floor and tailings an additional ~20% of seepage from the tailings is estimated to be recovered from Mesa J TSF 5, which represents an extra annual volume of ~520 ML in addition to the ~50% directly recovered through decant pumps. The current waste fines circuit consists of two discharge towers discharging the waste fines slurry into the central area of Mesa J TSF 5. Three Truflow pumps are located on each side of the TSF which collect the decant water. There are a number of improvement projects being assessed as part of the future Mesa H tailings storage, including trialling turret suction systems at the ponds, which should mean that the minimum operating level for pumping should be reduced and recovery would be further increased. Future tailings storage facilities will be designed to maximise decant return and minimise seepage.

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42	Wilderness Society	**Hydrogeological Processes** The total catchment area south of the Robe River is 65 km^2, of which 43 km^2 is directly affected by the proposed changes. One of the pools existing on the Robe River, the Yeera Bluff, is a Rights Reserve site of high significance to the traditional owners that will be heavily impacted by the proposed changes. The Wilderness Society currently does not agree that the revised proposal can meet the EPA's objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	**Noted – additional clarification provided.** **Catchment** The proposed Mesa H pits will affect runoff that would normally (pre-mining) flow into the Robe River between Japanese Pool and Yeera Bluff. Without mitigation, runoff from approximately 43 km^2 of the 65 km^2 contributing area south of the Robe River would be affected to some degree by mining at Mesa J and Mesa H (approximately 65%). A proposed Engineering diversion will serve the dual purpose of protecting mine pits and enabling runoff (from 26 km^2 of these contributing areas) to continue to reach the Robe River within 1 km of its natural creek confluence. The diversion structure is proposed along the south side of the Development Envelope. The proposed diversion is approximately 5.5 km in length and engineered to manage flows up to the 1:50 AEP level event. The proposed diversion will redirect flow along the south-west boundary of Mesa J and H through to the Mesa H central gully drainage line (Figure 5-28 of the ERD). A benefit of this diversion is that it reduces the mining affected catchment area from 43 km^2 to 17 km^2, and results in 74% of the natural runoff source area still being able to flow with minimum interruption to the Robe River channel gravel aquifers and associated pools. The proposed diversion route ensures that water management remains within tenure, with surface flows being safely conveyed down the central gully drainage line to a natural confluence during the operational phase of the mine. **Pools** The significance of Gneioora pool near Yeera Bluff is recognised by the Proponent, and hence the Proposed Change has been designed specifically to avoid and minimise impacts to the pools of the Robe River, in particular Gneioora Pool. Consultation with the Robe River Kuruma People has been undertaken specifically in relation to the predicted impacts of the Revised Proposal, including predicted impacts to the pools and proposed monitoring and mitigation strategies. Consultation remains ongoing with regular meetings to discuss current and proposed projects. The Revised Proposal is not expected to significantly impact Gneioora pool. Modelling indicates a maximum drawdown less than 0.5 m to the Robe River

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			to the north of Mesa H and a short term (less than one year) maximum 0.7 m drawdown around Yeera Bluff (Figure 5-21 and Figure 5-22 of the ERD). To account for any modelling uncertainty, this potential impact has been rounded up to be <1 m drawdown for the purposes of impact assessment. The potential impacts of mining and dewatering from the Revised Proposal on the pools along the Robe River are predicted to be localised, temporary in duration and relatively small, as the predicted groundwater drawdown of less than 1 m along the Robe River falls within the natural fluctuations observed in the water levels of the Robe River (2 – 3 m). The pool at Yeera Bluff is considered to be one of the most important pools as it is the only permanent pool along the Robe River in the vicinity of the Proposed Change and it has important Aboriginal cultural and social value. Given the magnitude and frequency of stream flow events, a single large rainfall event can completely replenish and effectively 're-set' the aquifer water levels, hence any effects would be seasonal and temporary, and the deeper pools and permanent pool at Yeera Bluff are expected to continue to persist without active management. Groundwater drawdown in the Robe River alluvium is therefore considered unlikely to cause a significant impact through any long term or permanent adverse impact to the pools' levels. An option of localised water supplementation into the permanent pool of Yeera Bluff in the Robe River may be implemented as a mitigation measure to maintain water levels if greater than expected reduction in levels occurs as a result of mining. This approach would be based on monitoring results indicating a variation of water levels beyond natural climatic variability and reference monitoring sites. In summary, the Proponent recognises the ecological, social and cultural values associated with Robe River and Jimmawurrada Creek, and the value of the aquifers as a water supply. The Proponent has designed the Proposed Change to minimise abstraction and surplus water discharge, which will be within authorised limits for the existing Mesa J Iron Ore Development. The Proposed Change will result in a small increase to current and future impacts associated with approved projects (Mesa J Iron Ore Development and CWSP). However, the Proponent has recognised that the Proposed Change may contribute to cumulative impacts within the Robe Valley and has accounted for this in the Proposed Change design and proposed management.

No.	Submitter	Submission and/or issue	Response to comment
			The Proponent considers that the Revised Proposal can be managed to meet the EPA's objective for Inland Waters through: • The Proposed Change design, in particular, avoidance, minimisation and mitigation strategies to limit impacts to pools of the Robe River, in particular, permanent pools; • The continued management in accordance with the existing RIWI and EP Act Part V licences; and • The implementation of the updated Mesa J Hub EMP and the Mesa J Hub Closure Plan.
43	Wilderness Society	**Closure & Rehabilitation** The closure plan states that complete aquifer recovery is predicted to take between 50 and 60 years, with the Robe River and Jimmawurrada Creek expected to recover 90% of the drawdown after the first or second significant rainfall events. The drawdown in the Yeera Bluff is estimated to take the longest to recover, with the last 20 cm of drawdown requiring up to 40 years to recover. We consider this closure plan too optimistic as it does not take into consideration the cumulative pressures already affecting the area. The six monitoring bores located to the east of the Southern Cutback Borefield, close to Jimmawurrada Creek, indicate a continuous decline in the water level since 2010, possibly attributed to a combination of factors including lower rainfall since 2011, Mesa J dewatering, decreased water supply from the Southern Cutback Borefield, and the aquifer through flow reduction due to the Coastal Water Supply Project. Additionally, inherent uncertainties in the conceptual models used, such as the climate projections and storage parameters, indicate that more research needs to be done to ensure the health of the river system (Independent Groundwater Consultant, 2017). **The Wilderness Society recommends that further research be done to ensure the health of the river system, particularly the assumption that watercourses**	**Noted – additional clarification provided.** Video and photographic records from cyclone Heidi in 2010 in the Bungaroo Valley show the entire valley becoming a high velocity stream with an approximately 3 m water column. Field observations also registered monitoring bores becoming artesian, months after the cyclone. This supports the understanding of substantial aquifer recharge and consequent recovery of water levels with prompt re-establishment to pre-mining conditions from upper Bungaroo, along Jimmawurrada Creek and to the Robe River. However, given the unpredictable nature of cyclones, the Mesa H groundwater numerical model conservatively excluded cyclones from model predictions, and instead used a replication of past rainfall events which were up to 1:100 annual recurrence interval. In addition, one model scenario was based on a 50% reduction in recharge from this baseline and seasonal groundwater lows. This is the model that predicted a maximum drawdown of up to 0.7 m in the Robe River alluvials. Based on the recommendation from peer review (Independent Groundwater Consultants, 2017) Rio Tinto has carried out a drilling and testing pump program focusing on the hydraulics of the Robe River, including the installation and testing of 3 production bores and 4 monitoring bores slotted across the Robe River alluvium and basement; additionally, a 30 day pumping test was undertaken abstracting water from the Robe River alluvium. The results of this work has increased our understanding of the Robe River hydrogeological parameters including storage, and confirmed the hydraulic barrier between the permanent pool at Yeera Bluff (Gnieoora) and the Mesa H channel iron deposit. There are two stream gauge stations located up gradient (Ngalooin Pool, Site Ref 707004) and down gradient (Yarraloola, Site Ref 707002) from

No.	Submitter	Submission and/or issue	Response to comment
		in such an arid region of Australia can quickly and permanently recover from a loss of water on this scale.	Mesa H deposit, approximately 34 km and 36 km respectively. The Ngalooin Pool records from 1976 and 1999 show that the average annual flow through the Robe River was 42 GL, meanwhile the Yarraloola records indicate over the period from 1974 to 2016, that the mean annual flow through Robe River was 119 GL. Furthermore, between 1993 and 2015, once every ~3 years stream flows higher than 200 GL have been recorded. This magnitude and periodicity of flows are at least 5 times higher than the cumulative yearly abstraction from the adjacent Coastal Water Supply Project and the Revised Proposal combined, supporting the modelling and understanding that the Robe River will recharge the alluvium following rainfall events during operations and post-closure, especially considering the maximum drawdown along the Robe River is expected to be less than 1m. The pools within the Study Area have been sampled annually since 1991 (prior to the commissioning and mining of the Mesa J Iron Ore Development) using a consistent methodology by Streamtec Pty Ltd. This monitoring has provided an integrated long-term dataset on water chemistry, channel and pool morphology, aquatic macroinvertebrates and fish, together with qualitative analysis of riparian and bank condition, weeds and water flow. The significance of this program is the duration and consistency of monitoring for nearly 30 years which has captured some long-term return frequency extreme natural events such as cyclones and prolonged dry periods, as well as pre and post mining / impact and non-impact sites. Monitoring and analysis of the data has concluded that seasonal and annual variation in rainfall and subsequent river flows with extreme natural events are the main drivers of pool diversity and ecosystems, with deeper pools generally showing higher levels of biodiversity due to water chemistry being more stable; and shallower pools showing greater fluctuations in water temperature and dissolved oxygen, including to levels unsuitable for local fauna (Dobbs and Davies 2009). Large rainfall events such as from cyclones can change the overall morphology of both the river channel and the pools, whereby the biodiversity and predictability of biodiversity can be significantly changed and effectively 'reset' by these events. Ongoing and future monitoring and analysis is proposed as outlined in both the EMP, and as part of closure monitoring, which will continue to further inform the ~ 30 years of existing river-system monitoring, including: • aquatic fauna monitoring; • riparian ecosystem health monitoring;

