

Amendment Notice #4

Licence Number	L8621/2011/1				
Licensee	Roy Hill Iron Ore Pty Ltd				
ACN	123 722 038				
Registered business address	5 Witham Road PERTH AIRPORT WA 6105				
Date of amendment	29 May 2018				
Prescribed Premises	Category 5 – Processing or beneficiation of metallic or non-metallic ore				
	Category 6 – Mine dewatering				
	Category 12 – Screening, etc. of material				
	Category 54 – Sewage Facility				
	Category 52 - Electric power generation				
	Category 57 – Used tyre storage (general)				
	Category 64 – Class II putrescible landfill site				
	Category 73 – Bulk storage of chemicals, etc.				
Premises	Roy Hill Iron Ore Mine				
	M46/518 and M46/519				
	Newman WA 6753				

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Date signed: 29 May 2018

Louise Lavery

A/Manager Licensing (Resource Industries)

an officer delegated under section 20 of the Environmental Protection Act 1986 (WA)

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the Environmental Protection Act 1986 Locked Bag 33 Cloisters Square PERTH WA 6850 info@dwer.wa.gov.au
CS Act	Contaminated Sites Act 2003 (WA)
Delegated Officer	an officer under section 20 of the EP Act
DMIRS	Department of Mines, Industry Regulation and Safety
	As of 1 July 2017, the Department of Mines and Petroleum and Department of Commerce amalgamated to form the Department of Mines, Industry Regulation and Safety (DMIRS).
DWER	Department of Water and Environmental Regulation.
	As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER).
	DWER was established under section 35 of the <i>Public Sector</i> <i>Management Act 1994</i> and is responsible for the administration of the <i>Environmental Protection Act 1986</i> along with other legislation.
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986 (WA)
EP Regulations	Environmental Protection Regulations 1987 (WA)

EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Facultative phreatophyte	Vegetation that can persist on unsaturated storage derived from surface inputs as well as using groundwater where available. Capable of functioning as both a vadophyte and a phreatophyte
GL/a	Gigalitres per annum
Hyporheic fauna	Aquatic invertebrate fauna which reside in the area below the streambed where water percolates through spaces between the rocks and cobbles (WRM, 2010)
km	kilometres
Licensee	Roy Hill Iron Ore Pty Ltd (RHIO)
m³	cubic metres
mbgl	metres below ground level
mg/L	Milligrams per litre
ML/day or ML/a	Megalitres per day or Megalites per annum
mRL	metres Reduced Level
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
Mulga	Acacia aneura
OEPA	Office of the Environmental Protection Authority
Phreatophyte	Plant species that rely on water sourced directly from the water table
RiWI Act	Rights in Water and Irrigation Act 1914
RSS	Rising Stage Samplers
SCADA	Supervisory Control and Data Acquisition: automated software that operates the process control system.
TDS	Total Dissolved Solids
Total Nitrogen	means the sum of total kjeldahl nitrogen (ammonia as nitrogen plus organic nitrogen) and nitrate as nitrogen plus nitrite as nitrogen

Total Phosphorus	means the sum of all forms of phosphorus (orthophosphate, condensed phosphate, and organic phosphate)
Vadophyte	Plant / vegetation that rely on water sourced from soil moisture and may be sustained by precipitation. Primarily uses water held in the vadose (unsaturated) zone that occurs above the water table
WLDL	(Level Troll) Water Level Data Loggers

Amendment Notice

This Notice is issued under section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

This Notice is limited to an amendment of Category 6 within L8621/2011/1 to allow for limited discharge of water to three creek discharge points for periods of scheduled release and unscheduled Process Plant maintenance.

The following Guidance Statements have informed the decision made on this amendment:

- *Guidance Statement: Setting Conditions* (October 2015)
- *Guidance Statement: Decision Making* (February 2017)
- *Guidance Statement: Risk Assessments* (February 2017)
- *Guidance Statement: Environmental Siting* (November 2016)

Amendment description

The Licensee, Roy Hill Iron Ore Pty Ltd (RHIO) submitted an application on 9 June 2017 to DER (now DWER) for an amendment to EP Act Licence L8621/2011/1 for the RHIO Mine (Premises). The amendment was requested to add three creek discharge points to existing licenced Category 6 - Mine Dewatering for the purpose of scheduled and unscheduled water discharge. The approved discharge to existing recharge basins of 378,000 tonnes per annual period remains unchanged, however additional authorisation for the creek discharge has been assessed and added as part of this amendment.

In addition, an omission was noted on the front page of Amendment Notice #3 (dated 17 November 2017). The omission was a category, being *'Category 52 - Electric power generation'* – which was one of the assessed components of Amendment Notice #3. As the 45MW diesel-fired power station has already been assessed, no risk assessment is required and Category 52 has been added to this document (front page of this amendment (#4)).

Mine dewatering - water discharge

The RHIO Process Plant is required to be shut down for maintenance purposes for approximately 31 days per calendar year. During this time the water from pit dewatering bores that is normally fed directly to the Process Plant for use, becomes excess and requires storage or disposal outside the Process Plant facility.

The hierarchy of excess (dewatering) water management within the L8621/2011/1

Premises requires the water to first be directed to existing turkeys nests for dust suppression, then to the Process Plant Dam and then recharge basins once the Process Plant Dam is full.

Once the recharge basins reach storage capacity, the Licensee propose to directdischarge surplus dewater from the bores to specific discharge locations within natural creek lines. The three proposed creek discharge locations are:

- No-Name Creek (to be named Zulu Dewatering Creek Discharge location);
- Kulbee Creek (Delta Dewatering Creek Discharge location); and
- West Kulbee Creek (Bravo Dewatering Creek Discharge location).

These locations are within Mining Lease M46/518 and the Prescribed Premises boundary as provided in Table 2.

These locations have been chosen as they are close to the existing dewatering pipeline network and so the installation of additional pipework will not be extensive. All pipelines to the discharge point will be buried beneath road and creek lines.

Pipework to one of the three locations located in No Name Creek (Zulu discharge location) has already been installed and was approved under previous amendment of L8621/2011/1 for use between 7 April 2016 and 24 November 2016. The remaining discharge locations (Bravo and Delta) are to be constructed under this amendment.

Dewatered water sourced from the Zulu pit dewatering bores will be discharged only to the 'Zulu Creek Discharge' location, water sourced from the Bravo pit will be discharged only to the 'Bravo Creek Discharge' location and water sourced from the Delta pit will be discharged only to the 'Delta Creek Discharge' location during scheduled discharge events. The Licensee has advised that the discharge of this excess dewater will only be required for a duration of 18-24 months, until such time that the Licensee have had their subsequent project water management strategy, approved under relevant EP Act legislation.

It is understood that the quality of groundwater below the RHIO Project area is likely to increase in salinity (total dissolved solids; TDS) over time with abstraction. The Licensee has committed that surplus water proposed for creek discharge will only be discharged if the TDS value is 2,000 mg/L, or lower. TDS from the dewatering bores is continually monitored via the SCADA system. The SCADA system will alert mine operators that TDS has exceeded the discharge limit and prompt the operator to cease the discharge. There will also be daily manual monitoring of TDS at the creek discharge point.

Scheduled discharge into the creek discharge points will be restricted to a maximum of 5 ML/day at a single point (15 ML/day total) for a total of 31 days per annum. The Licensee has indicated, based on field observations of previous discharges into No-Name Creek that this discharge volume will result in a stream surface water expression (wetting front) of up to 300m from the discharge point (under natural no-flow conditions) before the water fully infiltrates the stream bed.

RHIO has advised that currently the TDS of the groundwater produced from mine dewatering at Delta, Bravo and Zulu Pits is equivalent to the TDS of groundwater within the vicinity of the creeks. From drilling adjacent to the drainage lines and observation of creek flows, it is inferred that there are no near surface impermeable layers to restrict infiltration within the area.

Key aspects proposed by the Licensee for scheduled water discharge are:

- A maximum flow rate of 5 ML/day for a total of 31 days per annum will be discharged from each discharge point (15 ML/day total from the three discharge sites).
- Each scheduled event will be a maximum of 7 days per event (equalling a maximum of 105 ML discharge per 7 day event, or 4 weeks and 3 days of discharge per year).
- The concentrations of TDS in water discharged will be restricted to a maximum of 2,000 mg/L. The borefield SCADA system will alert operators that TDS has exceeded the discharge limit and prompt the operator to cease the discharge.
- Discharge at each location will be sourced from the corresponding borefield area (i.e. Bravo pit dewatering bores will feed the Bravo dewatering discharge point).
- Flow rates to the discharge points will be controlled by managing individual bore discharges to remain below the licence limit. Daily flow volumes will be managed against the daily discharge limit.
- The pipeline route distances are as follows: Zulu Creek Discharge Point to closest Zulu production bore – 2.7km
 Bravo Creek Discharge Point to closest Bravo production bore – 7.5km
 Delta Creek Discharge Point to closest Delta production bore – 1.7km

Table	2.	Pro	posed	creek	dischar	ae	locatio	ns
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Premise	Reference	Northing	Easting
Zulu Dewatering Creek Discharge Location	1	799548.13	7512847.16
(In No Name Creek)	2	799557.39	7512843.37
	3	799553.59	7512834.11
	4	799544.34	7512837.90
Bravo Dewatering Creek Discharge Location	1	800859.38	7510406.19
(In West Kulbee Creek)	2	800864.93	7510397.88
	3	800856.62	7510392.32
	4	800851.06	7510400.64
Delta Dewatering Creek Discharge Location	1	804844.01	7507797.24
(In Kulbee Creek)	2	804852.25	7507791.57
	3	804846.57	7507783.34
	4	804838.34	7507789.01
Datum: GDA 94 MGA Zone 50			

* Zulu Dewatering Creek Discharge location has discharge pipework already installed.

Unscheduled Process Dam Maintenance - water discharge

Anticipated to be required once every five years, the Licensee may require draining the Process Water Dam for inspection and repair. The Premises currently does not have the ability or infrastructure to store excess water from the Process Water Dam. During these periods, the Licensee has requested approval to discharge excess water from the Process Water Dam into the nearby, existing discharge point currently located within No Name Creek (Zulu dewatering discharge location).

In conjunction with disposal of water from the Process Plant Dam during Process Plant shut downs, the dewatering system will be valved off during this time to run as separate sections, thereby enabling some sections to continue to feed the dust suppression dams in support of mining and the Process Plant (if required).

The key aspects proposed by the Licensee for unscheduled water discharge comprise:

- Up to 100 ML into No-Name Creek discharge point during each unscheduled maintenance event.
- Each unscheduled maintenance event is anticipated to be once every five years.
- Flow rates into No-Name Creek during an unscheduled maintenance event, will be restricted to a maximum of 25 ML/day. At this maximum, it allows for 4 days of unscheduled water discharge.
- The quality of water discharged into No-Name Creek during an unscheduled maintenance event will have a maximum TDS of 6,000 mg/L.

Combined activities of mine dewatering and unscheduled process dam maintenance creek discharge

Based on the information provided by the Licensee, it is anticipated that a maximum of 465 ML/a (465,000 tonnes per year) may be required to be discharged across the three creek locations – being 31 days of discharge at a maximum of 15 ML/day (max 5 ML/day at each discharge location).

In addition, it is anticipated that once every five years, in addition to the planned creek discharge of 465 ML/a, that 100 ML/a will be discharged to No Name Creek as part of unscheduled Process Water Dam draining - excess water management. This additional discharge will increase the total discharge per annum to creek lines within the premises to 565 ML/a for that year (565,000 tonnes per year).

