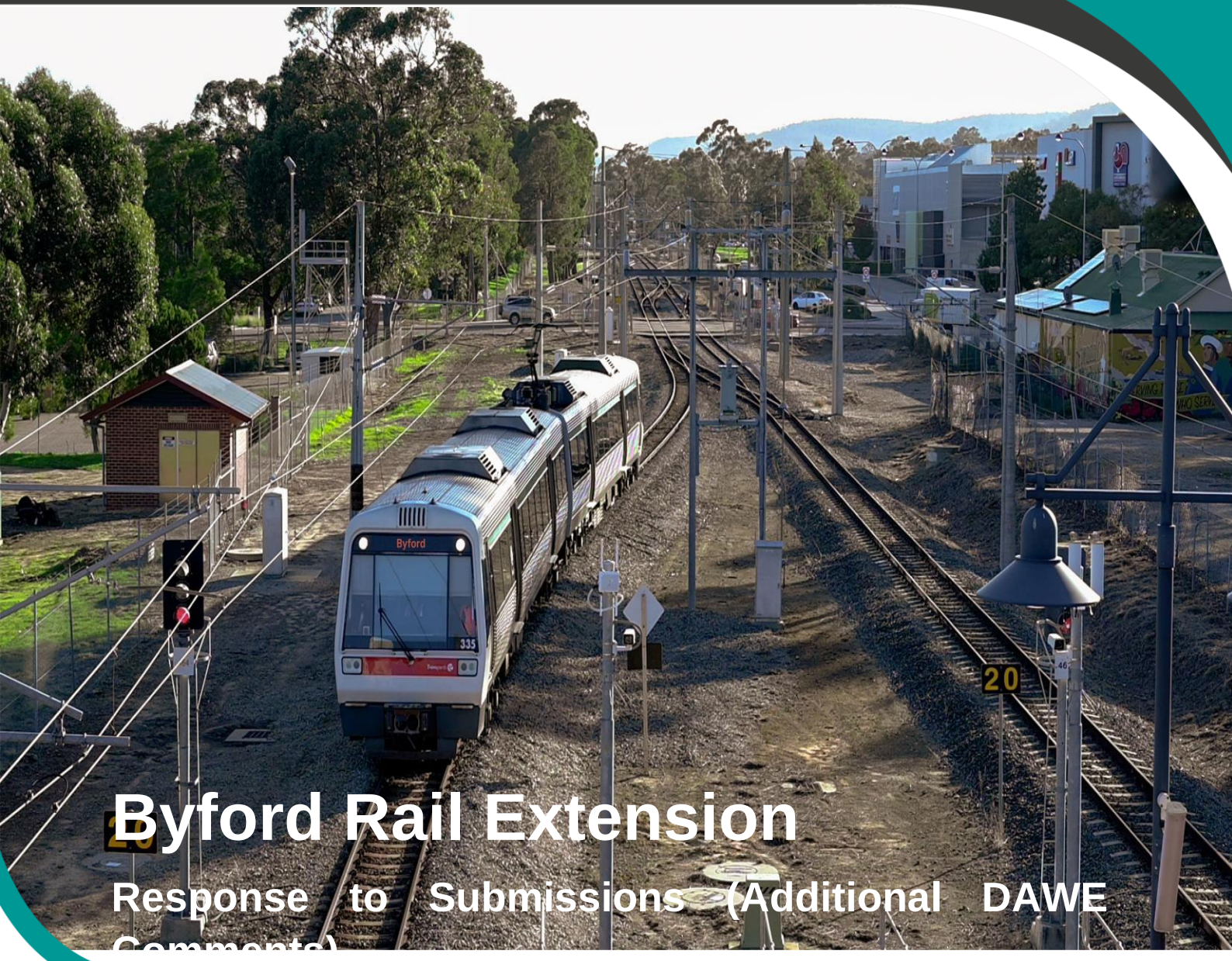
Public Transport Authority



Byford Rail Extension

Response to Submissions (Additional DAWE Comments)