No.	Submitter	Submission and/or issue	Response to comment
			• stygofauna monitoring; • pool monitoring including water depth and morphology; • groundwater level monitoring; and • water quality monitoring. This work will inform operational and closure management approaches to ensure the viability of the riverine ecosystems are maintained, as a result of mining operations.
44	DWER	**Waste Fine Storage Facility** "The mine plan will incorporate the use of mined-out pits within the adjacent Mesa J Iron Ore Development for in-pit WFSF over the life of the Revised Proposal…this is the method for storage of *inert waste fines residue*". The AMD risk assessment summary below shows the results for the static leach data relative to ANZECC/ARMCANZ [2000] for the different rock types of Mesa H: a) Wittenoom Formation (WD): elevated sulfate, aluminium, cadmium, chromium, copper, iron, manganese, niquel, selenium and zinc content; b) Marra Mamba Iron Formation (MM): elevated sulfate, nitrate, cadmium, manganese, nickel and selenium; and c) Hard pisolite (TPH), mixed pisolite (TPM): elevated aluminium. No geochemical test was conducted for Mesa H tailings. Thus, it is not possible to determine whether the tailings are inert. It is also clear that the rock types that will be mined will have elevated metal concentrations with the potential to impact groundwater quality once the pit is filled with wet tailings. Potentially acid forming rocks will be exposed during the pit life and the introduction of tailings will have potential to generate AMD.	**Noted – additional information provided.** Additional geochemical characterisation studies have been completed since the ERD was finalized (Attachment 4: Golder 2019); metallurgical tailings samples from Mesa H were subjected to total S, ANC, NAG, multi-element assay, tailings liquor testing and select LEAF tests (to investigate different liquid:solid contact ratios). Leach testing was carried out using both de-ionised and saline solution extraction. The saline and low-contact leach tests were considered the most relevant tests for representing in-situ field conditions likely to be experienced. The results indicate that Mesa H tailings are unlikely to generate AMD, with total sulfur being below the detection limit of 0.01%. The results showed that the Mesa H tailings solids are likely to be significantly enriched in Ag, Be and Fe, and slightly enriched in As, Co, Mo, Se, and W, similar to Mesa J tailings however the solubility of these and other elements of environmental concern were generally found to be low (with the potential exception of Zn) (Golder 2019). Total N was found to be present at concentrations of 80mg/L, and soluble nitrate (NO3) at concentrations of 18.5mg/L. Ag, As, Be, Bi, Hg, Sb, Se, Sn, W, U and Zr were not observed above their detection limit in the leachate, and were not found to mobilise in any of the experimental conditions. Cd, Cr, Cu, Pb and Ni mobilised occasionally, but only at low concentrations. Elevated concentrations of Fe, Al, and Mn in certain leach tests were considered likely associated with colloidal (particulate) forms, with tests at variable filter porosity indicating that their dissolved concentrations were likely to be substantially lower (Golder 2019).

No.	Submitter	Submission and/or issue	Response to comment
			Zn, NO3, Ba and Sr were observed to be leached under all of the tested experimental conditions for the Mesa H tailings at variable concentrations. The overall Mesa H tailings were found to be enriched in a suite of metals and metalloids but their solubility (i.e. available content in LEAF Framework terminology) were generally low with the exception of Zn, NO3, Ba and Sr (Golder 2019). Mesa J was selected as the preferred location for the WFSF rather than the alternative location of in-pit at Mesa H in order to reduce risk of seepage to the groundwater at Mesa H and to minimise clearing required for the Proposed Change. The geochemical risks associated with the Mesa H waste fines are minimised during operations as most of this seepage volume will be captured by in-pit dewatering bores and re-circulated through the wet plant, with an estimated 3 GL/a recirculated to the adjacent pits based on current volumes. The current groundwater monitoring program for Mesa J includes (and will continue to do so during life of mine for the Revised Proposal), numerous groundwater monitoring bores adjacent to the WFSF and along the valley, extending from the Robe River to upper Bungaroo, including the CWS borefield region. This monitoring will detect any changes to groundwater quality as a result of the WFSF if they occur. As per the Proponent's response to comment No. 37; the Closure Plan will be updated to include a commitment to assess the potential for seepage from the WFSF into the aquifer at closure and beyond and appropriate measures will be developed to manage any potential seepage. The Proponent has well established management strategies for the management of Potentially Acid Forming (PAF) materials, While the likelihood of encountering significant quantities of PAF material is considered low, if PAF materials are encountered, then existing management strategies within the Rio Tinto Iron Ore (WA) Mineral Waste Management Plan, and the SCARD Management Plan will be implemented to ensure waste material is adequately geochemically characterised and PAF material that poses an AMD risk is appropriately managed.
45	DWER	**Waste Fine Storage Facility** On ERD page 99, the proponent stated that the Waste Fine Waste Facility play an important role in the aquifer recharge. The proponent should provide a groundwater study showing	**Noted. Additional information provided.** Meaningful groundwater studies can only be conducted when the location and deposition strategy of the proposed WFSF is known. At the time of drafting the Mesa H ERD, the final proposed location of the WFSF to take

No.	Submitter	Submission and/or issue	Response to comment
		the long term effect of seepage from the various TSFs to groundwater quality. LEAF tests of Mesa H tailings are key to understanding which metals and metalloids will be inflowing to groundwater.	Mesa H fines was not determined, however locating the WFSF at Mesa J (additional to the existing WFSF's at Mesa J) was considered to be the most appropriate and lower risk location. A groundwater study has been conducted for the existing WFSF at the neighbouring Mesa J mine site, which is considered a reasonable surrogate for the proposed Mesa H Proposal. Though seepage from the existing Mesa J WFSFs was found to be affecting water levels locally, and concentrations of chloride, nitrate and copper were found to have increased or to be temporarily elevated in monitoring bores surrounding the existing WFSF, the study at the time found that the long term effects of seepage were unlikely to pose high risks to the receiving environment by any of the chemical parameters identified as of potential concern (i.e, chloride, nitrate or copper) (Rio Tinto, 2018). The experience at Mesa J is that the fate of seepage-affected groundwater (arising from the WFSFs), that might affect the downstream environment, is strongly influenced by the proximity of the WFSF to nearby pits and local creek/river systems. In the case of the latter, the risk is only of significance if the local creek/river is at times connected to the groundwater system (i.e. experiences groundwater baseflow). Most creeks/drainage lines at Mesa J are well above the water table and therefore disconnected from the underlying groundwater systems. Studies have shown that the pits can have large capture zones of groundwater around them, with water quality data at Mesa J showing that seepage affected groundwater migrates to these pits. WFSFs located outside of these capture zones can result in seepage-affected groundwater migrating towards downstream surface water and groundwater systems. RTIO proposes to undertake groundwater / seepage modelling studies at Mesa H to examine the risk of seepage-affected groundwaters to downstream systems, for one or a number of WFSF scenarios / options. Though LEAF tests had not been carried out on Mesa J tailings at the time of the study, the contaminants of potential concern (COPC) were identified via review of long term monitoring data. LEAF tests, however, have been conducted on Mesa H tailings samples and are discussed and presented in the Proponent's response to comment No. 44.
46	DWER	**Waste rock material characterisation** The AMD report indicates that Wittenoom Formation (WD) at Mesa H located below the water table poses an AMD risk if	**Noted – additional information provided.** Rio Tinto has assessed the AMD risks related to the development of unsaturated areas of PAF material during dewatering activities. It is

