Attachment 1

Table 1 – Responses to comments from the Department of Water and Environmental Regulation

Item	EPA Services Comment on Response	Response/Action
Terrestrial Fauna		
Item 1	**Comments** The Proponent has not demonstrated that the significant fauna exclusion zone (SFEZ) is appropriate for mitigating impacts to significant fauna and significant fauna habitats. The RtS states that the SFEZ was based on survey data that is over 10 years old. The RtS also revises the fauna corridor usage to be relevant for 'predominantly' the northern quoll and Pilbara olive python. **Actions** • Demonstrate the appropriateness and mitigating effect of the proposed SFEZ. • Justify how the available survey data provides sufficient confidence that the SFEZ will mitigate impacts of the proposal to terrestrial fauna. • Demonstrate how the SFEZ will achieve the outcome of avoiding direct impacts and minimising indirect impacts to terrestrial fauna in the context of the 'fauna corridor' being primarily relevant to only two species. • The proponent should investigate formalising a fauna corridor to the north through a change into the development envelope, noting the disturbance footprint does not show any features immediately north of the SFEZ.	Refer to response to Item 1, Table 2-1, in RTS report. Additional contemporary fauna data from the SFEZ is unavailable. However, as described in Appendix N to the ERD, several records of the Pilbara olive python and Northern quoll have been recorded within the SFEZ, confirming that suitable habitat occurs in this area. A new 'Fauna Corridor Exclusion Zone' has been proposed to protect a corridor to the north of the SFEZ, extending to the edge of the Development Envelope (refer Figure 2-1 of RTS).
Item 2	Not addressed, refer to Item 1.	Refer to updated response to Item 2, Table 2-1, in RTS report.
Item 3	**Comments** A desktop review (Appendix E) has been provided that classifies the ghost bat roost caves to correspond with the current, recommended roost categories for the species (Bat Call WA 2021). Although classifying the ghost bat roost caves to correspond with the current roost categories is appropriate, use of a desktop review is not an accurate method for assigning the classification. Accurate classification of roosts should be based on adequate survey data: "*breeding activities, such as mating and/or the repeated presence of females either pregnant or with pups, should be used to confirm the roost cave's categorisation. Often, ongoing studies or monitoring may be required before Category 1 and 2 roosts can be confirmed; it can rarely be unequivocally*	The Bat Call WA 2022 (Appendix E) review took account of the previous survey findings and did not raise any concerns in relation to the classification of cave CMPC-03 as Category 3. Given the author is common between the 2022 review and the referenced 2021 paper, Atlas is confident in the new classification. No 'later studies' have been completed, with a baseline monitoring programme scheduled to commence in May 2023. Atlas has now committed to retaining cave CMPC-08 (refer to the

	confirmed by a single visit" (Bat Call WA 2021), and diurnal occupancy should be confirmed using thermal camera, infra-lit video or direct observation (Bat Call WA 2021). The survey report (Biologic 2021), as reviewed in Appendix E, does not appear to include these methods and survey was outside of the breeding period for the species and, therefore, the category of cave cannot be determined with certainty. The removal of cave CMPC-03 (Category 3) has been justified on the classification made in Appendix E, as this roost cave classification is not considered critical habitat (unless a supporting roost site in 'apartment blocks'). However, a high number of ghost bat scat was recorded at cave CMPC-03 (compared to other caves in the study area), that were estimated to be 6 to 12 months old at the time of survey (Biologic 2021, Table 5.2). Therefore, this cave may be more significant than determined by the review (Appendix E). The survey report states "*two of the more accessible caves that contained a high amount of ghost bat faecal material were sheeted to assist with later studies*" i.e. CMPC-03 and CMPC-10 (Biologic 2021, p.23). However, the results from the scat analysis results have not been provided. Cave CMPC-08 (Category 2) is also proposed to be removed (ERD, Section 12.9.3.1). Cave CMPC-08 was reviewed to be a Category 2 roost cave (Appendix E) and as quoted in the response: "with the exception of CMPC-08, the other roosts nominated for removal are not critical habitat …". This category of roost should also be assumed to be a maternity site, which is critical habitat for the ghost bat (Bat Call WA 2021). Avoiding impact to critical habitat roost caves (Categories 1 and 2, and apartment blocks that may also include Categories 3 roost caves) is current 'best practice' (Bat Call WA 2021), which is not reflected by the Proponent's mitigation commitments. **Actions** • Provide confirmation of survey methods used and/or justification of why surveys were not performed to confirm diurnal occupancy to support reclassification of caves that are to be disturbed (e.g., CMPC-03). Provide further evidence to support the reclassification of Cave CMPC-03 to a Category 3 roost, which may require additional targeted surveys and scat analysis. Appropriate mitigation (e.g. avoidance) and management should be considered where Cave CMP-03 is determined to be a higher level, more significant, roost.	revised SSMP). As stated above, the Bat Call WA 2022 (Appendix E) review took account of the previous survey findings and did not raise any concerns in relation to the classification of cave CMPC-03 as Category 3. Given the author is common between the 2022 review and the referenced 2021 paper, Atlas is confident in the new classification.
Item 4	**Comments** The cumulative assessment included in Appendix E is based on regional habitat extent rather than survey: "*Given that the landscape for over 20 km to the south, north and west of McPhee is of similar uplands and ridgelines it is expected, albeit without the benefit of surveys, that there are potential Cat 2 caves and numerous Cat 3 and Cat 4 caves, therefore any cumulative impact will be minimal*" (Appendix E, p. 3). This conclusion is not an appropriate basis for a cumulative impact assessment to the ghost bat as no evidence (e.g. survey) has been provided to demonstrate that the	Refer to updated response to Item 4, Table 2-1, in RTS report. Additional critical habitat caves outside of the Development Envelope have been identified and are presented in new Figure 2-2. As outlined in Appendix E and Appendix J to the RTS, bats displaced from the Development would be expected to readily travel to these adjacent roosts. The SSMP outlines the proposed monitoring at caves within and adjacent to the Development Envelope.

	cumulative impact will be 'minimal' and the assumption is made based on predicted habitat only. **Actions** A cumulative impact assessment should be provided, which considers: • the number of known roosts in the local and regional area; • the proportion of roosts that will be removed by the Proposal; and • the categories and connectivity of these roosts e.g. predicted movement and dispersal between roosts.	

Item 5	**Comments**
	The proposed buffers (50 m) are intended only for maintaining the structural integrity of the caves and are not proposed for mitigating impacts to ghost bat colonies or populations. Typical buffer/exclusion zones at established mining operations in the Pilbara have used 200 to 250 m radius around Category 1 and 2 ghost bat roost caves, with smaller (100 m) distances for isolated critical Category 3 roosts (Bat Call WA 2021).
	
	Although buffers have been proposed, it appears that there is an expectation that ghost bats will abandon the roost caves. Appendix E states "*it is expected that these impacts will cause the temporary abandonment of some or all of the roosts within or immediately adjacent to the Development Envelope (DE) while operations are underway. Further, recent evidence has shown that PGb [ghost bats] will recolonise roosts after mining operations cease as long as the caves remain in a viable condition*." (Appendix E, p. 2). The survival or movements of ghost bats disturbed by mining is not discussed and no 'recent evidence' has been provided to support these conclusions, particularly as the life of mine is estimated at around 15 years.
	
	Actions
	
	• Provide evidence to justify the 50 m buffers to maintain cave integrity, rather than a larger buffer to maintain the resident ghost bat populations at significant caves, as has been implemented at other proposals in the Pilbara.
	
	• Where bats are predicted to abandon caves, provide evidence to support the conclusion that ghost bats would return post mining. Evidence should include (but not limited to):
	
	  ○ Other studies or examples demonstrating survival and movements of ghost bats that relocate when disturbed by mining impacts.
	  ○ The location and category of the roost caves the ghost bats are proposed to relocate to during mining.
		Ghost bats have been observed to abandon roosts when disturbed by human visitation (Bat Call 2021). They have also been known to abandon caves due to nearby disturbances from construction and mining activities including blasting (Jolly 1987, in Bat Call WA 2021). Mining operations within a few hundred metres of a roost are likely to result in ghost bats temporarily abandoning the roost. However, ghost bats will recolonise roosts once the disturbance has ceased (Bat Call 2021, 2023). Bat Call (2021) notes various sizes of avoidance buffers have been applied at other mining operations, including 200 to 250 m buffers for human interference, and 100 to 500 m buffers for category 2 and 3 caves to ensure they remain viable as diurnal roosts following the end of mining.
		
		Although the updated buffers (refer item 2 in Table 4-1 in the RTS report), which more closely align with the stated 'typical' buffers at other sites, add separation distance between the roosts and mining operations (i.e. the sources of noise, vibration, dust and light impacts, there remains the potential for indirect impacts.
		
		Appendix E and Appendix J to the RTS report provide evidence for the successful movement, survival and recolonization of roost caves. Figure 2-2 in the RTS report identifies the critical habitat caves located adjacent to the Development Envelope.

	How successful recolonisation of the roost caves (impacted by the Proposal) by ghost bats will be confirmed including after mine closure.	
Item 7	**Comments** It is noted that the trigger and threshold criteria and associated actions for conservation significant bat species caves have been updated within revision 4 of the SSMP (provided to DCCEEW and DWER on 10 February 2023). The SSMP sets out a 50 m trigger criteria 'buffer' for all bat caves, and specific threshold criteria buffers ranging from 50 m to 282 m (e.g. CMPC-25). It is understood that ground disturbance is not intended to occur within the 50 m trigger criteria buffer area. In the event that ground disturbance does occur within this outer 50 m buffer, the only trigger action is to "*ensure the avoidance buffer around the cave is demarcated*". **Action** Given the understanding that the encroachment of ground disturbing activities within a cave's nominated threshold criteria buffer area may result in otherwise avoidable environmental impact, it is recommended that the trigger and threshold actions area reviewed and updated to improve the mitigation of potential impacts. For example, additional trigger actions should be adopted (e.g. identify cause of incident; undertaken further education and awareness training; cease clearing activities) prior to any threshold criteria being exceeded.	The trigger and threshold actions have been reviewed and updated to improve the mitigation of potential impacts to the nominated caves. An additional action, '*Review of clearing undertaken against the issued ground disturbance permit (GDPs) and discuss revisions to the GDP and/or additional control measures, with the GDP owner and machine operator(s), prior to any further clearing*', has been added. Refer to the updated SSMP at Appendix B of the RTS report.
Item 8	**Actions** • Provide evidence to support the assumption that displaced ghost bats excluded from a cave will be able to safely relocate to another cave roost (see also Item 5). • Provide a summary or report demonstrating the effectiveness of the 'displacement' methods and monitoring undertaken at the Proponent's Miralga Creek Project (MS 1154). • The Proponent should consult with the Department of Biodiversity, Conservation and Attractions in relation to impacts to ghost bats and any authorisations required to disturb fauna.	Refer to response to item 5 above. At Miralga Creek, cameras and ultrasonic recorders were placed in cave CMRC-15 to confirm the absence of bats prior to final closure of the cave. Following that a camera was placed in the cave to confirm no bat present within the cave. No bats were recorded to have entered the cave following closure. An authorization to take or disturb threatened species under Section 40 of the Biodiversity Conservation Act 2016 (TFA 2223-0074) was applied for, and received, from the Department of Biodiversity, Conservation and Attractions (DBCA), prior to the closure of cave CMRC-15. A similar authorization may be required for McPhee cave closures, and will be discussed with the DBCA.
Item 9	**Comments** The RtS clarifies that there are no mitigation measures provided for restricted SRE fauna in the TFMP (now the Significant Species Management Plan) and that the 'Provisional Mine Exclusion Zone' (PMEZ) "*will [be] in place until …Atlas is able to demonstrate the occurrence ofconnected troglofaunal habitat beyond the proposed mining areas*". The locations of Potential SRE species Olpiidae gen. nov. and	Additional DNA work has been undertaken on the SRE taxa. Euryolpium sp. indet. was sequenced and matched regional sequences from the Newman area at around 8% genetic dissimilarity (Biologic, 2022). It has been given the operational taxonomic unit (OTU) name of Euryolpium `sp. Biologic-PSEU064`. Hence this OTU is not restricted to the McPhee area (Biologic, 2022)

