Environmental Basis of Design

Environment

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1 Purpose and Scope

This document provides details of Roy Hill's requirements and obligations with regards to Environmental Basis of Design for the Project works.

Roy Hill's key objective, with respect to environmental design, is to comply with environmental legal requirements and to ensure minimal environmental impact.

2 Specification Requirements

This document sets out the minimum environmental design specifications and requirements consistent with:

- Environmental approval specifications;
- Environmental approval application commitments;
- Environmental standards; and
- Current environmental practice.

The document will be updated periodically to incorporate new approval requirements or commitments relating to environmental design and changes in environmental design standards or practice.

In some circumstances, the environmental design specifications outlined in this document may not be achievable. In this case, deviation from the specifications must be approved by Roy Hill Environmental Manager.

3 Introduction

3.1 Roy Hill

Roy Hill includes an iron ore mine at the Roy Hill deposit, a mine process plant, a heavy haul railway system from mine to port and port facilities at Boodarie Industrial Estate, south west of Port Hedland, Western Australia.

The Roy Hill deposit is located approximately 277 kilometres due south of Port Hedland and is at the eastern end of the Chichester Range in the Pilbara region of Western Australia.

The mine, rail and port facilities are designed to produce up to 60 million tonnes per annum (Mtpa) of Hematite direct ship ore (DSO) as Lump and Fines.

The mine, rail and port projects were subject to individual State environmental assessment and approval under the *Environmental Protection Act 1986*. The Roy Hill railway was also assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 2000.*

In addition, a number of environmental approvals were issued and are in the process of being achieved under State legislation.

Approval requirements and commitments made within approval applications relating to environment design are outlined in this document.

Roy Hill includes the mine, port, rail and associated infrastructure.

3.1.1 Mine Site

The design of the Roy Hill mine includes:

- Ore processing facilities;
- Train loading facilities;
- Ancillary buildings, workshops and other support infrastructure
- Power station and power supply infrastructure;
- Fuel and explosive storage;
- Airstrip;
- Tailing Storage Facility (TSF);
- Evaporation pond;
- Accommodation camp, waste water treatment and landfill facilities;
- Bore fields and associated infrastructure;
- Mine pits;
- Waste rock dumps;
- Surface water diversions; and
- Haul and access roads.

The development of the Roy Hill mine will involve disturbance of up to 11,993 ha of native vegetation as approved under Ministerial Statements 824 and 829.

3.1.2 Railway

A dedicated heavy-haul standard gauge railway, approximately 344 km in length, was constructed to connect the Roy Hill mine to port facilities at Port Hedland.

The design of the railway infrastructure includes:

- Railway construction corridor (approximately 200 m wide);
- Terminal yard including a marshalling yard and track maintenance yard with associated workshops and maintenance facilities, storage and laydown areas, rail welding yard and amenities for workers;
- Passing sidings and back tracks;
- Waterway crossings via bridges and culverts;
- Construction water bores;
- Borrow sites and ballast storage areas for construction material;
- Communications cables, towers and signalling system;
- Accommodation camps, waste water treatment plants and landfills;
- Grade separated crossings over bridges of existing railways and the Great Northern Hwy;

- Access roads; and
- Construction power supplies.

3.1.3 Port Facility

Development of Roy Hill port facilities involved the construction and use of infrastructure located within the Boodarie Multi-user Stockyard Area and within the Port Hedland Inner Harbour. Iron ore is unloaded at Boodarie and placed via conveyor into stockpiles before being reclaimed and delivered, again via conveyor, to shipping berths in South West Creek for export.

The design of the port facility includes:

- Railway with a train unloader and stockyards at Boodarie, approximately 7 km south-west of the town of Port Hedland;
- Conveyors connecting the train unloader and stockyards to the wharf and ship loader (approximately 4 km south-west of Port Hedland); and
- Wharf and ship loading infrastructure at the Stanley Point berths within South-West Creek in the Port Hedland Inner Harbour.

3.2 Purpose

The purpose of this document is to provide project engineering, design and construction teams with information on design requirements for planned infrastructure to control environmental impacts.

Roy Hill key objective with respect to environmental design is to comply with environmental legal requirements and to ensure minimal environmental impact. This document sets out the minimum environmental design specifications and requirements consistent with:

- Environmental approval conditions and requirements;
- Environmental approval application commitments;
- Environmental standards; and
- Current environmental practice.

In some circumstances, the environmental design specifications outlined in this document may not be achievable. In this case deviation from the specifications must be approved by Roy Hill Environmental Manager.

3.3 Application and Scope

The Environmental Basis of Design (EBoD) is part of the Roy Hill suite of documents that form part of the relevant project Scope of Work and should be used in conjunction with the relevant engineering scope of work and associated guidelines.

The EBoD will be updated periodically to incorporate new approval requirements or commitments relating to environmental design and changes in environmental design standards or practice. Contractors will be issued with new versions of the EBoD as and when amended.

3.4 Key Environmental Factors

The document is divided into the three key project areas: Mine, Rail and Port. The Office of the Environmental Protection Authority (OEPA) listed the following environmental factors as being relevant to these project areas:

- Roy Hill 1 Iron Ore Mining Project (Report 1342):
  - Flora and Fauna;
  - Subterranean Fauna;
  - Groundwater;
  - Surface Water; and
  - Mine closure and Rehabilitation.
- Roy Hill Infrastructure Rail (Report 1370):
  - Flora and vegetation;
  - Terrestrial Fauna;
  - Indigenous Heritage; and
  - Rehabilitation.
- Roy Hill Port Infrastructure Project (Report 1377):
  - Benthic Primary Producer Habitat (including mangroves);
  - Surface water and Tidal Processes; and
  - Emissions (including dust).

A generic list of environmental objectives, associated with the environmental factors identified by the OEPA as relevant to Roy Hill, are presented in Table 1.

Table 1: Guide to Environmental Impact Assessment (EIA) Environmental Principles, Factors and Objectives (EIA Objectives Guide)

FACTOR	OBJECTIVE
BIOPHYSICAL	
Fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
Flora	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
Water (surface or ground)	To maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem maintenance, are protected.
POLLUTION MANAGEMENT	
Air Quality	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.
SOCIAL SURROUNDS	
Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

FACTOR	OBJECTIVE
OTHER	
Decommissioning/ Rehabilitation	To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.

4 Environmental Compliance and Standards

4.1 State and Commonwealth Acts and Regulations

All aspects of the design shall comply with relevant State and Commonwealth Acts and Regulations. This shall include, but not be limited to, the design requirements listed in the Section 5.

4.2 Environmental Approval Conditions

All aspects of the design shall comply with the environmental approvals, licences, permits, and associated documents that have been issued for the project.