No.	Submitter	Submission and/or issue	Response to comment
		exposed. The ERD mentioned that the pit design is considered unlikely to expose significant volumes of this rock type. However, the dewatering of the pit may have a detrimental impact to groundwater by exposing this rock type to oxygen. The proponent needs to address how this potential impact will be managed.	understood that the oxidation of this material may depend on a number of factors including the degree of de-saturation which would occur depending on the characteristics of this material, as well as the duration for which the groundwater table remains lowered. At Mesa H, pyritic black shale is associated with fresh basement material with a low hydraulic conductivity (i.e., the porosity of the matrix is considered to be extremely low, and relatively higher within fractures); this indicates the rate of oxygen transport (likely via diffusion) from the pit wall to the PAF material will be low, while the saturation of this material is expected to remain high due to pore pressure. Furthermore, the dewatering strategy aims to minimise the timeframe for which water must be abstracted from localised pit areas, where subsequent water table rebound is expected to be quick; this indicates a limited duration for which this material will remain within unsaturated conditions. Calculations indicate the oxygen consumption rates in sulfidic rock located 5 m behind a layer of intact, non-sulfidic rock could be at less than 1/20th of that of sulfide bearing talus located on the pit wall (Garvie et al. 2018).
47	DWER	**Waste fine materials characterisation** The report mentioned the use of a flocculants in the wet processing circuit. The proponent should provide the chemical composition of the reagents. Also, the proponent shall consider the concentration of this reagent(s) in the TSF/seepage.	**Agree – new information provided.** The flocculant proposed for use to thicken MEH tailings is Floerger®, an anionic polyacrylamide similar to those used at other iron ore sites (Attachment 3). This flocculant is estimated to remain within the solid fraction of the tailings; however, conservative modelling conducted for a surrogate WFSF seepage indicated that flocculant concentrations in the TSF seepage could reach about 55 ppm (Rio Tinto 2018d; Attachment 5). This peak concentration is well below the 100 ppm limit for toxicity to aquatic fauna as outlined in the flocculant material specification data sheet (MSDS) (McKee, J, 2018).
48	DWER	**Waste fine materials characterisation** The proponent should conduct LEAF test with Mesa H tailings to define the risk to groundwater and surface water quality from seepage of an in pit TSF.	**Agree – new information provided.** Extensive geochemical testing of the Mesa J tailings has been conducted including ABA and leach tests in both de-ionised and saline solution extraction (EGi 2014). The results indicate that higher concentrations of Cu, Zn, Sr and Ba can occur in saline extracts. Though Mesa H tailings are not expected to be significantly different from Mesa J tailings, metallurgical tailings samples from Mesa H were subjected to total S, ANC, NAG, multi-element assay, tailings liquor testing and select LEAF tests. The results of

No.	Submitter	Submission and/or issue	Response to comment
			all these tests suggest that Mesa H tailings are unlikely to generate AMD. Overall tailings were enriched in a suite of metals and metalloids but their solubility (i.e., available content in LEAF Framework terminology) were generally low with the exception of Zn, NO_3, Ba and Sr. These parameters were readily mobilized under a range of environmental conditions, while Cd, Cr, Cu, Pb and Ni were occasionally observed at concentrations of few ug/L. (Golder 2019).
49	DWER	**Waste fine materials characterisation** On ERD page 97, it was stated that the chemistry of Mesa H tailings is similar to Mesa J tailings, based on rheology tests. There is no sufficient data to corroborate this statement. Rheology is the study of flow and deformation of materials under applied forces, and it is incorrect to imply that both tailings have similar chemical properties base on rheology test results.	**Agree – new information provided.** Metallurgical testwork suggests that Mesa H ore is similar in terms of bulk chemistry and in-situ particle size to the ore mined at Mesa J but is likely to contain a higher proportion of clays. In addition, Mesa H tailings will be finer compared to those currently produced by Mesa J. From an environmental perspective, clays have the potential to contribute to solute loads when in contact with saline solutions via ion exchange. This work supplements the LEAF tests conducted on Mesa H tailings, as discussed above (Golder 2019).

Air Quality

No.	Submitter	Submission and/or issue	Response to comment
50	Wilderness Society	The proposal did not outline any of the direct air quality impacts, particularly to on-site workers and wildlife. Mines are one of the top contributors to air pollution, which is known to cause health issues such as respiratory illnesses and heart disease (Doctors for the Environment Australia, 2018). The proposal also lacks acknowledgement of the impacts of the non-greenhouse gas emissions, including sulfur dioxide and fugitive dust, both of which are also known to contribute to respiratory illnesses (Department of Environment and Heritage, 2005; Beal, 2016). Studies have demonstrated the importance in minimising risks and impacts on air quality through deposition strategies and management plans (Singh & Perwez, 2015; Schwegler, 2015). The proposal has not acknowledged these important air quality impacts or provided a clear management strategy for handling these environmental factors. **The Wilderness Society recommends that further research be conducted to determine the impact of the proposal on air quality in the region, with a focus on mine staff and wildlife in the surrounding area. The emission of fugitive dust and sulfur dioxide be studied prior to commencing with the proposal to understand their effects on air pollution and respiratory illnesses.**	**Noted – additional context and information provided.** The proposal and impact assessment was completed in accordance with the Environmental Scoping Document (ESD - Appendix 2 of the ERD) which sets out the key work requirements to be completed for the ERD. The ESD is provided to key regulatory stakeholders for review and input, and was approved by the Environmental Protection Authority at Meeting No. 1106 on 19 October 2017 as providing an acceptable basis for the preparation of the ERD. The requirements to be addressed for the 'air quality' factor are detailed in this document, and predominantly relate to assessment of greenhouse gases. The acceptability of the ERD to be released for public review on 8 April 2019 was predicated on demonstration of meeting all of the requirements as set out in the ESD. In addition to the ESD requirements, a dust assessment on sensitive receptors was undertaken in 2018 looking at predictions of dust levels at a number of sensitive receptor locations, arising from the development of the Mesa H iron ore deposit over the years from 2021 to 2032 (Envall 2018; Attachment 6). The assessment concluded that the dust predictions for typical operating circumstances were comfortably below standard human health dust criteria for airborne concentrations indicating that adverse impacts are generally unlikely (Envall 2018). The report did suggest additional management measures may be required under some clearing scenarios to minimise airborne dust. These may include the installation of dust monitoring at the receptor and the implementation of dust control measures if dust levels approach excessive levels, or the suspension of mining during dry conditions when winds are towards the sensitive receptor. According to DotEE (formerly DoEH) the main sources of sulfur dioxide in the air are considered to be derived from (DoEH 2005): • industrial activity that processes materials that contain sulfur, e.g. the generation of electricity from coal, oil or gas that contains sulfur • Some mineral ores also contain sulfur, and sulfur dioxide is released when they are processed. In addition, industrial activities that burn fossil fuels containing sulfur can be important sources of sulfur dioxide.

			• Sulfur dioxide is also present in motor vehicle emissions, as the result of fuel combustion. Sulfur dioxide emissions are very limited at Mesa H as: • the ore type (Channel Iron Deposit) is very low in sulfur (Rio Tinto 2017); • no mineral processing occurs on site, only crushing and primary sizing; • power generated for Mesa H is derived from a larger grid and power station in Dampier which powers numerous operational sites • Fuel efficiencies will be improved via use of autonomous haul trucks (in combination with the existing segregated but manned trucks) from 2021. • The operations are remote from large communities and other operations.

Revisions

During preparation of the Response to Submissions, revisions have been made to the items noted in the table below in response to additional queries received during the Public Environmental Review.

No.	Section of the ERD	Revision
1	ERD: Table 7-20	Table 7-20 revised (as provided in Response No. 23.) to correct error relating to *Pilbaracandona* sp. 'BOS526', which is known from reference sites *outside* the Proposal's drawdown extent.
2	ERD: Section 7.5.3.1	Correction of: *Modelling using 'Leapfrog' software within the footprint of the groundwater drawdown extent estimates that volumetrically, approximately 64% of saturated Robe River – Jimmawurrada Alluvial Aquifer habitat would be retained.* To: *Modelling using 'Leapfrog' software within the footprint of the groundwater drawdown extent estimates that volumetrically, approximately 64% of saturated Jimmawurrada Alluvial Aquifer habitat would be retained.*

References

API Management Pty Ltd (API) 2011. WPIOP Stage 1 (Mine and Rail) PER – Response to Submissions Report.

Astron Environmental Services Pty Ltd (Astron) 2016a. Mesa H Riparian Community Assessment. Prepared for Robe River Mining Co. Pty. Ltd.

Astron Environmental Services Pty Ltd (Astron) 2016b. Mesa H Level 2 Vegetation and Flora Assessment. Prepared for Robe River Mining Co. Pty. Ltd.

Astron Environmental Services Pty Ltd (Astron) 2016c. Mesa H Riparian Vegetation Baseline Monitoring, Prepared for Robe River Mining Co. Pty. Ltd.

Astron Environmental Services Pty Ltd (Astron) 2017. Mesa H Level 2 Fauna Assessment May 2016. Unpublished report prepared for Robe River Mining Co. Pty. Ltd.

Astron Environmental Services Pty Ltd (Astron) 2018. Mesa H Riparian Vegetation Monitoring Phase 2 October 2017. Prepared for Robe River Mining Co. Pty. Ltd.

Barrett, M. D. and Trudgen, M. E. 2018. '*Triodia pisoliticola* (Poaceae), a new species from the Pilbara region, Western Australia, and a description for T. sp. Mt Ella (M.E. Trudgen MET 12739)', The Journal of the Western Australian Herbarium, 29: 271–281, December, 2018. Available from https://florabase.dpaw.wa.gov.au/science/nuytsia/872.pdf

Beard, J.S. 1975a. Vegetation Survey of Western Australia: Pilbara. 1:1,000,000 Vegetation Series: Explanatory Notes to Sheet 5. University of Western Australia Press, Western Australia.

