



Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L6168/1991/11
Licence Holder	BHP Iron Ore Pty Ltd
ACN	008 700 981
File Number	DER2013/001190-1
Premises	Yandi (Marillana Creek) Iron Ore Mine Mining Tenements M270SA, G47/12, G47/13, G47/14, G47/15, G47/16, G47/17, G47/18 and G47/19 NEWMAN WA 6753
Date of Report	23 October 2024 (FINAL)
Decision	Revised licence granted

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1. Decision summary

Licence L6168/1991/11 is held by BHP Iron Ore Pty Ltd (BHP) (Licence Holder) for the Yandi (Marillana Creek) Iron Ore Mine (Yandi) (the Premises), located within Mining Lease M270SA and General Purpose Leases G47/12, G47/13, G47/14, G47/15, G47/16, G47/17, G47/18, G47/19, Newman, Western Australia. These tenements are held by the Yandi Joint Venture and accessed/used in accordance with the *Iron Ore (Marillana Creek) Agreement Act 1991*.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L6168/1991/11 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <https://dwer.wa.gov.au/regulatory-documents>.

2.2 Application summary

On 12 August 2024, the Licence Holder submitted an application to the department to amend Licence L6168/1991/11 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The amendment is for the inclusion of an additional discharge point to enable the temporary provision of surplus groundwater for a short-term hydrogeological trial (the project).

It is noted that the additional discharge point occurs outside of the Prescribed Premises boundary. However, noting BHP have tenure over the areas proposed to be used for reinjection (within ML266SA), regulatory controls are to be included on the Part V licence to manage the proposed trial.

This amendment is limited only to changes to Category 6 activities from the Existing Licence. No changes to the aspects of the existing Licence relating to Category 5, 12, 52, 54, 62, 64 and 73 have been requested by the Licence Holder.

There are no changes proposed to the production or design capacity for Category 6 activities.

2.3 Description of proposed activities

2.3.1 Scope of hydrogeological trial (Category 6 activities)

Hydrogeological monitoring across the Ministers north orebody and adjacent Jugari (Yandicoogina) gorge (the Gorge) has identified declining groundwater levels that is showing results of a decline in groundwater dependent ecosystem (GDE) health and water levels within surface water pools within the Gorge. BHP are proposing to undertake a short-term hydrogeological trial for six months which involves redirecting surplus groundwater discharged from BHP's Yandi Mine to a new discharge point in the Ministers North catchment via an overland pipeline, where it will be reinjected into an existing bore at the head of the Gorge. Based on the understanding of hydrogeological conceptualisation, reinjection within the Ministers North aquifer will support flow downstream along the alluvium substrate within Gorge. The aim of the trial is to stabilise observed decline in groundwater, to determine whether longer term supplementation via injection is beneficial and provide additional hydraulic data to support further investigation of observed decline.

BHP have constructed a temporary overland pipeline from the Yandi Mine (connected to the

existing surplus groundwater discharge point to Marillana Creek located at discharge point MCDMDEW040). The pipeline will be used to redirect surplus groundwater from the Yandi Transfer Tanks (Figure 1) to a reinjection bore (HMN0045P) located at the head of the gorge approximately 8km to the south (Figure 2) located on Mining Lease M266SA (Minister North tenure) where it will be utilised by the hydro-dynamic trial. The trial will run until the commencement of the 2024/25 wet season. The trial will cease during the wet season to minimise disturbance of natural hydrological conditions within the GDE.

BHP are currently licensed to discharge up to 15 gigalitres per year to Marillana Creek (41 ML/d) (discharge points MCDMDEW040 and MCDMDEW041). The proposed amendment seeks to enable the redirection of up to 2.7 ML/d of water for a maximum period of six months. The actual volume of water utilised during the trial will depend on hydrogeological conditions and responses.