	Euryolpium sp. indet and their associated Breakaway/Cliff habitat coincides with the proposed PMEZ, offering only temporary protection to these taxa (Figure 2-1). Additional non-impact Breakaway/Cliff habitat is west of the PMEZ, but is separated by Gorge/Gully and Hillcrest/Hillslope habitat and it is unknown if Olpiidae gen. nov. and *Euryolpium* sp. indet. inhabits or disperses through these habitat types (Figure 2-1). The conclusion that the "*Proposal is not expected to significantly impact the potentially restricted taxa or a significant proportion of the available habitat*" is not accurate. The Response states that 36% of Breakaway/Cliff habitat will be retained in the DE, but the ERD does not specify whether this calculation includes the PMEZ (Table 8-10). It is assumed that the 'approximate loss' refers to the total potential clearing area exclusive of the PMEZ, which has implications for taxa restricted to this habitat type. In the scenario that the temporary PMEZ is removed, the Breakaway/Cliff habitat locations of these species will be cleared and there will be no similar connected habitat outside impact areas. The reduction of the Breakaway/Cliff habitat type by 64% may also have consequences for vertebrate and subterranean fauna. The pseudoscorpion Olpiidae gen. nov. is described as "*potentially a new olpiid genus, or at least has not been collected in the Pilbara previously*" (Appendix Q, Section 4.4). This is significant because a relatively large amount of SRE sampling has been undertaken in some regions of the Pilbara and it is uncommon to discover new genera of Olpiidae (Unpublished data, Western Australian Museum). See also Item 10. **Action** Similar mitigation applied for troglofauna including additional survey should be considered for the potentially restricted SRE taxa (particularly Olpiidae gen. nov. and Euryolpium sp. indet.) until further information on the taxonomy and distribution of species can be resolved.	Olpiid taxonomy can be problematic, with particular conflicts between morphological species designations and genetic results. While some parts of the Pilbara region (e.g. the Hamersley ranges) are well sampled, there are large sampling gaps throughout other parts of the region, including the local area surrounding the Development Envelope. The significance of the taxonomist's opinion of "potentially a new olpiid genus, or at least has not been collected in the Pilbara previously" should be understood in the context of these unresolved taxonomic issues and sampling gaps. The detection of an unresolved or unknown genus of Olpiidae is not necessarily as significant as has been inferred in the comment because of the poor state of olpiid taxonomy and the lack of local sampling in this area of the Pilbara region. While this specimen was subsampled for sequencing, its poor state did not amplify enough genetic material to for sequencing. As such, it remains as Olpiidae sp. indet. It has been suggested that the specimen could be submitted to the WA Museum for further work by the specialist pseudoscorpion taxonomist, Dr Mark Harvey. For terrestrial invertebrates (SREs), there has been no equivalent modelling (to that completed for troglofauna) that can demonstrate the connectivity of habitats and the likely movement pathways for invertebrates. Thus, there is no evidence to suggest that an exclusion zone would be effective. Notwithstanding, Atlas commits to broadening the purpose of the nominated PMEZ to provide additional protection of the potentially restricted SRE species Olpiidae sp. and Euryolpium sp. Indet, until such time that further information on the taxonomy and/or distribution of these species can be collected and it can be demonstrated that the loss of this habitat would be unlikely to significantly impact the persistence of these taxa.
Item 10	**Comments (actions imbedded)** a) The taxonomy of Olpiidae gen. nov. and *Euryolpium* sp. indet. should be resolved (see also Item 9). It is recommended that molecular analysis is conducted to compare these specimens against existing molecular data (e.g. Genbank) to confirm that Olpiidae gen. nov. is a new genus and determine whether it and *Euryolpium* may occur outside the DE. Alternatively, additional targeted survey to locate the species outside of the impact areas may be required to demonstrate that the impacts to these taxa can be adequately mitigated. *Indolpium* 'AES02's is only known from a single site in the impact footprint and is surrounded by proposed infrastructure (ERD, Figure 8-10). However, it is reasonable to infer that this taxon will not be significantly impacted because it was collected from the Undulating hills habitat type that extends	Please refer to item 9 above in relation to the taxonomy of Olpiidae gen. nov. and *Euryolpium* sp. indet. Indolpium AES02 was sequenced and given the OTU name Indolpium `sp. Biologic-PSEU117'. This OTU was sequenced from other specimens that were morphologically identified as Indolpium AES03. This specimen is no longer considered a singleton. Because both Indolpium 'AES02` and Indolpium AES03 were collected at site 20 in Undulating hills habitat and based on the molecular results of Indolpium AES03/ Indolpium `sp. Biologic-PSEU117,' they are likely to be one and the same OTU that occurs in a variety of habitats (N. Gunawardene, pers. Comm). Figure 8-10 in the ERD presents the records of all confirmed and

	to the north and east of the locality. It should be included in Figure (2-1). b) Revised maps and figures have not been provided in the RtS. Figure 2-1 has been provided that illustrates the locations of four Potential SRE species mentioned in the RtS, but the singletons, Genus '7/4' sp. nov. and *Indolpium* 'AES02', were not included. Figure 2-1 should be revised to include all Potential or Confirmed SRE taxa and the RtS should discuss all species that may be restricted to impact areas e.g. Genus '7/4' sp. nov. was collected from "*a sandstone ridgetop, which was mapped as covering 12% of the Study Area*" and "*a waste dump is proposed at this site, potentially affecting a considerable portion of habitat for this species*" (Appendix Q, p. 19). While the same habitat type (Undulating low hills) extends to the north and south, the locality will be fragmented because it will be surrounded by pits and infrastructure. Molecular analysis may provide additional information regarding the distribution of Genus '7/4' sp. nov. The RtS considers the loss of 64% of Breakaway/Cliff habitat to not be a significant impact to SREs. Two Potential SRE taxa have only been recorded from this habitat type. The location of the retained habitat relative to the SRE records is important i.e. similar connected habitat should be retained as it has not been demonstrated that the pseudoscorpions Olpiidae gen. nov. and *Euryolpium* sp. indet. will occur at other unimpacted Breakaway/Cliff habitat due to potential breaks in habitat connectivity (see ID 9 and ID 10a above). The taxa Paradoxosomatidae sp. indet. and Idiopidae sp. indet. are surrounded by waste dumps on three sides and only a short, narrow (< 1km x ~32m) band of connected Breakaway/Cliff habitat will remain to the north-east and south-west of the collection sites, and this habitat will be isolated by the waste dumps to the north, west and east. It is unknown if these species could persist in or disperse through the Undulating hills habitat type to the south-east. Based on the scale in Figure 2-1, less than 1km of connected Breakaway/Cliff habitat will remain. Clarification should be provided on the likelihood of these species persisting in or dispersing through the Undulating hills habitat type within the development envelope. d) Refer to Item 10c e) Refer to above items Not addressed. Provide further information to identify the SRE taxa recorded in the SFEZ or other protection areas.	potential SRE species. Figure 2-4 in the RTS has been updated to include records for Genus '7/4' sp. nov. and *Indolpium* 'AES02'. Genus '7/4' is also an olpiid pseudoscorpion and has been recorded from various parts of the Pilbara (Mount Webber, Area C, Port Hedland). It is unknown how many species occur in this genus and until further taxonomic work is carried out on olpiid pseudoscorpions, it is difficult to make any statement on the degree of short-range endemism that may occur in this genus. Based on distributions of other olpiid pseudoscorpions it is considered unlikely that this species will be restricted to this sandstone ridgetop however as many of the olpiid genera still require large taxonomic revisions, uncertainty on its dispersal range remains. One juvenile mygalomorph specimen was collected and morphologically identified as Idiopidae sp. indet, however sequencing has revealed it to be a Halonoproctidae spider and it has been designated to the OTU Conothele `sp. Biologic-ARAN053`. This sequence did not match any other publicly available sequences and remains as a Potential SRE species. Conothele species are generally short ranging in distribution and commonly follow drainage lines (Huey et al., 2019). However, this specimen was collected in Breakaway/Cliff habitat. Distribution information or dispersal ability information is not available for most mygalomorph species. It therefore cannot be stated how much or how little of this habitat is required to be maintained to ensure the longevity of these species. Under the current maximum extent of the proposed waste rock dump, a minimum of 0.9 ha of the Breakaway/Cliff habitat in this area will remain, with additional Gorge/Gully habitat (high suitability habitat) to the south east. Paradoxosomatidae sp. indet., was collected already dead and no DNA could be extracted from the exoskeleton. Based on desktop assessment, Antichiropus cunicularis (`DIP026`) was collected multiple times in a variety of habitats (sandstone ridgetop, gully, stony plain and drainage areas) in wet pitfall traps. Biologic concluded that it is highly likely that the specimen collected represents this species as no other Antichiropus occurs in the Nullagine area. However, as it has no internal tissue, no conclusion can be made as to its identity. Antichiropus cunicularis appears to be locally widespread occurring in Mcphee Creek and Corunna Downs (Car et al. 2019). Please refer to the item above in relation to the protection of the potentially restricted SRE species Olpiidae sp. and Euryolpium sp. Indet through the PMEZ.