This document aims to summarise the approval conditions and requirements relating to environmental design, however it is also recommended that the relevant approval, licence or permit be consulted.

Where conflicting information exists, it shall be the more stringent standard that applies.

Where information is absent, engineers should consult with the Roy Hill Environment Manager.

4.3 Relevant Legislation

State and Commonwealth legislation applicable to the Roy Hill Project includes, but is not limited to, the following Acts and associated Regulations.

- *Aboriginal Heritage Act 1972*
- *Contaminated Sites Act 2003*
- *Dangerous Goods Safety Act 2004* and associated Regulations.
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
- *Environmental Protection Act 1986* (EP Act) and associated Regulations.
- *Environment Protection (Sea Dumping) Act 1981* (Cth)
- *Heritage of Western Australia Act 1990*
- *Local Government Act 1995*
- *Mining Act 1978*
- *Native Title Act 1993*
- *Planning and Development Act 2005*
- *Rights in Water and Irrigation Act 1914*
- *Wildlife Conservation Act 1950*
- *Waste Avoidance and Resource Recovery Act 2007*

- *Health Act 1911*
- *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*

5 Environmental Design Requirements

5.1 Key Design Requirements

The RH mine, rail and port projects were assessed and approved under Part IV and Part V of the *EP Act*. The mine project was also assessed and approved under the Mining Act. The assessment under the *EP Act* included considering ways in which the implementation of the project could avoid or reduce impacts on the environment.

Environmental approval is granted by the State Minister for Environment under s45 (5) of the *EP Act* through the issue of a Ministerial Statement that contains conditions that must be met prior to and during implementation of the project. The following Ministerial Statements were issued for the Roy Hill projects

- Ministerial Statement 824: Roy Hill 1 Iron Ore Mining Project Stage 1, 110 kilometres north of Newman, Shire of East Pilbara
- Ministerial Statement 829: Roy Hill 1 Iron Ore Mining Project Stage 2, 110 Kilometres north of Newman, Shire of East Pilbara
- Ministerial Statement 847: Roy Hill Infrastructure Railway, Shire of Ashburton, Shire of East Pilbara, Town of Port Hedland
- Ministerial Statement 858: Roy Hill 1 Iron Ore Project, Port Infrastructure Port Hedland
- Ministerial Statement 859: South West Creek Dredging and Reclamation Project

Ministerial Statement 859 was issued for the South West Creek Dredging and Reclamation Project (SWC Project) to the Port Hedland Port Authority (PHPA) (proponent). As a port user under the SWC Project approval, Roy Hill must comply with the requirements of MS859 for relevant activities.

Since issue of the original Ministerial Statements, multiple amendments have been sought under s45C and s46 of the EP Act.

Tables 2 to 6 outline the project description for the mine, rail and port projects respectively as contained in the current Schedule of each relevant Ministerial Statement.

Sections 6 to 9 describe the Environmental Design Requirements for each of the Roy Hill project areas.

5.2 Mine

Table 2: Ministerial Statement 824: Roy Hill 1 Iron Ore Mining Project Stage 1, 110 kilometres north of Newman, Shire of East Pilbara, Attachment 1 to Ministerial Statement 824 Change to Proposal, Key Characteristics Table (MS824)

Element	Description of proposal
Mine Life	20 years (Stage 1 and Stage 2)
Target Grade	60% Iron (average lump or fines) or higher
Mineral Resource	Up to 600 Mt from Bedded Mara Mamba Ore
Strip Ration	4:1 (average overburden to ore ratio)
Area of Disturbance	Up to 7200 hectares (ha) (includes 5,120 ha for mine pits)
Maximum Pit Depth	100 metres (m) nominal
Overburden	2,060 Mt overburden would be used as pit infill with some stored in out of pit dump
Mine Dewatering	Up to 396 GL total for Stage 1 and Stage 2
Dewatered Saline Groundwater to be disposed of to Evaporation Ponds	Up to 36 GL total for Stage 1 and 2
Dewatered Saline Groundwater to be used for dust suppression	Up to 3.7 GL/a for Stage 1 and Stage 2
Dewatered Saline Groundwater (up to – 30,000mg/L TDS) and RO Plant reject water to be disposed to recharge basins and/or reinjection bores	Up to 55 GL per annum for a period of up to 2 years.
Water Supply	Water from the mine and advanced dewatering would be used
Greenhouse Gas Emissions	280,000 tonnes CO2 – equivalent per annum
Realignment of Marble Bar road	A per Figure 5 attached to Ministerial Statement 824 (MS824)

Table 3: Ministerial Statement 829: Roy Hill 1 Iron Ore Mining Project Stage 2, 110 Kilometres north of Newman, Shire of East Pilbara Schedule 1: Table 1: Summary of Key Characteristics (MS829)

ELEMENT	DESCRIPTION OF PROPOSAL
Mine Life	20 years (Stage 1 and Stage 2)
Target Grade	60% Iron (Fe) (average lump or fines) or higher
Mineral Resource	Up to 400 Mt bedded Mara Mamba ore, 1 Bt detrital ore
Strip Ration	4:1 (average overburden to ore ratio)
Area of Disturbance	Up to 4,793 ha
Maximum Pit Depth	100 m
Overburden	Up to 2,000 Mt
Water Supply	150 GL from the remote borefield 48 GL from mine dewatering

ELEMENT	DESCRIPTION OF PROPOSAL
Mine Dewatering	Up to 396 GL total for Stage 1 and Stage 2
Dewatered Saline Groundwater to be disposed of to Evaporation Ponds	Up to 36 GL total for Stage 1 and 2
Dewatered Saline Groundwater to be used for dust suppression	Up to 3.7 Gl/a for Stage 1 and Stage 2
Dewatered Saline Groundwater (up to –30,000mg/L TDS) and RO Plant reject water to be disposed to recharge basins and/or reinjection bores	Up to 55 GL per annum for a period of up to 2 years.

5.3 Rail

Table 4: Ministerial Statement 847: Roy Hill Infrastructure Railway, Shire of Ashburton, Shire of East Pilbara, Town of Port Hedland: Attachment 1 to Ministerial Statement 847 Change to Proposal Key Characteristics Table (MS847)

Element	Description of proposal
Construction Period	24 Months
Operating life	20 + years
Length of Railway	Up to 351 kilometres
Permanent disturbance area	Up to 2,500 hectares
Construction disturbance area	Up to 7,400 hectares
Support Infrastructure	Passing loops and refuge sidings, marshaling yard, locomotive and ore wagon maintenance facilities, fuel storage, locomotive provisioning hall, wagon and locomotive wash-down facility, administration building, a communications backbone cable running the length of the rail corridor, radio communications towers and signaling system, water bores and 'turkeys nest' dams, borrow pits and ballast and sleeper storage areas, lay-down yards for construction and construction accommodation camps.
Access and construction roads	An access road for construction and maintenance will follow the railway for its entire length, deviation away from the rail alignment where terrain does not permit it to be adjacent to the railway.