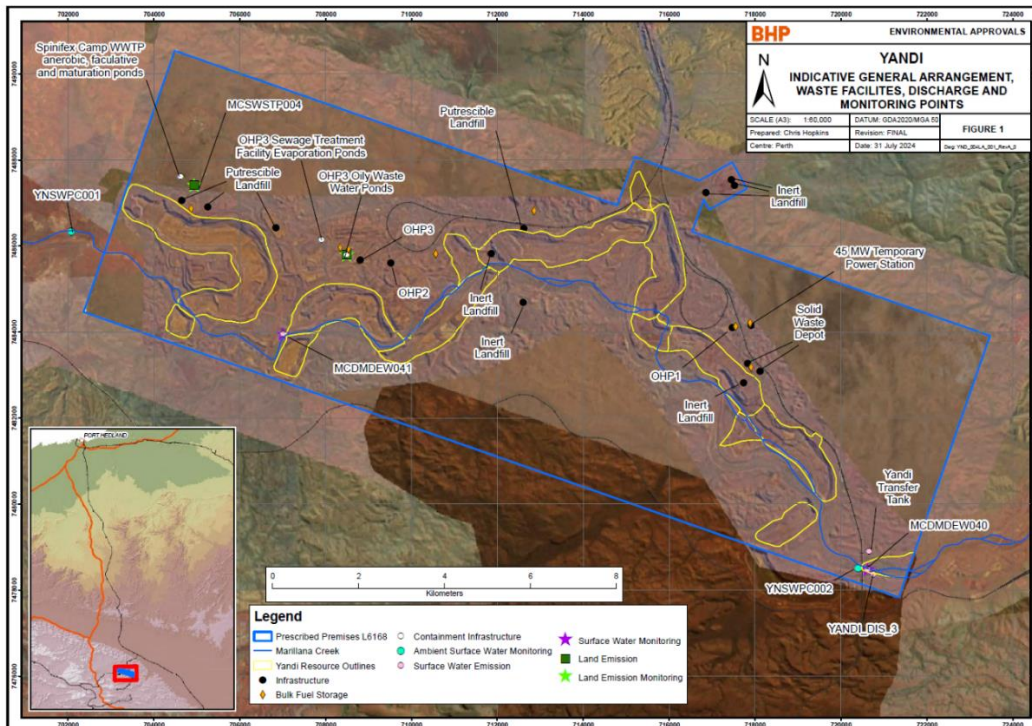


Figure 1: Surface water discharge and monitoring points

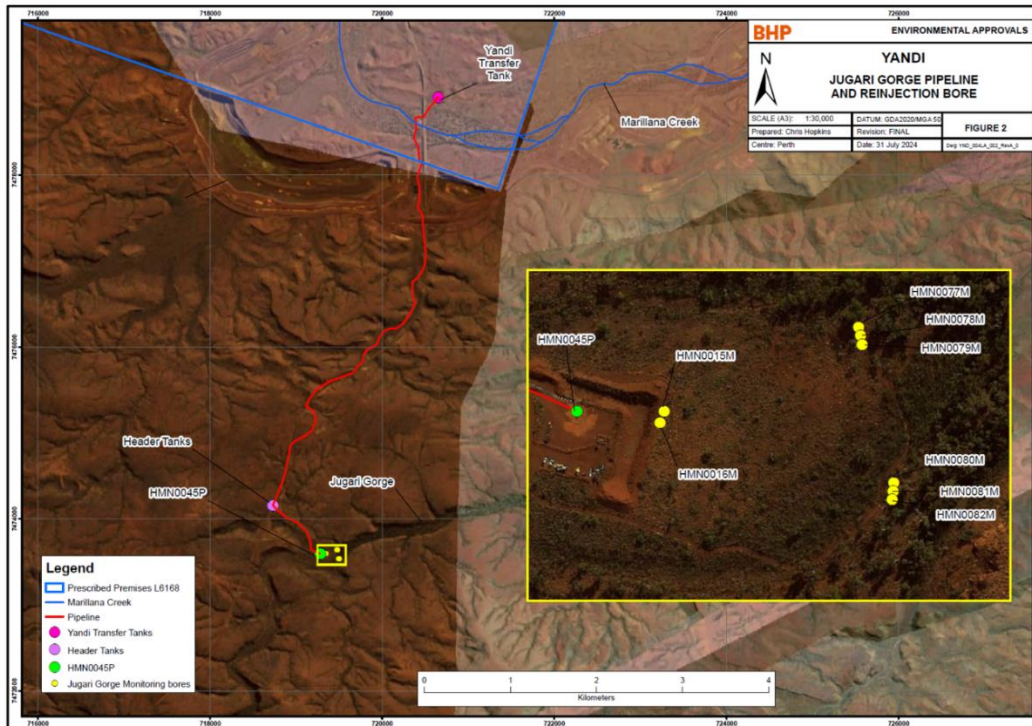


Figure 2: Jugari gorge pipeline and reinjection bore

It is noted that the Department were informed of the constructed pipeline during a meeting with BHP on 11 July 2024, prior to it being assessed. Retrospective approval for the construction of the pipeline will not be considered. However, the operation of this dewatering infrastructure going forward will be assessed and operational controls conditioned on the licence where required.

2.3.2 Water quality monitoring program

BHP have proposed a groundwater and surface water quality monitoring program for the trial that will be undertaken in accordance with the Jugari Short Term Trial Groundwater Supplementation Scheme: Trigger Action Response Plan (TARP).

Groundwater level monitoring will occur within the existing reinjection bore (bore HMN0045P) to assess groundwater level response within the casing, within three monitoring bores (bores HMN0015M, HMN0016M and HMN0083M) adjacent to the reinjection area, and along the length of the gorge within six newly installed bores (bores HMN0077M, HMN0078M, HMN0079M, HMN0080M, HMN0081M and HMN0082) to improve monitoring of local water levels within the alluvium. A further 21 monitoring bores in the vicinity of the reinjection will be monitored throughout the trial. The locations of the monitoring bores are shown in Figure 3.

If groundwater levels at the point of reinjection, or along the gorge, increases beyond set trigger levels as outlined in TARP, injection will be scaled back or halted.