The Licensee proposed control measures for both mine dewatering and unscheduled process dam maintenance water discharge to the three creek locations comprise:

- Discharge will be controlled over a rock rip-rap that will be placed on the side of the drainage channel to reduce the area being subject to the full force of flood events.
- Flow into the creek will be managed through a spreader pipe to ensure that inundation downstream of the discharge point is minimised.
- Monitoring of riparian vegetation is conducted in accordance with the approved RHIO Vegetation Monitoring Plan at monitoring sites located downstream of the discharge locations. Vegetation downstream of the discharge locations will be monitored via the landscape Digital Multi Spectral Imagery (DSMI). The

vegetation monitoring will allow the Licensee to identify any potential impacts on riparian vegetation and manage flow rates into the creek should impacts be observed.

- Discharge locations have been selected to facilitate anticipated flows and infiltration.
- The pipework will be installed above ground between the bores and the discharge points with the exception of road crossings and creek lines where it will be buried.
- The pipe will be white poly-pipe with diameters in the order of 200-250mm.
- Manual, calibrated (annually) flow meters will be installed at each discharge location. Flow meter readings will be recorded daily during discharge.
- Flows to the creeks will be controlled and limited to a maximum of 15 ML/day in the event that the site turkey nests, process water dam and on site recharge basins are full (25 ML/day for unscheduled dam maintenance).
- Continuous water quality monitoring (of EC) and flow rates will be recorded at each bore head and recorded in the site-managed SCADA system. A review of this data will be conducted against all bores operating at the same time to determine the final TDS prior to release of water.
- TDS of water discharged will be verified by daily testing at the discharge point.

Clarification of existing condition 1.3.10 regarding tailings delivery

The Licensee has advised that burst discs have been installed to trigger an alarm and automatic shutdown of the tailings delivery pipelines when overpressure has been detected and a burst of the protection devices was triggered. All of the tailings delivery system is automated and fully controlled by PLC (programmable logic control) and can be remotely and automatically shut down by the control operator if required (DWER Record A1517665). DWER considers this provision of information as adequate to address section (a) of current condition 1.3.10. In addition, the Licensee has advised that secondary containment (requirement of condition 1.3.10 (b)) is in place at the residue booster station and that this secondary containment area can contain a spill volume equal to the time between routine inspections (two inspections per shift). The Licensee has also increased the inspection frequency of the tailings delivery pipelines to meet the requirements of section (c) of current condition 1.3.10.

The original works approval condition requiring full secondary containment of the entire tailings delivery pipeline for the tailings delivery line construction has not been met. However, the Licensee has provided the above information to address the mitigation of the risk and this has been deemed as acceptable. As such, condition 1.3.10 has been amended to remove the requirement for the full tailings delivery route to have secondary containment for capturing spills.

Removed works specifications

Compliance information for Additional Ore Processing Facilities was received from the Licensee on 21 December 2017 and 19 January 2018. Compliance documentation was received from the Licensee for Landfill 2 construction on 11 January 2018.

The construction compliance information provided for both facilities is acceptable; and the specifications for construction as outlined in Table 1.3.6 will be removed from the Licence as part of this amendment.

Other approvals

The Environmental Protection Authority (EPA)

The Licensee submitted an application on 2 December 2016 to the Office of the EPA requesting the ability to discharge dewatered groundwater subject to implementation conditions from MS824 and MS829.

Specifically, the Licensee proposed to discharge dewatered non-saline groundwater (less than 2,000 mg/L TDS) to existing creek lines during periods of planned and unplanned maintenance of the mine Process Plant, anticipated to be up to 31 days per year. Discharge will be limited to 5ML/day at each discharge point.

In addition, the Licensee requested that during unplanned shutdowns of the Process Plant Dam, anticipated to be once every five years the Licensee would need to discharge up to 100ML water from the Process Plant Dam to No-Name Creek. Flow rates will be restricted during these events to 25ML/day and the water quality will be a maximum 6,000 mg/L TDS.

The OEPA stated (in correspondence dated 9 June 2017) that it was satisfied that the proposed discharge of dewatered non-saline groundwater to the existing creek lines was not inconsistent with MS824 (as amended by MS 902 and 979) and MS 829 (amended by MS 980) and consequently approval under Part IV (section 45C) of the EP Act was not required for the Licensee to be able to dispose the abovementioned surplus water to the creek lines.

The Licensee has provided the following information relating to other approvals as outlined in Table 3.

Legislation	Number	Approval
Environmental Protection and Biodiversity Conservation Act 1999	EPBC No: 2008/4624	Notification of Referral Decision – Not a Controlled Action
Environmental Protection Act 1986 (Part IV of the EP Act)	MS824 and MS829	MS824 (Stage 1) and MS829 (Stage 2)
Rights in Water and Irrigation Act 1914	GWL172642(3)	'Licence to Take Groundwater (s5C)' in accordance with the Rights in Water and Irrigation Act 1914 (RiWI Act) provides authorisation for the ability to abstract for the purpose of dewatering.

Table 3: Relevant approvals

Amendment history

Table 4 provides the amendment history for L8621/2011/1.

Table 4: Licence amendments

Instrument	Issued	Amendment						
	22/03/2012	New Licence issued approving operation of category 85 (sewage facility)						
	30/05/2013	Amendment to include category 89 (putrescible landfill)						
	19/09/2013	Amendment to include category 12 (screening of material) and upgrade from category 85 to category 54 (sewage facility)						
	8/5/2014	Amendment to incorporate expansion to the landfill (category 89)						
	5/2/2015	Amendment to add category 57 (used tyre storage), increase category 64 landfill design capacity and excise land for a small sewage facility						
	9/4/2015	Administrative amendment						
	5/11/2015	Amendment to include the MSA sewage facility and update licence template						
	7/4/2016	Amendment to include category 6 (dewatering) and 73 (bulk storage of chemicals), construction of northern recharge basin and southern and northern discharge locations to No-name Creek. Removal of Mankarlyikkakurra Exploration Camp.						
L8621/2011/1	29/04/2016	Amendment by Notice to extend Licence expiry date to 25/03/2034						
	24/11/2016	Amendment to include category 5 operations including ore processing plant and Tailings Storage Facility (TSF), additional sewage facility, landfill and dewatering recharge basins. Removal of conditions related to the discharge of dewatering effluent to the southern and northern discharge locations to No Name Creek, and the monitoring of those emissions, due to expiry of OEPA temporary authorisation to discharge.						
	13/1/2017	Amendment Notice 1 - approved operation of TSF evaporators to enhance water evaporation within TSF.						
	16/11/2017	Amendment Notice 2 –approved changes to the design and construction of the stage 2 raise of the TSF; addition of groundwater monitoring conditions around TSF, administrative changes.						
	17/11/2017	Amendment Notice 3 – approved operation of new power station, in-pit tyre disposal areas and additional crushing/screening facilities.						
	29/05/2018	Amendment Notice 4 (this notice) – addition of three creek discharge points for the purpose of mine dewatering - water discharge and unscheduled Process Dam Maintenance - water discharge. Addition of Category 52 to front page of Notice (administrative only as previously assessed under AN#3). Amendment to condition 1.3.10 to remove requirement for full secondary containment of tailings delivery line.						

Location and receptors

Table 5 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 5: Receptors and distance from activity boundary

Residential and Sensitive Premises	Distance from Prescribed Premises Boundary	Distance from nearest discharge location
Roy Hill Homestead	About 0.5 km away to the south	About 12.3km to the south of the Delta discharge location

Table 6 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which are relevant to the proposed amendment.

Environmental receptor	Distance from Prescribed Premises Boundary
Fortescue River and Marsh – Priority 1 ecological community	The Fortescue River and Marsh are located more than 2km southwest of the Project infrastructure (at the nearest point in the south of the Premises boundary) and approximately 7km to the south west of the nearest creek discharge point.
	Inflows to the Marsh occur from the Fortescue River (outside the Premise boundary) and other creeks within the region, along with sheet flow after storm events.
	The Kulbee Creek (and Kulbee Creek west arm) passes through the centre of the Premises, with the Kulkinbah Creek located to the southeast and No Name Creek to the northwest. These ephemeral creeks flow in a southwest direction towards the Fortescue River and Marsh. The Kulbee, Kulkinbah and No Name Creek catchments combined represent less than 0.5% of the Fortescue catchment. There are no permanent creeks, surface water pools or wetlands within the Premises.
Surface water body	There are three surface water bodies that will receive the additional water discharge. As discussed in the row above, Kulbee Creek west arm, Kulbee Creek (main) and No Name Creek are the environmental receptors. The discharge locations are all located within the Premises.
	During construction of the mine project, upstream sections of Kulbee Creek were diverted and re-instated in a nearby, alternate location to avoid infrastructure.
Vegetation	Groundwater dependent and surface water vegetation communities have been identified within the boundaries of the Premises, specifically the creek line areas which are the subject areas of this amendment. Large phreatophtyic vegetation is present on the banks of the proposed creek discharge locations (RHIO, 2009) No threatened or priority ecosystems have been identified. No DRF were located at the Premises.
Groundwater	Near the Zulu discharge point
	 23.22 to 44.7 mbgl at the bore (RHPB0018*) between March 2014 and July 2016.
	Near the Bravo discharge point
	 23.29 to 24.1 mbgl at the bore (RHPZ0022AS**) between August 2011 and June 2016.
	Near the Delta discharge point
	 23.29 to 24.1 mbgl at the bore (RHPZ0024S**) between July 2011 and June 2016.
	Across the mine area, production and monitoring bores were determined to be alkaline, and of brackish salinity (1,000 to 3,000 mg/L TDS).
Groundwater bores	Fortescue Metals Group Pty Ltd – About 4 km to the northwest of the Premise boundary.

Table 6: Environmental receptors and distance from activity boundary

*note: this bore is more than 1km downstream from the discharge point **note: this bore is more than 1km upstream from the discharge point

Vegetation

The vegetation within the Roy Hill Project area, in particular the riparian communities, are in relatively poor condition due to extensive historical and current pastoral activities that extend to the Fortescue Marsh. This also applies to a lesser yet significant degree to mulga (*Acacia aneura*) communities within the Project area (Ecologia, 2009).

Vegetation mapped in and around the proposed (Zulu) No Name Creek discharge location has been characterized as containing scattered *Eucalyptus vitrix* (Coolibah) over a low woodland of *Acacia aneura / A. coriacea* subsp. *pendens/ Atalya hemiglauca* over open shrubs over dense **Cenchrus ciliaris* (buffel grass [weed]) grassland.

Vegetation mapped in and around the proposed (Bravo) West Kulbee Creek and (Delta) Kulbee Creek discharge locations comprises groves of *Acacia aneura*. *Acacia rhodophloia* woodland over sparse shrubland of *Eremophila forestii* subsp. *Forestii*, *Senna artemisioides* subsp. *helmsii*, *Eremophila latrobei* subsp.*filiformis* over open to sparse grasses.

Regional hydrology and identified environmental values

The main surface water drainage through the Roy Hill Project area occurs in several significant southward draining catchments that have headwaters in the Chichester Range and terminate in, and provide minor surface water contributions to the Fortescue Marsh (No Name Creek, Kulbee Creek, Kulkinbah Creek and others) (MWH, 2015).

Groundwater contribution to the Fortescue Marsh water balance is minor when compared to surface water contributions; however, the Marsh is underlain by a large storage of saline to hypersaline groundwater. Recharge is associated with major cyclonic events that are episodic and relatively short-lived, resulting in some short-term mounding within the shallow groundwater system (MWH, 2015).

The Fortescue Marsh management area is zoned according to key environmental values (EPA, 2013). The location of the three proposed creek discharge locations is within the *Kulbee Alluvial Flank'* Fortescue Marsh management zone (zone 3a). This Zone has been characterized has having the "lowest environmental significance" "Relative priority" (EPA, 2013); however it has an important hydrological contribution to supporting the values in management zone 2c (Fortescue River Coolibah) and 1b (Marsh).

The key environmental values as identified in the report (EPA, 2013) comprise natural water regimes, natural springs and pools, mulga woodlands, species of conservation significance and subterranean fauna. The key environmental values of natural springs and pools, species of conservation significance and significant subterranean fauna have not been identified at or within the proposed creek discharge locations.