DAWE - Further information requirements for Byford Rail Extension EPBC

No	Information required	PTA's response	Further DAWE Comment	Additional Response
Terrestrial Fauna				
1.	*Translocation* -	NA		
Inland Waters				
2.	*Groundwater Drawdown Modelling* i) The Department notes that preliminary investigations undertaken by the proponent show that groundwater drawdown will extend up to a 50 m radius from the dewatering area at Wungong Brook (Appendix K to ERD, p. 32). However, the modelling does not appear to have been provided within	Modelling that was undertaken is described in Section 11.3.1.2.1 Dewatering at Wungong Brook" The modelling that was undertaken used an analytical approach to characterise the rate of dewatering for each footing for a two-week period, and extent and magnitude of drawdown. This approach was undertaken to inform the ERD of the risk of drawdown on Wungong Brook and potential nearby groundwater users. An output from the model that was not included in Appendix K of the ERD is shown below (from the pers. comm. reference made on page 273) to illustrate how the model was setup, the result and how it relates to dewatering the local hydrogeological setting. The model assumes the water table starts 2.5m into the sand unit (light blue). The green line shows the amount the water table is expected to be drawn down by dewatering with distance away from the excavation.	It is unclear how a drawdown depth of 0 m at a 50 m radius was obtained. DAWE's Office of Water Science estimated the drawdown depth at a radius of 50 m for hydraulic conductivity values of 1 m/d and 10 m/d to be 0.5 m and 1.1 m, respectively, using the Theis Equation (see Attachment B). Please provide a detailed outline and justification of the equations and parameters used in the analytical model to demonstrate how they calculated the drawdown radius. A sensitivity analysis should also be included with the hydraulic conductivity calculations. This can be done by varying the parameters used in the analytical model. Sensitivity analyses should also be included for the watering rate, storage coefficient, duration of dewatering activities, etc.	Details on how the drawdown was calculated are provided in an attached document from Golder. A sensitivity analysis was not undertaken because of the high degree of conservatism included in the calculations. This conservatism included: • An assumption that construction would require dewatering to a depth of 2.5 m into Guildford Sand. As displayed on Figure 37 of the ERD, the pile caps are expected to extend just below the water table i.e., between 0 m (minimum groundwater level) to 1 m (maximum groundwater level). The amount of saturated Guildford Sand (beneath the water table) is

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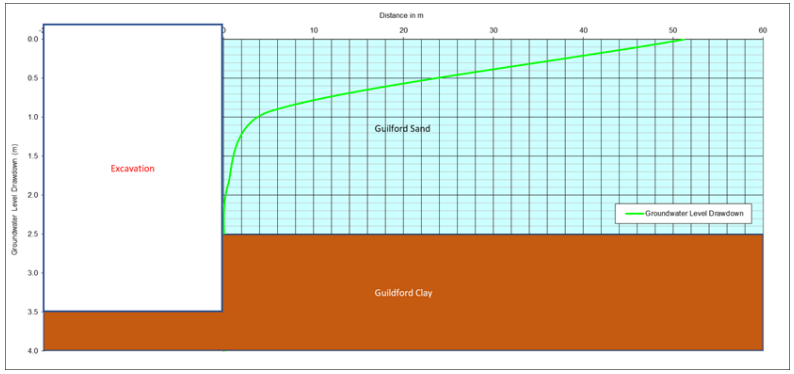
	the ERD documentation. ii) For greater certainty in predictions, groundwater modelling should be provided, including calibration results between observations and historical groundwater levels, a sensitivity analysis, and an uncertainty analysis.	 Temporary dewatering requirements for the project will be revised once detailed design has been completed and the construction requirements are further advanced.		expected to be between 0 m and about 0.5m. The assumed saturated thickness is at least five times higher than what is expected. • Golder tested the hydraulic conductivity of the Guildford Formation and derived a value of 0.03 m/d at MW01, and 0.2 m/d at MW02 and MW03. They concluded the focus of the dewatering was on the sand unit. The values in Golder's Table 5 were for these aquifers in the Perth region drawn from Davidson (1995), DoW (2008) and their professional experience in the Perth area. Their analysis adopted a hydraulic conductivity of 10 m/d, which is the upper end of the range. • The aquifer is of infinite extent. However, the Guildford Sand is not uniform and may only be saturated after recharge periods i.e., winter. If the sand aquifer is not extensive, drawdown will not propagate beyond its saturated limit. • They assumed there would be no recharge from

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				Wungong Brook during the dewatering period. • Their approach was worst case and did not include any form of mitigation e.g., infiltration of the abstracted groundwater.
		Risks relating to dewatering the alluvial sand at Wungong Brook are defined by the aquifer (thickness, extent, and permeability) and the depth and duration of dewatering. These constraints were assessed analytically (using a 2D model) rather than numerically (using a 3D model) because: • longer term seasonal fluctuations are not significant • transient changes in the rates and drawdown were not required to assess the risk. We only needed to know the worst-case condition. The modelled conditions assumed worst-case conditions: • The upper-most 2.5m of alluvial sand is fully saturated and overlies Guildford Formation clay of low permeability. The ERD (page 271) references dewatering 1m into the clay below the measured saturated thickness of 0.5m based on information from bore MW01. • Dewatering at the footing will drain the entire assumed 2.5m of sand aquifer for two weeks (for each footing). Dewatering 1m into the clay will be very localised because it has a very low permeability. • The aquifer is of uniform thickness and of infinite extent, meaning there are no constraints to how far drawdown can propagate. • No aquifer re-injection was applied. Re-injection of dewater would minimise the drawdown magnitude and extent. The site information indicates the saturated thickness is expected to be non-uniform i.e. becomes thinner away from the bridge site as illustrated on Figure 37. Depending on the time of the year, the alluvial sand where the footings are located is likely to be virtually dry. This means the aquifer	The bridge excavation depth of 3.5 m indicated in the response (Tab. 5, p. 48) does not match the depth indicated of up to 4.5 m in the bridge structure diagram provided in the ERD (Fig. 9). Please clarify the depth of excavation required for installing the bridge footings and ensure that this is incorporated into the dewatering modelling and consideration of Acid Sulfate Soils (ASS) mobilisation.	Figure 9 shows the expected depth of the pile caps below the final ground surface. However, figure 37 shows the expected depth the pile caps will extend below the water table and saturated thickness of the Guildford Sand unit that will require dewatering. This figure also shows the inferred water table during the wet (winter) and dry (summer) conditions. The pile caps are expected to extend between 0 m (minimum groundwater level) to 0.5 m (maximum groundwater level) below the clay unit of the Guildford Formation. The dewatering modelling assumed there is 2.5 m of saturated Guildford Formation sand to represent a conservative, worst-case scenario. As stated in Section 8.10.1, the PTA will undertake additional testing for ASS materials during the detailed design phase and