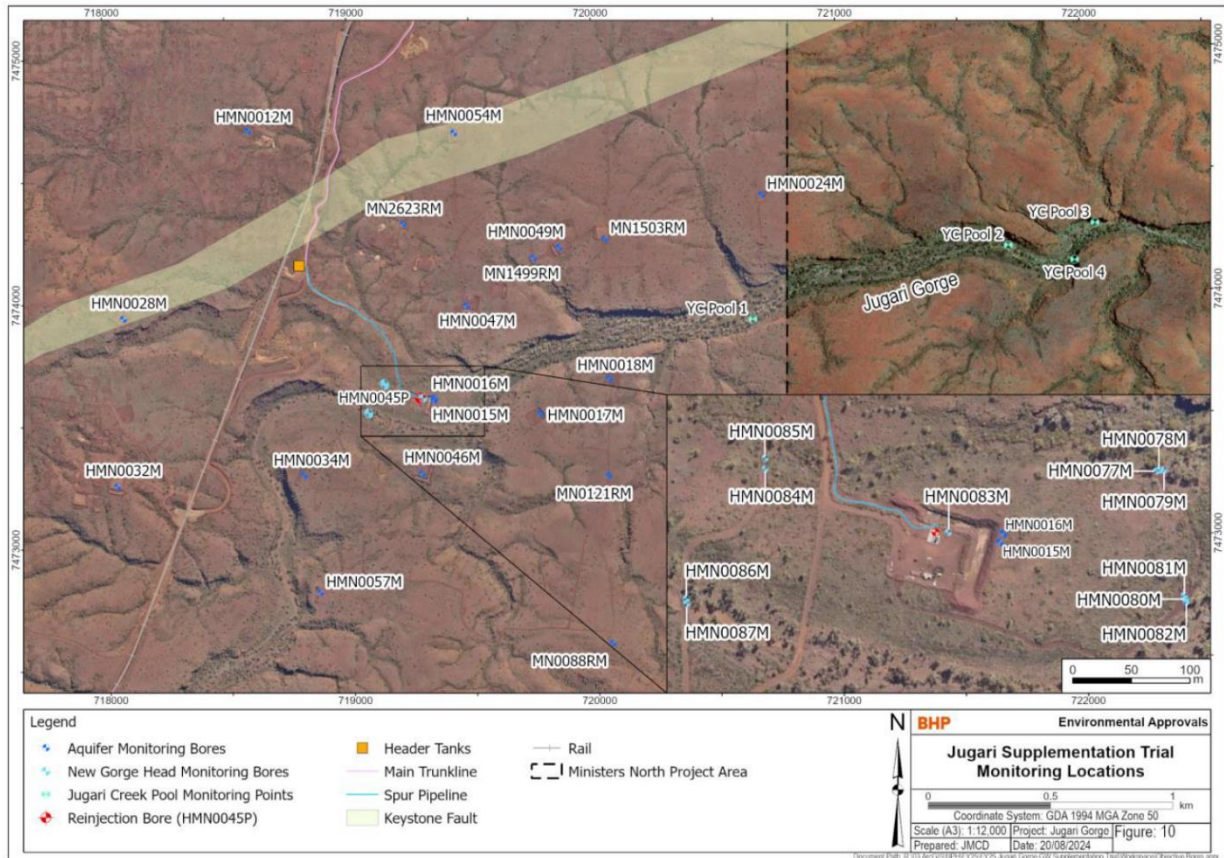


Figure 3: Trial monitoring bore locations

A detailed risk assessment of the Category 6 activities has been conducted under section 3.3 of this report.

3. Legislative context

3.1 Part IV of the EP Act

The Premises is subject to two Ministerial Statements issued under Part IV of the EP Act, MS679 as amended by MS1039:

- MS679 relates to the life-of-mine proposal to mine iron ore and includes clearing of native vegetation, subsequent rehabilitation and decommissioning of the site, and post-assessment amendments for mine production rate and throughput.
- MS1039 includes administrative amendments and replacement of conditions relating to Marillana Creek Diversion and consideration of proponent’s contribution to the offset fund.

Management of impacts to Marillana Creek and conservation of significant flora and fauna associated with ground disturbance activities have been assessed under the ministerial statements.

The objectives for relevant environmental factors that are based on the principles contained under Part IV of the EP Act are likely to be met through the Applicant’s proposed management and other decision-making processes, specifically Part V of the EP Act, to prevent any further drawdown, and manage potential water quality impacts (EPA, 2023).

It is unlikely that the trial may result in any additional detrimental environmental impacts outside

of those already assessed under MS679/ MS1039, as the intent of the trial is to stabilise groundwater decline and to determine whether long term supplementation is needed.

3.2 Contaminated Sites Act

The Premises was reported to the department in 2022 as a contamination assessment carried out on the site during 2021 and 2022 found per and poly-fluoroalkyl substances (PFAS) (such as from fire-fighting foams and PFAS-containing waste) in groundwater. The findings of the 2021/2022 contamination assessment indicated that there are eight main areas of potential concern within the site that may pose an ongoing risk from PFAS contamination. Limited groundwater sampling found perfluorooctanesulfonic acid (PFOS) was present at concentrations exceeding guideline values for freshwater ecosystems in two production bores located in the central sector of the borefield. However, the hydrogeological setting and migration mechanisms are not well understood and remains a residual data gap. Potential hydrocarbon contamination of localised soils was also historically reported to the department. The site was classified under the *Contaminated Sites Act 2003* (CS Act) as possibly contaminated – investigation required on 6 April 2023.

A risk assessment has indicated that further investigations are required to determine the potential risk posed by PFAS and hydrocarbons to human health and the environment including Marillana Creek. The department understands that BHP are in the process of carrying out further assessments at the site and a report is expected to be submitted to the department in December 2024.

3.3 Other relevant approvals

3.3.1 Water licencing

Groundwater supplementation will be undertaken by using an existing reinjection groundwater bore (HMN0045P) that has been installed under the *Rights in Water and Irrigation Act 1914* (RiWI Act) 26D CAW206074(1). Dewatering from Yandi mine is undertaken in accordance with the 5C GWL89501(11) groundwater licence. A submission has been made to the Department's Water Licencing Northwest Region to amend groundwater licence GWL89501(11) to include a reinjection of groundwater purpose against additional Minister North tenure ML266SA for this secondary use of the dewater. The applicant should ensure that the amendment to GWL89501(11) is approved prior to implementing the reinjection trial.

3.3.2 Aboriginal Heritage Act 1972

The project occurs within mining leases M270SA and ML266SA that both intersect several Aboriginal Sites and Heritage Sites that are registered under the *Aboriginal Heritage Act 1972* (AHA) and the site occurs within the Banjima Native Title Claim (WC 2011/006). It is understood consultation with the Banjima Native Title Aboriginal Corporation and ethnographic and archaeological surveys of the project area have been undertaken. It is up to the Applicant to ensure that all approvals under the AHA required for the project have been obtained prior to commencing operation. BHP are encouraged to contact the Department of Planning, Lands and Heritage (DPLH) prior to the commencement of operation to determine if any other approvals are required.

4. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk assessments* (DWER 2020).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

4.1 Source-pathways and receptors

4.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 1 below. Table 1 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 1: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Mine dewater containing trace levels of PFAS and elevated nitrogen	Reinjection of excess mine dewater into the Ministers North Aquifer	Groundwater injection	<p>Controls proposed within the TARP:</p> <ul style="list-style-type: none"> • Continuous monitoring of groundwater (via remote telemetry) levels within the reinjection bore, the new monitoring bores along the gorge and the ministers north aquifer monitoring bores; • If groundwater levels at the reinjection bore HMN0045P exceed 2m below top of the well casing, trial reinjection rate to be scaled back, paused or terminated until water levels have suitably declined in the bore; • In the event of emergency discharge due to failure of system, water shall be redirected into the existing sump on the pad to avoid direct surface water discharge to the creek; • If groundwater levels at the Jugari Gorge monitoring bores exceed 0.5 mBGL, the reinjection rate will be reduced until the groundwater level is below this trigger level; • If groundwater levels at the trigger monitoring bores (HMN0015MHMN0016M & HMN0083M) and the Ministers North aquifer monitoring bores exceed 564 mAHD, the reinjection rate will be reduced until the groundwater level is below this trigger level; • Fortnightly groundwater quality monitoring of the 26 monitoring bores located in the vicinity of the reinjection area; • Daily visual inspections of the Jugari Gorge creeklines within 500m of the gorge will be undertaken for the first two weeks of the trial and weekly thereafter to minimize risk of a surface water expression at the gorge;

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> If surface water expression is observed within the creek, the reinjection rate will be reduced until surface water has receded; Limit set for flow rate of a maximum of 2.7 ML/day; Trial reinjection rate to be scaled back, paused or terminated if significant water quality changes are observed during the trial. Groundwater dependent vegetation monitoring and aquatic monitoring to be undertaken during the trial in accordance with the applicant's TARP.
	Operation of overland discharge pipeline and Yandi transfer tanks to the Ministers North Aquifer	Discharges to land via pipeline leaks / ruptures	<ul style="list-style-type: none"> Pipelines to be visually inspected weekly during operation for identification of leaks or bursts; Pipelines and transfer tank areas shall be equipped with automatic shut-offs in the event of a burst or leak; Flow meters are fitted at the transfer and head tanks; and Isolation points are present along the above ground pipeline.

4.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 2 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Rio Tinto Hope Downs 4 Accommodation Camp	25 km South of Premises Screened out as receptor due to distance
Marillana and Juna Downs Homesteads	Approximately 35km from premises Screened out as receptor due to distance.
Environmental receptors	Distance from prescribed activity
Pilbara Groundwater Area, proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> (RIWI Act)	The prescribed activity is located within the Pilbara Groundwater Area. Main Aquifer is the Hammersley – Fractured Rock

	<p>Aquifer – groundwater levels may be deep below the surface, and water is generally fresh. Main use of the aquifer is for mining and mine dewatering from iron ore mines. Bores also drilled for road and railway construction.</p> <p>Groundwater depth across the prescribed premises ranges from from 5 to 55 m.</p>
Pilbara Surface Water Area, proclaimed under the RIWI Act	The prescribed activity is located within the Pilbara Surface Water Area, within the Fortescue River Upper surface water catchment.
Surface water lines	<p>Marillana Creek is situated within the Prescribed Premises boundary and drains into the Weeli Wollie Creek system. Weeli Wollie Creek drains into Fortescue Marsh, a place of high cultural importance and biodiversity area.</p> <p>The Jugaricoogina Creek runs through the Jugari Gorge from east to west.</p>
Native Vegetation	Native vegetation is located adjacent to the overland pipeline and the additional proposed discharge point.
Jugari Gorge Groundwater Dependent Ecosystem	<p>Jugari Gorge occurs approximately 8kms south of the Prescribed Premises boundary. Groundwater chemistry of the Ministers North aquifer which surrounds Jugari Gorge indicates that the groundwater in the aquifer is fresh.</p> <p>The Jugari Gorge supports a GDE with characteristics that align with the Department of Biodiversity, Conservation and Attractions Priority 2 PEC ‘Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region’. The values of the GDE include permanent pools, <i>Melaleuca argentea</i> woodland, hydro-mesic priority flora species, a high diversity of aquatic macro invertebrates, several unique stygal aquatic species and habitat for several vertebrate fauna species classified as Matters of Environmental Significance (MNES) (BHP, 2024).</p> <p>Monitoring data collected since 2018 indicates that the decline in groundwater levels within the Ministers North aquifer coincides with similar declines in surface water pools within Jugari Gorge.</p>
Aboriginal and Cultural Heritage sites	The prescribed activity occurs within the Banjima Native Title Claim (WC 2011/006).

4.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 4.1. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 4.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 3.

The Revised Licence L6168/1991/11 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. Category 6 activities.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 3: Risk assessment of potential emissions and discharges from the Premises during operation

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
Operation (including time-limited-operations operations)								
Reinjection of excess mine dewater into the Ministers North Aquifer	Injection of excess mine dewater containing trace levels of PFAS and elevated nitrogen	Groundwater injection may impact on surface water and groundwater quality due to the water containing concentrations of analytes of concern	Jugaricoogina Creek Jugari Gorge GDE Subterranean fauna	Refer to Section 3.1	C = Major L = Unlikely Medium Risk	No	<p>Condition 12 (Table 7): Authorised discharge point for mine dewater into Ministers North Aquifer</p> <p>Condition 13: Requirement for the implementation of the TARP</p> <p>Condition 14 (Table 8): Discharge criteria limits for PFAS compounds.</p> <p>Condition 15: Requirement for a detailed risk assessment to be provided to the CEO should PFAS compound limits be exceeded.</p> <p>Condition 22 (Table 11): Monitoring of point source emissions to surface water for the additional discharge point including additional parameters.</p> <p>Condition 26 (Table 15): Point source emissions monitoring for source water and ambient groundwater quality monitoring for 23 monitoring bores as shown in Figure 3 of this report.</p> <p>Condition 32: Annual Environmental Reporting updated</p>	See section 3.3 – detailed risk assessment
		Groundwater	Native	Refer to Section	C = Moderate	Yes	<p>Condition 12 (Table 7): Authorised discharge point for</p>	