5.4 Port Landside

Table 5: Ministerial Statement No. 859: Roy Hill 1 Iron Ore Project, Port Infrastructure Port Hedland Schedule 1 Table 1: Summary of Key proposal characteristics (MS858)

Element	Description
Rail	Railway, rail loop and train unloader
Stockyard	Stockyard at Boodarie
Conveyor	A 4 kilometre long elevated trestle type, covered conveyor connecting the stockyard to the wharf at South West Creek
Wharf	Wharf structures, two shipping berths and one ship loader in South West Creek
Life of Project	50 years or more
Throughput	55 million tonnes per annum

Element	Description
Moisture content of ore	The moisture content of the ores would be maintained above dust extinction levels
Terrestrial vegetation and ground disturbance	Not more than 382 hectares. • Rail corridor, conveyor, stockyard and other infrastructure to be constructed within a development envelope of 444 hectares as shown in Figure 2 and defined by the coordinates in Schedule 2; and • Pipeline for disposal of groundwater to be constructed within a pipeline development envelope of 0.7 hectares as shown in Figure 2.
Mangrove loss	Not more than 5 hectares
Disposal of dewatered groundwater	Disposal according to the following water use hierarchy: 1. Use on site. 2. Disposal to Dredge Material Management Area G 3. Disposal to dredged berth pockets in South West Creek

6 General Project Environmental Design Requirements

The following general requirements are applicable to all project areas.

6.1 Fauna Interactions and Habitat

Design Requirements	Source Document	Section
6.1.1 Barbed wire shall not be used on the project without specific authorisation from the Roy Hill Environmental Manager.	(PER S1 1589) Best Practice	8.2.2

6.2 Dust

Design Requirements	Source Document	Section
6.2.1 Consideration should be given to the prevailing wind direction and potential for dust deposition at sensitive receptors or residences when designing roads and other infrastructure.	(PER S1 1589) Best Practice	Table ESO -4

6.3 Weed

Design Requirements	Source Document	Section
6.3.1 Weed wash-down facilities shall meet the following requirements: • The facility shall enable a clear separation of vehicle/equipment wheels or tracks from the material that is being washed off; • Dirty wash-down water shall be able to drain efficiently to an earthen infiltration sump; • Only water (no detergent) shall be used for wash-down;	Best Practice	

Design Requirements	Source Document	Section
• The earthen infiltration sump shall be accessible using a front-end loader to periodically remove wash-down sediment; and • Self-contained systems that recycle wash-down water are acceptable provided the water is filtered to prevent seeds from being circulated through the system.		

6.4 Surface Water

Design Requirements	Source Document	Section
GENERAL		

6.4.1 Surface water management must include the following:
• Undertake culvert design and stabilisation including:
  ○ maintaining existing drainage patterns;
  ○ identifying drainage requirements and sizing culverts prior to construction; and
  ○ culverts designed to accommodate seasonal flows and appropriate flood levels.
• Install rip-rap rock protection to minimise erosion;
• Design final landforms in rehabilitation areas to be self-draining;
• Implement erosion control measures in disturbed areas (e.g. borrow pits) to ensure surface water runoff does not lead to erosion, sedimentation or ponding;
• All road infrastructure corridors are to incorporate floodways drains, culverts and bridges; and
• Implement measures to reduce alterations in sheet flows and downstream sedimentation regimes from pits and infrastructure.
	RHI-001-30-EN-REP-0911
	(PER S1 1589)
	(S2 ARI Appendix O)
		10.2.5

6.4.2 No structures are to be constructed that may obstruct the free flow of a river or creek.	(PMB172608) (PMB172612) (PMB172613) (PMB172618) Best Practice	
SEDIMENTATION CONTROLS		
6.4.3 Storm water released from construction areas shall be discharged via sediment reduction controls.	Best Practice	
6.4.4 Sedimentation controls shall be constructed immediately around large areas of clearing at risk of generating runoff and erosion.	Best Practice	

Design Requirements		Source Document	Section
EROSION CONTROL			
6.4.5	Rock armouring shall be used in areas with potentially high erosion (e.g. steep gradients and bends).	(PER S1 1589) (Mine S2 ARI Referral) (RH1-001-40EN-REP-0125) RH1-001-30-EN-FOR-0919	

6.5 Noise and Vibration

Design Requirements		Source Document	Section
6.5.1	Noise sensitive design will be used to minimise the impacts during operation (e.g. sizing rail loops to facilitate the smooth approach of trains).	(PER S1 1589)	8.6
6.5.2	Take into account the potential for excessive noise and vibration at sensitive places/residences when designing infrastructure.	(PER S1 1589)	8.6

6.6 Light Emissions

Design Requirements		Source Document	Section
6.6.1	Low ultraviolet emitting fixtures on tall, mounted structures shall be used.	(PER S1 1589)	
6.6.2	Light shields, amber filters and yellow lighting shall be used at sensitive locations.	(PER S1 1589)	
6.6.3	Motion detectors shall be utilised to trigger lights.	(PER S1 1589)	
6.6.4	Luminaries shall be positioned to directly focus on the intended target. Light spill shall be minimised.	(PER S1 1589)	
6.6.5	The use of tungsten, halogen, and low voltage dichroic or incandescent luminaries shall be avoided.	(PER S1 1589)	
6.6.6	Highly efficient, long lamp life fittings shall be used.	(PER S1 1589)	
6.6.7	T5 fluorescent lighting shall be selected in lieu of T8 fluorescents.	(PER S1 1589)	
6.6.8	Minimum wattage, low flux output lamps which safely fulfil the needs of a specific task shall be utilised.	(PER S1 1589)	

6.6.9	Electronic lighting control gear shall be installed on Project luminaries to manage voltage, reduce energy consumption and increase lamp life.	(PER S1 1589)	
6.6.10	Light outputs shall comply with Australian Standard and Building Code of Australia (The Building Code of Australia) maintenance levels.	(PER S1 1589)	
6.6.11	All outdoor lighting shall be provided with automated control.	(PER S1 1589)	
6.6.12	Select lighting with beam characteristics applicable to the specific task at hand.	(PER S1 1589)	8.7
6.6.13	Luminance at onsite accommodation shall not exceed window luminance of 1 lux.	(PER S1 1589)	3.1