Hydrogeology

The Roy Hill orebody is in direct hydraulic connection with the regional aquifers via the mineralised Marra Mamba Formation being in direct connection with the Tertiary detritals and Oakover Formation, and potentially the regional karst aquifer of the Wittenoom Formation to the south (MWH, 2015).

Aquatic fauna

Consultants Wetland Research and Management (WRM) conducted a survey in 2015 of the aquatic fauna in Kulbee Creek. The survey identified 18 taxa of emergent fauna during sediment rehydration trials. No species recorded were listed as being of conservation significance by the International Union for Conservation of Nature (IUCN) Red List, EPBC Act or the Department of Park and Wildlife (DPaW) Threatened Fauna Schedule.

No information regarding the emergent fauna (including hyporheic fauna) in and around the No Name Creek discharge area was available at the time of this assessment.

No information regarding the macrofauna in and around the creek discharge areas was available at the time of this assessment.

Risk assessment

Tables 7 and 8 below describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

Risk Event									
Source/Activities		Potential Potentia emissions receptor		Potential pathway	Potential adverse impacts	rating	rating	Risk	Reasoning
Cat 6	Construction of dewatering discharge infrastructure within creek lines	Dust: associated with construction activities	Local vegetation	Air / wind dispersion	Vegetation health impacts	-	-	-	The movement of vehicles both in and outside the creekline is unlikely to generate significant dust given the gravelly nature of the existing creek base. Construction activities, and associated dust emissions (if any), will be of relatively short duration.
Mine Mine dewatering: premises on which water is extracted and discharged to the environment to allow mining of ore ore	Vehicle	Noise	No nearby residences or other sensitive receptors.	Air / wind dispersion	None				The buffer distance between the nearest
	movements on unsealed access roads and pipeline construction activities	Dust	Hill Homestead is more than 12.3km to the south of the closest discharge point construction area		None	-	-	-	Roy Hill homestead is considered sufficient to prevent noise and dust impacts from occurring. Construction activities, and associated noise and dust emissions, will be of relatively short duration and no greater than normal mine site operational use of unsealed roads.

Table 7: Risk assessment for proposed amendments during construction

Risk Event									
Source/Activities Pote emit		Potential Potential emissions receptors		Potential pathway pathway		Consequence rating	Likelihood rating	Risk	Reasoning
Cat 6 Mine dewatering: premises on which water is extracted and discharged to the environment to allow mining of ore	Discharge to creek lines within the Premises	Dewater to surface-water receiving environment	Riparian ecosystems	Direct discharge – release of water into the creek	Disruption of normal, localised ecosystem function	Moderate	Possible	Medium	The discharge of excess water will create an additional water source outside sporadic rainfall events within creek lines that are not continually-flowing. This could create an artificial ecosystem whereby vegetation dependency on surface water could increase. Addition of the surface water will increase the localised accessibility of water to (facultative) phreatophytic vegetation, vadophytic vegetation (see 'Phreatophtic vegetation' below) and opportunistic vegetation (e.g. weeds) and maintain a saturated habitat for stygofauna and other creekbed macrofauna. Opportunistic facultative phreatophytic vegetation eg: <i>E.victrix</i> (Coolibah) have already been recorded within the No Name Creek (Zulu discharge point) (See Table 6 and vegetation information in the section above). There is potential for vegetation death post-creek discharge cessation following dependency of vegetation on an artificial water source. It is noted that vegetation monitoring is occurring (as required under Part IV [Roy Hill Iron Ore Vegetation Condition Environmental Management Plan (EMP), dated 6/7/171) within the Premises

Table 8: Risk assessment for proposed amendments during operation

Risk Event									
Source/Activiti	ities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									boundary. However the monitoring points for the existing program are further than the estimated ~300m downstream of excess discharge flow (at each discharge location). In addition, the targets for monitoring under the RHIO Vegetation Condition EMP relate to the drawdown of groundwater impacting vegetation and the diversion of surface water flows impacting vegetation. As such, it is considered that the current monitoring locations are too far away to observe any impacts from within estimated outfall zone of ~300m downstream and the current targets of the EMP are not aimed at addressing unplanned increases in surface water flow (such as the creek discharge, subject of this amendment). <u>Consequence:</u> Despite the low TDS levels proposed for discharge and the management measures proposed by the Licensee, the onsite impacts have the potential to be mid- level. The offsite impacts on a wider scale are determined to be minimal. The Specific Consequence Criteria (from EPA, 2013) are at risk of not being met. Therefore the consequence is moderate.

Risk Event									
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	consequence rating	Likelihood rating	Risk	Reasoning
									as possible . <u>Overall Risk Rating</u> : Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) determines the overall rating of risk of disruption to normal, localised ecosystem function to be medium .
				Direct discharge – unscheduled release of water into No Name Creek	Disruption of normal, localised ecosystem function	Moderate	Possible	Medium	Noting that up to 100 ML of water will be discharged to No Name Creek over a period of 4 days (restricted to max. 25 ML/d) once, every 5 years; the max TDS of 6,000mg/L will flush the Creek with higher salinity than scheduled disposal (2,000 mg/L TDS). In addition, it is reasonable to assume that the greater volume of water discharged during the unscheduled period may flow further down the creek than the 5 ML/d (scheduled), therefore lengthening any potential impact zone within/along the creek bed. <u>Consequence:</u> Despite the low TDS levels/ brackish water quality proposed for discharge during unscheduled events and the management measures proposed by the Licensee, the onsite impacts have the potential to be mid-level. The offsite impacts on a wider scale are determined to be minimal. The Specific Consequence Criteria (from EPA, 2013) are at risk of not being met. Therefore the consequence is

	Risk Event								
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									moderate.Likelihood: occur at some time. The likelihood consequence has been determined as possible.Overall Risk Rating: Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) determines the overall rating of risk of disruption to normal, localised ecosystem function to be medium.
			Riparian ecosystems	Direct discharge	Increased dispersion of opportunistic weeds causing ecosystem disruption via dispersal and competition	-	-	-	Weeds have been identified in and around the discharge areas. The addition of a flowing water source into the creek provides a mechanism for further weed dispersal and the provision of a water source as a growth medium. For areas where the vegetation is already partially degraded, the addition of weeds will be detrimental to normal ecosystem function. The increased presence of weeds will compete for space in areas where water is available therefore reducing the surface area for native species establishment. This aspect has not been assessed as it has previously been assessed and is managed under Part IV of the EP Act.
			Fortescue Marsh	Indirect discharge	Impact to hydrological	Minor	Unlikely	Medium	The creek systems to receive the additional discharge are only

Risk Event									
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	rating	Likelihood rating	Risk	Reasoning
					and ecological integrity of major tributaries entering the Marsh Downstream impact to the Fortescue Marsh				connected to the Fortescue Marsh during flooding associated with intense cyclonic events. However, whilst the activities (both creek discharge and recharge from filtration of discharged water through the creek bed) may have relatively short duration and flows (from the Licensee operations) will be controlled via rip-rap and spreader pipes, the additional/ artificial discharges have the potential to impact the water and environmental values of the Marsh (1b) and Fortescue River Coolibah (2c) (EPA, 2013) management zones. Impacts comprise addition of heavy metals, nutrients and a potential increase in creek turbidity which may be further exacerbated during cyclonic flooding of creeklines. These impacts are potentially at variance with the EPA, 2013 Management objective for Zone 3a – <i>'Kulbee Alluvial Flank'</i> to ' <i>Protect the hydrological and ecological integrity of major tributaries entering the Marsh.</i> <u>Consequence:</u> The Fortescue Marsh is located approximately 7km to the south west of the nearest creek discharge point. Taking the distance and the management of water quality as proposed by the Licensee into consideration, the offsite impacts on a local scale are determined to be minimal and potentially not

		Risl	k Event						
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									detectable on wider scale. Therefore the consequence is minor . <u>Likelihood:</u> Impact to the hydrological and ecological integrity of each (creek) tributary will probably not occur in most circumstances, therefore the likelihood is determined to be unlikely . <u>Overall Risk Rating</u> : Comparison of the consequence and likelihood
							5		ratings described above with the Risk Rating Matrix determines the overall rating of risk of impacts to the hydrological and ecological integrity of the three tributaries or downstream impacts to the Fortescue Marsh to be medium .
			Phreatophytic vegetation	Groundwater Surface water inputs	Disruption of normal, localised ecosystem function	Minor	Possible	Medium	Additional water source outside sporadic rainfall events to creek lines that are not continually-flowing creating an artificial ecosystem whereby vegetation dependency and establishment of facultative phreatophytic vegetation (utilizing both surface water and localized, mounded groundwater) could increase.
									There is potential for phreatophytic vegetation death post-creek discharge cessation following dependency of vegetation on the artificial water source cause by localized water mounding below the discharge area.

Risk Event									
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									It is understood that Rising Stage Samplers (RSS) and Level Troll Water Level Data Loggers (WLDL) are present in watercourses around the mine site to record surface water flows during rainfall events. RSS stations allow water quality at different depths of stream flow to be tested, whilst WLDLs record surface water depth on a continual basis during a flow event. These have been installed to meet compliance requirements for MS 824 and 829. Sites NN2 (in No Name Creek) and WKC4 (in West Kulbee Creek) are located downstream of the proposed Zulu and Bravo discharge locations. It is understood that these two locations are greater than 300m downstream from the proposed discharge points and as such are unlikely to record flow information from the scheduled and unscheduled discharge events. Site NN1 (in No Name Creek) (RHIO, 2016) is located approximately 3.6km upstream of the Zulu discharge location and only provides indicative data on natural flows that may reach the Zulu discharge point. <u>Consequence:</u> The impact from additional water input in the short term may be beneficial for the period of discharge, however this impact will not be able to be determined until discharge commences and the surrounding vegetation 'reacts' to the

	Risk Event								
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									change in conditions. In addition, the establishment and then impact to phreatophtic vegetation once discharge ceases, is unknown. Given the flow is anticipated to only travel ~300m downstream before infiltration and potential groundwater mounding from this additional discharge will be of low TDS, the zone of influence on/ to vegetation is not anticipated to be widespread. The on-site impacts are considered to be low level and off site impacts, minimal. Therefore, the consequence is considered to be minor. <u>Likelihood:</u> Based on the proposed Licensee controls (TDS management) and unknown reaction of the vegetation during and post- discharge cessation, the likelihood consequence has been determined as possible . <u>Overall Risk Rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix determines the overall rating of risk of impact to phreatophytic vegetation to be medium .
			Groundwater	Land to groundwater	Change to groundwater quality	Minor	Unlikely	Medium	Information provided by the Licensee has indicated similarities in water quality data during a representation time period between 11 February and 17 May 2015. Noting that data is over 2.5 years old and groundwater salinities will be increasing with

	k Event							
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
								increased depth and groundwater abstraction, the Licensee has committed to maintaining a scheduled discharge limit of 2,000 mg/L TDS, and 6,000 mg/L TDS for unscheduled events which are to occur once every 5 years. It is anticipated that any impact to groundwater composition and quality will be localized to a zone (see mounding in the row below) below the recharge area and not distributed significant distances away from the recharge points radially below ground. <u>Consequence:</u> The environmental impact from the discharge of similar- quality water to the creek environment and localized groundwater area would result in low level on-site impacts. Therefore, the consequence is minor . <u>Likelihood</u> : Based on the distance to the nearest (human) groundwater user and the management measures and monitoring proposed by the Licensee, the likelihood of the consequence occurring is unlikely . <u>Overall Risk Rating</u> : Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) determines the overall rating of risk

Risk Event								
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	consequence rating	Likelihood rating	Risk	Reasoning
								groundwater quality to be medium .
			Land to groundwater	Mounding below discharge point	Minor	Unlikely	Medium	The impact from the introduction of similar-quality water to the localized groundwater area is considered to result in low level on-site impacts. The impact being on vegetation dependency and establishment of facultative phreatophytic vegetation (utilizing both surface water and localized, mounded groundwater) by vegetation that has adapted to the current environmental conditions and availability of water. It is likely that there would be some level of groundwater mounding in similar recharge areas of the creek lines following the flooding associated with intense cyclonic events. Although the duration and quantity of these cyclonic flood events vary, it is anticipated that the sub-surface pattern of mounding (caused by the Licensee dewatering and unscheduled process dam discharge) would be familiar with the input and dispersal of the additional water below ground. <u>Consequence:</u> The impact from mounding of water below the localized discharge point is considered to have low-level on-site impacts based on Licensee management of water quality and expected familiarity of the receiving

Risk Event									
Source/A	ctivities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	Consequence rating	Likelihood rating	Risk	Reasoning
									inflow. The consequence is therefore deemed minor . <u>Likelihood</u> : Based on the location of the discharge locations and the familiarity of the receiving subsurface environment for (natural) episodic recharge, the likelihood of mounding causing an impact is considered to be unlikely . <u>Overall Risk Rating</u> : Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) determines the overall rating of risk of an impact occurring from mounding to be medium . Note: this risk has been assessed separately to any mounding that may occur elsewhere within the Premises as a result of other recharge activities.
	Dewatering of mining area	Change in hydrological processes and quality from removal of groundwater source	Subterranean fauna	Movement and removal of groundwater resource	Change to chemical composition and quality of groundwater by abstraction pulling saline water hydraulically closer to the surface		-	-	This aspect has not been assessed as it has previously been assessed and approved under Part IV of the EP Act.