Beard, J.S. 1975b. Pilbara Explanatory Notes and Map Sheet, 1:1,000,000 Series, Vegetation Survey of Western Australia. University of Western Australia Press, Nedlands.

Biota Environmental Sciences (Biota) 2019a. Mesa H Subterranean Fauna habitat and impact risk assessment. Unpublished report prepared for Rio Tinto.

Biota Environmental Sciences (Biota) 2019b. Mesa H Subterranean Fauna Assessment 2018. Unpublished report prepared for Rio Tinto.

Bureau of Meterology (BoM) 2018. Climate Data Online. Available from: http://www.bom.gov.au/climate/data/.

Department of the Environment and Heritage (DoEH) 2005. Sulfur Dioxide (SO2), Air Quality Fact Sheet. Available from: https://www.environment.gov.au/protection/publications/factsheet-sulfur-dioxide-so2.

Department of Mines and Petroleum (DMP) and Environmental Protection Authority (EPA) 2015. Guidelines for Preparing Mine Closure Plans. Perth: Department of Mines and Petroleum.

Dobbs, R & Davies, PM 2009, Long-term ecological research on a Pilbara river system – analysis of long-term Robe River aquatic monitoring dataset, Centre of Excellence in Natural Resource Management, University of Western Australia, Perth.

EGi 2014. Geochemical Assessment of Tailings from Yandi, Paraburdoo, Tom Price, Brockman 4 and Mesa J.

Environmental Alliances Pty Ltd (ENVALL) 2018. Mesa H Dust Dispersion Modelling. Unpublished report prepared for Rio Tinto.

Environmental Protection Authority (EPA) 2016a. Environmental Factor Guideline: Flora and Vegetation. EPA, Western Australia.

Environmental Protection Authority (EPA) 2016b. Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment. EPA, Western Australia.

Environmental Protection Authority (EPA) 2016c. Technical Guidance: Sampling methods for

Subterranean Fauna. EPA, Western Australia.

Environmental Protection Authority (EPA) 2016d. Technical Guidance: Subterranean Fauna survey. EPA, Western Australia

Fortescue Metals Group (FMG) 2018. Eliwana Iron Ore Mine Project Environmental Review Document. October 2018.

Garvie et al. 2018. Oxidation and solute accumulation in pit wall rock: limiting changes to pit lake water quality. A. Garvie, C. Linklater, R. Staines, J. Chapman, and R. Green in Proceedings of the Eighth Australian Workshop on Acid and Metalliferous Drainage pp.339-350, 2018.

Golder 2019. Mesa H Geochemical Characterisation Technical Memorandum. Unpublished memo prepared for Rio Tinto Iron Ore, 9 August 2019.

Independent Groundwater Consultants 2017. Peer Review: Mesa H: H3: Hydrogeological Assessment. Unpublished report prepared for Rio Tinto Iron Ore.

Rio Tinto Iron Ore (Rio Tinto) 2017. Mesa H 2017 AMD Risk Assessment Update Summary.

Rio Tinto Iron Ore (Rio Tinto) 2018a. Addendum to Assessment of Groundwater Dependent Vegetation distribution on the Robe River – Targeted Riparian Vegetation Survey - Stage 1: Groundwater Dependent Vegetation distribution within Jimmawurrada Creek. Unpublished report prepared by Rio Tinto Iron Ore, December 2017.

Rio Tinto Iron Ore (Rio Tinto) 2018b. Assessment of Groundwater Dependent Vegetation distribution on the Robe River - Targeted Riparian Vegetation Survey (Stage 1). Unpublished report prepared by Rio Tinto Iron Ore, May 2017.

Rio Tinto Iron Ore (Rio Tinto) 2018c. Mesa A Hub Proposal Environmental Review Document.

Rio Tinto Iron Ore (Rio Tinto) 2018dd. Internal Memo: Mesa J Flocculant Concentration in Waste Fines Storage.

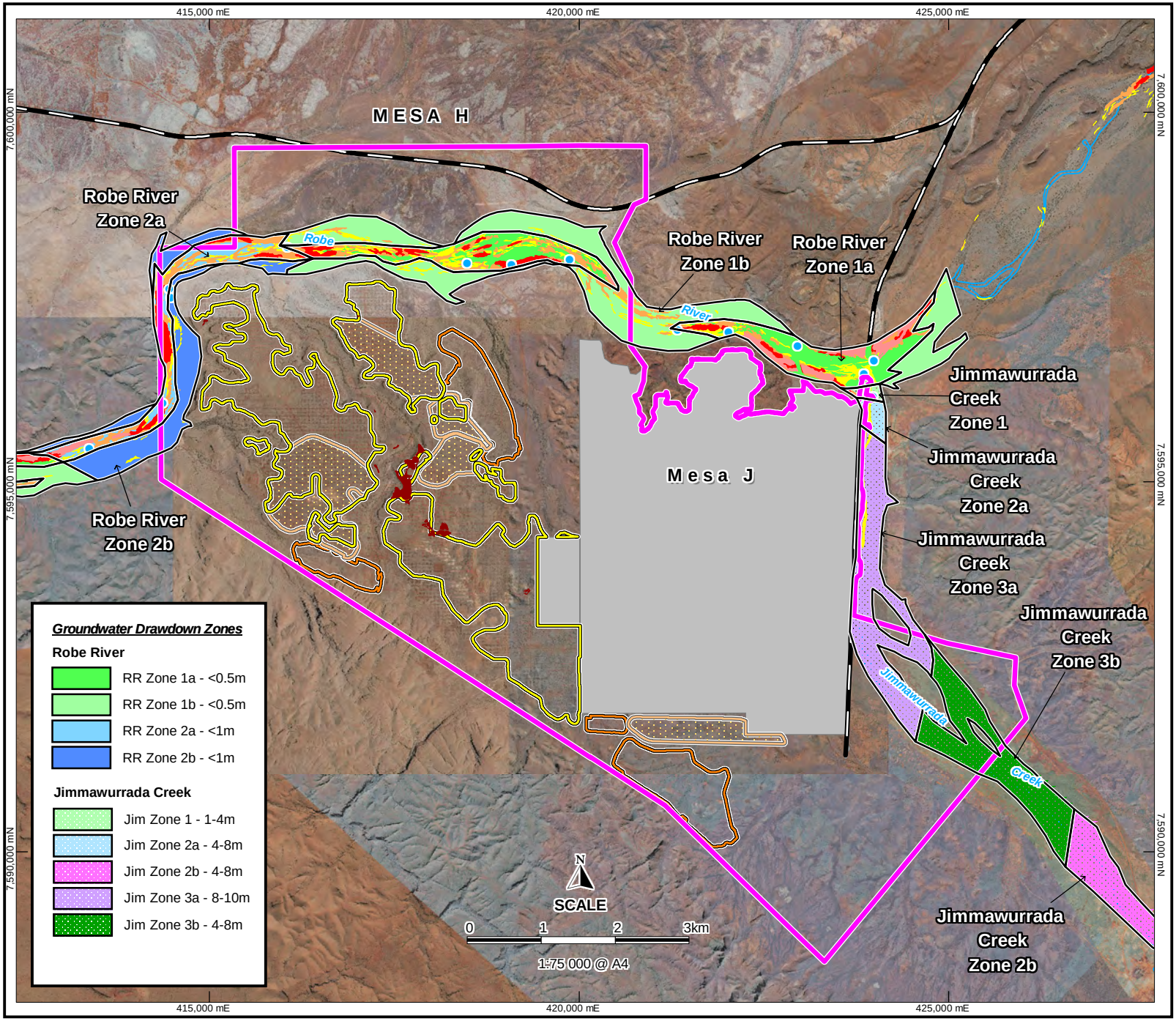
Rio Tinto Iron Ore (Rio Tinto) 2019. Mesa H H3 Hydrogeological Assessment 2019. February 2019.

Streamtec 2017. Mesa ‘J’ Project Robe River Pools Study – April 2017. Unpublished report prepared for Rio Tinto, Perth.

Streamtec 2018. Mesa ‘J’ Project Robe River Pools Study – December 2018. Unpublished report prepared for Rio Tinto, Perth.