6.7 Hazardous Materials

Design Requirements		Source Document	Section
6.7.1	Equipment will be designed and operated to prevent spills and leaks through the provision of inbuilt safeguards such as relief valves, overflow protection, and automatic and manual shut-down systems.	Best Practice	
6.7.2	Bunded storage areas shall be graded to drain away from the storage tanks to a sump which can be emptied or pumped, as required.	Best Practice	
6.7.3	Distances between diesel fuel tanks and bunding shall be maintained as described in Australian Standard AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids (AS 1940-2004).	Best Practice	
6.7.4	All hydrocarbon and chemical transfer points shall be secondarily contained.	Best Practice	
6.7.5	All bulk chemical and hydrocarbon storage facilities shall comply with the requirements of the Dangerous Goods (Storage and Handling) Regulations 2000 and Australia Standard AS 1940 The Storage and Handling of Flammable and Combustible Liquids (AS 1940-2004).	Best Practice	
6.7.6	Where facilities hold multiple storage containers, bunding shall be capable of holding no less than 110% of the volume of the largest storage vessel and at least 25% of the total volume of substances stored.	Best Practice	
6.7.7	Meters shall be fitted to all hydrocarbon transfer pumps to enable volumes to be recorded.	Best Practice	
6.7.8	HDPE liners used for bunding shall have maximum permeability of 1x10-9 m/s. Black 'builders plastic' shall not to be used for lining bunds	Best Practice	

6.8 Waste

Design Requirements	Source Document	Section
6.8.1 Landfills and Tyre Storage/Disposal areas shall be constructed and operated in accordance with the relevant Operating Licence or Works Approval.	EP Act	
6.8.2 Stormwater at all landfill or waste storage sites is to be adequately managed so that: • It is diverted from areas of the site where there is waste; and • Water that has come into contact with waste is to be diverted into a sump on the site, or otherwise retained on the site.	Environmental Protection (Rural Landfill) Regulations 2002	
ABLUTION FACILITIES		
6.8.3 Level indicators shall be fitted on all demountable toilet blocks to indicate when the facility is nearing capacity.	Best Practice	
6.8.4 Temporary demountable toilet blocks used on the Project area to be of a design approved by Department of Health	Best Practice	

6.9 Wastewater

Design Requirements	Source Document	Section
6.9.1 Wastewater and sewage will be treated onsite via packaged Wastewater Treatment Plants (WWTP).	(PER S1 1589)	5.4.2
6.9.2 WWTPs will be designed in accordance with the following guidelines: • Water Quality Protection Note No. 22 (DoW, 2008); • Draft guidelines for the use of recycled water in Western Australia (DoH, 2009); and • National Water Quality Management Strategy - Australian Guidelines for Sewage Systems: Effluent Management (ARMCA & ANZECC, 1997).	Best Practice	
6.9.3 HDPE 150 mm Class 12.5 effluent water pipelines will be constructed between the WWTP and the spray fields. The pipelines will be buried to minimise solar contraction/expansion, and as protection from any fire exposure.	Best Practice	
6.9.4 Chlorinated treated wastewater will be discharged to a dedicated spray irrigation disposal field or subsurface irrigation area, as determined by the size of the wastewater treatment facility and to meet requirements of Regulations.	Best Practice	
6.9.5 Surface water will be diverted around WWTPs and spray irrigation fields.	Best Practice	

Design Requirements		Source Document	Section
6.9.6	Wastewater system to be a minimum of 30 m from a well, bore, creek or any watercourse.	Best Practice	

7 Mine Environmental Design Requirements

7.1 Dust

Design Requirements	Source Document	Section
7.1.1 Water sprays are to be installed on the discharge end of the stacker boom at the plant crushed ore stockpile which operates continuously during discharge onto the stockpile.	Email	
7.1.2 The Process Plant Lump to Fines Crushing Facility, the ROM 2 DSO Screening Facility .and the ROM 2 Jaw Crushers will be designed and constructed in accordance with: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104. • Department of Water and Environmental Regulation – Licence L8621/2011/1 Amendment Notice #3 (November 2017).	OP-APP-00047	2.3

7.2 Groundwater

Design Requirements	Source Document	Section
7.2.1 All reinjection bores shall be constructed in accordance with design specifications outlined in: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OPP-APP-00047	2.19.2
7.2.2 All recharge basins shall be constructed in accordance with design specifications outlined in: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OPP-APP-00047	2.19.4

7.3 Surface Water

Design Requirements	Source Document	Section
SURFACE WATER STRUCTURES		
7.3.1 All surface water management structures including levees, diversions, rock protection and detention structures, shall be constructed in accordance with design specifications outlined in: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104..	OP-APP-00047	2.15
7.3.2 Avoid or minimise directional changes in flow regimes and structures that will increase flow velocities	(PER S1 1589)	8.8

Design Requirements	Source Document	Section
7.3.3 Avoid where practicable constructing infrastructure in locations blocking overland flow.	(PER S1 1589)	Table 4.1
7.3.4 Embankment slopes will be designed to encourage water infiltration and reduce erosion and water runoff	(PER S1 1589)	7.4.1
7.3.5 Design mine structures to avoid and minimise adverse impacts on ground and surface water quality.	(PER S1 1589)	6.1.1
7.3.6 To manage stormwater interacting with the mine landform roads and infrastructure corridor design will take into account the natural topography to minimise the number of culverts and bridges required	(PER S1 1589)	7.4.1
7.3.7 Creek diversion and/or surface water management structures are constructed and operated in accordance with the approved design.	OP-APP-00047	7.2
DIVERSION STRUCTURES		
7.3.8 Install engineered dispersion systems at discharge points of diversion drains to reintroduce sheet flow minimising the impact on the downstream environment.	(MS824) (PER S1 1589) (S2 ARI Referral)	
7.3.9 Ensure that surface water diversion structures do not adversely affect Mulga and riparian vegetation retained in the proposal area	(MS829)	9-1
7.3.10 Design and construct stormwater diversion drains to reduce the flooding risk to the Project and minimise the impact on stormwater flows into the Fortescue Marsh catchment area.	(PER S1 1589)	7.4.2
7.3.11 Surface water diversion structures shall be designed, installed and managed to enable non-contaminated water to be directed around disturbed and construction areas	(PER S1 1589)	
7.3.12 Diversion channels shall be constructed with similar gradients to the natural drainage systems in the Project area.	OPP-APP-00047	
DRAINAGE SYSTEMS		
7.3.13 At the TSF, maintain internal and subsurface drainage systems to recover excess water and reuse water where possible.	(PER S1 1589)	7.3.3
7.3.14 The surface drainage across the mine will be constructed to divert stormwater away from infrastructure items or disturbance areas.	(PER S1 1589)	Pg 107
7.3.15 Infrastructure is to be located, where practicable, to avoid drainage lines.	(PER S1 1589)	
SEDIMENTATION CONTROL		
7.3.16 Construct sedimentation controls prior to disturbing large areas for infrastructure or mining.	(PER S1 1589)	7.4