Decision

The risks to groundwater from the physical activity of dewatering the groundwater resource and management of weed distribution have previously been assessed under Part IV of the EP Act and under the *RiWI Act.*

MS 824 and MS 829 have specific conditions (Condition 6) relating to the management of groundwater abstraction from the mine areas and borefield. Conditions ensure abstraction does not adversely affect vegetation to be retained in the proposal area, and that drawdown of groundwater does not extend beyond the coordinates as approved as part of the Part IV assessment. As such, the environmental impacts from the dewatering of the mine pits has not been considered in this assessment.

MS824 (Condition 10) and MS829 (Condition 11) discusses the introduction of new weed species and limitation of weed coverage to that surveyed during original baseline (vegetation) monitoring. As the management of weed distribution has been conditioned by the two Ministerial Statements, no additional conditions are to be applied to this amendment notice for the management of weeds.

Taking the key environmental value of *'natural water regimes'* as identified in the Fortescue Marsh management area report (EPA, 2013 ['Kulbee Alluvial Flank' zone]) into consideration, additional conditions are proposed around the monitoring of the vegetation to assess the impacts of sporadic discharge of water to the creek lines. It is understood that the Licensee propose to discharge water that is of similar salinity to local groundwater (2,000 mg/L being slightly brackish), however the impact of the sporadic release of large volumes of water, which may have varying quality* to localized creek areas may alter natural water regimes and increased localized water mounding and the full environmental impact of this is currently not well known.

Surface water availability or persistence of water features, physical disturbances and hydrologic connectivity resulting from this highly dynamic regime in turn plays a central role in shaping aquatic and terrestrial ecosystem processes, species life history strategies and interactions and population dynamics (Box et al.,2008; Leigh et al., 2010; Pinder et al., 2010; Sponseller etal., 2013). Changes in hydroclimatic patterns and extremes that might alter the natural disturbance regime would thus have profound consequences for the structure and functioning of often highly specialised and adapted arid ecosystems (Newman et al., 2006; Leigh et al., 2010).

The Delegated Officer considers that the impact on the other key environmental value of *'Mulga woodlands'* identified in the localized creek discharge areas will be captured by the (proposed) conditions for the impact review on *'natural water regimes'*, as mentioned above as no separate conditioning specifically for *'Mulga woodlands'* is deemed to be required.

It is understood that the Licensee has an existing EMP (Roy Hill Iron Ore Vegetation Condition Environmental Management Plan) that includes monitoring points nearby to the proposed discharge locations. However, upon review of these locations and the proposed monitoring schedule within the EMP, it has been determined that the existing monitoring points are unlikely to capture the localized impacts that need to be analyzed from the immediate surrounds of the discharge locations. As such, additional monitoring information has been included in the conditions below. RSS and WLDL currently installed around the Premises to record surface flows during rainfall events are unlikely to record flow events from the scheduled and unscheduled dewatering discharge events. As such, additional conditions have been included below to identify the flow rates and distance flows have travelled during each discharge event.

* Varying quality for the purpose of this section is defined by all water quality data and is not limited to *pH*, TDS and EC.

Licensee comments

The Licensee was provided with the draft Amendment Notice on 2 February 2018 and for a second review on 4 May 2018. Comments received from the Licensee have been considered by the Delegated Officer as shown in Appendix 2.

Amendment

1. Condition 1.3.10 of the licence is amended by the insertion of the bold text shown in underline below.

1.3.10 The Licensee shall ensure that:

(a) all tailings delivery pipelines are equipped with automatic cut-outs in the event of a pipe failure;

(b) all tailings delivery pipelines are <u>provided with secondary containment at the</u> booster station area sufficient to contain any spill for a period equal to the time <u>between routine inspections;</u> and

(c) Twice daily inspections are undertaken on the integrity of all the tailings delivery and tailings decant pipelines.

2. Condition 1.3.14, Table 1.3.6 of the licence is amended by the insertion of the bold text shown in underline and deletion of text shown in strikethrough, below.

1.3.14 The Licensee must not depart from the specifications in Table 1.3.6 except:

- (a) where such departure is minor in nature and does not materially change or affect the infrastructure; or
- (b) where such departure improves the functionality of the infrastructure and does not increase risks to public health, public amenity or the environment; and
- (c) all other Conditions in this Licence are still satisfied.

Table 1.3.6:	Works specifications
Column 1	Column 2
<u>Zulu</u>	1. Construction and placement of the rock rip-rap area in the defined creek
<u>Dewatering</u>	bed/channel (at 'Zulu Creek Discharge Point' in Schedule 1: Map of
<u>Creek</u>	dewatering bore areas and creek discharge points) to minimise erosion
Discharge	and vegetation disturbance.
location	2. Spreader pipe to disperse flow across the rip-rap area
	3. Flow meter near the discharge point to record discharge volumes
	4. Pipelines are/will be buried beneath road and creek lines
	5. The length (to nearest bore of the pipeline to the discharge point) will be
	approximately 2.7km.
Bravo	1. Construction and placement of rock rip-rap in the defined creek
Dewatering	bed/channel (at 'Bravo Creek Discharge Point' in Schedule 1: Map of
Creek	dewatering bore areas and creek discharge points) to minimise erosion
Discharge	and vegetation disturbance
location	2. Spreader pipe to disperse flow across the rip-rap area

	3. Flow meter near the discharge point to record discharge volumes
	4. Pipelines are/will be buried beneath road and creek lines
	5. The length (to nearest bore of the pipeline to the discharge point) will be
	approximately 7.5km.
Delta	1. Construction and placement of rock rip-rap in the defined creek
Dewatering	bed/channel (at 'Delta Creek Discharge Point' in Schedule 1: Map of
Creek	dewatering bore areas and creek discharge points) to minimise erosion
Discharge	and vegetation disturbance
location	2. Spreader pipe to disperse flow across the rip-rap area
	3. Flow meter near the discharge point to record discharge volumes
	4. Pipelines are/will be buried beneath road and creek lines
	5. The length (to nearest bore of the pipeline to the discharge point) will be
	approximately 1.7 km.
Mine Power	1. Comprised of:
Station	 56 x Caterpillar 3516B (XQ2000) diesel generators:
	• 2 x 110 000L double skinned diesel storage tanks
	 28 x transformers in self-bunded modules:
	 1 x 27 0001 self-bunded lube storage tank: and
	• 1 x 21,000L self-builded lube stolage talk, and
	• I x oil water separator system (OWS), designed to treat stormwater to
	Iess than Iomg/L IPH;
	2. Constructed as per Attachment 3 titled Roy Hill Iron Ore Mine - Power Station
	Layout ; and
	3. Exhaust emissions from each generator via two 0.45m diameter stacks at a
1 11 1	neight of 2.9m above ground level at a velocity of 34.6m/s
In-pit tyre	1. To be located within Delta Mine Pit as per Attachment 4 titled "Roy Hill Iron Ore
disposal area	Mine - In-pit Tyre Disposal Locations"; and
	2. Base of tyre disposal area to be at least 3m above original groundwater level
Additional Ore	1. Lump to Fines Crushing Facility, DSO Screening Facility and Jaw Crushers 1-3
Processing	to be constructed at locations depicted in Attachment 1 Premises Map;
Facilities	2. Lump to Fines Crushing Facility with design capacity of 3.4mtpa;
	3. Lump to Fines Crushing Facility to be enclosed to limit dust emissions during
	operations;
	4. DSO Screening Plant with design capacity of 4mtpa;
	5. Fransfer points at Lump to Fines Crushing Facility, DSO Screening Facility and
	Jaw Crushers 1-3 are fitted with water sprayers to minimise dust during ore
	transfer; and
	b. Jaw Crushers 1-3 with combined design capacity of 9,000tph and fitted with
	internal and external dust curtains, primary and secondary scrapers, wind-
	guards and surge bins
Stage 2 TSF	1. Phased removal of relevant Cell (1 or 2) tailings delivery pipelines, decant
raise	pipework and associated infrastructure;
	2. Phased bulk earthworks construction of embankment lifts of relevant Cell (1 or
	2) including raising of decant structure, to a design level of 442mRL;
	3. Re-installation of tailings delivery pipelines, decant pipework and associated
	infrastructure at relevant Cell prior to commencement of raise on subsequent
	Cell; and
	4. Pipelines located around the top of the dam wall are to be constructed of P12
	DN450 HDPE and pipelines constructed from the Booster Station to the inflow
	area on the dam wall, constructed of C12 DN450 Carbon Steel Pipe.
Landfill 2	The Licensee must ensure that the Landfill 2:
(See Schedule	1. has a 1.8 metre security fence and gate erected around the perimeter of the
1: Maps)	landfill;
	2. nas appropriate signage which specifies what types of wastes are accepted at
	the landfill and where they are to be deposited;
	3. Is contained within the Premises boundary;
	4. has a tirebreak of 3 metres around the boundary of the landfill;
	5. has a stormwater diversion levee north east of the landfill which is designed to-
	prevent any stormwater from entering the landfill from outside;
	6. a minimum distance of 3 metres is maintained between the base of each trench
	and the highest level of the water table aquifer;

7. is designed so all contaminated stormwater is retained within the landfill area;
8. has sufficient soil, which has been excavated from the creation of trenches at
the landfill, stockpiled adjacent to the open trenches and enough to cover the
tipping area at least twice;
9. has water used for dust suppression during excavation and backfilling of each
trench; and
10. has two groundwater monitoring bores located hydraulically up and down
gradient of the landfill, and baseline groundwater monitoring is conducted prior-
to disposal of any waste into the landfill.

"*UK Environment Agency, 2009 and British Geological Survey, 2010.