Subterranean Fauna		
Item 14	**Comments** The RtS states that three taxa are "*singletons only known from indirect impact*" areas. An additional taxon appears to also only known from an indirect impact area, Chthoniidae `sp. Biologic-PSEU040`, but in an area designated for a road, which is unlikely to cause significant impacts to troglofauna species. The citation for the Mesa A and Mesa J proposals, Rio Tinto (2018), in reference to 'troglofauna continuing to use habitats below the proposed stockpile and waste dump', provided in the RtS is not included in the References (p. 88-89). The comments below are based on relevant publicly available documents. The Mesa A Hub ERD (Rio Tinto 2018) discusses that schizomid specimens had been recorded from available drill holes in the Mesa A pit floor (mined) but cautioned that 'further work is required to evaluate the diversity of troglofauna present in disturbed habitats and utilisation of those habitats by troglofauna.' Troglofauna have been collected from waste rock dumps at another Rio Tinto site, the Mesa K proposal. However, in the Mesa K example, there were no baseline studies undertaken to make comparison between the pre-mining (1996) and post-mining (2007) troglofauna records to determine whether the species collected in the waste dumps 'were collected from below or in waste dump' (see Biota 2007; Biota 2017). Although troglofauna were recorded from rehabilitated waste dumps at Mesa K, the report (Biota 2007) does not identify if the traps were set within the waste layers, indicating whether troglofauna occurred in the waste rock or in remnant habitat beneath the dump structure. **Action** Provide references listed below in the revised RtS to sources used as evidence of troglofauna using habitats below stockpiles and waste dump landforms. Biota (2007). *Mesa K remnant mining project troglobitic fauna survey*. Biota Environmental Sciences, Leederville. Biota (2017). *Mesas A and K Targeted Troglofauna Survey*. Biota Environmental Sciences, Leederville. Rio Tinto (2018). *Mesa A Hub Revised Proposal Environmental Review Document*. September 2018. Rio Tinto, Perth.	The statement about the lack of potential indirect impact to Chthoniidae `sp. Biologic-PSEU040 from construction of a road is consistent with advice received from specialist consultants (Biologic). Suitable habitat for this species occurs outside of direct impact areas (pits) and indirect impact areas (roads, waste dumps, and surface disturbance), and Biologic concluded that the level of risk to this species from the proposed development was low (Biologic 2021). References in the revised RTS have been updated as suggested. Due to the difficulties of sampling habitats within and beneath waste dumps (principally, the difficulties of drilling uncased holes within waste dumps while avoiding collapse), there have been very few studies investigating the effects on troglofauna habitat, or the ongoing persistence of troglofauna species, under waste dumps. Assessments of indirect impacts to troglofauna habitats are therefore often inferential, based on first principles, or lacking empirical data. The wording in the RTS has been updated in an attempt to clarify the argument, given this residual uncertainty.
Item 15	**Comments** The RtS states that an area of topsoil stockpile of approximately '2.2 ha has been	This 2.2 ha area is shown in Figure 2-6 of the RTS report, by the parts of the blue polygon identified in the legend as 'Indirect Impact (Topsoil)' not overlapped by the green polygons identified in the legend as

	avoided' and describes 'high suitability habitat ... connected to areas that extend outside the conceptual footprint'. The location of the 2.2 ha referred to is not specified, however, a portion of an 'avoided' area at the Avon West topsoil footprint (RtS, Figure 2-2) appears to coincide with the location of a 'potential' heritage site (see ERD, Figure 10-1), and although it includes troglofauna habitat, has not been designed specifically to protect subterranean fauna. **Action** Provide clarification on the location of the 2.2 ha of avoided habitat.	'Current indicative topsoil stockpile footprint'. Thus the size of the topsoil stockpiles footprint has been significantly reduced compared to the area presented in the Conceptual Footprint. Item 15 in Table 2-1 of the RTS report has been updated to include a reference to this figure.
Item 16	**Comment** Although the remaining stygofauna habitat in Main Range has not been quantified, the information provided in the response has adequately justified this approach. Based on the new Figure 2-7 provided in the RtS, only two stygobitic taxa, Enchytraeidae 'sp. McP.' (also known as 'sp. E13', Biologic 2021) and *Microcyclops varicans*, have been recorded from the groundwater drawdown area. Impacts to these taxa are not likely to be significant due to their widespread distributions (Biologic 2021, Table 5.3) **Action** None	None
Inland Waters		
Item 21	**Comment** Peer review by AQ2 (Appendix F) confirms the hydrogeological conceptualisation presented in the H3 report is consistent with other studies and recent testing. The groundwater model satisfies the requirements of Australian groundwater modelling guidelines and is suitable for hydrogeological impact assessment. However, it is noted that the proposal has changed since the peer review was undertaken and it is suggested the peer review is updated.	The GHD model has not changed since submission of the ERD. The purpose of the peer review was to critique the model against best practices according to the Australian Groundwater Modelling Guidelines and its fit-for-purpose, which has been established. The hydrogeological conceptualization that underpins the approach to GHD's groundwater model, and the groundwater modelling completed, was found to be fit for purpose and consistent with the Australian Groundwater Modelling Guidelines. The approach to the modelling has not changed and no updates to the peer review are required. Some updates to the dewatering estimates have been completed using the same modelling approach.
Item 22	**Comments** Information has been provided to describe the predicted changes to pools and catchments. Three pools within the disturbance footprint are not directly impacted, however inflows post mining will be reduced. It has been demonstrated the inflows will not be reduced sufficiently to prevent filling and flushing of pools on an annual basis. However, the RtS does not clearly identify the direct impacts of the project on pools within the disturbance footprint. The impact is not that three pools may be avoided,	The RTS has been updated, including an additional column in Table 2-4 indicating which pools are expected to be directly impacted. Atlas is confident that impacts to pools WMPC-01, WMPC-03, WMPC-22 and MCP-03-12 can be avoided. All occur within registered heritage sites and will not be directly impacted. Table 2-3 in the RTS demonstrates that following the impact to the catchments of WMPC-01, WMPC-03 and WMPC-22, sufficient surface

	the impact is that 12 of 15 pools within disturbance footprint will be directly impacted. **Action** • The predicted impacts from loss of persistent water features should be clearly identified. Furthermore, please clearly state the level of confidence in avoiding impacts to 3 of the 15 pools in the Indicative Footprint.	water inflows will remain to refill these pools multiple times a year. Appendix M of the updated RTS provides information pertaining to the locations of the pools and their water quality (Section 2.5.6, Section 2.6 and Figure 2.12), and describes the potential for impacts to the pools (Section 4.2).
Item 23 - 25	**Comments** The revised pool classification dataset does not address the comments in items 23 through 25. Biologic (2022a) refers to the following pools as 'permanent / semi-permanent': VMPC-78 (McPC3), WMPC-12 (McPC1), VMPC-83 (BMcPC3) and VMPC-84 (BMcPC2). Water was present during both wet season and dry season surveys, and dry season water quality indicates groundwater influence (Biologic 2022a). In the absence of additional data to support reclassifying pools as semi-permanent a precautionary approach should be applied and the pools classified as permanent pools. The revised dataset in the s43A response has changed the pool classification for some of these pools from permanent to semi- permanent (VMPC-78, VMPC-83). Pools WMPC-12 and VMPC- 84 remain semi-permanent, however should be reclassified as permanent. **Actions** Revise the dataset to classify pools identified by Biologic (2022a) as permanent / semi-permanent to permanent pools. The following amendments are required to pool classification Figure 2-8: • WMPC-01 shown as semi-permanent when classified by Biologic (2022a) as permanent. Correct classification shown in revised Table 2-4. • Permanent range pool WMPC-03 is not clearly shown on figure. • See also item 26 below.	The figure (now Figure 2-10) has been updated as requested. Text has been added against item 26 in Table 2-1 of the RTS report introducing the pool (and associated heritage site) MCP-03-12. Table 2-4 already classified WMPC-01 as permanent so no change was required. The status of VMPC-78, VMPC-83, VMPC-84 and WMPC-12 has been updated to match Figure 2-10.
Item 26	**Comment** Revised Fig 2-8 shows location of WMPC-29. However, Figure 2-8 does not show locations of Pools WMPC-04, -05, -20, or -22. It includes Pool MCP-03-12 which is not referenced elsewhere. It is difficult to ascertain which pool is which. **Action** Provide figures clearly showing the location of all pools.	The figure (now Figure 2-10) has been updated as requested.

Item 27	**Comments** New figure provided shows depth to groundwater in area of main range pools, and non-artesian conditions have been identified from measured water levels. The RtS has not addressed the hydrogeological understanding of the connectivity between the fractured rock aquifer and the alluvial aquifer, however it is noted that work to install and monitor bores has commenced (Item 28), the information from which should be included in revision of the Water Management Plan. **Action** Details of the proposed groundwater monitoring program should be incorporated into the revised Water Management Plan.	The WMP has been updated to include locations, monitoring frequency, analytes and purpose of the proposed monitoring bores. See also Atlas response to Item 40. Monitoring bore locations as shown in RTS Figure 2-14. Appendix M of the updated RTS addresses the hydrogeological understanding of connectivity between the fractured rock aquifer and the alluvial aquifer (Section 2.5).
Item 28	**Comment** Figure 2-10 is provided showing the conceptual baseline hydrogeological understanding. The proponent describes the predicted lack of connection between the MRD and Main Range pools due to the depth of groundwater. Main range pools are thought to be recharged by rainfall and surface water flows. There has been limited connectivity shown between the MRD aquifer and the basement aquifer. Any minor change in groundwater levels in the basement as a result of dewatering the MRD is not predicted to impact on pools and creeks. The connectivity between the alluvial aquifer hosting the downstream creeks and pools and the underlying basement is not well understood. The proponent has committed to the installation of a series of regional bores to investigate the connectivity. The location and timing of installation and proposed monitoring program is not identified. The primary source of alluvial aquifer recharge is thought to be rainfall and surface water flows. The proponent believes the alluvial aquifer is unlikely to be regularly saturated, however there is the presence of potentially permanent pools which may be fed by perched groundwater. **Action** Details of the proposed groundwater monitoring program (including locations and timing) should be included in the revised RtS.	Details of the proposed monitoring program have been added into the RTS under item 43 in Table 2-1. A new figure (Figure 2-15) has been added into the RTS.
Item 29	Refer to Item 25 and 26	
Item 30	Refer to Item 28	
Item 32	**Comments**	Prolonged soil inundation creates the potential for a decrease in flora

	Item 30 refers to hydrogeological conceptualisation and not creek discharge. It is noted that the proponent has submitted a revised mine plan, with reduced dewatering requirement, reduced the creek discharge and wetting fronts across the three creeks. As with original proposal the wetting front is likely to result in a transition from *E. victrix* dominated to *E. camaldulensis* dominated riparian community further upstream. **Action** Provide clarification regarding the potential for broader ecological consequences arising from the transition of riparian vegetation communities due to changes in soil inundation along the creek lines.	species diversity from hypoxic conditions around the roots (Argus et al. 2014) for species that rely on soil dissolved oxygen, or an increase in vegetation cover given certain riparian species' preference for permanent water e.g. sedges. Minimal impact to native avifauna and terrestrial vertebrate fauna is expected, as they will utilize the creekline vegetation in the same way regardless of which species of Eucalyptus is present, as long as tree cover or height is not drastically changed. Aquatic fauna, particularly frogs and native fish, may be favored by a spatial and/or temporal increase in inundation in the short term, though decline in these artificial conditions at the completion of dewatering would likely result in a return to baseline conditions and populations. An increase in water availability in the creeks may cause an increase in weeds (species and/or density). Livestock may also be attracted to the creeklines which would likely impact (reduce) vegetation condition due to grazing and trampling. Current vegetation condition along the discharge creeklines ranged from Good (within the Development Envelope) to Poor and Degraded further downstream (ERD Appendix L). Isolated sections recorded as in Very Good condition were also mapped (ERD Appendix L). Appendix M of the updated RTS describes the ecohydrological conditions and conceptual model (Section 3.1 and Section 3.2), with potential ecohydrological impacts summarised in Section 4.3.
Item 34	**Comment** Noted that further work (refer Item 28) and monitoring is proposed to determine the connectivity between the alluvial system and the underlying fractured rock aquifer.	No response required.
Item 36	**Comment** Noting that Mine Closure Plans (MCP) are required to be reviewed every three years over the life of a mine, the incorporation of post closure surface water quality monitoring into the MCPshould be reviewed periodically in the context of available data generated from monitoring as per the Water Management Plan. **Action** The continual review of water quality data and the consideration of post closure surface water quality monitoring should be reflected in the MCP.	Atlas has provided post-mining commitments to monitor surface water quality directly through monitoring of pool water quality, and indirectly through monitoring of riparian vegetation under the Water Management Plan. Dewater discharge will not be continuing post mining and as such, there is limited opportunity for other ongoing surface water monitoring due to the very intermittent nature and short duration of natural stream flows in the region. The ongoing review of monitoring data will occur as specified in the Water Management Plan (refer Section 4.2), with relevant considerations to be incorporated into the Mine Closure Plan as required.