Design Requirements	Source Document	Section
SHEETFLOW		
7.3.17 The design of sheet flow structures will be undertaken in conjunction with the road design	OPP-APP-00047 Appendix 14	6.7
CREEKS		
7.3.18 Maintain the natural shape of creek banks and avoid altering the gradient of the bed whenever possible	(PER S1 1589)	8.8
7.3.19 All creek discharge locations shall be constructed in accordance with design specifications outlined in: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104. • Department of Water and Environmental Regulation – Licence L8621/2011/1 Amendment Notice #4 (May 2018).	OPP-APP-00047	2.20
FORTESCUE RIVER		
7.3.20 Construct the Stage 2 water supply pipeline crossing at the Fortescue River during minimum flow periods to reduce potential disturbance to the river.	(PER S1 1589)	
7.3.21 Appropriate stabilisation techniques (e.g. geotextile and gabions) will be used to maintain the integrity of the of the Fortescue River banks to minimise additional sediment loading.	(Mine S2 ARI Referral)	
CONTAMINATED WATER		
7.3.22 Design, install and manage surface water containment structures that will enable potentially contaminated water to be collected and managed.	(PER S1 1589)	6.13.2
7.3.23 Maintain stormwater diversion structures to direct uncontaminated stormwater (water collected outside the facility) away from hazardous material storage facilities	OP-APP-00047	2.6
EVAPORATION PONDS		
7.3.24 Evaporation ponds shall be designed and constructed in accordance with RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104 (Appendix 19, Roy Hill Iron Ore Pty Ltd Report for Evaporation Ponds, Preliminary Design, July 2012 – Revision 1, GHD.)	OP-APP-00047 100RH-1730-GE-REP-2202	2.21
7.3.25 A network of monitoring bores will be installed down gradient of the evaporation pond and monitored to identify any seepage from the pond.	Roy Hill 1 Iron Ore mining Project Stage 1 Assessment 1589 Public Environmental Review Draft Response to Submissions	Page 2

7.4 Hazardous Materials

Design Requirements		Source Document	Section
7.4.1	Best practice fuel supply options for generators, and also for the generation of power for mobile lighting rigs, is to be considered during the detailed design and at equipment selection stage (e.g. use biodiesel in lieu of diesel).	(PER S1 Appendix 5)	6.5.1
7.4.2	The site infrastructure will include storage facilities for Ammonium Nitrate (AN), emulsion-based explosives, boosters and detonators. Storage facilities will be located, designed and operated in accordance with AS 2187.1:1998 Explosives – Storage, transport and use – Storage. The facilities will be licenced in accordance with Dangerous Goods Safety (Explosives) Regulations 2007	Best Practice	
7.4.3	Treated oily water from the separators shall have a total recoverable hydrocarbons (TRH) concentration of <15mg/L prior to discharge to the environment.	OP-APP-00047	2.6
7.4.4	The Mine Power Station will be designed and constructed in accordance with: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104 • Department of Water and Environmental Regulation – Licence L8621/2011/1 Amendment Notice #3 (November 2017).	OP-APP-00047	2.24

7.5 Waste

Design Requirements		Source Document	Section
MINE LANDFILL			
7.5.1	Landfills will be designed and constructed in accordance with the relevant operating licence application.		
7.5.2	A firebreak at least 3 metres wide shall be cleared and maintained around landfill boundaries at all times.	Environmental Protection (Rural Landfill) Regulations 2002	
7.5.3	Landfills will be constructed such that a separation distance of at least 3m between the base of the current and future landfill disposal area and the highest level of groundwater can be maintained at all times.	Environmental Protection (Rural Landfill) Regulations 2002	
7.5.4	The landfill shall be designed and managed to ensure the tipping area of the landfill trenches are not greater than: • 30 metres in length, and • 2 metres above ground level in height.	Environmental Protection (Rural Landfill) Regulations 2002	

Design Requirements	Source Document	Section
WASTE ROCK DUMPS		
7.5.5 Waste Rock Dumps will be designed in accordance with specifications outlined in the RHIO Mine Closure Plan and Roy Hill Waste Landform Design Manual	OP-PLN-00250 OP-MAN-00030	
7.5.6 Use a store and release cover system to prevent stormwater overtopping the Waste Rock Dump (WRD) and causing excessive erosion.	(PER S1 1589)	8.9.1
7.5.7 The height of the mining landforms (WRD) will be designed to be consistent with the surrounding terrain while minimising the footprint and area required for clearing.	(PER S1 1589)	8.13
7.5.8 Potential impacts associated with the storage of overburden will be managed through the following strategies: • Design and construct the WRD to blend with the natural landforms found within the Project area; • Progressive rehabilitation and revegetation of the lower slopes during operation of the WRD; • direct surface water around the toe of the WRD to minimise the potential for stormwater to undermine the foundation of the structure; • Embankments of the WRD to have an average slope of less than 18^{o} to minimise erosion and increase the revegetation and stabilisation of the slope; • Use a store and release cover system to prevent stormwater overtopping the WRD and causing excessive erosion; • Undertake an accurate assessment of the overburden volume available for backfill to ensure optimised backfilling of mined out pits to minimise the size of the out of pit storage facility; and • Where surface depressions will remain post-closure they are to be free draining to prevent water ponding.	(PER S1 1589)	8.9.1
7.5.9 The waste rock dumps will be located, designed and constructed to ensure that they are non-polluting and so that their final shape, height, stability, surface drainage, resistance to erosion, ability to support native vegetation are comparable to natural landforms in the area.	(MS824)	11-5
7.5.10 The detailed engineering of the proposed waste rock dump and overburden back fill operations will require consideration to the management of PAF minerals should any be removed or exposed by mining operations.	(PER S1 Appendix 8)	1.9