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		would typically be less saturated than assumed and of limited extent. Because these conditions were not known precisely, worst case conditions were used. Page 273 of the ERD explained the magnitude of drawdown at 40 to 50m from the proposed footings are less than about one-tenth (0.2m) of the normal water table seasonal fluctuation (2m). Because the dewatering rate, and extent and duration of the drawdown, even under worst case conditions, were small and localised, the risk to local GDEs and potential nearby groundwater users in the context of natural variability was considered to be very low.		that if they are present, they will be managed in accordance with the CEMP and DWER guidance.
3.	*Impacts on groundwater dependent ecosystems (GDEs)* i) The Department considers that the proponent has broadly identified, described, analysed, and assessed most impacts on groundwater quality and quantity that may potentially result from construction and operation activities. However, potential impacts of groundwater drawdown on GDEs require	***i). Potential impacts to groundwater dependent ecosystems*** PTA consider that the potential impacts to groundwater dependent ecosystems associated with the Proposal are minimal. Groundwater abstraction for construction and dust suppression are considered unlikely to result in impacts to groundwater dependent ecosystems as: - Groundwater abstraction will be temporary - Abstraction will be from the deeper Leederville and/or Yarragadee aquifers and not the shallow superficial aquifer which ecosystems are potentially accessing (to meet their water requirements) - Abstraction wells for construction water will be located at least 50 metres, and where possible 100 metres away from sensitive receptors further reducing the likelihood of groundwater drawdown impacts. Further discussion of the potential for impact and the degree of groundwater dependency of threatened ecological communities present within and adjoining the proposal area is provided below. ***ii). Groundwater dependency of TECs*** The assessment of groundwater dependency was based on the risk assessment for potential impact to groundwater dependent ecosystems developed by Froend et al (2004) for the Department of Water and Environmental Regulation as part of the assessment of potential impacts on GDEs on the Gnangara Mound on the Swan Coastal Plain. The methodology is consistent with the current methodology used by DWER	**Comments regarding points i) and ii):** Based on the drawdown values presented by the proponent, DAWE agrees that impacts to these TECs are likely to be minimal if abstraction bores are placed at least 50 m (and where possible 100 m) from their locations. However, the proponent should reassess the impacts to these TECs due to water abstraction if the revised analytical model (as per comment above) results in a drawdown radius that extends to the locations of these TECs. If that's the case, mitigation measures should be discussed and management measures, such as developing site-specific drawdown triggers, implemented.	**Response to comments regarding points i) and ii):** As discussed on Page 275 in the ERD, bores in the Guildford Formation typically do not yield groundwater at the rates required for construction. Accordingly, bores intersecting the deeper Yarragadee or Leederville aquifers will be required. In their risk assessment, Golder (Appendix K, Section 11) determined 50 m buffers were required to minimise drawdown impacts. The risk of drawdown reaching the water table from the deep aquifers is low because of the Guildford Formation clay that is present beneath the site. As discussed in ERD Section 8.7.2 and Section 5.2.1 in Appendix K, this clay separates