		In accordance with DMIRS requirements, the Mine Closure plan will be reviewed and updated every three years and or with submission of a Mining Proposal. The purpose of these reviews, as identified in the DMIRS guidance document '*How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*', is to ensure ongoing review, development and continuous improvement throughout the life of mine to meet the DMIRS closure objective of the site being safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use without unacceptable liability to the State. The review and consideration of all environmental monitoring, including surface water quality, is inherent to this process and will be incorporated into the Mine Closure Plan as regulated by DMIRS under the *Mining Act 1978*.
Item 37	**Comment** Superseded by amendment to proposal.	Noted
Item 40	**Comment** Not adequately addressed. While the Water Management Plan (WMP) has been updated to identify proposed monitoring bore locations and groundwater dependent vegetation (GDV) monitoring locations, with both types being co-located in some areas, no reference bore locations are provided and GDV sites are not appropriate. Reference GDV sites are identified, with the WMP stating '*Reference sites supporting comparable vegetation assemblage outside of the area of impact will also be surveyed as a comparison against the impact monitoring sites'*. Review of Ecoscape vegetation mapping does not identify comparable GDV vegetation assemblages at the reference sites proposed in the WMP. Detail of reference sites should be provided. Proposed bore monitoring location do not include any bores located outside the DE with which to monitor changes climatic groundwater level response. **Action** • Identify appropriate reference GDV monitoring locations. • Identify appropriate bore monitoring locations outside of DE to provide reference. • Locating a groundwater bore adjacent to a reference GDV site.	There is minimal GDV mapped outside of the DE and/or area of potential impact that will not be influenced by dewatering discharge, therefore it is difficult to propose new or additional GDV monitoring locations. All proposed GDV monitoring sites have been ground-truthed prior to selection. GDV monitoring sites have been located towards the boundary of the Development Envelope, and further downstream, to provide data to support the assessment of actual impacts against predicted impacts. The reference sites are only required to identify any broader-scale impacts or changes, for example those associated with climatic conditions. An additional monitoring bore (MCP0241) is proposed adjacent to GDV monitoring site MCP-GDV-06.

Item 42	**Comment** The adaptive management approach should allow for the 2 m threshold criterion to be amended in future if monitoring data shows a different trigger is more appropriate. Refer also to Item 40.	Noted Section 4.2 of the WMP states that '*The WMP will be reviewed every 12 months and as required. All reviews will consider…..Threshold/trigger criteria and threshold/trigger level actions, and whether environmental outcomes and objectives are being achieved…..*'.
Item 43	Refer to Item 40	
Item 44	**Comment** Noted that the proponent has committed to install loggers for continuous groundwater level monitoring in Table 4. Note: Commitment is in Table 4 not Tables 3 and 5 of the updated WMP as stated in the RtS. **Action** Amend the table references as required in the revised RtS.	Reference updated in RTS.
Item 45	**Comment** Contingency actions have been included in WMP. The threshold contingency actions for environmental outcomes 1 and 4 appear to be arepetition of the trigger levels actions and involve 'developing actions to prevent a recurrence'. The WMP should be more pro-active in considering potential actions to prevent the environmental outcome not being met. **Action** Amend the threshold contingency actions for environmental outcomes 1 and 4 such that the contingency response is pro-active and ensures that environmental outcomes are achieved.	The threshold contingency actions in the WMP for Environmental Outcome No. 1 and No. 4 have been amended to provide additional clarity. The actions to be taken will need to be selected on a case by case basis, depending on the factors which have been deemed to have contribute to the triggers and/or threshold being exceeded.
Item 46	**Comment** The method of monitoring the wetting front has been updated to continuous monitoring at the locations of the predicted wetting extents. The threshold contingency actions appear to be a repetition of the trigger levels actions and involve 'developing actions to prevent a recurrence'. The WMP should be more pro-active in considering potential actions to prevent the environmental outcome not being met. **Action** Amend the threshold contingency actions such that the contingency response is pro-active and ensures that environmental outcomes are achieved.	Refer to response to item 45 above.

Item 47	**Comment** The environmental outcome has been amended. The WMP only requires water quality monitoring at the point of discharge. **Action** Please consider additional surface water quality monitoring locations downstream of the discharge locations to monitor changes to water quality from potential erosion and scour produced from a more regular flow in the creek lines.	Atlas has committed to monitoring surface water quality at the proposed discharge locations. In addition, Atlas commits to quarterly sampling at GDV sites MCP-GDV-L1, MCP-GDV-B1, and MCP-GDV-M3 if the creeks are flowing. Field parameters pH, EC and temperature will be measured at the time of sampling. Water samples will also be collected, to be analysed for the standard suite of analytes. Refer to proposed monitoring program in support of Environmental Outcome 2 (Table 4 in the WMP).
Item 48	**Comment** The WMP provides for baseline and biannual monitoring for an expanded suite of water quality indicators. However, no detail is provided in the WMP as to how the resultant water quality data will be used to monitor of the management target(s) are being met. **Action** The WMP should be updated to include detail on how the water quality data will be evaluated in the context of the management target(s), e.g. through default criteria, site-specific criteria and/or relative to baseline data.	The water quality data collected throughout the life of mine will be routinely assessed at the time of collection. In addition to this, the data is collated, analysed and summarised in the annual Compliance Assessment Report (CAR). This routine and ongoing process of data collection, assessment, analysis and reporting is how the water quality data will be used to monitor if the management targets are being met. In addition to the above, The WMP has been updated to include detail on how the water quality data will be evaluated in the context of the management targets. Data collected via the nominated sampling method and frequency will be compared to the nominated triggers and thresholds to determine the required response actions. Section 4.1 of the WMP has been updated to include the following: • All field and laboratory monitoring data required as part of this WMP will be collected and stored in a suitable database structure and reviewed on a quarterly basis. • Time-series monitoring data will be systematically evaluated and compared to baseline data and predictions on a quarterly basis to verify whether groundwater and surface water responses to operational activities are the same or similar to predictions. Appendix M of the updated RTS describes the existing baseline and proposed ongoing monitoring (Section 5), and the adaptive management approach of the WMP (Section 6).
Item 49	**Comment** The adaptive management approach should allow for the 2 m threshold criterion to be amended in future if monitoring data shows a different trigger is more appropriate.	Noted Section 4.2 of the WMP states that '*The WMP will be reviewed every 12 months and as required. All reviews will consider…..Threshold/trigger criteria and threshold/trigger level actions, and whether environmental outcomes and objectives are being achieved…..*'.

Item 50	**Comments** Adequately addressed. PAF material occurs mainly at the base of the Murray and Avon pits and is therefore likely to be mined out late in the mining schedule (pg 33 of Mine closure Plan 25/11/2021). Groundwater occurs at about 50 mbgl in the proposed areas for waste rock dumps and risk of AMD contamination from waste rock dumps is likely to be very low. **Actions** • To provide context, please provide justification for considering the groundwater not to be a sensitive receptor to seepage from landforms in the WMP. Please consult with the DWER North West Region in relation to groundwater monitoring locations for PAF management.	Waste rock dumps will be constructed in accordance with standard design practices to prevent leaching and migration of potential reactive material. Waste rock dumps only will receive potential PAF material late in the mine schedule allowing for significant buildup of volumes of benign material and cell construction prior to receiving any potential PAF. Groundwater is not considered a sensitive receptor due to the depth to groundwater and expected preferential flow of surface water runoff/landform seepage at the toe of the WRD at natural ground level.
Item 51	**Comment** Noted, refer also to comments at Item 40.	
Item 53	**Comments** The RtS acknowledges that areas of the creek lines may become completely inundated for months to years during peak discharge. However, the risk of loss of *E. victrix* and significant change to the EvApyCci vegetation community is considered 'low'. **Action** • Further information is required to substantiate the apparent low risk to *E. victrix* and the EvApyCci vegetation community, including a quantitative assessment of potentialimpacts where possible (e.g. spatial area/length that may be impacted). • Provide clarification on the monitoring that will be undertaken to assess impacts during operation and what management actions may be implemented in the event that unacceptable impacts occur.	Generally understood to be a facultative phreatophyte, Eucalyptus victrix may display root plasticity and other adaptations in response to its location and growing conditions (Batini 2009, Rio Tinto 2018) in its early growing stages. So, E. victrix that germinate and establish in a creek channel may be more tolerant of flooding than those that occur on adjacent, drier floodplains which would be more tolerant of drier conditions. In some areas (e.g. Karijini National Park) E. victrix woodland is known to tolerate several weeks of inundation (Batini 2009) however they are not tolerant of long-term flooding (Grierson 2010). In the worst case scenario as outlined in the WMP, impacts would be along 6.9 km in McPhee Creek, 6.8 km in branch of McPhee Creek and 4.4 km in Lionel Creek; a total of 18.1 km of riparian vegetation which may see some decline in E. victrix, changes in species assemblage and diversity, and potential changes in vegetation condition. However, due to the likelihood of decline in E. victrix numbers or of E. victrix health being patchy or localized, the potential impacts mentioned earlier are more likely to be in the order of 6.1 km in total (i.e. in line with the base case wetting front scenario). GDV monitoring parameters have been expanded to include number of mature trees, foliar cover (to measure leaf loss), tree seedling recruitment and seedling death, species assemblage and growth

		rate/DBH. Management actions are provided in the Water Management Plan. Post-operational rehabilitation of impacted areas will be governed by the Mine Closure Plan which will nominate completion criteria relevant to rehabilitation areas, including impacted creeklines. Appendix M of the updated RTS describes the ecohydrological conditions and conceptual model (Section 3.1 and Section 3.2), with potential ecohydrological impacts summarised in Section 4.3.
Offsets		
Item 59	**Comments**	
	The amended Residual Impact Significance Model (RISM) table does not include impacts to *Acacia aphanoclada* (P1) and *Rostellularia adscendens* var. *latifolia* (P3) that were identified in the ERD. Impacts to bat caves and surface water pools cannot be offset through the Pilbara Environmental Offset Fund. Based on currently available information, it is uncertain if there will be a significant residual impact to troglofauna. **Actions** • Review the impact to *Acacia aphanoclada* (P1) and *Rostellularia adscendens* var. *latifolia* (P3) and amend the RISM table as required. • Impacts to troglofauna should be included in the RISM table as they may require an offset.	The RISM within the RTS has been updated to include *Acacia aphanoclada* (P1) and *Rostellularia adscendens* var. *latifolia* (P3). Troglofauna were included in the original RISM, but a heading has been added to make the relevant paragraph clearer. No significant residual impacts are expected.