Design Requirements	Source Document	Section
TAILINGS STORAGE FACILITY		
7.5.11 Roy Hill TSF is to be constructed and operated in accordance with: • The design intent as expressed in the Design Report dated 19 December 2013 (100RHM252-2720-GE-REP-0003), and the current edition of the Guidelines on the safe design and operating standards for tailings storage issued by the DMIRS. • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OP-APP-00047	2.7
7.5.12 Optimisation of waste fines handling and water recovery will be considered in designing the TSF of a mineral processing plant to reduce pumping distances, make use of gravity flow and other energy efficiency and water recovery engineering principles. This is usually done by locating the TSF as close to the process plant as practical and utilising any slope on the site.	(PER S1 Appendix 5)	6.5.1
7.5.13 The TSF will be located, designed and constructed to ensure it is non-polluting and so that its final shape, height, stability, surface drainage, resistance to erosion, ability to support native vegetation is comparable to natural landforms in the area.	(MS824)	11-5
MINE PROCESSING PLANT		
7.5.14 The Mine Processing Plant will be designed and constructed in accordance with: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OP-APP-00047	2.2
7.5.15 The Water Blending Plant will be designed and constructed in accordance with: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OP-APP-00047	2.17
IN-PIT TYRE DISPOSAL		
7.5.16 In-Pit Tyre Disposal areas will be designed and constructed in accordance with: • RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104 • Department of Water and Environmental Regulation – Licence L8621/2011/1 Amendment Notice #3 (November 2017).	OP-APP-00047	2.26

7.6 Wastewater

Design Requirements		Source Document	Section
EVAPORATION PONDS			
7.6.1	Evaporation ponds shall be designed and constructed in accordance with RHIO Mining Proposal for M46/518, M46/519, L47/346, L47/347, L47/642, L47/735 and L46/104.	OP-APP-00047	2.21

7.7 Greenhouse Gas

Design Requirements		Source Document	Section
7.7.1	Consideration will be given to distance minimisation in developing the plant layout of stationary equipment to minimise haulage or pumping distances.	(PER S1 Appendix 5)	6.5.1
7.7.2	Speed control and motor starting methods will be considered in designing the process plant and selecting equipment such as conveyors, motors and pumps. Speed control (e.g. variable speed drives) and starting of specific equipment (e.g. soft starters) will be addressed in the detailed design and equipment selection stage and will be driven by the practicalities of each specific motor drive.	(PER S1 Appendix 5)	6.5.1
7.7.3	Optimisation of crushing and screening circuits will be considered in designing the process plant and selecting equipment.	(PER S1 Appendix 5)	6.5.1

7.8 Fire

Design Requirements		Source Document	Section
7.8.1	Implement a fire break around camps, key infrastructure (e.g. telecoms towers) and active construction locations.	Best Practice	

8 Rail Environmental Design Requirements

8.1 Fauna Interactions and Habitat

Design Requirements		Source Document	Section
8.1.1	Crossings shall be provided for livestock.	(SRL Licence 2011)	Schedule 1 14 (3)
8.1.2	Fauna friendly culverts will be constructed at locations where they maximise the benefit to EPBC listed threatened species (within potential suitable habitat for Mulgara, Bilby and Northern Quoll). This includes locating culverts: • At surface waterways including gullies, creeks lines and gorges (which typically align with areas where culverts would need to be installed for drainage purposes); • In areas adjacent to permanent or seasonal water bodies; and • In areas of rocky habitats that are bisected by the rail line including rocky scree slopes, breakaways, boulder fields mesas, rocky ranges and gorges.	(100RH-3000-EN-REP-2009)	7.1 Appendix 16
8.1.3	To maximise fauna use of culverts, the diameter should be based on providing the largest diameter possible that the depth of the rail line embankment will allow.	(100RH-3000-EN-REP-2009)	Appendix 16
8.1.4	It is recommended that some soil substrate is placed in culverts after construction to encourage fauna use of culverts.	(100RH-3000-EN-REP-2009)	Appendix 16
8.1.5	It is recommended that culverts be installed as close to ground level as possible to avoid vertical surfaces at culvert entrances that may obstruct entry by fauna, or make it difficult for fauna to locate culverts, particularly Mulgara.	(100RH-3000-EN-REP-2009)	Appendix 16

8.2 Surface Water

Design Requirements		Source Document	Section
CULVERTS			
8.2.1	Final culvert locations will be decided by engineers on the ground so that the culverts best fit the exact site conditions.	RH1-001-30-EN-FOR-0919	5.2
8.2.2	Culverts and bridges will be designed with consideration of the ecological water requirements for sensitive areas, particularly the Fortescue Marsh.	RH1-001-30-EN-FOR-0919	5.1
8.2.3	Design (Bridge) crossings to accommodate at least 1:100 ARI year rainfall events. Note: Culvert crossings are to be designed to accommodate at least 1:20 ARI year rainfall events.	(RH1-001-30-EN-REP-0911)	10.4.5

Design Requirements		Source Document	Section
8.2.4	Hydrological culverts will be designed in consultation with DEC as required by Condition 6 of MS847.	100RH-3000-EN-REP-2009	7.1
8.2.5	Watercourse and drainage line crossings will consist of culverts or bridges. Culverts will be used in preference to bridges.	(RH1-001-30-EN-REP-0911)	4.5.5
8.2.6	Design bridges, culverts and river crossings to reduce alteration of flows and water quality during flow events as far as practicable.	(RH1-001-30-EN-REP-0911)	10.4.5
EROSION CONTROL			
8.2.7	Install scour protection blankets at inlets and outlets of culverts where practicable.	(RH1-001-30-EN-REP-0911)	10.4.5
8.2.8	Install stabilising material on steep areas that have been cleared adjacent to drainage channels.	(RH1-001-30-EN-REP-0911)	10.4.5

8.3 Hazardous Materials

Design Requirements		Source Document	Section
8.3.1	Design infrastructure and selection of laydown areas to limit the potential for groundwater contamination (e.g. fuel tank locations, locomotive refuelling sites).	(RH1-001-30-EN-REP-0911)	10.7.2
FUEL STORAGE – TERMINAL YARD			
8.3.2	The fuel storage and decanting functions will be located within a secure area.	(100RH-3000-EN-REP-2024)	2.2
8.3.3	A pair of bulk storage tanks built to AS 1940 (Storage and handling of flammable and combustible liquids) ((AS 1940-2004) and compliant with AS 1692 (Steel tanks for flammable and combustible liquids) (AS 1692-2006), with a total stored capacity of 4 ML shall be provided for storage and dispensing of diesel fuel.	(100RH-3000-EN-REP-2024)	2.2
8.3.4	The tank design shall provide for pressure and vacuum relief and self-desiccating filters with 100% redundancy. Access to the roof of the tanks shall be provided by an AS 1657-1992 Fixed platforms, walkways, stairways and ladders - Design, construction and installation (AS 1657-1992) compliant escape ladder.	(100RH-3000-EN-REP-2024)	2.2
8.3.5	The fuel terminal will consist of an oily water collector and primary separator for final treatment at the wash-down facility.	(100RH-3000-EN-REP-2024)	2.2