Attachment 1:	**Revised or new figures**
Attachment 2:	**Predicted saturated alluvial aquifer habitat remaining under various groundwater drawdown scenarios**
Attachment 3:	**Floerger AN 900 series Anionic polyacrylamide: Environmental Data**
Attachment 4:	**Mesa H Geochemical Characterisation Technical Memorandum**
Attachment 5:	**Mesa J Flocculant Concentration in Waste Fines Storage**
Attachment 6:	**Mesa H Dust Dispersion Modelling**

Attachment 1: Revised or new figures



LEGEND

- Development Envelope
- Ministerial Statement 208
- Railway
- Major Watercourse

Conceptual Mine Layout

- Mine Pit
- Waste Dump
- Topsoil / Subsoil Stockpile

Significant Vegetation

- C1AAa
- C1AAb
- C1A`
- C1b
- AprTwTsr

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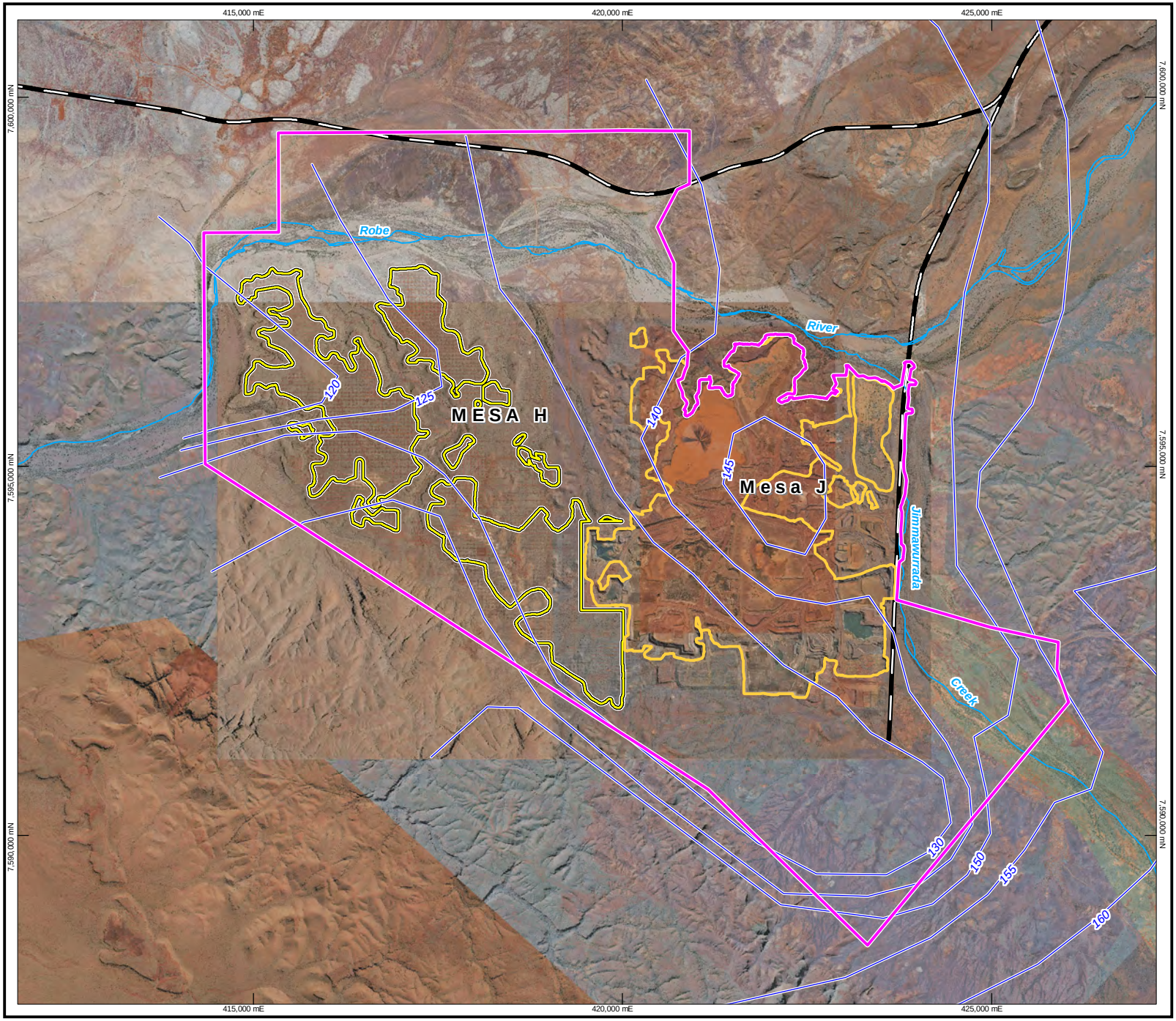
Iron Ore (WA)

Figure 1
Predicted groundwater drawdown zones and significant vegetation mapping

Drawn: T.M.
Date: July, 2019

Plan No: PDE0152304v9
Proj: MGA 94 Zone 50

Geospatial Information and Mapping



LEGEND

- Development Envelope
- Water table contour (RL)
- Mesa H proposed pit
- Mesa J Pit
- Railway
- Major Watercourse

N

SCALE

1 0 1 2 3km

1:75 000 @ A4

Disclaimer

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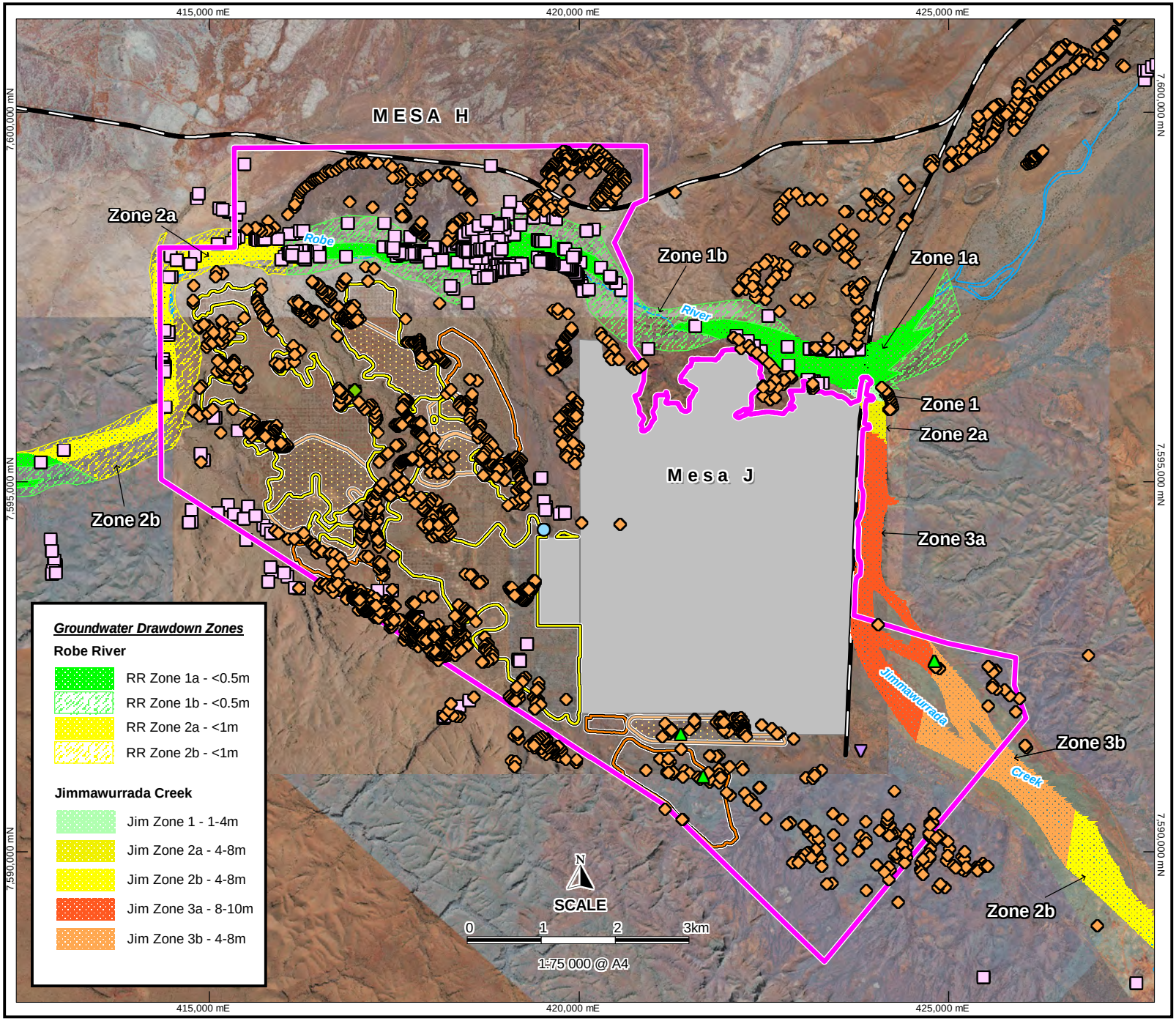
Iron Ore (WA)

Figure 2 Current Groundwater levels September 2019

Drawn: T.M
Date: September, 2019

Plan No: PDE0165755v3
Proj: MGA94 Zone50



LEGEND

- Development Envelope
- Ministerial Statement 208
- Railway
- Major Watercourse

Conceptual Mine Layout

- Mine Pit
- Waste Dump
- Topsoil / Subsoil Stockpile

Priority 3 Flora

- Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)
- Triodia pisoliticola

Priority 4 Flora

- Rhynchosia bungarensis

Species of Interest

- Cynanchum pedunculatum
- Sauropus crassifolius
- Senna sp. Meekatharra (E. Bailey 1-26)