Table 2 – Responses to agency and public submissions

Item	EPA Services/Agency comment on response	Response/Action
General		
Item 4	**Comment** The RtS correctly identifies that if approval is granted for the proposal, conditions are likely to be applied that limit the extent of clearing of specific fauna habitat. It is noted that further refinements of the indicative disturbance footprint are ongoing. However, limited information is provided in the RtS to demonstrate the use of avoidance measures that have been applied over the course of the proposal being defined. **Action** Provide further information to address the content of Item 4, including a summary of the avoidance measures that have been applied to the proposal over time relevant to the five aspects listed in the comment: 1. Clearing of high value habitat 2. Impacts to pools 3. Dewatering, interruption to surface water catchments, discharge and hydrological changes 4. Bat caves 5. Aboriginal cultural heritage sites	The RTS has been updated to present a summary of the avoidance and minimization measures adopted through the development of the Proposal, Conceptual Footprint and proposed management measures (refer to updated response to item 4 in Table 3-1).
Flora and Vegetation		
Item 8	**Comment** The RtS notes that the proponent has committed to investigating the feasibility of creating alternative surface water features adjacent to pits to provide alternative water sources. The RtS also notes elsewhere that the final pit profile will include steep slopes, a hard substrate and no shallow area, making access more difficult and less attractive to fauna. Noting that 12 of 15 pools within the development envelope will be impacted, providing alternative water sources may be important to minimise impacts to terrestrial fauna.	The RTS has been updated to confirm that this commitment, made in relation to native fauna, is reflected in the Mine Closure Plan. A minimum of two surface water features will be developed, adjacent to the Main Range (to the east), to replace water features lost during mining and provide water for fauna use. The features will nominally target a depth of ~1 m (when full) to provide a persistent (permanent to

	Action Provide further detail regarding the potential nature and viability of creating alternative surface water features. Provide clarification on how this commitment will be formalised and amend supporting management plans as required (e.g. Water Management Plan, Mine Closure Plan).	semi-permanent) water resource, with at least one gently sloping bank to support safe fauna access. These features will be constructed from mined waste rock and will capture incidental rainfall and local surface water flows only. Long-term stability will be provided by the incorporation of erosion protection measures, supported by the establishment of vegetation during rehabilitation. These features will be developed late in the mine life to avoid attracting fauna into operational areas.
Subterranean Fauna		
Items 9 – 13, 15, 16	**Comment** The proponent's commitment in relation to mining of the eastern section of Crescent Moon only when, and if, it can be demonstrated that the troglofauna habitat of Crescent Moon occurs outside of the impact area is expected to be formalised through Ministerial Conditions, should the proposal be approved. Conditions are also expected to require further habitat modelling and sampling work, including within suitable habitat that will not be mined in the future.	Noted
Terrestrial Fauna		
Item 20	**Comment** The SSMP has been amended to include more proactive management targets relating to feral species. The management and monitoring actions are limited to within the development envelope, which excludes the SFEZ. Given the reported high fauna value of the SFEZ, and its effective encapsulation by the development envelope, proactive management and monitoring actions should be expanded to include the SFEZ. **Action** The SSMP should be amended to include management and monitoring actions within or related to the SFEZ to mitigate potential impacts to terrestrial fauna within the SFEZ and to enhance the ecological value of the SFEZ.	The SSMP has been updated.

Item 22	**Comment** The RtS acknowledges that the loss of high value habitat for Pilbara olive python and surface water pools has the potential to result in a long-term decrease in the size of the local population. This is recognised as a significant residual impact that will be subject to offset. The RtS does not address the characterisation of the high value habitat within the DE as a 'source population'and the long-term viability of potential 'sink populations' in the surrounding area. **Action** Provide an assessment of the potential impact to Pilbara olive python populations in the surrounding area, and their long-term viability, as a result of the loss of high value habitat and associated potential 'source populations' within the disturbance footprint.	Due to the amount of high value habitat within the Development Envelope, the Pilbara olive python population present is likely to represent one that would meet the criteria of a source population. However, this does not necessarily mean that the surrounding area supports or represents distinct 'sink populations'. The species occurs in habitats that are widespread in the area surrounding the Development Envelope, including major drainage lines, and rocky ranges, and which are also likely to support or represent source populations in their own right. This is exemplified by multiple Pilbara olive python records recorded in the creeks surrounding the Development Envelope (Biologic 2021). Furthermore, important habitats such as major drainage lines are long and linear and encourage movement through the landscape. Additionally, we also know that the Pilbara olive python is a species that persist well in disturbed and highly modified environments, such as those in and neighboring mine sites, including dams, turkeys nests, water discharge areas. For this reason, it is expected that impacts to the species will be restricted to within the Development Envelope, and that any neighboring populations will not be severely impacted.
Item 23	**Comment** The RtS has not addressed the comment relating to the alternative siting of infrastructure to avoid greater bilby habitat (i.e. siting infrastructure within spinifex stony plains instead of spinifex sandplains). **Action** Provide discussion on the consideration of alternatives and potential changes to the disturbance footprint to avoid loss of greater bilby habitat.	The Conceptual Footprint as presented within the Environmental Review Document intersected a total of 24.5 ha of Spinifex Sandplain habitat. Following further refinement of the Project design, the footprint (as presented in the Mining Proposal for 'Stage 1') has reduced in this area to a total of 12.1 ha. This footprint is required for the main site access road, which is spatially constrained by topography and heritage values. Atlas commits to an upper limit of direct disturbance to Spinifex Sandplain habitat of 12.1 ha. The RTS has been updated to formalize this commitment.
Item 28	**Comment** The RtS refers to issues raised in this item being addressed specifically in the ERD. **Action** For completeness and transparency, please identify relevant sections of the ERD discussing indirect impacts and provide a brief summary of the significance of these impacts to terrestrial fauna.	The RTS has been updated as requested.

Inland Waters		
Items 34 – 73 (DCCEEW)	Noting the changes to the proposal and the altered impacts to inland waters, items 34 – 73 originating from DCCEEW have been superseded. Please refer to and respond, using consistent numbering, to the DCCEEW comments at Attachment 2.	NA
Social Surroundings		
Item 74 and 75	The proponent's commitments in relation cultural heritage and engagement with traditional owners, including those set out in the RtS, should be reflected in the final Cultural Heritage Management Plan.	The Draft Aboriginal Cultural Heritage Management Plan (ACMPH), as provided In Confidence to the EPA in support of the environmental assessment of the Proposal, includes management recommendations and commitments to meeting all legislative requirements related to aboriginal cultural heritage, as per the Aboriginal Heritage Act 1972 and the Aboriginal Cultural Heritage Act 2021. Further, the ACHMP includes management strategies for highly significant sites (Walled Niche, Ngurrara sites, Engraving and Grinding sites, and Yintas) and areas of key cultural concern (i.e. water ways).
Other		
Item 76	**Comment** The RtS provides general information relating to offsets policy and the Pilbara Environmental Offsets Fund. However, the RtS does not address the aspect of the submission relating to the available information being sufficient to "*allow for definitive assessment of the scale and significance of potential direct, indirect and cumulative impacts on threatened fauna, particularly the two threatened bat species that would enable the extent of residual impacts to be confidently evaluated*". **Action** Please provide a response to the submission that: "*the ERD does not currently allow for definitive assessment of the scale and significance of potential direct, indirect and cumulative impacts on threatened fauna, particularly the two threatened bat species that would enable the extent of residual impacts to be confidently evaluated*".	The RTS has been updated to include additional discussion of the potential direct, indirect and cumulative impacts on threatened fauna.

Table 3 - Revised Inland Waters comments provided by DCCEEW (superseding previous Items 34 – 73)

Comment Number	Section/Page number/document	DCCEEW Comment	Response/Action
1.	**General Comment**	• The Department's previous review highlighted concerns relating to altered flow characteristics of the three creeks, McPhee Creek, Branch of McPhee Creek and Lionel Creek, large scale abstraction of groundwater within the development envelope and long-term legacy impacts with voids. • The Department notes that documentation has subsequently been updated including a change in the mine plan and a reduction in the discharge amount over the lifetime of the project.	Noted
2.	**Water Management Plan – general comments**	• The Water Management Plan (Atlas 2022) presents objective based provisions and management actions for the operational phases of the proposed project. The Department has considered the environmental outcomes, criteria, response actions and monitoring proposed in Table 4-5 (Atlas 2022, pp. 13, 14-18). The Department is of the view that the proposed outcome-based provisions are not useful without adequate baseline monitoring to inform the environmental criteria and responsive actions. It is unclear how the impacts to the creeks, groundwater, groundwater dependant ecosystems and aquatic ecology can be assessed without adequate baseline monitoring to inform trigger values (Paragraphs 16-17). The Department lacks confidence that the proposed management options presented in the Water Management Plan will achieve the environmental outcomes and objectives. • The Department notes that the current mine plan reduces the dewatering quantities (AQ2 2022b, p. 3). It is unclear if this new mine plan has been included in the Water Management Plan. Regardless of the reduction in dewatering volumes, given the fragility of the ecosystem, the dependence of riparian vegetation on alluvial groundwater, and the possibility that groundwater supports the permanent and semi-permanent pools in the proposed project area, the project will likely result in direct and	The updated mine plan has been included in the WMP. An analysis of additional baseline data from groundwater and surface water (pools) is provided in AQ2 (2023), forming Appendix M of the RTS report, which supports the nominated triggers and thresholds outlined in the WMP. See also response to EPA item 40 above. Atlas has committed to drilling and installing a network of monitoring bores to detect and track potential impacts including one additional reference monitoring bore (MCP0241) to be co-located with GDV reference site MCP-GDV-06 (See Figure 2-14 in the RTS report).

		indirect impacts (discussed further in Paragraphs below). • There are several points raised by the peer reviewer AQ2 (2022a) which capture key concerns. The Department notes that the review is from February 2022, and it is unclear if the review has considered the Water Management Plan in the current format. The Department in principle agrees with the points raised by AQ2 (2022a) in their review and some of these have been captured in the Paragraphs (but are not limited to) below. The Department notes that the McPhee Dewatering memo (AQ2 2022b) has also been authored by AQ2.	
3.	**Groundwater**	• The documentation states that the numerical groundwater model will be updated once the mine goes into operation (Atlas 2022, p. 12). The Department agrees that the model should be updated, with the update based • on the altered mine plan (AQ2 2022b, p.3) and undertaken prior to commencing of minor. The updated model should also incorporate more recent monitoring data (i.e. last two years). o The Department requires that the update of the groundwater model includes the feedback provided in the review undertaken by AQ2 (2022a). The findings and recommendations of the review undertaken by AQ2 (2022a) are relevant and appropriate and should also consider the points raised regarding the modelling for the dewatering and discharge rates (Paragraphs 7-8). • The proponent has outlined that the modelling suggests the expansion of the drawdown footprint will continue post mine closure until a new long-term equilibrium establishes and monitoring is therefore proposed beyond operations (Atlas 2022, p.11). Drawdown has been predicted to continue for 2500 years post closure, with bedrock drawdown predicted to stabilise within 1000 to 2000 years under current climatic conditions (GHD 2021a, p. iv and OWS 2022-074, Paragraph 4a). Furthermore, within the development envelope the model predicts drawdown in excess of 2 m in areas of groundwater dependant vegetation (GDV) (approximately 50.0 ha of vegetation) (Atlas 2022, p. 11). o The Department notes that the proponent intends to have trigger actions relating to GDV health (Atlas 2022, p.11) in conjunction with groundwater levels at a number of	Appendix M of the RTS (AQ2, 2023) provides a summary of the conceptual hydrogeology, eco-hydrology and surface water at McPhee. This summary is a consolidation of the current conceptual hydrogeological understanding and potential impacts and incorporates additional baseline data and expanded analysis. Appendix M is intended to address a range of comments and concerns highlighted by the department. Atlas commits to updating the groundwater model to incorporate additional baseline data and address the peer review feedback provided by AQ2 (AQ2, 2022a) once dewatering commences (the WMP already includes a commitment for the regular review and update of the plan as additional monitoring data becomes available). This adaptive management approach is also reiterated in RTS Appendix M. An update to the groundwater model, based on data available to date, will not produce a different result than the scenarios run to date. In order to improve the accuracy/reliability of the modelling predictions, data in response to larger scale, active aquifer stress (i.e. commencement of deposit scale dewatering) will need to be collected and calibrated against. Therefore, updates to the groundwater model are proposed once project dewatering has provided this data.