Design Requirements		Source Document	Section
8.3.6	The tank shall be built on a suitable foundation within a Geotech/HDPE composite lined earthen bund. The bund shall be sized sufficiently to comply with AS 1940 (AS 1940-2004). Access and egress to the bund will be provided by a minimum of two structural ramps complying with AS 1657 (AS 1657-1992). The tank will be externally painted with a 2 coat zinc epoxy and finished in white to reduce thermal gain.	(100RH-3000-EN-REP-2024)	2.2
8.3.7	This facility shall include bunded storage, receiving and unloading facilities for single, double and triple road tankers at a rate of 1800 litres/min each, rail loading facilities for filling 100 kL fuel tank cars (minimum of 4 at a time) for transfer of fuel to a mine storage facility, a pipeline for supply of diesel fuel, road tanker filling facilities for dispensing fuel to storage facilities at the marina and port stock yards for daily operation use and refuelling bowsers for light and medium vehicle fuelling.	(100RH-3000-EN-REP-2024)	2.2
8.3.8	Fuel temperature compensation devices shall be installed to adjust delivered fuel volumes to 15˚C and air elimination is essential to remove entrained air that normally occurs during truck unloading.	(100RH-3000-EN-REP-2024)	2.2
8.3.9	A flow meter shall be installed that provides audit and tracking of all fuel movements and transactions on the system. The flow meter shall be compatible with the system installed at the refuelling stations.	(100RH-3000-EN-REP-2024)	2.2
8.3.10	Level transmitters on the storage tank shall be used for level monitoring and initiation of low/high alarms. The tank high level shall have a 100% redundancy. On tank low level being initiated all diesel movements will cease, the tank will be isolated from the transfer manifold and diesel transfer from the tank will not commence until the low level is reset. When the tank high level alarm is initiated, an audible and visual alarm shall be activated providing several minutes for the driver to stop filling and evacuate the refuelling hoses. When the high is initiated the unloading pumps shall cut out and the unloading manifold shall be isolated from the tank preventing a diesel spill.	(100RH-3000-EN-REP-2024)	2.2
8.3.11	Tank level indication shall be displayed at the tanker unloading control station for driver verification, in addition to interfacing to the fuel monitoring system for front office use.	(100RH-3000-EN-REP-2024)	2.2
8.3.12	During idle periods tank manifold inlet and outlet valves shall be in the failsafe closed position. All valves shall be driven open under system control when a diesel fuel movement takes place.	(100RH-3000-EN-REP-2024)	2.2

Design Requirements	Source Document	Section
8.3.13 Diesel supply to light vehicles shall comprise of a supply pump located inside the diesel storage bund which feeds via transfer piping and a pressure reducing valve for a bowser capable of discharging diesel at a rate of 80 litres/min. A system shall be installed at each refuelling station together with dry break hose couplings.	(100RH-3000-EN-REP-2024)	2.2
8.3.14 Transfer piping from the fuel terminal to the rolling stock workshop shall be double jacketed steel inner pipe, jacketed with a steel outer pipe and providing an interstitial space. The assembly shall be wrapped in PVC backed butyl mastic wrap tape, for the sections that are laid below ground. Alternatively the transfer piping will be a purposely designed secondary containment polyethylene pipe with the double walls fittings, joined via an electro-fusion welding process.	(100RH-3000-EN-REP-2024)	2.2
8.3.15 The facility shall include an oily water separator facility for containment and treatment of spills.	(100RH-3000-EN-REP-2024)	2.2
8.3.16 All loading and unloading points shall be provided with spill catchment pads with collection sump point that connect to the oily water facility.	(100RH-3000-EN-REP-2024)	2.2

8.4 Wastewater

Design Requirements	Source Document	Section
8.4.1 The WWTP at the Rail Terminal Yard will be constructed in accordance with Roy Hill Infrastructure Pty Ltd: Draft Rail Terminal Yard, Fuel Terminal Yard and Waste Water Treatment Plant – Application for Works Approval, (October 2011).	(100RH-3000-EN-REP-2024)	

8.5 Fire

Design Requirements	Source Document	Section
8.5.1 Implement a fire break around camps, key infrastructure (e.g. telecoms towers) and active construction locations.	(RH1-001-30-EN-REP-0911)	10.2.5

9 Port Environmental Design Requirements

9.1 Dust

Design Requirements		Source Document	Section
PORT LANDSIDE			
9.1.1	A weather station and up to six remote dust monitoring stations shall be incorporated into the OHF control system for the stockyard dust suppression system and necessary environmental monitoring systems. Dust monitoring stations will include at least four PM10 BAM 1020 Solar powered dust monitoring stations, to Australian Standards (cyclone rated) and at least two E-sampler dust monitoring stations.	(100RH-4000-EN-REP-2001)	9.1
9.1.2	Design of the Port OHF will be such that the moisture content of ore received from the mine will be maintained at or above dust extinction levels.	(100RH-4000-EN-REP-2001)	6.1
9.1.3	All machines within the OHF stockyard shall be designed for operation with minimum practical dust emissions.	(100RH-4000-EN-PLN-2001)	6.4
9.1.4	Both the car dumper facility and screening plant will be fitted with bag house dust extraction systems.	(100RH-4000-EN-PLN-2001)	6.3
9.1.5	The car dumper will be enclosed and include a close-fitting cover that prevents the development of free dust.	(100RH-4000-EN-PLN-2001)	6.3
9.1.6	The lump and fines surge bins shall be covered to reduce the egress of dust from the top of the bins. The bins area connected to the screening plant bag house dust extraction system.	(100RH-4000-EN-PLN-2001)	6.3
9.1.7	The OHF control system will be configured to prevent the overfilling of conveyors i.e. conveyor belt capacity will not be exceeded.	(100RH-4000-EN-REP-2001)	9.1
9.1.8	All conveyors include: • Scrapers on all head or tripper pulleys; • Shuttles and trippers with reversible scrapers; • Ploughs on the return belt ahead of all pulley; • Adequate belt edge distance between the product and the belt edge; and, • Scrapings being returned to the ore stream wherever possible.	(100RH-4000-EN-PLN-2001)	6.4
9.1.9	Moisture analysers shall be located on the in-load circuit after exit of car dumper and the out-load circuit before the elevated overland conveyor. The moisture analyser on the overland conveyor shall be located within 100m of the transfer and sample station to enable correlation with the moisture measured at the sample station.	(100RH-4000-EN-PLN-2001)	6.4