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	further consideration. ii) The Department notes that both the *Corymbia calophylla* - *Kingia australis* woodlands on heavy soils of the Swan Coastal Plain Threatened Ecological Community (SCP3a TEC) and the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (Banksia Woodlands TEC) are highly dependent on groundwater and therefore vulnerable to changes in groundwater levels. Any direct impact on these TECs would also likely be propagated to	for the assessment of the potential risk of impact from groundwater drawdown on dependent ecosystems. The risk assessment used the current depth to groundwater to provide an indication of potential groundwater dependence (of ecosystems). The risk assessment developed by Froend et al (2004) was based on the outcomes of studies into GDEs on the Swan Coastal Plain where the Proposal is situated. Much of the assessment of the response of groundwater dependent ecosystems to changes in groundwater levels on the Swan Coastal Plain is based on the long term changes of vegetation in wetland and Banksia Woodland communities and targeted eco-physiological investigations. The assertion (in the comment provided by DAWE) that Banksia Woodlands are highly groundwater dependent is only partially correct. The framework of Froend et al (2004) identifies that the greatest dependency on groundwater and sensitivity or risk of impact to groundwater dependent ecosystems (from changes in groundwater levels) occurs where current or pre-existing groundwater levels are shallow. On the Swan Coastal Plain where the Proposal is located the greatest risk occurs where current groundwater levels are 0-3m and 3-6 m below ground surface. The risk of potential impact and dependence of ecosystems on groundwater decreases with increasing depth to groundwater. Four categories (maximum depth to groundwater 0-3m, 3-6m, 6-10m and >10m below ground level) were developed based on the results of eco-physiological studies which demonstrated that the utilisation and dependence on groundwater by phreatophytic *Banksia* species decreased with increasing depth to groundwater (Zencich et al. 2002). Utilisation and dependence on groundwater varied with position in the landscape (and depth to groundwater) and season. *Banksia attenuata* occurring at sites where the depth to groundwater was deepest (30m) were not utilising groundwater to meet their water requirements and were utilising soil water (Zencich et al 2002). Similarly, dampland communities (TEC community SCP3a is an example of a dampland vegetation community) are considered by Froend et al (2004) as an example of ecosystems with proportional dependence on groundwater. The degree of groundwater dependence and risk of impact		the superficial aquifer from the deeper confined aquifers. There are two indicative construction water abstraction areas at Byford Station and Eleventh Road (Figure 1 below). The nearest TEC is 400m to the north of the proposed Byford Station (ERD Figure 14C and 14D, attached new map Figure 1). The risk of abstracting groundwater from the Yarragadee Aquifer impacting groundwater levels in the superficial aquifer at that distance is considered negligible. Figure 14B in the ERD (Figure 1 below) identifies an area at Eleventh Road that could be used to locate a water supply bore in the middle of the project area. This location was identified on the basis that it would be at least 50 m away from the TEC. As indicated in Figure 1 the water abstraction area is approximately 100m from the TEC remaining after clearing within the indicative project footprint.

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	Black Cockatoos, which rely on these vegetation communities for both foraging and breeding. *iii)* In particular, the Department is concerned that the groundwater level data collected since December 2020 may not be sufficient to reflect the natural	from changes in groundwater level is considered to decrease as depth to groundwater increases (Froend et al 2004). ***iii). Determination of depth to groundwater*** The ERD provides details of the current depth to groundwater. Groundwater levels for the BRE Proposal have been established using: • BRE groundwater level monitoring data. • Historical groundwater level data reported by Rockwater (1995) based on observations between measurements recorded in 1995 and 2020. • Groundwater level data from the DWER managed dataset. Further details of the investigation into groundwater are provided in Golder (2021). Groundwater levels (contours) for the Proposal Area and adjoining areas are shown in the ERD in figure 33. As stated above these		On pages 275 and 276 in the ERD, there is an explanation as to how the PTA will manage drawdown-related impacts, including the development of triggers and contingency measures in line with current DWER policies. This approach is commonly used for other METRONET rail projects in Perth.