3. Condition 1.3.18 and Table 1.3.7 of the licence is inserted as shown in bold, underlined text below.

Table 1.3.7: Production or design capacity limits			
Category ¹	Category description ¹	Premises production or design capacity limit	
5	Processing or beneficiation of metallic or non-metallic ore	65,000,000 tonnes per annual period	
6	Mine dewatering	 378,000 tonnes per annual period 843,000 (scheduled) tonnes per annual period discharged <u>Comprising:</u> <u>378,000 tonnes per annual period discharged to recharge basins.</u> 5,000 tonnes per day over 31 days per annum with a maximum of 7 days per scheduled event, discharged at Zulu Creek Discharge location. (Maximum discharge of 155,000 tonnes per annum) <u>5,000 tonnes per day over 31 days per annum with a maximum of 7 days per scheduled event, discharge at Zulu Creek Discharge location. (Maximum discharge of 155,000 tonnes per annum)</u> 	
		scheduled event, discharged at Bravo Creek Discharge location. Maximum discharge volume to Bravo Creek Discharge of 155,000 tonnes per annum). • 5, 000 tonnes per day over 31 days per annum with a maximum of 7 days per scheduled event, discharged at Delta Creek Discharge location. Maximum discharge volume to Delta Creek Discharge of 155,000 tonnes per annum) and In addition to the abovementioned 843,000 (scheduled tonnes), once every 5 years Comprising: • 100,000 tonnes per annual period;	

		<u>with no more than a maximum of 25,000 tonnes per day to the Zulu</u> <u>Creek discharge location</u>
12	Screening, etc. of material	6,570,000 tonnes per annual period
73	Bulk storage of chemicals, etc.	5,530 cubic metres in aggregate as per Bulk Fuel Facility specifications in Table 1.3.4

4. The Licence is amended by the insertion of the following sub-section 2.5 and condition 2.5.1 has been added to the licence as shown in bold underline below:

Condition 2.5 Point source emissions to surface water

2.5.1 Creek discharge from Zulu, Bravo and Delta dewatering areas is to occur for a maximum period of 12 months, or when subsequent site-watermanagement strategies have been approved under the Environmental Protection Act 1986, or whichever date comes first.

5. The Licence is amended by the insertion of Condition 2.5.2 and Table 2.5.1 as shown in bold underline below:

2.5.2 The Licensee shall ensure that where waste is emitted to surface water from the emission points in Table 2.5.1 and identified on the map of surface water emission points in Schedule 1, it is done in accordance with the conditions of this Licence.

Table 2.5.1: Point source emissions to su	<u>ırface water</u>	
Emission point reference	Description	Source including
		<u>abatement</u>
Zulu Dewatering Creek Discharge	Discharge to	Water from dewatering of
location	No Name	Zulu pit
	<u>Creek</u>	
		Water from Process Water
		<u>Dam</u>
Bravo Dewatering Creek Discharge	Discharge to	Water from dewatering of
<u>location</u>	West Kulbee	Bravo pit
	<u>Creek</u>	
Delta Dewatering Creek Discharge	Discharge to	Water from dewatering of
location	Kulbee Creek	Delta pit

6. The Licence is amended by the insertion of Condition 2.5.3 as shown in bold, underlined text below.

2.5.3 The Licensee shall record and maintain daily records of the discharge of water to the emission points as referenced in Table 2.5.2 for the purpose of preparing a summary report to be submitted to the CEO within 4 weeks of discharge. The report is to detail the reason for discharge, volumes discharged at each location, water quality and duration of discharge. The report shall also assess the discharged water quality and compare that data to the relevant trigger levels for parameters 95% protection of freshwater ecosystems (ANZECC / ARMCANZ (2000)).

7. Condition 2.5.4, Table 2.5.2 of the Licence is inserted into the Licence as shown in

bold, underlined text below.

2.5.4 The Licensee shall not cause or allow point source emissions to surface water greater than the limits listed in Table 2.5.2.

Table 2.5.2: Poin	t source emission lim	its to surface water	
Emission point	Parameter	<u>Limit</u>	Averaging period
<u>reference</u>		<u>(including units)</u>	
Zulu, Bravo	Total Dissolved	2 000 mg/l	Continuous during
and Delta	<u>Solids (mg/L)</u>	<u>2,000 mg/L</u>	discharge for the
Dewatering	<u>Electrical</u>	<u>3,000 µS/cm</u>	approved period of up
<u>Creek</u>	Conductivity (EC)		<u>to 31 days per annum</u>
<u>Discharge</u>	<u>(µS/cm)</u>		with a maximum of 7
locations			days for each
			<u>scheduled event.</u>
<u>Zulu</u>	Total Dissolved	<u>6,000 mg/L</u>	Continuous over 4
Dewatering	<u>Solids</u>		days of unscheduled
<u>Creek</u>	Electrical	<u>8,759 μS/cm</u>	process dam water
<u>Discharge</u>	Conductivity (EC)		<u>discharge, once every</u>
location	<u>(µS/cm)</u>		<u>5 years</u>

8. Condition 3.6.1, Table 3.6.1 of the Licence is amended by the insertion of new rows as shown in bold underline below.

Table 3.6.1: Monitoring of ambient groundwater quality				
Monitoring point reference as depicted in Schedule 1	Parameter	Units	Averaging period	Frequency
RHPZ0026S and RHPZ0034 Landfill2: 2 bores as shown in Landfill 2 map, following construction and prior to operation.	Standing Water Level ¹ pH ¹ Electrical Conductivity Total Dissolved Solids Total Hardness Aluminium (Al), Arsenic (As), Barium (Ba), Boron (B), Cadmium (Cd), Chloride (Cl), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Silver (Ag), Sodium (Na) and Zinc (Zn)	m(AHD) pH units μS/cm mg/L	Spot sample	Quarterly
RHZ0026S, RHPZ0034 and RHPZ0035	Total Recoverable Hydrocarbons	mg/L		
TSFMW01, TSFMW02, TSFMW03, TSFMW04, TSFMW05, TSFMW06, TSFMW07, and TSFMW08	Standing Water Level ¹	m(AHD)	Spot sample	Monthly
Bores providing	Electrical Conductivity	<u>µS/cm</u>	<u>Daily</u>	<u>Continuous</u>

<u>water to the</u> <u>discharge points</u> <u>from the Zulu,</u> <u>Bravo and Delta</u> <u>Dewatering Bore</u>	<u>Total Dissolved Solids</u> <u>Volumetric flow rate¹</u>	<u>mg/L</u> <u>m³/day</u>		<u>during discharge</u>
<u>Areas</u>	Other parameters (mg/L): <u>Alkalinity (CaCO₃), Total</u> <u>Hardness (mgCaCO₃), Ca, Cl,</u> <u>SO₄, HCO₃, CO₃, Al, Ag, As, B,</u> <u>Ba, Be, Ca, Cl, Cd, Co, Cr, Cu,</u> <u>Fe, Hg, K, Mg, Mn, Mo, Na, Ni,</u> <u>Pb, S, Se, Si, Sn, Sr, Ti, Tl, U,</u> <u>V, Zn, NO₂, Nitrate as NO₃,</u> <u>NH₄, Total Nitrogen, Total</u> <u>Phosphorus, TSS.</u>	<u>mg/L</u>	<u>Spot sample</u>	<u>Once, at the</u> <u>commencement</u> <u>of each</u> <u>discharge event</u>

9. Condition 3.6.2, Table 3.6.2 of the Licence is inserted into the Licence as shown in bold, underlined text below.

Table 3.6.2: Monit	toring of receiving env	vironment	
Emission point	Parameter	<u>Details</u>	<u>Frequency</u>
<u>reference</u>			
<u>Zulu, Bravo and</u> <u>Delta Dewatering</u> <u>Creek Discharge</u> <u>locations</u>	<u>Establishment, GPS</u> <u>record and operation</u> <u>of permanent photo</u> <u>monitoring points at</u> <u>each emission point</u> <u>to determine</u> <u>vegetation and</u> <u>ecosystem condition</u>	Establishment of fixed focal length - photo points at the following locations to enable capture of a representative picture of vegetation condition: • The discharge location • 150m downstream from discharge location • ~300m downstream from discharge location	First photo to be taken at each fixed location prior to commencement of initial discharge at each emission point and thereafter quarterly from each photo point
Zulu, Bravo and Delta Dewatering Creek Discharge locations	<u>Distance (m) of</u> <u>(wetting front) flow</u> <u>travelled down creek</u> <u>line</u>	<u>GPS record of</u> <u>furthest wetting front</u> <u>distance within creek</u> <u>line during each</u> <u>discharge event. To</u> <u>occur when creek is</u> <u>not flowing as a result</u> <u>of a rainfall event.</u>	<u>Within 24 hours of the</u> <u>cessation of every</u> <u>discharge event</u>

- 10. Condition 3.7, Monitoring of point source emissions to surface water has been added to the licence.
- 11. Condition 3.7.1, Table 3.7.1 is inserted into the licence as shown in bold, underlined text below.

Table 3.7.1: Monitori	ng of point source emissions	s to surface water	
Emission point	Parameter	Units	Frequency
reference			
	pH ²	pH units	Continuous
	Volumetric flow rate ¹	m³/dav	during discharge
	Duration of discharge	Dates/davs	<u></u>
	Electrical Conductivity ²	uS/cm	
	Total Dissolved Solids ²	ma/L	
	pH ²	pH units	Spot sample at the
Zulu, Bravo and	Temperature ²	°C	commencement of
Delta Dewatering	Dissolved oxygen ²	mg/L and %	each discharge
Creek Discharge	Electrical Conductivity ²	uS/cm	event
points as specified in	Total Dissolved Solids ²	ma/L	
Schedule 1 (Map of	Other parameters (mg/L):	<u></u>	
dewatering bore	Alkalinity (CaCO ₃). Total		
<u>areas and discharge</u>	Hardness (mgCaCO ₃). Ca.		
<u>locations)</u>	CI. SO4. HCO3. CO3. AI. Ag.		
	As. B. Ba. Be. Ca. Cl. Cd. Co.		
	Cr, Cu, Fe, Hq, K, Mq, Mn,		
	Mo. Na. Ni. Pb. S. Se. Si. Sn.		
	Sr, Ti, TI, U, V, Zn, NO ₂ , NO ₃ ,		
	NH4, Total Nitrogen, Total		
	Phosphorus, TSS.		
Zulu Creek	Al, As, Cd, Co, Cr, Cu, Hg,	mg/L ³	Twice daily during
Discharge point	Mn, Mo, Ni, Pb, Zn, V		Process Water Dam
receiving Process			discharge ³
Water Dam discharge			
as specified in			
Schedule 1 (Map of			
dewatering bore			
areas and discharge			
locations)			

3.7.1 The Licensee shall undertake the monitoring as specified in Table 3.7.1.

Note 1: Flow meter must be operational and calibrated in accordance with the manufacturer's specifications and relevant Australian Standard.

Note 2: In field non-NATA accredited analysis permitted.

Note 3: Twice daily samples are to be used as representative samples to determine EP Regs, Schedule 4, Part 3, Table 2, point: 'Waste that can potentially accumulate in the environment or living tissue (for each kilogram discharged per day)'. Flow rate from Process Water Dam will need to be used to determine volume discharged per day, multiplied by quantity present in representative samples. This information will be required to be presented in Annual Fee calculations, when Process Water Dam is emptied.