Rio Tinto

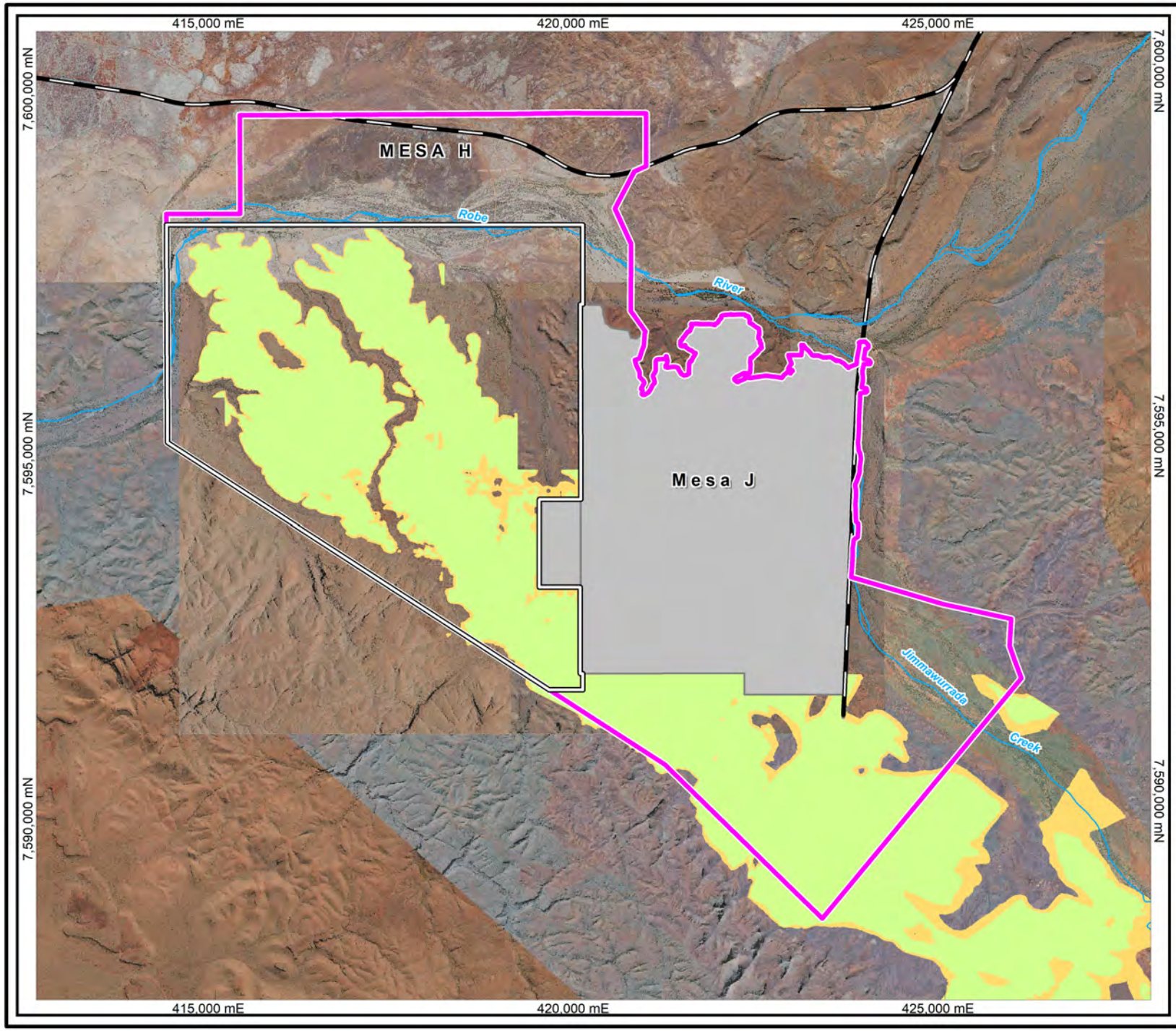
Iron Ore (WA)

Figure 3
Predicted groundwater drawdown zones and significant flora

Drawn: T.M.
Date: July, 2019

Plan No: PDE0152304v8
Proj: MGA 94 Zone 50

Geospatial Information and Mapping



LEGEND

- Development Envelope
- Ministerial Statement 208
- Major Watercourse

3D Modelled habitat Prospectivity

- Habitat Prospectivity : High
- Habitat Prospectivity : Medium
- Extent of the Mesa H Landform used to calculate the retention of > 50% viable troglofauna habitat

N

SCALE

0 1 2 3km

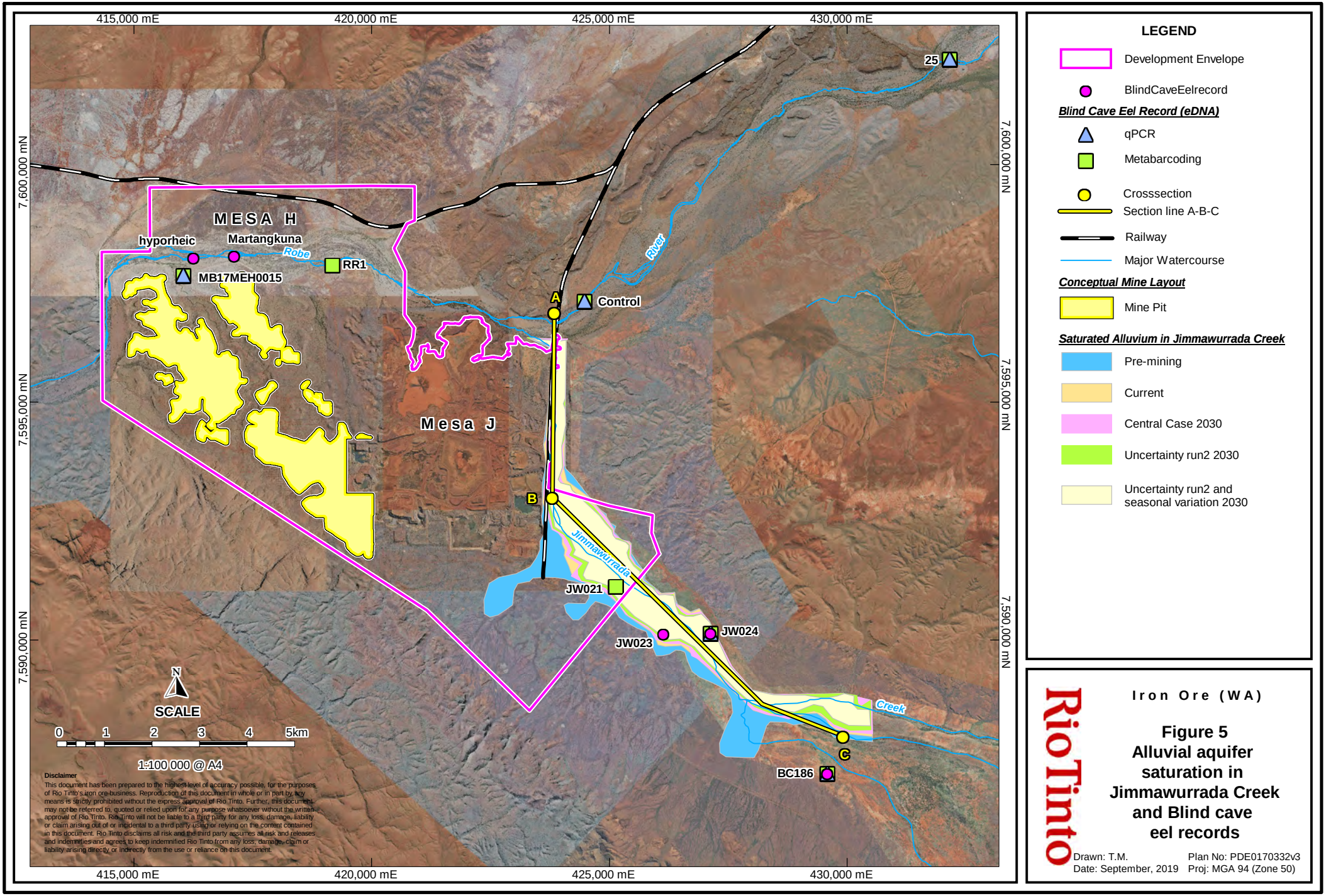
1:75 000 @ A4

Rio Tinto

Iron Ore (WA)

Figure 4
Extent of the Mesa H Landform used to calculate the retention of > 50% viable troglofauna habitat