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	variability of groundwater levels given these levels are estimated to be at their highest from September to October. The proponent's conclusion that the SCP3a TEC and wetland within Lambert Lane Nature Reserve have little dependency on groundwater, based on the fact that two bores in this location were dry in December and January, requires reassessment. iv) The Department supports the recommendation for further groundwater and surface water monitoring (Appendix L to ERD, p. 4), and considers that this should be	were developed taking into account recent and historical monitoring results. The conclusions drawn on the likely groundwater dependency of the ecosystems within Lambert Lane Nature Reserve are based on groundwater data from recent monitoring and the Golder (2021) report. The groundwater at the time of sampling (late 2020) was greater than 8 m for Lambert Lane and around 11-12 m below ground level for Fletcher Park. These groundwater depths are comparable with those derived from the groundwater contours and incorporate results from a larger dataset. The conclusion regarding likely groundwater dependency was based on the current depth to groundwater at 8 m below ground level and the inferred dependency of wetland ecosystems with a maximum depth to groundwater based on the categories described by Froend et al (2004). That is, in the 6-10 m category where risk of impact from changes in groundwater level is lower than for ecosystems where the maximum depth to groundwater is shallow (0-3 m below ground level). ***iv. Request for additional groundwater and surface water monitoring*** Groundwater and surface water characteristics within the BRE proposal area have been determined using data collected from the site as well as long-term datasets managed by the DWER. The long-term datasets provide insight into seasonal and temporal variations. As outlined in the ERD (p. 242), the three surface water monitoring locations established by PTA complement the existing network of eight sites monitored by the DWER. Regional groundwater data show seasonal fluctuations of between 1.5 m and 2.5 m with seasonal high groundwater levels occurring around October and seasonal low levels occurring around May. Davison (1995) reported that seasonal variation of around 3 m is not uncommon in clayey soils of the Guildford Formation near the Darling Scarp. Historical maximum groundwater levels for the BRE Proposal have been established using: • BRE groundwater level monitoring data.	**Comments regarding points iii) and iv):** The proponent asserts in their response that historical data collected by Rockwater (1995) was used to determine the maximum groundwater levels in the vicinity of the development. However, this process has not been outlined in the ERD nor in the attached appendices. It is unclear how the historical data from Rockwater or the DWER database has been used to estimate the maximum groundwater levels. DAWE notes that the ERD states that only the data collected by Golder since November 2020 was used to estimate the maximum groundwater levels. DAWE considers that data collected in the area prior to 2020 should be summarised in the ERD, alongside the recent data, to provide information on the temporal and seasonal variation of groundwater levels. This information can then be used to inform the assessment of the extent of groundwater dependency of the TECs identified in the vicinity of Wungong Brook. However, if historical data in the project vicinity is not available, the proponent should undertake further monitoring for at least two years prior to construction.	**Response to comments regarding points iii) and iv):** Section 5.2 in the Golder Report (ERD Appendix K) discussed the Rockwater data. They also refer to Rockwater in Section 8.1 when they are discussing the use of the Rockwater data while developing maximum groundwater levels (MGLs) for the site. Historical data used to support the development of the MGLs are shown on Figure 12 in the Golder report (Appendix K). Current data from two of Rockwater's bores are also shown on Figure 12 as well as Table 7, Table 8, and Appendix B. The ERD references these data on Page 252. The MGL data are included in Table 44 of the ERD and presented on Figure 33. Page 19 in the Golder report references the use of the Rockwater bore data as follows: "*Historical groundwater level data reported by Rockwater (1995) based on observed comparisons between measurements in SED05 and SES17 in 1995 and 2020*." And:

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	undertaken for at least two years prior to commencing construction in order to capture the seasonal and temporal variation, and to confirm the extent of groundwater dependence in Fletcher Park, Lambert Lane Nature Reserve and Wungong Brook. v) The Department also considers that the proponent should undertake an isotope study (e.g. as described in Doody *et al.* 2019[1], p. 35), or use other methods, to confirm the level of groundwater dependence within these areas.	• Historical groundwater level data reported by Rockwater (1995) based on observations between measurements recorded in 1995 and 2020. • Groundwater level data from the DWER managed dataset. The PTA will continue to monitor groundwater and surface water in the BRE proposal area prior to the commencement of construction. The continued monitoring will build upon the data collected to date. This data will inform detailed project design and establish a comprehensive baseline data set for water quality and groundwater level information specific to the project area. ***v. Request for additional studies*** Given the likely low level of risk of impact and information available from other sources, isotopic sampling is not considered necessary and may not be suitable in this situation. Isotopic sampling relies on differences in fractionation of naturally occurring isotopes in water. Samples are taken from potential water sources and samples from vegetation are 'matched' against potential water sources based on isotopic signature. The technique doesn't always work well for shallow unconfined aquifers where evaporation (directly from aquifer through capillary rise) results in fractionation of groundwater and a similar isotopic signature to surface and soil water. PTA consider that given the short-term nature of groundwater use and commitment to locate abstraction bores at least 50 metres, and where possible 100 metres away from sensitive receptors (note potential groundwater abstraction locations are provided in Figure 35 and 36 of the ERD), which will further mitigate the potential impact from drawdown additional studies are not warranted.		"*Given that there was a reasonable similarity between the 1995 and 2020 measured groundwater level measurements in SES17 and SED05 (within around 1 m), the estimated maximum groundwater levels in the Rockwater wells were utilised as secondary guide points for the groundwater level contouring*." There is no mapped TEC in the vicinity of Wungong Brook, which is the location of the proposed short-term dewatering. As demonstrated on the ERD Maps 14B and 14C within the ERD, the proximity of water abstraction locations to the TEC is greater than 100m. An additional map has been prepared for this response to demonstrate this. The TEC is more than 400m from Wungong Brook (Figure 1 below). PTA will continue to monitor groundwater in the project area during the project construction phase.
			Comments regarding point v): DAWE agrees that results of isotopic studies may be inconclusive if vegetation in GDEs are utilising water that solely contains shallow	**Response to comments regarding point v):** Dewatering for the construction of the proposal is only proposed to occur at Wungong