12. The Licence is amended by the insertion of new rows as shown in bold italics below, to (Condition 4.2 Reporting) Table 4.2.1

Table 4.2.1: Annual Environmental Report			
Condition or Table (if relevant)	Parameter	Format or Form ¹	
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified	

Tables 1.3.1 and 1.3.7	Actual throughput for the reporting period for approved categories under Schedule 1 of the <i>Environmental</i> <i>Protection Regulations</i> 1987	None specified
Condition 1.3.12	Summary of any failure or malfunction of any infrastructure listed in Table 1.3.5 and any action taken post inspection.	None specified
Table 2.3.1	An updated description of the irrigation area(s) reporting any decline in health, against previous years, and corrective actions	None specified
Table 2.4.1	Compliance	TSF Cell 1 evaporator use Vs wind direction annual data
Condition 2.5.3	Summary of reports detailing the reason for discharge – timing of discharge, volume discharged, water quality and comparison to ANZECC / ARMCANZ (2000) Freshwater Guidelines with discussion on elevated results.	<u>None specified</u>
<u>Table 2.5.2</u>	<u>Compliance</u>	<u>Table demonstrating daily averaged TDS</u> <u>values (using the hourly data) as</u> recorded during creek discharge events
Table 3.2.1	Volumetric flow rate, Duration of discharge, Electrical Conductivity, Total Dissolved Solids	GR1
Table 3.3.1	Monthly records and cumulative volume for each WWTP Biochemical Oxygen Demand, Total Suspended Solids, pH, Total Nitrogen, Total Phosphorus, <i>E.coli</i> , Total Dissolved Solids, Total Recoverable Hydrocarbons	None specified
Table 3.5.1	Tailings Storage Facility: volume (m ³) of tailings deposited and volume (m ³) of water recovered	Volumes recorded each month and a comparison against previous records
	Seepage recovery volumes (m ³)	Table format: volumes recorded each month and a comparison against previous records
Condition 3.5.2	Annual water balance of TSF	None specified
Table 3.6.1	Groundwater quality parameters: Standing Water Level, pH, Electrical Conductivity, Total Dissolved Solids, Aluminium (Al), Arsenic (As), Barium (Ba), Boron (B), Cadmium (Cd, Chromium (Cr), Chloride (Cl), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Silver (Ag), Sodium (Na), Zinc (Zn), and Total Recoverable Hydrocarbons TSFMW01, TSFMW02, TSFMW03, TSFMW04, TSFMW05, TSFMW03,	AGW1 Table format providing: monthly
	TSFMW04, TSFMW05, TSFMW06, TSFMW07 and TSFMW08 standing water level data	Standing water level data

Table 3.6.2	Demonstration of vegetation and	Report providing:
<u>1 aDIE 3.6.2</u>	<u>stream ecosystem condition</u>	 <u>GPS location, photographic</u> <u>information and comparison of</u> <u>vegetation and stream</u> <u>ecosystem condition between</u> <u>established photographic</u> <u>points;</u> <u>Information on annual</u> <u>assessment of vegetation health</u> <u>as per the Roy Hill Vegetation</u> <u>Health Monitoring Program.</u> <u>Specifically:</u> <u>- General site condition</u> <u>- Soil surface states</u> <u>- Projected Foliar Cover (PFC),</u> <u>stratum cover dominance and</u> <u>weeds</u> <u>- Recruitment</u> <u>- Sample plants</u> <u>- Quantitative parameters.</u> <u>Discussion on the findings of</u> <u>the vegetation assessment in</u> <u>comparison with the</u> <u>Management objectives and</u> <u>strategies found in EPA, 2013</u> (for 'Zone 3a – Kulbee Alluvial <u>Flank – Natural water regimes</u>)
<u>Table 3.6.2</u> <u>and Table</u> <u>3.7.1</u>	<u>Record of flow distance</u>	<u>Table providing comparison of flow</u> <u>volumes and maximum distance</u> <u>flow has travelled down each creek</u> <u>line for each discharge event</u>
<u>Tables 3.6.1</u> <u>and 3.7.1</u>	<u>All parameters</u>	Table format providing dates of creek discharge duration, results and comparison of results between groundwater samples from bores providing water to the discharge points from the Zulu, Bravo and Delta Dewatering Bore Areas (data required in Table 3.6.1) and results from Table 3.7.1.
Condition 4.1.2	Compliance	None Specified
Condition 4.1.3	Complaints summary	None specified
Condition 4.1.4	Records of waste types and quantities received at the site and disposed of at the site	None specified

13. Condition 4.3.1, Table 4.3.1 is amended by the insertion of new rows as shown in bold italics below.

Table 4.3.1: Notification requirements			
Condition or table	Parameter	Notification	Format or form ²
(if relevant)		requirement	
1.3.1 and 2.1.1	Breach of any limit specified in the Licence	Part A: As soon as practicable, but no later than 5pm of the next usual working day from the incident being identified. Part B: As soon as practicable	N1
3.1.4	Calibration report	As soon as practicable.	None specified
<u>3.6.2</u>	<u>Unscheduled release</u> <u>of water to Zulu</u> <u>Dewatering Creek</u> <u>Discharge location</u>	<u>No later than 5pm of</u> <u>the next usual</u> <u>working day from the</u> <u>cessation of</u> <u>Unscheduled</u> <u>discharge event</u>	Email to CEO including: Date of commencement and cessation, time of commencement and cessation, flow rate, flow volume (tonnes), maximum distance of flow down the creek, general weather conditions and other site-specific observations of note.

Note 1: Notification requirements in the Licence shall not negate the requirement to comply with s72 of the Act. Note 2: Forms are in Schedule 2

14. Schedule 1: Maps, Premises map including storage and creek discharge locations. This map has been included within Schedule 1 of the licence and replaces the deleted Figure as shown in strikethrough, below.





15. Schedule 1: Maps, Map of dewatering bore areas and discharge locations. This map has been included within Schedule 1 of the Licence.

Map of dewatering bore areas and creek discharge points

The dewatering bores, pipeline corridors and creek discharge points are shown in the map below. All areas on this map are within the Premises boundary. The bores within the polygons will feed the three corresponding discharge points located within this Map.



Appendix 1: Key documents

Document title	In text ref	Availability
An arid zone awash with diversity: patterns in the distribution of aquatic invertebrates in the Pilbara region of Western Australia, Rec. W.Austr. Museum, 78, 205–246, 2010. Pinder, A. M., Halse, S. A., Shiel, R. J., and McRae, J. M.	Pinder et al., 2010	-
Application Form (Amendment): L8621/2011/1 - Roy Hill Iron Ore Pty Ltd, dated 9 June 2017	-	DWER record A1448975
Application Supporting Document. Mine_Operating_Licence_Amendment_ Application_for_Creek Discharge OP- APP-00031, Rev 1, dated 7 June 2017	-	DWER record A1455587
Aquatic fauna Evaluation of Kulbee Creek and Kulbee Creek West Sediment rehydration study Prepared for: Roy Hill Iron Ore Pty Limited By: Wetland Research & Management. Wetland Research and Management (2015)	WRM, 2015	Available from Licensee
Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand. Paper No. 4. Canberra. 2000.	ANZECC/AR MCANZ , 2000	http://www.agriculture.gov.au/wa ter/quality/nwqms
Central Australian waterbodies: The importance of permanence in a desert landscape, J. Arid Environ., 72, 1395– 1413, 2008. Box, J. B., Duguid, A., Read, R. E., Kimber, R. G., Knapton, A.,Davis, J., and Bowland, A. E.	Box et al.,2008	-
Cumulative Impacts of RTIO Mining on the Weeli Wolli Creek System Dry 08 & wet 09 sampling. Final report. July 2010.	WRM, 2010	http://www.epa.wa.gov.au/sites/ default/files/PER_documentatio n/Appendix%20A6%20- %20Cumulative%20Impacts%2 0of%20RTIO%20Mining.pdf
DER Guidance Statement on Licence duration, August 2016	-	accessed at <u>www.dwer.wa.gov.au</u>
DER Guidance Statement on Decision Making, February 2017	-	

Document title	In text ref	Availability
DER Guidance Statement on Environmental Siting, November 2016	-	
DER Guidance Statement on Risk Assessments, February 2017	-	
DER Guidance Statement on Setting Conditions, November 2015	-	
Pilbara water in mining guideline, Department of Water, Water resource allocation planning series Report no. 34 September 2009.	DoW, 2009	http://www.water.wa.gov.au/data /assets/pdf_file/0013/1570/88526.p df
Ecohydrological Conceptualisation of the Fortescue Marsh Region Report Prepared for BHP Billiton Iron Ore September 2015	MWH, 2015	Available at: <u>http://www.bhp.com/-</u> /media/bhp/regulatory-information- media/iron-ore/western-australia- iron-ore/0000/report- appendices/160316 ironore waio pilbarastrategicassessment_state_ appendix7_appendixe_report.pdf
Email from the Licensee RE: 3 Creek discharge locations assessment: Zulu Creek Discharge location and general queries - Request for map update dated 30 November 2017	-	DWER record A1571303
Email from the Licensee: <i>Ministerial</i> <i>Statement 824 & 829 - Mine</i> <i>Dewatering Discharge into Creeks</i> dated 11 May 2017	-	DWER record A1428360
Environmental and water assessments relating to mining and mining-related activities in the Fortescue Marsh management area, Report 1484, July 2013. Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the <i>Environmental Protection Act 1986</i> .	EPA, 2013	http://www.epa.wa.gov.au/sites/ default/files/Publications/Rep14 84%20Fortescue%20Marsh%20 s16e%20010713.pdf
Ecohydrology of water-limited environments: a scientific vision, Water Resour. Res., 42, 1–15,2006. Newman, B. D., Wilcox, B. P., Archer, S. R., Breshears, D. D.,Dahm, C. N., Duffy, C. J., McDowell, N. G., Phillips, F. M.,Scanlon, B. R., and Vivoni, E. R.:	Newman et al., 2006	-
Impacts of high inter-annual variability of rainfall on a century of extreme hydrologic regime of northwest Australia. A. Rouillard, G. Skrzypek, S.	-	https://www.researchgate.net/pu blication/267752921_Impacts_of _high_inter- annual_variability_of_rainfall_on

Document title	In text ref	Availability
Dogramaci, C. Turney, and P. F. Grierson. Date accessed: December 2017		_a_century_of_extreme_hydrolo gic_regime_of_northwest_Austr alia
L8621/2011/1 – Construction Compliance Documentation – Crushing Facilities dated 21/12/17	-	DWER Record A1584287
L8621/2011/1 – [the Licensee] response to letter of 16 January 2018	-	DWER Record A1600402
Applicant notification - L8621/2011/1 - completion of construction - additional ore processing facilities: supplementary information provided for compliance dated 1/2/2018	-	DWER Record A1603685
L8621/2011/1 - Construction Compliance Documentation - Landfill 2 dated 11/1/2018	-	DWER Record A1596171
Applicant notification - L8621/2011/1 - completion of construction - Landfill 2 dated 16/1/2018	-	DWER Record A15894358
Licence L8621/2011/1 – Roy Hill Iron Ore Mine	L8621/2011/ 1	accessed at <u>www.dwer.wa.gov.au</u>
Ministerial Statements 824 and 829	MS 824 and MS 829	accessed at <u>www.epa.wa.gov.au/</u>
On the multiple ecological roles of water in river networks, Ecosphere, 4, 1–4, 2013. Sponseller, R. A., Heffernan, J. B., and Fisher, S. G.	Sponseller et al., 2013	-
The Licensee address of condition 1.3.10 TSF delivery and return pipelines query. Email dated 17 August 2017	DWER Record A1517665	DWER Record A1517665
(The Licensee) RHIO Mine Draft Operating Licence Amendment Notice #4 - Comments and Schedule 1 Response (OP-LET-00582) Dated 12 February 2018	-	DWER Record A1622027
Roy Hill Iron Ore Mine Monitoring Manual – Environment (Rev 3 dated 19 December 2016) (OP-MAN-00007)	-	DWER record A1555903
Roy Hill Iron Ore Vegetation Condition Environmental Management Plan (OP- REP-00363) Rev 0 dated 6 July 2017.	-	DWER record A1566943
Roy Hill Iron Ore Groundwater and Surface Water Monitoring Assessment 2016 – Report to the OEPA for MS 824 and MS 829, OP-REP-00431 dated 27 March 2017.	RHIO, 2016	DWER record A1514892
Roy Hill 1 Vegetation and Flora Assessment. Report produced for Hancock Prospecting Pty Ltd, Western Australia. (April, 2009). Ecologia	Ecologia, 2009	https://consultation.epa.wa.gov.au/ seven-day-comment-on- referrals/a603855/supporting_docu