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
		injection within the aquifer resulting in an increased level of groundwater levels above historical levels leading to groundwater mounding resulting in a decline in vegetation health and impacts to subterranean fauna habitat.	vegetation Jugari Gorge GDE Subterranean fauna habitat	3.1	L = Unlikely Medium Risk		mine dewater into Ministers North Aquifer Condition 13: Requirement for the implementation of the TARP Condition 26 (Table 15): Point source emissions monitoring for source water and ambient groundwater quality monitoring for 23 monitoring bores as shown in Figure 3 of this report.	consideration the Applicant's proposed controls outlined under Section 4.1 including the continuous groundwater monitoring of trial monitoring bores to measure groundwater levels that have trigger levels imposed and action responses to ensure surface water expression does not occur. In addition, the Delegated Officer has taken into account that the reinjection infrastructure is set to a maximum flow rate of 2.7 mL/day which is constrained by pipe dimensions. The actual injection rate will be determined via monitoring with reinjection rates gradually increasing in 0.2 mL/day intervals throughout the trial to test local hydrogeological conditions. As noted in the applicants trigger action responses, the trial reinjection rate will be scaled back, paused or terminated if groundwater mounding is identified during monitoring.
Operation of overland discharge pipeline that connects the existing pipeline to the Ministers North Aquifer reinjection point.	Discharge of excess mine dewater containing trace levels of PFAS and elevated nitrogen	Pipeline leak or rupture resulting in discharge onto native vegetation causing topsoil contamination and plant stress or death.	Native vegetation surrounding overland discharge pipeline	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Yes	N/A	The Delegated Officer considers the likelihood of this risk event to be unlikely noting the controls proposed by the applicant. General offences relating to pollution or unreasonable emissions (section 49 of the EP Act), and/or environmental harm (sections 50A, 50B and 50C) and notification of certain discharges of waste (section 72 of the EP Act), apply.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk assessments* (DWER 2020).

Note 2: Proposed Licence Holder's controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

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4.3 Detailed risk assessment for reinjection of mine dewater into Aquifer

4.3.1 Overview of risk events

As noted under section 3.2, the Premises was recently classified as a “possibly contaminated – investigation required” site due to the presence of PFAS contaminants being found in the groundwater. Low level PFAS concentrations as well as other heavy metals and hydrocarbons have also been recorded in the source water (mine dewater) during routine surface water monitoring as reported to the department in BHP’s most recent 2023 Annual Environmental Report (AER) (BHP, 2023).

The reinjection of mine dewater to the Ministers North Aquifer, resulting in releases of low level PFAS, heavy metals and hydrocarbons, may adversely impact the health of the GDE through surface and groundwater contamination should elevated concentrations of certain contaminants be observed. This in turn may affect the biodiversity and aboriginal and cultural significance of the gorge as well as the Jugaricoogina Creek.

4.3.2 Review of water quality data

As outlined under section 2.3.1, water will be sourced from the existing surplus disposal from the Yandi Mine, that is currently being discharged to Marillana Creek and will be redirected to the Ministers North Aquifer for groundwater reinjection. As the mine dewater is injected, it should promote attenuation within the Ministers North aquifer which will increase mixing and promote natural movement of the existing groundwater into the gorge.

BHP is required to report annually on the two existing surface water quality discharge points (MCDMDEW040 & MCDMDEW041) into Marillana creek which is the source water for the hydrogeological trial. The most recent surface water quality monitoring data for Marillana Creek was reported in BHP’s 2023 AER and is presented in Table 4 below. Available groundwater chemistry data (since 2009) of the Ministers North Aquifer and recent sampling events of Jugari Gorge is also detailed in Table 4. Noting the pristine nature of the receiving environment of the Jugari gorge, a comparison of the surplus water quality data (source water) for heavy metals and hydrocarbons has been compared to the 99% species protection freshwater default guideline values within the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC & ARMCANZ (2000)).

There are no current guidelines and default guideline values for PFAS at the time of the assessment, except for PFOS in freshwater environment (ANZG 2023). The draft default guideline values for PFOS in freshwater systems (ANZG 2023) supersedes the interim guideline values specified in the NEMP (HEPA 2020). The NEMP also outlines interim default guideline values for PFOA, which is still applicable as no ANZG guidance has been published on this compound. For bioaccumulative contaminants, which includes many PFAS, the Water Quality Guideline framework specifies that a 99% species protection default guideline values should be used for assessing toxicity in high conservation value ecosystems. Therefore, the traces of PFOS and perfluorooctanoic acid (PFOA) contaminants recorded during water sampling have been compared against the 99% species protection default guideline values contained within the Australian and New Zealand Guidelines for Fresh & Marine Quality Draft toxicant default guideline values for aquatic ecosystem protection: PFOS in freshwater and the Heads of EPAs Australia and New Zealand (HEPA) 2020, respectively.