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			water isotopic signatures. However, vegetation may be utilising deeper groundwater, which would have a distinct isotopic signature, and such studies would enable this to be identified. If the drawdown radius is likely to extend further and intersect with potential GDEs, it would be prudent to further investigate to what extent these ecosystems use groundwater so that, should impacts occur, the likely cause is easier to identify.	Brook, to facilitate the removal of the existing pylon. This dewatering will be from the shallow aquifer and as such use of isotope analysis is not considered applicable. As stated in Section 6.4.9 Terrestrial and Aquatic Groundwater Dependent Ecosystems, the FCT3a TEC has been identified as being a terrestrial GDE, reliant on sub-surface groundwater. PTA does not propose to abstract water for construction use from within 50 to 100 m of these areas of TEC, as shown in Figure 14 of the ERD and Figure 1 provided with this response. Given the setback from the TEC, and the natural seasonal fluctuations in groundwater in the area, the risk to the TEC of the water abstraction is low. Management measures including monitoring of water levels and vegetation condition will ensure the TEC is not impacted by dewatering activities. Management measures that the PTA has committed to are provided on Page 276 in the ERD. Isotope analysis is unlikely to be a relevant methodology in terms of determining the required

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				management and mitigation at this site. As part of standard operating procedure as required under abstraction licencing, PTA will conduct water level monitoring during abstraction. In addition to this, photo and condition monitoring will be conducted within the patches of TEC adjacent to the Development Envelope.
4.	*Surface Waters*	NA		
		NA		
5.	*Wetlands*	NA		
6.	*Acid Sulfate Soils (ASS)* i) The Department notes that some areas of the development envelope, particularly near surface water features, are considered by the proponent to be at a low to medium risk of ASS to a depth of 3 m (Appendix K to ERD, p. 12). Furthermore, samples collected in the	Most of the BRE project area is mapped as 'no known risk of ASS occurring'. Areas mapped as 'low to moderate risk of ASS occurring within 3 m of the natural surface' are associated with surface water features. A preliminary ASS assessment was conducted by Golder (2020) as part of the groundwater monitoring well installation. The assessment involved ASS testing (field and laboratory analysis) at selected locations. The results from the assessment confirmed ASS at three test locations: monitoring well (MW) 01 near Wungong Brook – at 4m depth, MW 03 near Byron Road at 1.5m depth and MW 04 south of Lambert Lane at 1.5m, 4.5m and 5m depths). The potential to disturb ASS materials during construction is limited to the following activities: • Dewatering to temporarily lower groundwater levels; • Abstracting groundwater for use during construction; and • Direct excavation of ASS materials. The above potential disturbance pathways are discussed below. **Dewatering**	The proponent states that, in the development envelope, ASS generally occur below groundwater levels. However, this conflicts with the findings of Golder who states that ASS were detected above the groundwater table (App. K to ERD, p. 25). ASS were detected at 1.5 m depth (MW 03 near Byron Road) and at 1.5m, 4.5m and 5m depths (MW 04 south of Lambert Lane). Given that exact excavation depths throughout the project area have not been provided in the ERD (except for Wungong Creek), DAWE is concerned that ASS could be mobilised during construction.	There is minimal excavation planned for the construction of the Proposal. The only planned excavation is for the installation of foundations at the Wungong Brook bridge and the Armadale and Byford stations. The remainder of the alignment is to be constructed on fill. The potential to impact ASS will be further evaluated at detailed design which will permit more targeted investigation if required. ASS is managed in accordance with industry recognised DWER processes and guidelines and as such, the risk of mobilisation of ASS is considered extremely low.

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	development envelope confirmed the presence of ASS in three locations in the upper 5 m of soil. ii) The Department considers that mobilisation of ASS materials will detrimentally effect GDEs and aquatic ecosystems in the area. For example, the Banksia Woodlands TEC may be susceptible to death or decline due to increased acidity and soluble aluminium concentrations. iii) While the proponent states that they will manage any ASS material in accordance with CEMP and DWER	Agonis (2021) consider that dewatering is required at the Wungong Brook crossing for the construction of the single span rail and PSP bridges. The preliminary design for the bridges requires a temporary lowering of groundwater up to 1.5 m from the maximum groundwater level. This depth has been estimated assuming that excavations for the bridge pile caps will be 0.5 m below maximum groundwater level. A 1 m lowering of the groundwater level beneath the excavation is needed to achieve adequate compaction. This will result in the temporary and localised reduction in groundwater levels of 1.5 m at this location. Once detailed design for the rail and PSP bridges has been completed, the above assumptions will be re-visited to determine if additional ASS investigations at this location is required. If a further investigation is needed, this will be conducted in accordance with the DWER's guidelines *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015). If the site investigations confirm that ASS material will be disturbed at this location, the PTA or its contractor will prepare and implement an ASS Management Plan outlining the approach to handling and treatment of ASS materials and dewatering effluent. Management and monitoring will be conducted in accordance with DWER guidelines *Treatment and management of soils and water in acid sulfate soil landscapes* (DER, 2015). Conventional construction ASS management methods will be applied and may include staging of disturbance to minimise the time that ASS are exposed to the atmosphere, bunding to collect runoff during earthworks, stockpile management for excavated soils, monitoring, and treatment of soils with the appropriate amount of neutralising material to counter the soils actual and potential acidity. Monitoring of dewatering effluent will be conducted in accordance with DWER guidelines. Neutralising will be completed where results indicate that treatment is required. Monitoring of dewatering effluent before and after treatment will be completed. Groundwater monitoring will also be conducted in accordance with DWER guidelines during and after the completion of dewatering activities to assess the impacts of dewatering on groundwater. Implementing the above approach will reduce the risk of adverse impacts to groundwater and surface water quality at Wungong Brook and therefore	The proponent's plan to revisit their assumptions regarding ASS and to conduct additional investigations at Wungong Brook is imperative. The subsequent preparation and implementation of management and monitoring plans as per the DWER guidelines are likely to be necessary to ensure there are no negative impacts to GDEs and aquatic ecosystems	Given this and the proximity of any proposed dewatering activities to MNES, the risk of ASS impacting MNES is considered low.