		monitoring locations. The trigger values will be set to where drawdown is greater than 2 m below seasonal baseline and a decline in the GDV health (to be noted in one monitoring period) (Atlas 2022, p. 11 and Table 4, p. 16). The proponent also intends to monitor the health of riparian vegetation (Atlas 2022, p. 11 and Table 4, p. 17), however, this will be limited to the dewatering discharge creek lines inside the development envelope (Atlas 2022, p. 11). i. The Department suggests that the proponent defines the difference between GDV and riparian vegetation. Please clarify how the two types of vegetation have been delineated. ii. The monitoring locations have not been provided and a 'decline in health' has not been defined. The Department suggests a map outlining the monitoring locations, pools, GDV, riparian vegetation, Groundwater Dependant Ecosystems (GDEs), discharge locations and wetting front be included. iii. It is unclear how the proponent defined trigger values without baseline monitoring being undertaken. The proponent has not undertaken shallow groundwater monitoring of the alluvial aquifers in and around the creeks in the development area and downstream including the wetting front extent (Paragraph 14ei-ii). The Department suggests seasonal baseline data be collected over a minimum of two years in these areas (Paragraph 16-17). • The proponent suggested a separate threshold for GDV within the development envelope (Atlas 2022, p. 11 and Table 4, p. 17). The Department notes that this threshold is unclear and suggests the proponent clarify what the threshold value is, how it is was determined (i.e. from what data) and how this will be monitored including the frequency of monitoring. o Given the predictions in the current groundwater model, the Department suggests that the proponent undertake shallow hydrological testing in the creeks (this was also	A map outlining the monitoring locations, pools, GDV, discharge locations is included in RTS Figure 2-14. The wetting fronts in relation to GDV are shown in RTS Figure 2-13. Conservative triggers and thresholds were chosen in relation to water levels, water quality and vegetation health. Ongoing baseline data collection will inform future updates to the WMP. Creekline vegetation accesses residual moisture held in the basement weathered zone and the overlying thin discontinuous alluvial material (refer to RTS Appendix M). Recharge to the alluvium and weathered zone occurs seasonally via surface water flows and direct rainfall. Enough moisture is stored in these areas between events to sustain the existing vegetation communities. Modelling suggests that residual drawdown at closure may occur, however given recharge occurs from the surface and not from regional movement of groundwater, any residual drawdown is unlikely to impact vegetation along the creek lines. Riparian vegetation has been defined as the terrestrial vegetation growing directly adjacent to or within ephemeral or permanent watercourses or waterholes, that comprises distinct plant assemblages present directly or indirectly due to the presence of the watercourse or waterhole. GDV is defined as vegetation communities that have occasional, seasonal or permanent dependence on groundwater for their maintenance. The terms 'Riparian vegetation' and 'GDV' are sometimes used interchangeably to describe the same vegetation, but not all riparian vegetation is groundwater dependent. The typical species present in the region, such as Northern Quoll, either do not drink free water and are

		noted in the review AQ2 (2022, p. 4)). This is critical for monitoring the dewatering impacts as a result of discharge, the wetting front, pools and the downstream main aquifer areas. Infiltration of excess water along the nominated creek lines has the potential to increase groundwater levels in areas under affected creeks. As the excess water disposal decreases, the creek systems will return to their pre-dewatering status, this will also lead to impacts on the riparian vegetation, i.e., back to an ephemeral environment. ○ Shallow groundwater monitoring bores along the creeks should be monitored monthly (for two years, Paragraphs 16-17) to assess the impacts of the excess water infiltration (GHD 2021, p. 158). The installation of the monitoring bores and analysis of the data will enable the proponent to gain a better understanding and conceptualisation of the site. ○ The shallow groundwater changes could impact the Significant Fauna Envelope (GDH 2021a, 2021). Lowering of water levels has the potential to influence vegetation communities that rely on groundwater. Groundwater drawdown may remove or deplete seasonally important water resources, without which some plants may be unable to survive prolonged dry periods. These GDEs may provide valuable habitat, including roosts and food, and refugia for bats, birds and marsupials, particularly during drier periods. Riparian vegetation can also mediate water quality via biofiltration and reduce erosion. • This monitoring data should also be used to inform the groundwater model and the estimated dewatering rates as well as inform the trigger values in the Water Management Plan. Furthermore, the data should be used to inform an ecohydrological conceptual model (Paragraph 19).	not reliant on GDV per se, or would be favoured in the short term by extended flooding (in the case of Pilbara Leaf-nosed Bat, Ghost Bat and Pilbara Olive Python).
4.	**Dewatering**	• The altered mine plan includes shallower pits, and some reduction in the extent of mining (in particular, the Murray Pit).	The dewatering assessment currently underway is not

		The proponent states that the changes to the mine plan will result in a reduction in the dewatering requirements for the Project (AQ2 2022b, p. 3). The water supply required for the proposed project has been estimated at 1.26 GL/year over the life of the mine (12 years - 2023 to 2034). This is a reduction from the previous estimated water demand of 2.0 GL/year. Over the life of the mine, the dewatering rate (which is referred to as the Base Case scenario) is predicted to exceed water supply requirements, with the annual disposal requirements to reach an annual average of 1.90 GL/year to 2.21 GL/year (AQ2 2022b, p. 9). o The Department notes that there is a further dewatering assessment (AQ2, 2022 in prep) being undertaken by AQ2. The Department suggests the updated document be provided for consideration once completed as changes in the dewatering and disposal will alter the wetting extent and potential alluvial groundwater levels in the creeks. This updated dewatering plan should also consider the updated groundwater model (as highlighted in Paragraph 5 and 5a). o The AQ2 (2022b) scope did not include the Crescent Moon deposit. Mining from this deposit is scheduled from Year 13 to 15 and the proponent has stated that dewatering and excess water discharge will not be required at Crescent Moon. The Department notes that the demand during mining at Crescent Moon is also estimated at 1.26 GL/yr (AQ2 2022b, p. 4). Crescent Moon should be included in future dewatering and site water balance calculations to provide a transparent assessment of the water demands of the site (refer to Paragraph 16-17). • The Department notes that the proponent has outlined contingency actions in relation to dewatering in the outcome-based provisions in the Water Management Plan (Atlas 2022, Table 4, p.14). However, the contingency action is only to vary the discharge between creeks by adjusting the dewatering plan. Please provide further details on the threshold contingency plan (Atlas 2022, Appendix C, Table 4, p. 14), including details on alternative options to manage the excess water from dewatering (AQ2	intended to re-define the possible impacts from implementation of the project. Rather it is work to assist Atlas in the execution of dewatering, including the development of scenarios using a mixture of existing and future dewatering bores to optimize the operation. Future updates to the site-wide water balance model will include Crescent Moon as required. Triggers and threshold values proposed in the WMP are adopted based on the requirements for ecosystem protection, not the dewatering rates and discharge volumes. The Threshold Contingency actions for dewatering discharge have been updated in Table 4 of the WMP as follows: Threshold contingency actions: • If exceedance is attributed to Proposal activities, communicate findings to relevant personnel. Response actions may include alterations to the dewatering strategy, including varying discharge between creeks or adjusting the mine dewatering plan to reduce the required dewatering volumes to reduce the wetting front(s) exceeding the threshold. Or, • Pause dewater discharge into creek with exceedance. • Vary discharge between creeks if possible. • Conduct impact assessment to determine effects of threshold exceedance and identify appropriate management response.

		2022, p. 9).	
5.	**Pools**	• The proponent has not adequality identified the surface water pools in the project area and there is still uncertainty regarding their groundwater dependence. The project will impact pools through changes in surface water flows (and water quality), with continuous discharge, as well as potentially through groundwater drawdown (Paragraphs 6-7). The Department notes that the proponent expects the groundwater drawdown within the development envelop to be counter balanced by the groundwater levels rising in the alluvial aquifer as a result of discharge (Atlas 2022, p. 9). ○ Please provide further ground truthing studies to determine if the surface water pools are groundwater dependant. ○ To provide further clarity of the project area and downstream catchments, please provide a map of the pools, GDV, riparian vegetation and GDEs in relation to the drawdown contours and wetting zones. ○ The pools should also be included in the ecohydrological conceptual model (Paragraph 19). • Depending on the extent and severity of the drawdown, the permanency of groundwater-fed pools may be affected. Permanent pools could become semi-permanent and dry for much of the year or may become intermittent (surface water fed only). These pools may provide valuable habitat and connectivity for aquatic biota and critical refugia during dryer periods. They may also support aquatic flora (macrophytes) which, if present, would provide important habitat and food for fauna. The loss of these pools, or alteration in permanency, would likely cause the abundance and diversity of aquatic biota in the area, including many invertebrates, to decline. o The lowering of groundwater levels from dewatering has the potential to influence pools should these be connected to the regional groundwater system. The Department notes that the proponent has not considered the influence of the alluvial/shallow groundwater system which could be providing	Please refer to EPA item 23 above. A new pools map (RTS Figure 2-10) and an updated table of pool classifications (RTS Table 2-4) have been provided in the RTS. The pools located near the deposit are not dependent on the groundwater present in the orebody aquifer which will be dewatered, the vertical separation between these water bodies is greater than 50 m. Pools located down gradient of the discharge wetting fronts are outside the extent of groundwater drawdown and therefore will not be impacted. Recharge to the pools occurs seasonally via direct rainfall and surface water runoff. For the downstream pools, enough residual moisture is retained in the thin alluvial cover and weathered zone of the bedrock to support the associated GDV and permanent pools where present. Because streamflow and recharge occur seasonally, potential impacts from drawdown are not likely to be observed. Refer to Appendix M of the RTS for a description of the pools and ecohydrological conceptual model.