Table 4: Comparison of water quality data

Discharge point locations		Surplus water discharge (source)			Ministers North Aquifer			Jugari Gorge		ANZ Guidelines 99% Freshwater species protection criteria	ANZG 2023 & PFAS NEMP 2020 99% Freshwater species protection criteria
Description		Discharge from monitoring bores MCDMDEW040 & MCDMDEW041 to Marillana Creek			Discharge Yandi Transfer Tanks to reinjection bore HMN0045P (receiving environment)			Surface Water Pools		Default guideline values for freshwater	Default guideline values for freshwater
Parameter	Unit	2023	2023	2023	2023	2023	2023	January 2024	March 2024		
		Minimum	Maximum	Average	Minimum	Maximum	Average				
pH	pH	6.9	7.9	7.2	7.07	8.31	7.82	7.7	-	-	-
Electrical conductivity (EC)	µS/cm	940	1200	1040	229	707	486	602	-	-	-
Total dissolved solids (TDS)	mg/L	520	730	617	149	460	316	391	-	-	-
Total suspended solids (TSS)	mg/L	6	21	11	-	-	-	-	-	-	-
Total Recoverable Hydrocarbons (C ₁₀ - C ₃₆)	mg/L	<100	<100	<100	<50	<50	<50	-	-	-	-
Sodium (Na)	mg/L	70	95	84	21	53	32	41	54	-	-
Potassium (K)	mg/L	5.4	12	8	5	13	9	13	13	-	-
Calcium (Ca)	mg/L	43	63	52	6	69	36	43	59	-	-
Magnesium (Mg)	mg/L	38	60	47	9	38	22	28	33	-	-
Chloride (Cl ⁻)	mg/L	99	150	121	20	78	37	51	43	0.0004	

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Discharge point locations		Surplus water discharge (source)			Ministers North Aquifer			Jugari Gorge		ANZ Guidelines 99% Freshwater species protection criteria	ANZG 2023 & PFAS NEMP 2020 99% Freshwater species protection criteria
Description		Discharge from monitoring bores MCDMDEW040 & MCDMDEW041 to Marillana Creek			Discharge Yandi Transfer Tanks to reinjection bore HMN0045P (receiving environment)			Surface Water Pools		Default guideline values for freshwater	Default guideline values for freshwater
Parameter	Unit	2023	2023	2023	2023	2023	2023	January 2024	March 2024		
		Minimum	Maximum	Average	Minimum	Maximum	Average				
Carbonate	mg/L	<5	<5	<5	<1	<1	<1	<1	<1	-	-
Bicarbonate	mg/L	310	450	370	60	325	187	212	303	-	-
Sulphate	mg/L	50	71	59	2	57	23	53	21	-	-
Nitrate (NO ₃)	mg/L	6.4	14	11	0.01	1.33	0.26	<0.01	<0.01	1.0	-
Aluminium (Al)	mg/L	<0.005	<0.005	<0.005	0.005	0.005	0.005	-	-	0.027	-
Boron (B)	mg/L	0.35	0.48	0.39	0.10	0.21	0.14	-	-	0.34	-
Iron (Fe)	mg/L	<0.005	<0.005	<0.005	0.003	0.29	0.019	-	-	-	-
Copper (Cu)	mg/L	<0.001	<0.001	<0.001	0.0005	0.008	0.0009	-	-	0.001	-
Zinc (Zn)	mg/L	<0.005	<0.005	<0.005	0.003	0.29	0.019	-	-	0.0024	-
Silver (Ag)	mg/L	<0.001	<0.001	<0.001	-	-	-	-	-	0.00002	-
Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001	0.003	0.0007	-	-	AsIII 0.001 AsV 0.0008	-
Chromium (Cr)	mg/L	<0.001	<<0.001	<0.001	<0.001	0.003	0.0013	-	-	CrIII 0.0033 CrVI 0.00001	-
Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	-	-	0.00006	-
Mercury (Hg)	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	0.00006	-
Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	0.001	-	-	0.008	-
Selenium (Se)	mg/L	0.001	0.001	<0.001	<0.001	0.001	<0.001	-	-	0.005	-

Discharge point locations		Surplus water discharge (source)			Ministers North Aquifer			Jugari Gorge		ANZ Guidelines 99% Freshwater species protection criteria	ANZG 2023 & PFAS NEMP 2020 99% Freshwater species protection criteria
Description		Discharge from monitoring bores MCDMDEW040 & MCDMDEW041 to Marillana Creek			Discharge Yandi Transfer Tanks to reinjection bore HMN0045P (receiving environment)			Surface Water Pools		Default guideline values for freshwater	Default guideline values for freshwater
Parameter	Unit	2023	2023	2023	2023	2023	2023	January 2024	March 2024		
		Minimum	Maximum	Average	Minimum	Maximum	Average				
Manganese (Mn)	mg/L	<0.001	<0.001	<0.001	<0.001	0.910	0.051	-	-	1.2	-
PFOS	µg/L	<0.0002	0.0004	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	0.0091*
PFHxS	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	-
PFOA	µg/L	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	19**

Note 1: Shaded grey and bold values are above recommended ANZEC & ARMCANZ 2000 default drinking water guideline with a 99% species protection for freshwater.

Note 2: *indicates default guideline values obtained from ANZG (2023) default drinking water guideline with a 99% species protection for freshwater.

Note 3: **indicates default guideline values obtained from NEMP (2020) default drinking water guideline with a 99% species protection for freshwater.

Surface water monitoring (Table 4) related to the discharge of mine dewater (reinjection source water) detected elevated levels of nitrate and boron that exceed the 99% species protection default guideline values with maximum concentrations of 14 and 0.48 recorded respectively (ANZEC & ARM CANZ, 2000). The presence of nitrate and boron concentrations have also been recorded within the Ministers North Aquifer, which is an undeveloped mining area, indicating this is reflective of the natural regional setting. Although metal concentrations recorded in the source water are elevated, the water discharged into Ministers North Aquifer is likely to become diluted when it is mixed into the aquifer and the change in groundwater chemistry is unlikely to impact upon nearby receptors (i.e. the GDE gorge).

The monitoring of PFAS compounds (PFOS, PFOA and Perfluorohexanesulfonic acid (PFHxS)) in the source water has occurred since 2020, noting that BHP phased out FPAS fire-fighting foams at the Premises in 2022. The results of two samples taken during the most recent 2024 data showed detections of PFOS concentrations in the source water (0.0003 µg/L and 0.0004 µg/L). Both samples did not exceed the 99% species protection default guideline value for PFOS, being 0.0091 µg/L (ANZG, 2023) (No detections of PFOA and PFHxS were recorded during the most recent annual reporting as required by the licence).