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	guidelines, the impacts of this material potentially entering surface water or groundwater, including impacts on GDEs and aquatic ecosystems, have not been specified in the ERD. Additionally, specific management methods have not been described. The Department considers that these should be provided.	reduce the risk of causing a significant impact on Carter's Freshwater mussel. Based on the current concept design, dewatering is not required at any other locations. This assumption will be reviewed during the detailed design phase. **Groundwater Abstraction** Temporary abstraction of groundwater will be required to supply water for dust suppression and for ground compaction during construction. Two general locations for abstraction bores are proposed, these are in the vicinity of Eleventh Road and Byford Station. Subject to approvals under the *Rights in Water and Irrigation Act 1914*, groundwater will be abstracted from deeper semi-confined and confined aquifers (i.e. the Leederville or Yarragadee). Abstraction from these aquifers will not impact upon groundwater levels in the superficial aquifer and therefore do not represent a risk to disturbing ASS at these locations. The superficial aquifer is not a viable source of groundwater due to the low permeability of the superficial formation which will only yield low volumes of groundwater. **Excavation** ASS, where present, generally occurs at depths below groundwater. Therefore, the risk of exposing or disturbing ASS during excavation is restricted to those locations where excavation will occur at or below groundwater. The BRE has been designed to minimise the need for the excavation and removal of large amounts of material where possible. The railway will mostly be at existing ground level or raised using imported fill with limited cut below existing ground level. The extent of cut will be relatively minor after topsoil stripping and stockpiling. The depth to groundwater varies along the Development Envelope. However, it is generally below the proposed excavation depths. Therefore, there is minimal risk of encountering ASS material during excavation. Excavation below the maximum groundwater level may be required near Wungong Brook for the construction of the pile caps for the rail and PSP bridges. The management of ASS at Wungong Brook has been outlined above under dewatering.		

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		Conclusion Based on the above information, the risk of disturbing ASS during construction is predominantly contained to the Wungong Brook crossing. This risk will be closely managed during construction. The risk at other locations is considered low, as there is no requirement for dewatering and planned excavation is limited to surficial soils. The potential to disturb ASS during construction will be revisited by PTA during detailed design. Where necessary, additional field investigations will be conducted and if required, an ASS and Dewatering Management Plan will be prepared in accordance with DWER guidelines. ASS and dewatering are routinely managed during major construction projects without causing adverse impacts to the environment.		
7.	*Water contamination/chemical alteration* i) Three sites overlapping the development envelope have been identified as "possibly contaminated" and one site is awaiting classification (Appendix K to the ERD, p. 24). The proponent has stated that they will undertake appropriate measures if contaminated	**i. Management of Potentially Contaminated Materials** Specific mitigation measures cannot be provided at this stage, as management strategies will be specific to the type and extent of contamination (if present) and the construction requirements of the final design for the BRE. Contamination risk is being investigated and managed in accordance with the requirements of the *Contaminated Sites Act 2003* and DWER guidelines. This involves a series of sequential steps that commences with a Preliminary Site Investigation (PSI) to identify areas of potential concern, followed by a Sampling and Quality Analysis Plan (SAQP) to outline a sampling and analysis regime for areas of potential concern. The SAQP is implemented and the results reported in a Detailed Site Investigation, and where required, a remediation action plan is prepared to outline the steps required to remediate areas of contamination within the context of the BRE proposal. The sequential investigation and reporting process outlined above accounts for the potential risks to sensitive receptors including human health and the environment. Possible impacts to matters of national environmental significance are included within the definition of environment.	DAWE agrees that groundwater contamination is most likely to come from the superficial aquifer associated with dewatering at Wungong Brook. While noting that the closest contaminated site is approximately 1-1.5 km from Wungong Brook, more detailed modelling of the drawdown radius should help to confirm that contaminated groundwater from this site will not mobilised.	The dewatering at Wungong Brook will occur more than 1-1.5 km away from the nearest contaminated site. As stated in previous responses, the drawdown cone is not anticipated to extend more than about 50 m from the location of dewatering. Given the small extent of drawdown and the short duration of dewatering at Wungong Brook, dewatering will not cause the mobilisation of contaminants from the contaminated site.