		intermittent sources to the pools. • The proponent has only considered EC and pH in the Outcome Based Provisions trigger criterion for the pool water quality (Atlas 2022, Table 4, p. 17). This trigger relates to no significant contamination to surface water as a result of mining and associated activities. Please include the full suite of analytes, as outlined in Paragraph 15aii.	
6.	**Subterranean fauna assessment**	• Please undertake desktop studies and ground-truthing field survey to identify stygofauna within, and around, the project development area. The proposed project has the potential to significantly impact subterranean fauna (both stygofauna and troglofauna) through the excavation of mine pits, extraction of groundwater and the alteration of habitat (exposure of cavities, changes to air currents). Additionally, impacts could arise from degradation of habitat through water quality changes from increased acidity or leachates and impacts to alluvial aquifer fauna connected to the creeks due to surface water discharges (excess water wetting front).	A significant amount of survey work has been completed to characterize the subterranean fauna communities within the Development Envelope (refer ERD Figure 9-1, ERD Figure 9-2 and associated text in Section 9.3.1. Sampling of troglofaunal targeted high and medium perspectivity habitat. Impact assessment has been completed in relation to species impacts and habitat loss (direct and indirect). A low number of sparsely distributed stygofauna species were recorded across the Main Range and Avon West. The impact assessment considered both the effects of direct habitat loss (i.e. mining) and indirect impacts (including groundwater drawdown and contamination of habitat). Significant impacts from acidity, leachates and impacts within the alluvial aquifer are not expected, given appropriate PAF management, the pits acting as groundwater sinks, and the very limited drawdown within the alluvial aquifer (given the disconnect between the different aquifers).
7.	**Surface water** **Water balance model**	• The water balance model has not been provided in detail (Atlas 2022, pp 5 & 12); this model is critical. The lack of an updated and detailed water balance model does not provide confidence in the proponent's understanding of the site's operations. The water balance should consider the evaporation rates, net increase in storage of the modelled creek system, clarify the runoff simulation, the climate sequencing used (use of historical data) and the sensitivity on the model parameters used (as highlighted by AQ2 2022a, p. 7 and 18). Whilst The Department understands that site water balances do require refinements and changes throughout the design and implementation of the project site, the limited model presented only included worst case dewatering rates, and creek discharge rates (yearly estimates), it does not include the site	The water balance model will be updated within six months of the commencement of dewatering. Relevant changes to the water balance will be described as necessary in annual updates to the WMP.

		water demands.	
8.	**Surface water modelling**	• While The Department appreciates that flow events are not common in the project area, not having any baseline data for the surface water flows in McPhee Creek, Branch of McPhee Creek and Lionel Creek lowers confidence in the model predictions as it is essentially an uncalibrated model. Given the intent of the model refinements presented as part of the Water Management Plan (Atlas 2022), is to outline trigger criterion and trigger level actions to meet outcome-based provisions, confidence in the modelling predictions is critical. The surface water model review conducted by AQ2 (2022a) highlights valid concerns with the surface water modelling undertaken to this point. Please consider the points raised by AQ2 and revises the surface water assessment and modelling. Below The Department has highlighted some key points of concern relating to the surface water assessments and modelling provided. • The model refinements the proponent has presented (Atlas 2022 Appendix C) do not provide confidence in the characterisation of the creek discharge flows, furthermore it does not provide a clear understanding of the potential impacts, nor the current condition of the stream, creeks and pools located downstream of the proposed project. Please present modelling which considers an expanded range of flow events. This will provide greater confidence in the characterisation of creek discharge flows and the potential impact of the baseline scenario and worst-case scenario stream flows at pools downstream. • In the water balance applications, the proponent used rainfall data which was supplemented with SILO rainfall data. However, it is unclear as to how the SILO data was used in the surface water assessment (AQ2 2022a, p. 9). OWS suggests that the proponent should clarify the use of this SILO rainfall data in the assessment. • Please consider drawing on times-series data, for example, from Water Observations from Space (WOfS) to determine the presence and patterning of surface water more accurately in the	With the exception of a cyclonic event, which rarely reaches the McPhee Creek site, rain events are typically patchy and isolated. Flow events are therefore irregular and of short duration, making them difficult and impractical to successfully capture. Furthermore, attempts to measure flows in these environments are often thwarted by natural occurrences (e.g., sediments interfering with sensors during the flow event rendering the data unusable, damage to or unexpected movement of equipment from weather events and livestock, etc.). Due to the sparse nature and irregularity of rain events, this can often mean numerous wet seasons (years) are needed before any meaningful data is collected, with no guarantee of success. Baseline monitoring of flow rates in the proposed discharge creeks is therefore unlikely to be achieved to the standard required for model calibration purposes. Notwithstanding this, Atlas, Roy Hill and the associated consultant team are all keenly aware of the importance of confidence in all types of models. Considering the above, the surface water model was constructed using the available site-specific information that has been captured to date, as well as published, peer reviewed and widely accepted typical values for certain parameters that are relevant to the conditions present at the site. Reconstructing the surface water model is therefore not considered to be of any benefit to the proposal. SILO generates a daily rainfall record based on the available BoM sites. This daily rainfall is used to determine monthly and annual totals. These are the rainfall inputs typically used for the water balance. The surface water assessment of catchment runoff and streamflow uses the Intensity-Frequency-Duration rainfall depths generated by BoM for that location.

		project area over time.
		
		• The Department previously highlighted that the decrease in catchment area for McPhee Creek was predicted to be 1,348 ha, with a 40% reduction in runoff for the Branch of McPhee Creek and an overall 11% reduction at the confluence of McPhee Creek (OWS 2022-074, Paragraph 1ci). Changes in the catchment area, including any diversions or alterations to the drainage pathways and channels, are likely to impact on the downstream receiving environment through changes to the frequency, velocities and volumes of flow, and water quality. Please describe the anticipated changes to drainage pathways and model their impact on surface flow regimes.
		
		• The Department notes that the wetting front (excess groundwater discharge) may alter the amount of water available for the vegetation and fauna in the creek.
		  • The excess discharge into the creeks could elevate groundwater levels in the alluvium and creek subsurface. This increase in groundwater levels and continuous availability of water could lead to water logging, loss of riparian vegetation and recruitment issues. It could also cause the system to become adapted to water levels which will change again post-mining (no discharge).
		
		  • The proponent states that the wetting front will not impact the surface water receptors and will not result in substantial changes to flow regimes of McPhee Creek, Branch of McPhee Creek and Lionel Creek. The Department does not agree. Continual discharges will change the ephemeral systems to a more permanent flow regime and potentially impact the presence and water quality of the permanent and semi-permanent pools (Atlas 2022, Figure 2, p. 6).
		• The proponent has not adequately considered the downstream impacts to the creek catchment areas from dewatering (Atlas 2022, 9). Please consider the potential impacts (both direct and indirect) on the downstream area (AQ2 2022, p. 8).
			The current condition of the discharge creek lines has been thoroughly surveyed and characterised as part of an Ecohydrological Assessment (Appendix M of RtS).
			
			From experience at other sites in the Pilbara region, the WOfS platform does not adequately detect the presence of surface water. While this platform can detect larger bodies of water (e.g. flowing rivers), we have unfortunately found that it often fails to detect the majority of surface water pools of interest at this and other sites within the Pilbara.
			
			The 40% reduction in catchment area indicated by GHD (2021, p22) does not apply to the entire Branch of McPhee catchment. It only applies to sub-catchment MC3. The full catchment for the Branch of McPhee Creek will only be reduced by 11% (see Table 14, GHD 2021). For context, the size and location of each sub-catchment are illustrated on the Figures provided in Appendix A (GHD 2021).
			
			The justification for such a reduction being considered a "relatively minor impact" is provided in Table 20 and Table 24. These tables demonstrate that, even with the catchment reductions indicated, each pool is still predicted to receive a runoff volume that is at least 314 times greater than its capacity. The naturally occurring hydrological regimes associated with the pools will therefore be maintained.
			
			Consequently, the annual surface water runoff volumes flowing into and through the pools will continue to be significantly greater than the storage capacity of each pool. Thus, the pools will all continue to be naturally filled to overflowing and flushed on an annual basis, as currently occurs.
			
			Atlas agrees that the discharge of excess dewater into the creeks is likely to elevate groundwater levels within

			the alluvium and creek subsurface, and also likely to cause groundwater to exist in areas where it is not normally present. Atlas agrees that this may lead to water logging of riparian vegetation. Atlas agrees that there will be changes to the flow regimes of the creek lines, but that this will be limited to within the development envelope. These anticipated impacts, being within the development envelope, should therefore be considered as acceptable.
9.	**Discharge – water quality**	● The proponent has provided 'baseline' monitoring data for the pools, however, it is based on single grab samples (GHD 2022b, Table 1, p. 10). This data is not representative of the individual pools water quality or an adequate baseline data set, but rather only indicative of a single sample at that time. It is also unclear when the water was sample taken (i.e., was it pre- or post-streamflow events) and which pools the data refers to. ○ Regarding the data provided in Table 1 (GHD 2022b, Table 1, p. 10), the Department notes that the aluminium concentrations for the 'pools' located in the Branch of McPhee and Lionel Creek exceed ANZG guideline values for 95% species protection for aquatic ecosystems. Furthermore, arsenic, boron, chromium, copper, iron also showed slight exceedances above the 95% ANZG guideline values for species protection for aquatic ecosystems. i. The Department recommends further monitoring to obtain a suitable baseline, and analysis of the high concentrations, as well as consideration of the likelihood of seasonal influences and natural variabilities (evaporation, shallow groundwater inflow etc). ii. The baseline monitoring should also be used to develop water quality objectives for the receiving environment for discharges.	As discussed in the ERD (Section 6.3.7.2) the water quality in the downstream pools varied temporally (seasonally) and spatially. The water was generally basic (alkaline), brackish to saline and high in nutrients. The baseline data spans more than 'single grab samples'. ERD Section 6.5.2.2, including Table 6-9, provides a comparison of water quality between the groundwater (to be discharged) and the downstream pools. The groundwater is of high quality, with the pH similar to that recorded in the pools and low levels of dissolved metals and suspended solids. Slightly elevated concentrations of Boron and Iron were recorded in the groundwater, but also in the pools. The water quality is also discussed in Appendix M of the updated RTS. Atlas is continuing to collect baseline data. As additional baseline data is collected, updates to the triggers and thresholds, where appropriate, will be incorporated into future updates of the WMP. Data loggers will be located at each of the three discharge points, with wetting front loggers also located at two locations along each creekline (refer to Table 4 and Figure A1 of the WMP, and RTS Figure 2-14). Atlas agree to expand the allocation of trigger criteria to additional parameters (refer to the updated WMP).