Document title	In text ref	Availability
(2009).		ments/Appendix%204%20%20Roy %20Hill%201%20Vegetation%20% 20Flora%20Assessment.pdf
Roy Hill Iron Ore Mining project Stage 1 Public Environmental Review Volume 1	RHIO, 2009	http://www.epa.wa.gov.au/sites/def ault/files/PER_documentation/Roy %20Hill%201%20Iron%20Ore%20 Mining%20Project%20Stage%201 %20Public%20Environmental%20 Review.pdf
Roy Hill Mine Annual Aquifer Review – Aug 2016 – July 2017 Report [OP-REP- 00471, Issue Date 31/10/2017]	RHIO AAR, 2017	DWER record A1623622
Sequential floods drive "booms" and wetland persistence in drylandrivers: a synthesis, Mar. Freshwater Res., 61, 896–908, 2010. Leigh, C., Sheldon, F., Kingsford, R. T., Arthington, A. H.	Leigh et al., 2010	-
The Hyporheic Handbook: A handbook on the groundwater-surface water interface and hyporheic zone for environment managers. UK Environment Agency, 2009.	UK Environment Agency, 2009	https://www.gov.uk/government/pu blications/the-hyporheic-handbook- groundwater-surface-water- interface-and-hyporheic-zone-for- environment-managers.
The riparian flora and plant communities of the Pilbara region of Western Australia. M.N. Lyons (Records of the Western Australian Museum, Supplement 78: 485–513 (2015).)	-	http://museum.wa.gov.au/sites/defa ult/files/SuppWAMuseum_2015_78 (2)_485to513_LYONS_1.pdf
Technical Guidance Sampling methods for Subterranean fauna. Environmental Protection Authority, December 2016.	EPA, 2016	WA EPA (refer to the guidance at web site and the WA Museum. <u>http://www.epa.wa.gov.au/sites/def</u> <u>ault/files/Policies_and_Guidance/T</u> <u>ech%20guidance-%20Sampling-</u> <u>Subt-fauna-Dec-2016.pdf</u>)
Technical Note: Hyporheic Zone Sampling Procedures. British Geological Survey Technical Report OR/10/048. British Geological Survey, 2010.	British Geological Survey, 2010	http://nora.nerc.ac.uk/11707/1/OR1 0048.pdf.

Appendix 2: Summary of Licensee comments

The Licensee was provided with the draft Amendment Notice on 2 February 2018 for review and comment. The Licensee responded on 12 February 2018 with comments on the draft and provision of requested additional information (RHIO-OP-LET-00582). The Licensee was provided with the opportunity for a second review of the draft on 4 May 2018. No further comments were provided on the draft when it was returned by the Licensee on 17 May 2018.

Condition/ Section of Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft		
Amendment		
Description		
Scheduled water	Clarification that each scheduled water discharge event	The information has been included within the
discharge	will be a 'maximum of 7 days in duration, per event.'	amendment description information.
		The original draft had assessed the maximum duration as being up to 31 successive days of water discharge per annum. The reduction of successive days to 7 days, reduces the potential for the wetting front to be further down the creek due to the lessened creek-bed saturation period.
Unscheduled water discharge	The Licensee clarified aspects that were unclear from the original proposal regarding Mine Dewatering Disposal and Unscheduled Dam Water Disposal.	The information has been reviewed and minor wording amendments have been carried out to the assessment text.
	'Mine dewatering Disposal – this includes period of scheduled and unscheduled maintenance of the Process Plant. Unscheduled Dam Water Disposal – Is the contingency for unscheduled maintenance of the Process Plant Dam'	The Delegated Officer considers that there is no increase to the risk from the clarification of water disposal information as provided as there are no changes to the proposed water quality and quantity that has already been assessed as part of the draft.
Combined activities of	Clarified that 465 tonnes per year of water would be	Clarification noted.
scheduled and	discharged to creeks 'Over 5/6 shutdowns of	
unscheduled creek	approximately 6 days each'	

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
discharge		
	The Licensee queried why the colour of the discharge pipeline needed to be specified	As advised in correspondence by the Licensee on 24 November 2017 (DWER record A1571303), 'The pipe will be white polypipe with diameters in the order of 200-250mm.'
		It is also noted that given the length of the largely above-ground pipelines (+1.7km to 7.5km), that a temperature gradient may occur along the pipeline. This gradient will depend on the heat of the ground, ambient environmental temperature, wall-thickness of the installed pipeline and the colour of the pipeline in relation to absorptivity of heat. Given the warmer climate of the Pilbara, it is possible that the water temperature within a darker-coloured (eg: black) pipeline could increase over the conveyance distance. At the creek deposition locations, warmer water temperature may impact the local microfauna and vegetation. As such, the Delegated Officer considers that the Licensees commitment regarding colour of the pipeline should be included as a condition of the materials involved in construction.
Risk Assessment		
Cat 6: Dewater to surface-water receiving environment, Riparian ecosystem receptors.	The Licensee considers that discharge of excess water to the creek lines will not create an additional water source outside sporadic rainfall events. 'This discharge is only for a maximum of 7 days, so based on the observed infiltration and evaporation rates, it is unlikely to significantly differ to a rainfall event.'	Consistent rainfall events in this region are difficult to quantify in terms of volume and subsequent infiltration rates. The reasoning provided within the risk assessment discusses the addition of water to the creek ecosystem that is surplus to natural/ sporadic rainfall events.
		It is understood that the Licensee interprets the

Condition/ Section of		
Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft		
		discharge events as not being significantly different to rainfall events.
		The Licensee has inferred that there are no near surface impermeable layers to restrict infiltration within the creek bed area(s) (the Licensee doc: OP-APP- 00031). No information regarding evaporation rates have been provided by the Licensee, as such it is unclear what information constitutes observed infiltration and evaporation rates.
		At the time of draft assessment, the maximum duration of discharge release, being 7 days per scheduled water discharge event, had not been provided by the Licensee. Based on this, the maximum duration of 31 days was assumed; being the worst case release of 31 days at 5ML per day at each discharge location.
		The Delegated Officer has reviewed this information and considers the risk to the environment as being lower than originally assessed in terms of (extended) duration of exposure of the environment by the additional water source. Whilst the reduction of successive discharge days to 7 days reduces the potential for the wetting front to be further down the creek due to the lessened creek-bed saturation period (i.e.: 7 vs 31 days of creek bed saturation), the overall quantity of water discharged remains the same. The footprint may not be as long down the creek as first assessed, but there is not enough evidence provided to determine if this additional water will create an artificial ecosystem whereby vegetation dependency could increase

Condition/ Section of		
Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft		
Cat 6: Dewater to	Regarding current (RHIO Vegetation Condition EMP)	The Delegated Officer has considered these comments
surface-water receiving	vegetation condition monitoring locations being located too	in the context of the new information provided by the
environment, Riparian	far away from the proposed discharge points to observe	Licensee with respect to maximum 7 day discharge
cont	a 300m downstream, the Licensee has provided the	wide water management strategy and the management
com	following:	measures as proposed in the application Supporting
	lonowing.	Document. It is noted that the site-wide management
	'Potential impacts will be short term and very localised.	measures will remove the requirement for creek
	We have approval under Part IV to clear vegetation, and	discharge in the future, subject to Part IV EP Act
	appropriate measures (approved by EPA) in place to	approvals.
	ensure that that remnant vegetation health is maintained.	
	Inere is 2,700na of riparian vegetation within the RH mine	The risk associated with the application of groundwater
	10ha of rinarian vegetation which is <1% '	chemical parameters that are being transferred from
		the below ground environment to the surface
		environment.
		DWER note the small sample size of data provided
		within the Licensee Supporting Document (OP-APP-
		00031) regarding the quality of three (2015) samples of
		pit groundwater (being 1 sample from 1 bore in each
		three samples from locations nearby to the three
		discharge locations. No samples were received from
		the creeks as the creeks are largely dry for the majority
		of the year. No creek-bed pore water samples were
		provided to indicate the existing pore water quality
		around the discharge areas.
		No baseline aquatic biology study information was
		disposal locations. This provided limited information on
		what impacts the deposition of the additional water

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
Cat 6: Dewater to surface-water receiving environment, Riparian ecosystem receptors cont		source, including the impacts additional metals and nutrients would have on the local ecology. Information on emergent fauna found in Kulbee Creek (WRM, 2015) was discussed and no species recorded are listed as being of conservation significance by the International Union for Conservation of Nature (IUCN) Red List, EPBC Act or the Department of Park and Wildlife (DPaW, now DBCA) Threatened Fauna Schedule. It is not clear if the sample sites/s within the 2015 WRM Kulbee Creek survey are nearby to the Kulbee Creek discharge point.
		While chloride, pH, EC, and TDS have been discussed above, it is noted that the nitrate levels of the groundwater samples taken in 2015 are all greater than the 95% level of protection (% species), between 7.7 times and 68.5 times higher (ANZECC, 2000). The 95% level of protection has been applied from the ANZECC Guidelines for freshwater ecosystems as it most 'commonly applies to ecosystems that could be classified as slightly to moderately disturbed' (ANZECC/ARMCANZ, 2000).
		Zinc levels from the groundwater sample data collected in 2015, provided in the Licensee's Supporting Document are between 3.75 and 6.25 times higher than the 95% ANZECC level of protection for 3 of the samples. Both zinc and nitrates have the potential to become ecotoxicants when applied in large quantities/ concentrations.
		DWER has also consulted the Roy Hill Mine Annual Aquifer Review 2016-2017 (RHIO AAR, 2017) and the

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
Cat 6: Dewater to surface-water receiving environment, Riparian ecosystem receptors cont		data for RHPB0018 displayed Nitrate (as NO ₃) at 32 times higher than the 95% ANZECC levels and Zinc at 5.6 times higher. TDS (3,300 mg/L), Cl ⁻ and Na ⁺ were also reported as being high for this bore. No additional data was available (in the AAR) for the remaining bores listed in the Supporting Document [Table 11].
		This groundwater information however, is not necessarily deemed representative of the nitrate or zinc levels within the creek beds as no samples of (creek bed) water quality were provided as part of the Supporting Documentation. This lack of provision of data is assumed to be as a result of the creek only flowing when there is an episodic rainfall event.
		The site rain gauge (AWS1) between the Delta and Bravo discharge point recorded annual rainfall (Aug to Jul) of 679mm and the gauge (AWS3) closest to the Zulu Creek discharge location, 689.9mm. The months with highest rainfall were January to April (RHIO AAR, 2017). No information was available indicating whether this volume of rainfall caused the creeks within the Premises to flow.
		Based on the comparison of nitrates and zinc against ANZECC guideline values provided above, it is unclear how it can be proven that the impacts will be short term and very localised given potential ecotoxicant levels are significantly higher than the guidelines for freshwater ecosystems. The estimated wetting front distance of ~300m is also to be demonstrated as the actual zone of impact (ie: 0m being the discharge location and ~300m downstream being the estimated extent of the wetting

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
Cat 6: Dewater to surface-water receiving environment, Riparian ecosystem receptors cont	The Licensee considers that the consequence and likelihood of disruption of normal, localised ecosystem function on riparian ecosystems near the discharge locations should be based on: 'maximum discharge period of 7 days, expected quality of water from the dewatering bores and the required commencement of MAR (Strategy)* in mid-2018.' *Note: MAR Strategy not approved under Part IV or V of the EP Act at the time of issue of this amendment	front from discharge events). Hence conditions on measurement of flow distance per event are required. It is considered that the conditioned photo and vegetation monitoring included within this amendment should provide a good initial indication on the impact of additional water including the metals, inorganics and other chemicals naturally contained within the groundwater may have on the surface water environment, with vegetation health being an initial indicator of changes to the environment. The provision of information regarding maximum 7 day- duration of any scheduled discharge event was not available for consideration and context during the initial assessment. This information, in the context of water volume and inundation / infiltration potential and the impact to the riparian ecosystems has now been taken into consideration. The Delegated Officer considers that the impact could still occur, albeit within a shortened footprint down each creek line as groundwater mounding is likely to occur beneath the creek recharge area. It is considered that the conditioned photo and vegetation monitoring included within this amendment should provide a good initial indication on the impact of additional water including the metals, inorganics and other chemicals naturally contained within the groundwater may have on the surface water environment, with vegetation health being an initial indicator of changes to the environment.
Cat 6: Dewater to surface-water receiving	Regarding impacts from the addition of heavy metals, nutrients, and a potential increase in creek turbidity which	The Licensee's reference to the EPA 2013 and DoW 2009 documents is noted. Of the five points listed in