Drawn: M.Swebbs Plan No: PDE0170666V2
Date: September, 2019 Proj: MGA94 Zone50


415,000 mE
420,000 mE
425,000 mE
430,000 mE
7,600,000 mN
7,595,000 mN
7,590,000 mN
MESA H
Mesa J
hyporheic
Martangkuna
Robe
RR1
MB17MEH0015
Control
A
B
C
25
River
Jimmawurrada
Creek
JW021
JW023
JW024
BC186
N
SCALE
0 1 2 3 4 5km
1:100 000 @ A4
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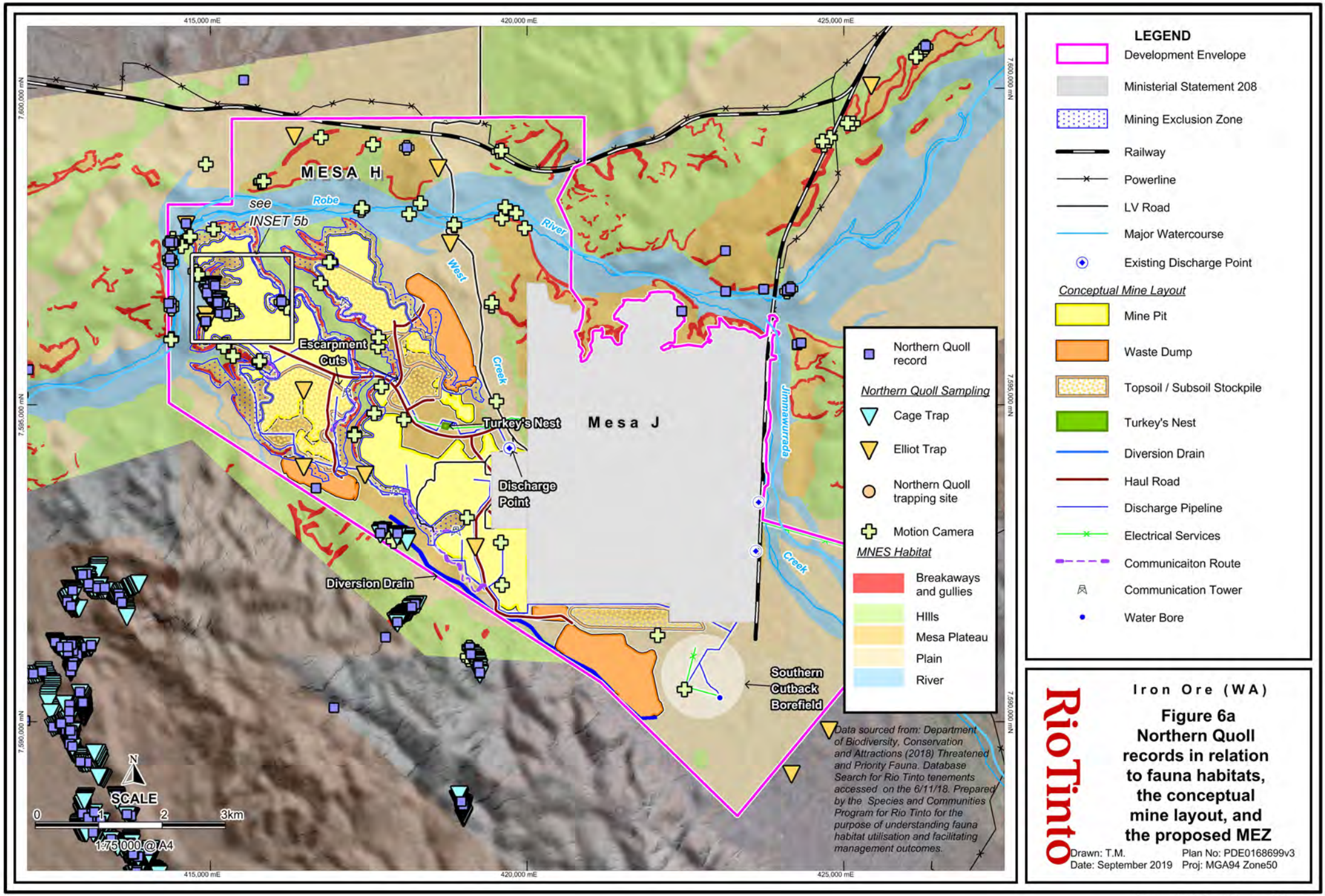
LEGEND
Development Envelope
BlindCaveEelrecord
Blind Cave Eel Record (eDNA)
qPCR
Metabarcoding
Crosssection
Section line A-B-C
Railway
Major Watercourse
Conceptual Mine Layout
Mine Pit
Saturated Alluvium in Jimmawurrada Creek
Pre-mining
Current
Central Case 2030
Uncertainty run2 2030
Uncertainty run2 and seasonal variation 2030
Rio Tinto
Iron Ore (WA)
Figure 5
Alluvial aquifer saturation in Jimmawurrada Creek and Blind cave eel records
Drawn: T.M.
Date: September, 2019
Plan No: PDE0170332v3
Proj: MGA 94 (Zone 50)



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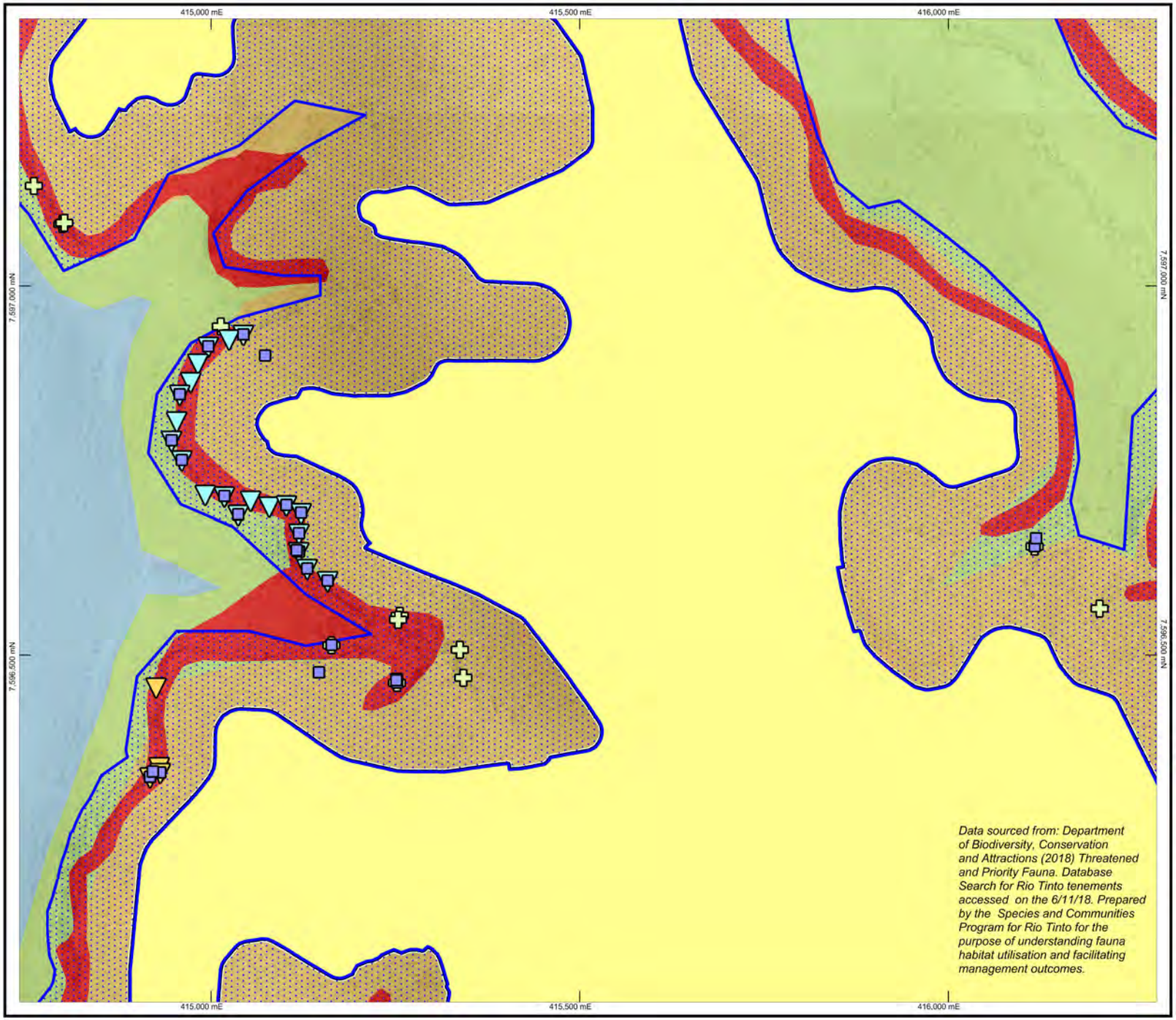
Iron Ore (WA)

Figure 6a
Northern Quoll records in relation to fauna habitats, the conceptual mine layout, and the proposed MEZ

Drawn: T.M.
Date: September 2019
Plan No: PDE0168699v3
Proj: MGA94 Zone50

Geospatial Information and Mapping



LEGEND

- Mining Exclusion Zone
- *Conceptual Mine Layout*
  - Mine Pit
- Northern Quoll record
- *Northern Quoll Sampling*
  - Cage Trap
  - Elliot Trap
  - Northern Quoll trapping site
  - Motion Camera
- *MNES Habitat*
  - Breakaways and gullies
  - HIlls
  - Mesa Plateau
  - Plain
  - River

N

SCALE

100 0 100 200m

1:7 500 @ A4

Data sourced from: Department of Biodiversity, Conservation and Attractions (2018) Threatened and Priority Fauna. Database Search for Rio Tinto tenements accessed on the 6/11/18. Prepared by the Species and Communities Program for Rio Tinto for the purpose of understanding fauna habitat utilisation and facilitating management outcomes.