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	material needs to be disturbed in one of these areas. The Department requests the proponent provide details about these specific mitigation measures in the ERD. ii) Although the proponent states that these areas are unlikely to be disturbed during construction, the Department considers that contaminated groundwater could be mobilised during abstraction or dewatering. iii) The Department therefore considers that the proponent should undertake a detailed model for abstraction and dewatering to ensure that	The PTA will require the appointed contractor to prepare a Construction Environmental Management Plan (CEMP). CEMPs for METRONET projects under construction have included measures to manage unexpected finds encountered during construction. **ii. Mobilisation of Contaminated Groundwater (Dewatering Abstraction)** The ERD outlines three locations where dewatering or groundwater abstraction may occur. These include: • Wungong Brook rail/PSP bridges (dewatering); • Eleventh Road (groundwater abstraction for construction water); • Byford Station (groundwater abstraction for construction water). The above sites are not located near the potentially contaminated sites referenced in Appendix K of the ERD. Therefore, there is no risk of mobilising potentially contaminated groundwater. Groundwater contamination, if present, would be found within the superficial aquifer (i.e. the shallowest groundwater aquifer). Dewatering is most likely to occur near Wungong Brook. Monitoring of water quality has not recorded evidence of contamination at this location. Groundwater abstraction for construction water will be sourced from deeper confined aquifers (Leederville or Yarragadee Aquifers) near Eleventh Road and Byford Station. As these aquifers are confined there is minimal risk of the potentially contaminated sites impacting the groundwater within these aquifers. **iii. Detailed Groundwater Modelling** Construction water will be sourced from deep semi-confined and confined aquifers (Leederville and Yarragadee Aquifers), not from the shallow groundwater system (i.e. the superficial aquifer). Matters of national environmental significance (such as threatened ecological communities, Carter's Freshwater Mussel, etc.) do not access or rely upon groundwater within these deeper aquifers. They are more likely to access groundwater from the shallow superficial aquifer, surface water features or direct rainfall. Therefore, abstraction of groundwater from the deeper aquifers will not impact on matters of national environmental significance.		

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	potentially contaminated groundwater is not mobilised, and identify how the impact of any mobilisation would be mitigated. iv) The proponent notes that groundwater abstracted at Wungong Brook bridge may be re-injected via shallow re-injection bores or an infiltration basin downstream from the site (ERD, p. 273). The Department notes that elevated concentrations of nitrate and nitrite were identified in groundwater at Wungong Brook bridge but not in surface water (ERD, Table 45). Infiltration of	Agonis (2021) determined that temporary dewatering would only be required at the Wungong Brook during the construction of the footings for the rail and PSP bridges. A temporary lowering of groundwater by up to 1.5 m from the maximum groundwater levels has been predicted. Assuming a dewatering rate of 5 litres/second and accounting for the soil properties at this location, it is predicted that groundwater drawdown will be in the range of 0.2 m at 50 m from the dewatering location. The predicted lowering of groundwater levels will be temporary for the duration of the bridge footing construction and represents approximately one-tenth of the seasonal groundwater variation. The required dewatering is not expected to have a significant impact upon matters of national environmental significance. As outlined in the ERD, the PTA will translocate Carter's freshwater mussel from this location and undertake monitoring of groundwater and surface water. The DWER is responsible for administering dewatering licences. The PTA or its contractor will obtain approval to conduct dewatering in accordance with the *RIWI Act 1914*. If required, groundwater modelling will be completed for this process, once detailed design for the bridges has been completed. **iv. Wungong Brook Groundwater Abstraction** The ERD indicates that dewatering effluent associated with the construction of the rail and PSP bridges will be either re-infiltrated nearby to the shallow aquifer, or used as a source of construction water. It appears that the submitter has interpreted that dewatering effluent will be discharged to the surface water. The PTA confirms that this is not the proposed method of disposal. The PTA will ensure that dewatering effluent is infiltrated to groundwater via re-injection bores or infiltration basins. This method commonly used in construction projects and is a preferred method of disposal as it returns water to the shallow aquifer (i.e. from where it was abstracted). As explained in the ERD, at various times of the year, groundwater from the superficial aquifer discharges to the Wungong Brook. The fact that nitrate and nitrite levels are lower in the surface water of Wungong Brook,		

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	abstracted groundwater could result in elevated concentrations of nitrate and nitrite in surface water if the groundwater is left to infiltrate through a basin. This could in turn impact EPBC listed species and communities. Therefore, the proponent should specify how this will be monitored and managed.	is likely attributable to the artificial release of water from Wungong Dam, further upstream which impacts on surface water quality in the Brook. To minimise the risk of adversely impacting Carter's freshwater mussel at this location, PTA will translocate individuals to nearby areas with suitable habitat.		

1. Attachments