Although very low concentrations of PFOS compounds have been detected in the source water, noting the pristine receiving environment proposed for groundwater supplementation, and the prevalence, persistence, and toxicity of PFAS compounds that have a resistance to natural degradation, it is important to consider the applicant's proposed regulatory controls which have been outlined in the TARP and in Table 1 of this report to ensure they are adequate.

4.3.3 Applicant's regulatory controls

4.3.3.1 Water Quality monitoring

PFAS contaminants

The NEMP provides guidance regarding the reuse of PFAS-contaminated materials and advises that the proposed reuse must not result in an unacceptable or increased risk to human health and/or the environment. While the proposal does not align with the principles of the PFAS NEMP of not adding PFAS impacts (even at very low concentrations) to areas where there is no prior detectable PFAS, the department recognises that the ecological benefits of the proposal make this an exceptional case and that the risks are low when weighed against the declining groundwater levels of the GDE in the gorge. However, noting many PFAS compounds in water are known to have high solubility meaning they can readily leach from soils and sediments into surface water and groundwater, where they can enter creeks, rivers and lakes, and become part of the food chain, being transferred from organism to organism as they accumulate, posing a risk of causing adverse effects to human health and the environment, even at low concentrations, adequate water quality monitoring for PFAS compounds during the trial is required.

The water quality analytical suite presented in the TARP is currently limited to fortnightly monitoring of three PFAS compounds (PFOS, PFHxS and PFOA). These three PFAS compounds are usually primary indicators part of the presence of a broad range of PFAS compounds including other short and long chain perfluoroalkyl acids (PFAAs) and precursors. In addition, the TARP does not contain any trigger limits or actions proposed if contaminants of concern are found to exceed the relevant guidelines.

As outlined in the TARP, the applicant has proposed to undertake fortnightly groundwater quality monitoring for the two adjacent monitoring bores to the reinjection area (bores HMN0015M and HMN0016M) and the 18 monitoring bores within the Ministers North Aquifer. The applicant has not included monitoring of groundwater quality for the six bores located along the length of the gorge (bores HMN0077M to HMN0082).

Noting the above and the pristine environment proposed for groundwater reinjection, the Delegated Officer considers the proposed PFAS suite by the applicant for water quality monitoring to be insufficient for managing the potential impacts from this risk event. As such, the following have been conditioned in licence L6168/1991/11 as additional regulatory requirements:

- **Condition 22 (Table 11):** The proposed water quality monitoring program for monitoring point source emissions to surface water has been expanded to not only include PFOS, PFHxS and PFOA, but to include up to 28 PFAS compounds associated with mining operations and the use of fire-fighting foams to ensure concentrations of the other PFAS compounds are monitored and recorded.
- **Condition 13:** The Delegated Officer has included a new condition that requires BHP to implement the TARP during the trial.
- **Condition 14 (Table 8):** In addition to the monitoring of 28 PFAS compounds, the Delegated Officer has specified the default guideline value (at 99% species protection level) as a limit for PFOS and PFOA. This limit criteria has been specified as a new condition on the licence, Should the specified limits be exceeded during the fortnightly monitoring for the first two months of the trial, monitoring on a fortnightly basis should continue and a further risk assessment be undertaken and submitted to the department for review.
- **Condition 15:** The Delegated Officer has included a new condition on the licence that specifies if PFAS compounds are found to exceed the limits specified in Table 8, a detailed risk assessment in accordance with the PFAS NEMP must be carried out to determine related risks to the receiving environment and a report provided to the CEO within 60 days of the results being issued by the laboratory.
- **Condition 26 (Table 15):** The Delegated Officer has included a new condition on the licence to undertake monitoring of point source emissions to groundwater and ambient groundwater quality for all trial monitoring bores including the bores located along the length of the gorge and the additional discharge point (Yandi Transfer Tanks to reinjection bore HMN0045P), to obtain a quantitative assessment of local groundwater quality and for any groundwater chemistry changes during the trial.

The Delegated Officer notes that the findings of the next phase of the contamination assessment for the Yandi Mine Site as outlined under section 3.2 should be reviewed when available and the TARP be revised as necessary.

Hydrocarbon Contaminants

The analytical suite associated with hydrocarbon contamination in the TARP is limited to the monitoring of Total Recoverable Hydrocarbons (TRH) C10-C38. Noting the presence of hydrocarbon contaminants recorded in the surplus water quality data (source water) and the sensitivity of the pristine receiving environment, the Delegated Officer considers that the analytical suite proposed by the applicant is insufficient for managing impacts of hydrocarbon contamination to surface and groundwater quality. The analytical suite has been expanded to include other compounds associated with mining operations (i.e. vehicle wash-down pad, former drum lay-down area, heavy equipment service bay, above ground storage tank and former mobile equipment workshop) such as speciated TRH analysis, benzene, toluene, ethylbenzene, xylene and benzo(a)pyrene. The expanded analytical suite is reflected under Condition 22 (Table 11) of the licence.

Other contaminants of concern

As noted above in section 4.3.2, surface water monitoring of the source water detected elevated levels of nitrate exceed the 99% species protection default guideline value. It important to note the significant degradation of water quality may occur as a result of excess nitrogen causing increased nutrient loads and eutrophication in waterways. However, noting the applicant's

proposed controls to monitor contaminant concentrations fortnightly during the first two months of the trial, any increase in nitrogen levels would be identified during monitoring. In addition, the water discharged into Ministers North Aquifer is likely to become diluted when it is mixed into the aquifer and the change in groundwater chemistry is unlikely to impact upon nearby receptors (the GDE gorge).

5. Consultation

Table 5 provides a summary of the consultation undertaken by the department.