Rio Tinto

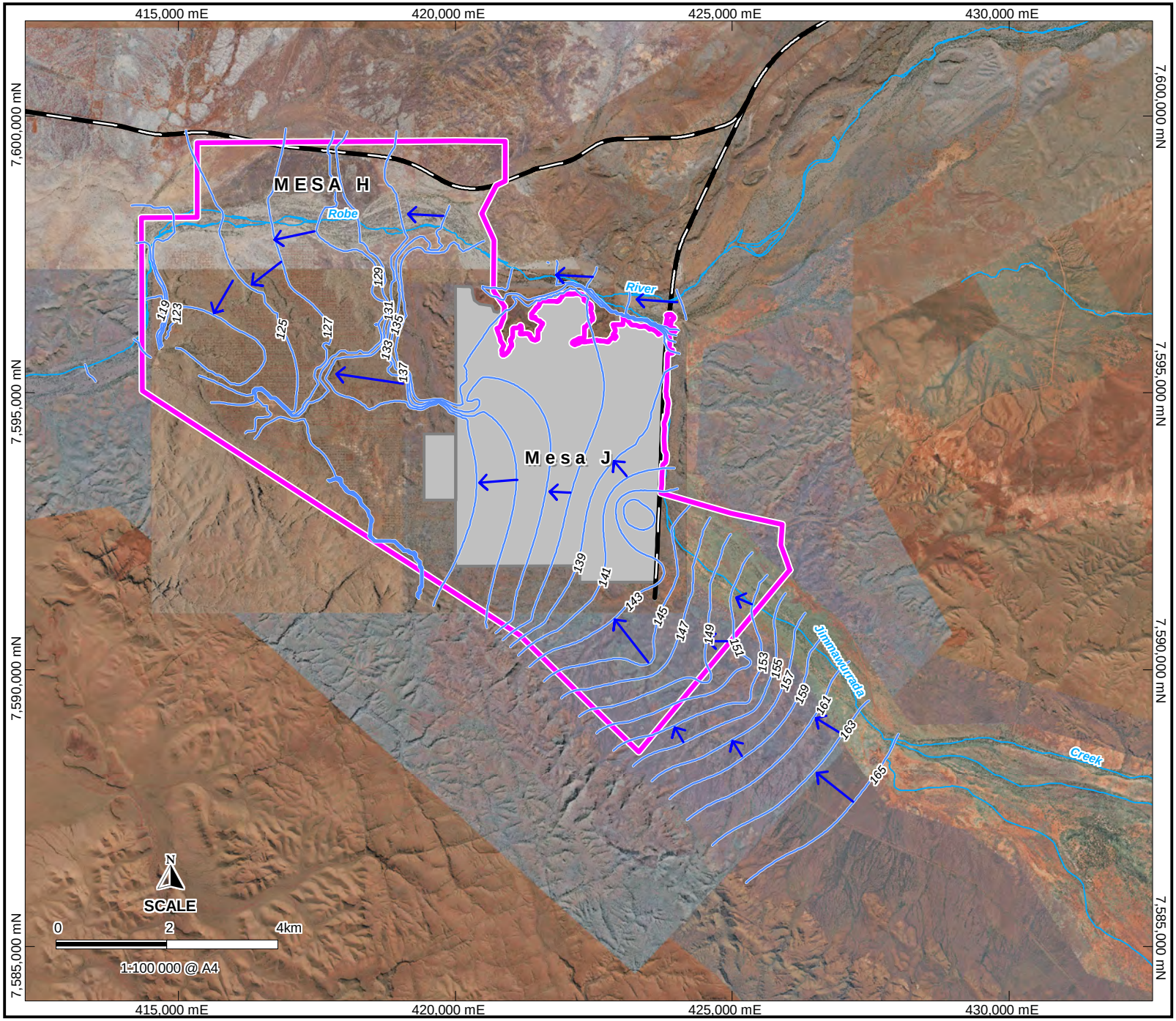
Iron Ore (WA)

Figure 6b Northern Quoll records in relation to the proposed MEZ

Drawn: T.M.
Date: September, 2019

Plan No: PDE0169492v2
Proj: MGA94 Zone50

Geospatial Information and Mapping



LEGEND

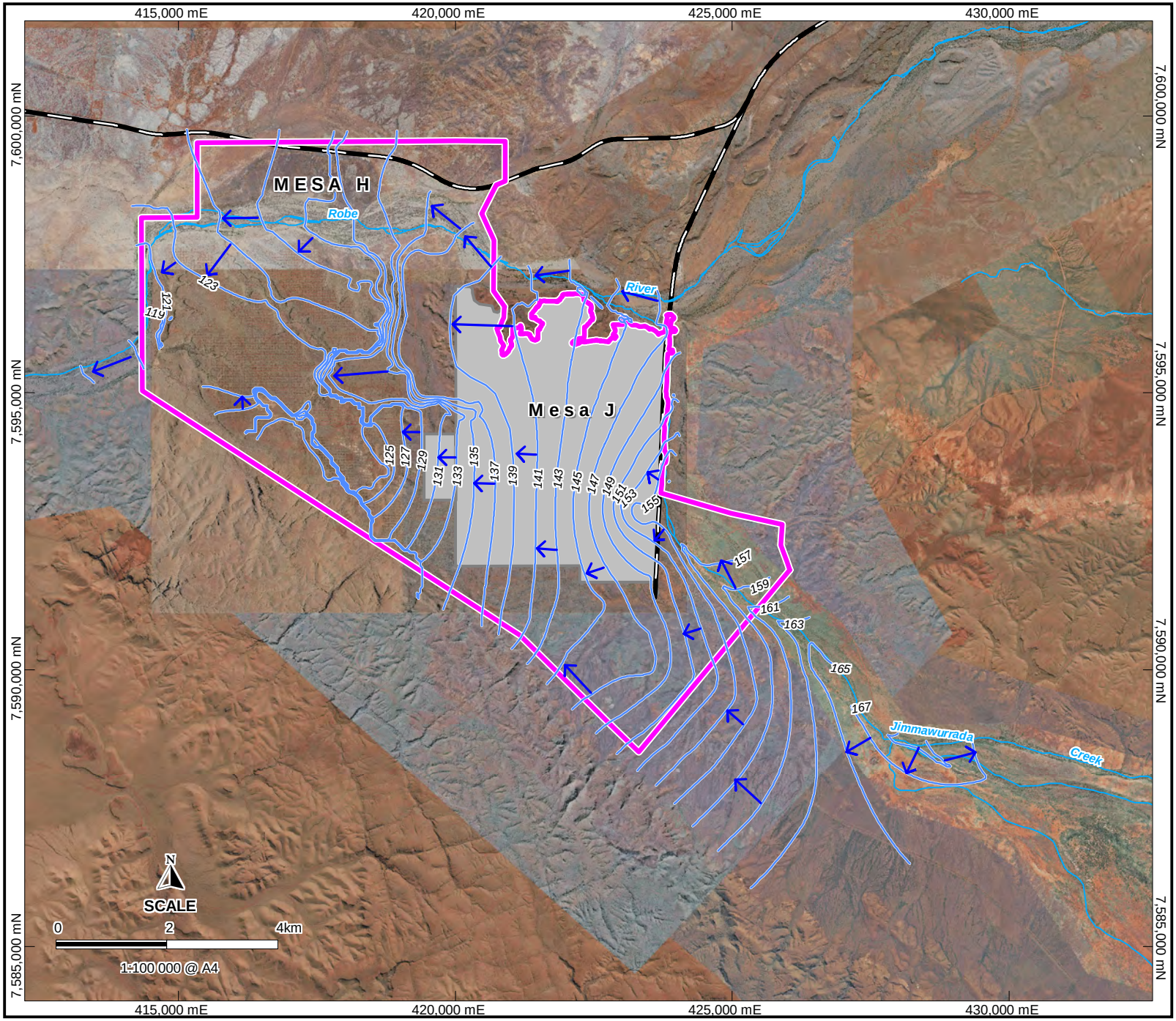
- Development Envelope
- Ministerial Statement 208
- Railway
- Major Watercourse
- 2030 Flow lines
- 2030 Drawdown contours

Rio Tinto

Iron Ore (WA)

Figure 7a. Modelled groundwater contours and the direction of groundwater flow at the peak of groundwater drawdown (2030)

Drawn: T.M
Date: September, 2019
Plan No: PDE0170527v2
Proj: MGA94 Zone50



LEGEND

- Development Envelope
- Ministerial Statement 208
- Railway
- Major Watercourse
- 2037 Flow lines
- 2037 Drawdown contours

Rio Tinto

Iron Ore (WA)

Figure 7b. Modelled groundwater contours and the direction of groundwater flow at the end of mining (2037)

Drawn: T.M
Date: September, 2019
Plan No: PDE0170527v2
Proj: MGA94 Zone50

Attachment 2: Predicted saturated alluvial aquifer habitat remaining under various groundwater drawdown scenarios

Attachment 3: Floerger AN 900 series Anionic polyacrylamide: Environmental Data

Attachment 4: Mesa H Geochemical Characterisation Technical Memorandum

Attachment 5: Mesa J Flocculant Concentration in Waste Fines Storage

Attachment 6: Mesa H Dust Dispersion Modelling