		iii. The Department notes that the proponent intends to use surface water loggers for daily measurements at the nominated monitoring points, undertake periodic visual inspections and use remote sensing at other locations (Atlas 2022, p. 10). However, the locations of the monitoring points have not been provided. iv. The Management Plan (Atlas 2022, p. 15) outlines limited trigger criteria for the dewatering discharge. Please include a wider range of physicochemical parameters plus metals, metalloids and nutrients in the trigger criteria. v. The Department requires that the discharge water quality prior to being released should be tested to ensure that it is representative of the receiving environments water quality and within receiving environment trigger levels. vi. Discharge of water from the project could change the physical, chemical and biological characteristics of surface water. Species composition in the pools and creeks will change if biota are unable to survive or undergo critical life stages under the new conditions. Intergenerational impacts to species could take years to be noticed and disruptions to natural ecological processes could persist long after mine closure, causing continued decline in biological diversity (NSW Government, 2002).	Atlas are unable to assess the quality of the discharge until dewatering (and therefore discharge) commences. Until such time, the groundwater quality data from the proposed dewatering bores is considered to be an appropriate indicator of the discharge water quality. Please refer to the baseline water quality presented in Appendix M of the RtS. Appendix B of the WMP provides a table outlining baseline water quality data for selected analytes with comparison to ANZG values. Baseline data exceeds the 95% protection criteria for aquatic species, for a number of analytes. The 95% values are therefore not proposed as trigger or threshold criteria for these analytes. Atlas have not developed trigger and threshold values for impacts to downstream pools outside the development envelope as management provisions in the WMP prevent discharge from reaching these pools.
10.	**Baseline monitoring**	• Please undertake further baseline monitoring, provide the updated data sets and use this new data to update groundwater modelling (Paragraph 5) and surface water modelling (Paragraph 14). Adequate baseline dataset are essential for developing suitable trigger criteria for the Water Management Plan. Currently trigger levels relate to modelling which is at times based on worst case scenarios, potentially not establishing appropriate environmental criteria for the trigger levels to be set against. • The data collected from the expanded baseline monitoring	Atlas is continuing to collect baseline data. This data will be used for updates to the groundwater and surface water modelling and will inform future updates to the WMP. Further, all historical baseline monitoring data for surface water and groundwater is presented in AQ2 (2023) forming Appendix M to the RTS report. Trigger and threshold data have been selected based on baseline data, where available, in acknowledgement

		should be used to inform the groundwater and surface water modelling as well as inform the Water Management Plan Outcome Based Provisions (Atlas 2022, Table 4, pp. 14-18). •The monitoring program should include regular measurements of groundwater levels, i.e., monthly over two years. The monitoring program should also measure both pH and EC at the same time, as well as equip several the monitoring locations with loggers. Monitoring of groundwater should also include a broader range of physicochemical parameters, metals, metalloids and nutrients. The results should be compared with the ANZG Guidelines (2018) for 95% species protection for aquatic ecosystems. •The monitoring locations with the loggers should be placed in areas along the creeks where a more detailed understanding of the water level changes in response to the wetting front (excess discharge) and rainfall events is required. •Please undertake two years of baseline monitoring data for surface water monitoring, as outlined in Paragraphs 15a,i & ii. • Baseline monitoring should be undertaken prior to any mining activities commencing, including, site construction and landscape modifications or discharge of mine affected water (treated or not treated).	that the Default Guideline Values (DGV) referenced in with ANZECC & ARMCANZ (2000) have not been developed or based on typical water types of the Pilbara, but generically based on those occurring in "Tropical Australia" representing the regions, northern Queensland, the Northern Territory and north-west Western Australia collectively. The updated WMP provides trigger and threshold criteria for dewater discharge water quality (Table 4). Criteria were developed based on assessment of historical baseline groundwater chemistry from 2011 to 2023 (AQ2, 2023). The baseline data includes dry and wet season monitoring at downgradient pools. Baseline data are summarized in Appendix B of the WMP.
11.	**Further work**	• Please provide an updated surface water management plan which includes: ○ Details of the expected discharge quantities and management of excess groundwater through discharge including: i. updated information on the location of the discharge points, the calculated surface water discharge rates (daily/weekly) and frequency of discharge into McPhee Creek, Branch of McPhee Creek and Lionel Creek, and their timing; ii. if discharge is entering into a dry creek bed, consideration of erosion and resulting	Dewater discharge points will be constructed with erosion protection, including geotextile fabric and rock armour, to break up and slow the water flow and reduce the likelihood of erosion and sediment mobilization. Surface water drainage infrastructure will consist of minor earth works to control surface water pathways where intercepted by infrastructure, including the construction and/or installation of minor drains, culverts and sediment traps.

		mobilisation of sediments; iii. If discharges could lead to first-flush events transporting sediment and contaminants; iv. details on the proposed surface water infrastructure (i.e., diversion of the creeks, realignment of surface water pathways and discharge points); and v. the type of onsite water treatment, including details on the types of flocculants proposed. ○ A water quality assessment, which includes the monitoring of surface water up and downstream of the project development envelope, including downstream to the Nullagine River. • Impacts resulting from any mine affected water (MAW) used as dust suppression, resulting in the infiltration and lateral movement of contaminants contained in the MAW used, as well as contaminants being blown beyond the project area as the water evaporates. ○ seepage from the waste rock dumps, and if so, the proponent should provide further information on how seepage will be managed and mitigated – i.e., contaminates becoming mobilised and entering streams, creeks and groundwater. ○ An erosion and sediment management plan that outlines the potential impacts of erosion to surfaces, drainage paths and water within the project site from all activities (construction, production and rehabilitation) should be provided. Increased sedimentation from the project may contribute to increased turbidity that could impact downstream water quality and aquatic biota.	An assessment of surface water quality is provided in Appendix M of the RTS. This includes seasonal data from creeklines outside the development envelope and beyond the extent of modelled impacts. Water sourced for dust suppression comes from the dewatering system. Groundwater quality is described in Appendix M of the RTS. As this water is fresh, no impacts from dust suppression activities are anticipated. No deleterious seepage from the WRD is anticipated. WRDs are to be constructed in accordance with standard design practices to prevent leaching and migration of potential deleterious material.
12.	**Ecohydrological model**	• Please develop an ecohydrological model to conceptualise connections between groundwater, surface water and ecology within and around the project site. This should identify the potential pathways and mechanisms of the effects of altered surface flows (changes in flow from ephemeral to flowing as a result of the wetting	A conceptual ecohydrological model was developed by AQ2 based on non-intrusive field surveys within the proposed discharge creek lines (Figure 3.2 of summary hydro memo Appendix M of the RtS). The conceptual ecohydrological model identifies the connections between groundwater, surface water and ecology within the discharge creek lines. Based on this conceptual model, the potential for groundwater dependence is considered to be low along the upper reaches of the creek lines. Closer to the Nullagine

			River there may be some groundwater use, based on the tree densities and species observed. These areas occur beyond the limits of proposed discharge and drawdown impacts.
13.	**Post-mining impacts**	• Previous comments highlighted concerns relating to the remnant pit voids and long-term impacts which have not been addressed in the water management plan. Permanent pit lakes are predicted to develop in the Avon and Murray pits, and a semi-permanent pit lake to develop in the Ord Pit (AQ2 2022a, p.3). Both Avon and Murray pits are predicted to develop into groundwater sinks. Remnant workings and final voids can pose long-term risks to groundwater levels and quality resulting in potential long-term impacts, including reducing the water quality through interaction with groundwater and surface water systems, compromising ecological values. ○ If the voids remain open, please consider the associated risks to the environment from the development of poor water quality and it's potential to degrade groundwater quality. Please model the chemical evolution of pit lake water quality to determine if elevated concentrations of metals, metalloids, sulfate or a acidic pH will develop over time and consider the influence of localized and regional-scale drivers on these processes. i. The Department notes that AQ2 (2022a p. 6) highlighted that the predicted pit lake water levels have been identified as being impacted by rainfall run-off. AQ2 (2022a, p. 6) considered that the representation of the catchment run off is at the higher end of the range, potentially overpredicting the rate of runoff to the pit void lakes. The Department agrees with AQ2 (2022a) and suggest that the proponent reconsiders the simulated approaches of either 30% or 50% catchment rainfall as the rainfall inflow will influence the model predictions of the chemical evolution of the pit water. • The proponent has estimated the evaporation from the pit voids using two different rates, one for long- term pan evaporation and the another for shallow water table areas, the reasoning behind this is unclear and it should be explained in detail (AQ2 2022a, pp. 6-7).	As stated in the Mine Closure Plan (MCP), under assessment by DMIRS, the open pits will remain open after closure. The MCP states that '*non-acid forming (NAF) waste rock will initially be used as construction material for access roads, ramps, ROM, stockpile bases, drainage structures and safety bunds. The remainder will be stored in two above ground waste rock dumps or backfilled in pits*'. Thus a degree of backfilling of the pits may occur. The pits are expected to be groundwater sinks (i.e. groundwater will flow into and collect in the pits. The pits will store incident rainfall and surface water that enters the open pits will be left to evaporate. No transport of the collected water is expected outside of each pit, due to the aquitard (i.e. impermeable to water flows) shale layer that separates the orebody aquifer from the surrounding regional hydrogeological regime. The long term closure impacts are described in Appendix M of the updated RTS. The risk of poor pit water quality is specifically assessed within the MCP. Atlas will reduce access to the open pits and provide alternative water sources for fauna. The use of two different rates for evaporation is clearly explained in the H3 Hydrogeological Assessment (GHD 2021). Page 129 of the H3 report states that "Evaporation from a potential pit lake was represented using the EVT package. The EVT surface was set at the elevation of the pit base / wall for each column of cells within a void, and an extinction depth of 0.5 m

		○ These rates will influence the model predictions of the chemical evolution of the pit water. i. Mitigation plans should be developed that highlight how the final void/s will be managed, indicating if the proponent intends to leave the void open, or backfill with waste material.	adopted. The EVT rate was assigned at 2,655 mm/y, which corresponds to 80% of the average pan evaporation to account for shading and sheltering effects within the pit". Elsewhere in the model domain, evapotranspiration was considered in the range of 1,600 to 2,000 mm/yr based on BoM estimates.
14.	**Revised water model peer review, dewatering memo, surface water hydrology memo and discharge assessment memo**	• The Department in principle supports the recommendations provided by the peer review (AQ2 2022a). Noting however, this review is for the groundwater model and surface water model provided by GHD in 2021 and does not review the Water Management Plan. Please update the Water Management Plan once adequate baseline monitoring data has been collected and the proponent has considered the review undertaken by AQ2 to inform their modelling (as highlighted in the Paragraphs above).	The WMP provides for regular review and incorporation of monitoring data as follows: '*The WMP will be reviewed every 12 months and as required. All reviews will consider….Outcomes of monitoring programs*'. No changes to the WMP are deemed required to address this comment.

References

AQ2 2022a. McPhee Creek Peer Review of Groundwater, Surface Water and Water Balance Modelling for McPhee Creek. Appendix F. 7 February 2022. Document no. 012b. AQ2 2022b. McPhee Dewatering. Appendix G. 6 December 2022 Document no. 055d Atlas 2022. Water management Plan, McPhee creek Iron Ore Project. Appendix C.

GHD 2021a. McPhee Creek Iron Ore Project Water Management Studies: H3 Groundwater Report. GHD Pty Limited. Dated October 2021.

GDH 2022a. McPhee Iron Ore Project – Response to ERD Comments. Surface Water Hydrology. 12596259-HYD-MEM-001– Final. Appendix H. 9 December 2022. GDH 2022b. McPhee Iron Ore Project – Response to ERD Comments. Creek Discharge Assessment. 12596259-HYD-MEM-002 Final. Appendix I. 9 December 2022.

NSW Government 2002. *Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands - key threatening process listing*. NSW Scientific Committee - final determination. Available [online]: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-

species/nsw-threatened-species-scientific- committee/determinations/final- determinations/2000-2003/alteration-to-the-natural-flow-regimes-key-threatening- process-listing