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
Amenument Notice Draft environment, Fortescue Marsh receptor, indirect discharge.	 may be further exacerbated during cyclonic flooding of creek lines and the potential for these to be at variance with the EPA, 2013 Management objective for Zone 3a – 'Kulbee Alluvial Flank' to 'Protect the hydrological and ecological integrity of major tributaries entering the Marsh.'. The Licensee has provided the following comment: This report (EPA, 2013) states the management strategies to meet this objective are: That water should be managed in accordance with the below report http://www.water.wa.gov.au/data/assets/pdf_file/0013/1 570/88526.pdf DoW Report page 43 – outlines one of the departments options for use and/or release of dewatering discharge.to be: controlled release to the environment where the dewater release is allowed to flow into a designated water course or wetland determined by the proponent and agreed by the department is Ensure that changes to the rate and timing of seasonal discharges to the tributaries do not significantly alter their hydrological and ecological integrity. Ensure that groundwater drawdown does not lead 	 the DoW, 2009 '6. <i>Mine site operations policy – 6.2 Use and release of water</i>', the Delegated Officer has considered the following: <i>Efficient use on site</i>:The Licensee has advised water disposal at the creek discharge locations will occur when all currently approved containment facilities are full. <i>Used for fit-for purpose activities (processing and dust suppression, etc)</i>: The Licensee has advised water disposal at the creek discharge locations will occur when all currently approved containment facilities are full. <i>Used for fit-for purpose activities (processing and dust suppression, etc)</i>: The Licensee has advised water disposal at the creek discharge locations will occur when all currently approved containment facilities are full. <i>Transferred to meet other demand</i>:The Licensee has advised that the water will be transferred within the premises to meet other mine-operational demands before creek discharge will occur. The Licensee has not advised of any water-sharing agreements with regards to provision to other proponents or for public water supply. <i>Injection back into the aquifer</i>:The Licensee has advised that this option is intended for future water management and this is currently subject to Part IV EP Act assessment. <i>Controlled release to the environment where the dewater release is allowed to flow (either through a pipe or overland) into a designated water course or wetland determined by the proponent and agreed by the department:</i> This option is the subject of this
	to the loss of keystone species within riparian communities (such as Coolibah) along major tributaries.	amendment. The Licensee has propo dewatering discharge locations and the departr (via the Delegated Officer) has assessed th locations. The Delegated Officer has agreed to

Condition/ Section of		
Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft		
		proposed disposal locations and included relevant conditions within this licence amendment to allow the Licensee to identify if additional impacts are occurring from the discharge of excess mine water.
		 With regards to EPA 2013, '3a Kulbee Alluvial Flank', 2 of the 6 management strategies for natural water regimes as mentioned by the Licensee, the Delegated Officer has considered the following: The Licensee has requested dewatering discharge to be on as as-needs basis for operational purposes and no information on disposal of excess dewatering water to compliment seasonal rainfall has been provided. Given the potential for creek dewatering discharge to occur outside of seasonal rainfall months, there is potential for hydrological and ecological integrity to be altered within the extent of the discharge footprint to the wetting front. These alterations are not anticipated to be carried down each creek to the impact Fortescue Marsh (+7km from the nearest creek discharge point). The effect of drawdown by dewatering has not been considered within this assessment as the dewatering bores are located near the mine pits and this amendment was for the discharge of water to creek location is anticipated to cause localised groundwater mounding (as opposed to drawdown) around the creek discharge areas. This mounding may provide an additional localised water source for riparian communities (og: Coelibab) and
		potentially alter the dependency of the species

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
		during the water deposition period and for the duration of the mound –life underground. Whilst there may not be a loss of the keystone species, there may be a future impact on vegetation water dependency after sporadic creek dewatering discharges, cease.
		Taking the above information into account, the Delegated Officer considers that whilst impacts are likely to comprise the localised effects from the addition of heavy metals, nutrients and a potential increase in creek turbidity, the likelihood of downstream impact from this activity to the Fortescue Marsh, be revised to unlikely .
		In accordance with ratings described in the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) the change to the likelihood does not change the overall rating of risk of downstream impacts to the Fortescue Marsh, being medium .
Cat 6: Dewater to surface-water receiving environment, Phreatophtytic vegetation, Groundwater/ Surface water inputs	The Licensee has commented with regards to 'creating an artificial ecosystem' and for 'phreatophytic vegetation death post-creek discharge cessation': 'this is only short term – up to 7 days or so at a time.'	The provision of information regarding maximum 7 day- duration of any scheduled discharge event was not available for consideration and context during the assessment. This information, in the context of water volume and inundation / infiltration potential and the impact to the phreatophytic vegetation has been taken into consideration over the updated time period. The Delegated Officer considers that the impact could still occur, albeit within a shortened footprint down each creek line as groundwater mounding is likely to occur beneath the creek recharge area. The Delegated Officer does not consider that the risk

Condition/ Section of Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
		profile for this aspect has changed as the water volume entering the creek lines has not altered, localised mounding is still likely and no seasonal patterning of water deposition has been proposed to lessen the potential impact to phreatophytic vegetation.
Decision		
	With regards to the Delegated Officers determination that existing vegetation monitoring points (from (Roy Hill Iron Ore Vegetation Condition Environmental Management Plan) are unlikely to capture the localized impacts, the Licensee commented: ' <i>Part IV provides us with approval to impact vegetation and that we are to maintain health of remnant vegetation. Part IV should cover this requirement and this should not be duplicated in Part V. Localised impacts are such a small percentage of the overall vegetation on site.</i> '	The Licensee comments are noted. In the absence of specific creek line ecosystem data for the discharge areas, vegetation monitoring in addition to the water quality and photographic (licence) conditions have been deemed relevant to capture initial ecosystem impacts experienced from dewatering discharge. As noted in responses above, the groundwater will be adding additional nitrates and zinc to the system; ecotoxicants when built up in the ecosystem. It is considered that the proposed vegetation monitoring will provide an indication on overall local ecosystem health as opposed to solely assessing impacts to the vegetation.
Conditions	1	
Condition 1.3.14, Table 1.3.6	The Licensee has queried why 'pipeline length (of the pipeline from the dewatering bore locations to the discharge location) is relevant, particularly as this relates to "minimum". Does it matter what the minimum pipeline length is?'	The Delegated Officer considers pipeline length relevant to the assessment and conditions the length of the pipeline as the length dictates how long the pathway of water transport, including containment volume (of pipe) will be in relation to causing a potential unauthorised emission over the pipeline length.

Condition/ Section of		
Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft		
		For example, if the pipeline was short then the capacity of the pipeline holding a liquid would have a lower quantity (Litres) available should there be a spill from the pipeline. If there was an emergency shutdown of the pipeline required then it would be easier to control the smaller volume of water and the potential for offsite runoff and impact would be lower. Conversely, if the pipeline was longer, the volume of the pipeline would be greater, therefore if a spill was to occur, the likelihood of a greater volume being emitted would be higher. It is anticipated that the spill would be harder contain given the increase in volume.
		The Licensee has discussed how 'daily monitoring of the flow meter combined with the monitored and regulated flow rate, from each individual bore feeding to the discharge points, will indicate when the discharge is nearing the daily licence limit (i.e. flow rates will inform the length of time the discharge can occur for and flow meter readings will confirm this)'. It is considered this information plus the pipeline length and diameter (internal capacity) will also be required to be known such that when discharge volumes are nearing the daily discharge limit, that the holding capacity of each pipeline will also be taken into consideration. This will help limit the potential for the remaining excess water in the pipeline after the bores are turned off is not discharged, exceeding the approved limit.
		The inclusion of 'minimum' length is provided to assist the Licensee during construction to provide flexibility. It is noted that this may cause some confusion and as such the condition has been amended to remove

Condition/ Section of Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
		'minimum length' and instead specify the 'approximate' distance (as advised by the Licensee during the assessment).
	Compliance documentation has been submitted for Additional ore Processing Facilities and Landfill 2.	These comments have been noted and correspondence regarding compliance provided to the Licensee. The construction requirements (work specifications) for Additional Ore Processing Facilities and Landfill 2 have been removed from Table 1.3.6 as part of this amendment.
Condition 1.3.18 and Table 1.3.7	The Licensee queried the terminology used for the Category 6 production or design capacity limit and provided suggested text for update of the condition.	The comment has been reviewed and the limit column updated for ease of interpretation.
Condition 2.5.2	The Licensee advised that the proposed condition around summary reports on the reason for discharge – volume, water quality and schedule of discharge should be amended: 'This [reporting requirement] will result in potentially 6+ reports each year (one for each shutdown plus an unscheduled event) RHIO believes that this should be amended to report in the AER.'	The request for amendment of condition 2.5.2 has been considered in the context of previous incidents at this site in relation to unauthorised discharge of dewatering water to the environment. The Delegated Officer considers this condition appropriate to monitor the parameters discussed within the condition (and condition 1.3.18) within a relative time period that may be missed should reporting only be conducted during the annual period/ AER as requested.
Condition 2.5.4, Table 2.5.2	The Licensee inserted text for clarification purposes with reference to the averaging period of the Zulu, Bravo and Delta Dewatering Creek Discharge locations.	The inserted text was reviewed and accepted.
Condition 3.6.2, Table 3.6.2	The Licensee considers that the requirement for establishment of three photo points at each discharge location is a duplication of Part IV EP Act requirements: 'As previously stated above, this condition appears to be duplicating our current Part IV requirement, given the very	Please refer to the response as provided for Condition 4.2, Table 4.2.1, below.

Condition/ Section of Amendment Notice	Summary of Licensee comment	DWER response and consideration of risk
Draft	localized impact, of short durations and likely to only occur for a period of 12 months and the fact that the vegetation equates to less than 1% of remnant vegetation Roy Hill does not believe this condition is warranted nor pragmatic.'	
	The Licensee queried how GPS records of the wetting front can be obtained if the creek is already flowing.	The Licensees' comment has been considered and the condition amended accordingly.
Condition 4.2, Table 4.2.1	The Licensee considers that the compliance reporting requirements included to demonstrate vegetation and stream ecosystem conditions are a 'Duplication of Part IV requirement, please see comments relating to vegetation monitoring above'	The text as clarified within the (Table 8) Risk Assessment outlines that the existing vegetation monitoring locations required/ approved under Pt IV of the EP Act are located further away than the creek discharge wetting front extent as proposed by the Licensee (~300m downstream). As such, it is deemed that these existing monitoring locations are not likely to capture any changes to the vegetation as a result of the additional water deposition in the creek lines.
		It is also noted that the Part IV assessment and subsequent amendments to the Ministerial Statement(s) have not assessed the impact of additional water sources (i.e. dewatering discharge) within the existing creek lines, rather the Part IV assessments have assessed the impact of the operation on groundwater dependent vegetation (from abstraction/ drawdown) and disruption of surface flows and Mulga (from installation of surface water diversion structures).
		The monitoring parameters as contained within the <i>'Roy Hill Iron Ore Pty Ltd Vegetation Health Monitoring'</i> (Part IV EP Act) reporting requirements were reviewed as part of this assessment. It was determined that the parameters as outlined in this report were adequate to

Condition/ Section of Amendment Notice Draft	Summary of Licensee comment	DWER response and consideration of risk
		capture potential vegetation health impacts that may result from the creek discharge. As such, the reporting requirements were adopted as a Part V Licence condition.
Condition 4.2, Table 4.2.1 cont	The Licensee requested further detail on the requirements comparison of results from Table 3.7.1.	The text within Table 4.2.1 has been amended to further clarify the reporting requirements with regards to water quality parameter comparison.