Table 5: Consultation

Consultation method	Comments received	Department response
Shire of East Pilbara advised of proposal on 28 August 2024.	No comments received.	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal on 28 August 2024.	No comments received.	N/A
Department of Planning, Lands and Heritage (DPLH) advised of proposal on 28 August 2024.	<p>DPLH replied on 10 September 2024 advising the following:</p> <ul style="list-style-type: none"> • Mining Lease M 270SA intersects a number of registered Aboriginal Sites and Heritage Sites; • The applicant's reference to the <i>Aboriginal Cultural Heritage Act 2022</i> contained within the supporting document should be changed to <i>Aboriginal Heritage Act 1972</i> (AHA); • BHP are encouraged to request advice from the DPLH prior to the commencement of works to determine if any approvals are required under the AHA; • To ensure the granting of the licence amendment does not impact the Aboriginal heritage of the area; and • The granting of the licence amendment does not count as approval for the works under the APA. 	<p>Noted. The Delegated Officer notes that the works for the construction of the overland pipeline have already been completed. It is understood that BHP have already consulted with the representatives of the Banjima Native Title Aboriginal Corporation regarding the project and that they are supportive for the project to go ahead to prevent the permanent pool in the gorge from drying out. As noted under section 3.3.2, it is BHP's responsibility to ensure that they all approvals under the AHA have been obtained for the project prior to commencing operation.</p>
Banjima Native Title Aboriginal Corporation RNTBC advised of proposal on 28 August 2024.	No comments received.	N/A

Consultation method	Comments received	Department response
Department of Jobs, Tourism, Science and Innovation (JTSI) advised of proposal on 28 August 2024.	JTSI replied on 18 September 2024 advising that they have no comments to provide for the proposal.	Noted.
Licence Holder was provided with draft amendment on 18 October 2024.	<p>Comments received on 21 October 2024; BHP reviewed the draft amendment and advised that they have no comments/requested changes.</p> <p>BHP provided a finalised copy of the TARP as requested by the Delegated Officer.</p> <p>BHP confirmed that the sampling date for the groundwater chemistry data provided for the Ministers North Aquifer was collated from the 2023 sampling program.</p>	<p>The Delegated Officer has reviewed the finalised copy of the TARP and noted that there were some differences identified in the trial monitoring bore locations proposed in the draft TARP compared to the locations proposed in the final version.</p> <p>The trial monitoring bore locations specified under Condition 26 (Table 15) of the Licence have been amended to be consistent with the finalised TARP. Figure 6, Schedule 1 and Figure 3 of the Amendment Report have both been to reflect the updated trial monitoring bore locations.</p> <p>The sampling date for the groundwater chemistry data for the Ministers North Aquifer noted under Table 4 of the Amendment Report has been updated accordingly following the additional information provided by the applicant.</p>

6. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Summary of amendments

Table 6 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 6: Summary of licence amendments

Condition no.	Proposed amendments
-	General administrative updates to conditions numbering throughout where required and schedules.
Condition 12 (Table 7):	Updated to include additional discharge point (Yandi Transfer Tanks to reinjection bore HMN0045P).
Condition 13	New condition to ensure the Licence Holder implements and adheres to the monitoring requirements, triggers and action responses outlined in the TARP.

Condition no.	Proposed amendments
Condition 14 (Table 8)	New Condition to ensure the Licence Holder does not exceed the concentration limits for certain PFAS compounds.
Condition 15	New condition requiring the Licence Holder to carry out additional monitoring and a detailed risk assessment in accordance with the PFAS NEMP if PFAS limits are exceeded to determine the related risks to the environment. The condition also requires the Licence Holder provide the report to the CEO within 60 days of the related analytical results being issued to the laboratory.
Condition 18	Previous condition 15. Amendment of condition to include a requirement for laboratory samples to be analysed using the appropriate limit of reporting to allow comparison with the relevant environmental guidelines.
Condition 22 (Table 11)	Previous condition 19 (Table 10). Table updated to include monitoring for PFAS compounds and hydrocarbons.
Condition 26 (Table 15)	New condition to include monitoring of point source emissions to groundwater (Yandi Transfer Tanks to reinjection bore HMN0045P) and ambient groundwater quality of the trial monitoring bores in the reinjection area.
Condition 32 (Table 16)	Previous condition 28 (Table 14). Table updated to include the results of emissions and discharge limits as specified under condition 14 (Table 8) and ambient groundwater quality and point source emissions to groundwater monitoring data as specified under condition 26 (Table 15).
Schedule 1, Figure 6	Inclusion of Figure 6: Trial monitoring bore locations under Schedule 1.
Schedule 3 (Table 21)	Inclusion of 28 PFAS compounds required for monitoring as required by condition 26 (Table 15).

References

1. ANZECC & ARMCANZ (2000) Australian and New Zealand guidelines for fresh and marine water quality. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.
2. ANZG 2023, *Draft toxicant default guideline values for aquatic ecosystem protection: Perfluorooctane sulfonate (PFOS) in freshwater*, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australian Capital Territory.
3. BHP 2023, *BHP Iron Ore Annual Environmental Report – July 2022 – June 2023*, Perth Western Australia. DWER Reference: DWERDT844019.
4. BHP 2024, *Yandi Licence Amendment – Supporting Documentation for the Application to Amend Environmental Licence L6168/1991/11*, dated August 2024. DWER Reference: DWERDT989945.
5. BHP 2024a, *Jugari Short Term Trial Groundwater Supplementation Scheme – Trigger Action Response Plan (TARP) – DRAFT for consultation*, dated 19 June 2024. DWER Reference: DWERDT989945.
6. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
8. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
9. Environmental Protection Authority (EPA) 2023, *Statement of environmental principles, factors, objectives and aims of EIA*, EPA, Western Australia.
10. Heads of EPAs Australia and New Zealand (HEPA) 2020, *'PFAS National Environmental Management Plan Version 2.0'*, – January 2020, Department of Climate Change, Energy, the Environment and Water.