Design Requirements	Source Document	Section
9.1.10 The elevated overland conveyor will be covered along its length with a cover designed to act as a wind break and minimise fugitive dust emissions.	(100RH-4000-EN-PLN-2001)	6.5
9.1.11 Where the overland conveyor crosses the BHP access corridor the conveyor shall be fully enclosed to prevent spillages and interference. All other parts of the overland conveyor shall be fitted with conveyor noise/dust covers only.	(100RH-4000-EN-PLN-2001)	6.5
9.1.12 All transfer stations will prevent dust generation and spillage or loss of material and include: • Chutes of 'WEBA' type design and manufacture; • Dust tight covers on transfer chutes; • Chutes shall be designed to catch dribble and belt cleaner discharge; • Dust proof skirts prior and post the impact areas fitted with dust curtains; • Dust curtains at the entry and exit of the belts into the chutes; • Two dust curtains a minimum of 150 mm apart prior to the impact area; • Double dust curtains shall also be provided at the belt discharge from the skirts; • A rubber seal shall below the return belt, where the belt exits the discharge chute; • The belt discharge curtains shall be separated by a suitable length to enable the dust to settle and a misting spray to be used if required (approx. 1500 mm); • Spray bars will be included at the exit chutes for all transfer stations. • Inspection and access doors with a batten down latching device and shall be sealed with dust-tight with gaskets.	(100RH-4000-EN-PLN-2001)	6.4
9.1.13 The internal volume of the transfer stations will be sized to accept/contain the volume of material during belt rundown.	(100RH-4000-EN-PLN-2001)	6.4
9.1.14 With the exception of the Transfer Station leading onto the elevated overland conveyor all Transfer Stations along the elevated overland conveyor include: • Solid concrete flooring; and • Belt Wash stations, if the return belt is not travelling over concrete or solid flooring.	(100RH-4000-EN-PLN-2001)	6.5
9.1.15 Belt wash stations will comprise squeegees and high pressure water sprays with slurry returned to the ore stream.		
9.1.16 OHF stockpile area dust suppression system includes:	(100RH-4000-EN-REP-2001)	6.4

Design Requirements	Source Document	Section
• Water cannons installed parallel to each row of stockpiles; • Water cannons positioned to suit water spray trajectory, height and slope of stockpile; and • Consideration of chemical suppressants, if practicable.		
9.1.17 The stockyard will be serviced by two stackers and one reclaimer fitted with dust suppression sprays. The location of dust suppression sprays shall be selected to minimise dust emissions from machine operation.	(100RH-4000-EN-PLN-2001)	6.4
9.1.18 The stackers will be rail mounted travelling, luffing and slewing units. The stackers shall include sprays at the boom discharge located to spray the outer surface of the ore stream after discharge from the boom. The stacker sprays shall be adjustable for the stacking rate to prevent over wetting of the product. The Stackers shall be fitted with a wind hood on the discharge.	(100RH-4000-EN-PLN-2001)	6.4
9.1.19 The discharge from the stacker boom conveyor shall free fall from the conveyor head pulley with a dust curtain and spray bar required to control any nuisance dust. The stackers will have a wind hood on the discharge. The location of dust suppression sprays shall be selected to minimise dust emissions from machine operation.	(100RH-4000-EN-PLN-2001)	6.4
9.1.20 The Reclaimer shall include sprays at the bucket wheel positioned to wet the stockpile at the digging face. Water sprays shall be provided on the Reclaimer boom conveyor prior to discharge into the central chute and at the end of the yard conveyor loading zone (Impact Table).	(100RH-4000-EN-PLN-2001)	6.4
PORT MARINE		
9.1.21 The Shiploader shall include water sprays at the boom discharge located to spray the outer surface of the ore stream after discharge from the boom.	(100RH-4000-EN-PLN-2001)	6.6
9.1.22 All primary and secondary scrapings from shiploader boom return belt shall be directed to discharge into the main ore stream falling onto the boom conveyor or the ships hold.	(100RH-4000-EN-PLN-2001)	6.6

9.2 Surface Water

Design Requirements	Source Document	Section
PORT LANDSIDE		

Design Requirements		Source Document	Section
9.2.1	Earthworks include longitudinal and transverse drainage channels, plus retention and sedimentation basins for collected stormwater together with access roads.	(100RH-4000-EN-REP-2001)	6.2
9.2.2	Stormwater treatment within the OHF rail loop will include an array of drains, sedimentation basins, oil and grit/sediment separators, culverts and a water treatment plant if required.	(100RH-4000-EN-REP-2001)	9.4
9.2.3	Stormwater and stockpile drainage collected from the stockpile areas is to progress to sedimentation ponds.	(100RH-4000-EN-REP-2001)	9.4
9.2.4	Sedimentation basin shall be designed to remove 80 % of all of fine sediments in the 10 year ARI design peak flow. Sufficient basin depth shall be provided to ensure adequate storage for deposited sediment and be lined with low permeable fill.	(100RH-4000-EN-REP-2001)	9.4
9.2.5	Culverts within the OHF rail loop embankment will allow release of stormwater into the surrounding environment. Culverts will be located to direct water to natural surface water flows and ensure ponding does not occur.	(100RH-4000-EN-REP-2001)	9.4
9.2.6	The height of (elevated overland conveyor) trestles over the land surface is higher than maximum 1:100 year storm surge level.	(100RH-4000-EN-PLN-2001)	6.5
9.2.7	A variety of physical and procedural erosion and sediment control measures are employed to limit the risk of erosion and sedimentation resulting from construction of temporary hydraulic structures within the OHF. These include: • Rock protection / rip rap; • Sedimentation basins / sediment traps; • Adopting low channel grades; and, • Avoiding sharp changes in flow direction.	(100RH-4000-EN-REP-2001)	9.4

9.3 Vibration and Noise

Design Requirements		Source Document	Section
PORT LANDSIDE			
9.3.1	All OHF equipment shall minimise noise.	(100RH-4000-EN-REP-2001)	9.2
9.3.2	All OHF equipment, wherever practicable, is fitted with appropriate noise reduction devices.	(100RH-4000-EN-REP-2001)	9.2
9.3.3	The OHF car dumper and screening plant will have bag house dust extraction systems.	(100RH-4000-EN-REP-2001)	6.4
9.3.4	The screening plant design incorporates the effects of flow-induced noise and vibration and general structure borne noise and vibration from various components.	(100RH-4000-EN-REP-2001)	6.4

9.4 Hazardous Materials

Design Requirements		Source Document	Section
PORT LANDSIDE			
9.4.1	Containment bunds shall be graded to drain away from facilities to a lined sump via gravity feed or self-starting sump pumps. Wastewater will be treated with oily water separators with treated water being transferred to holding tanks and sludge waste pumped out by a Controlled Waste Contractor on a periodic basis for offsite disposal to a licensed facility. Treated water will be returned to the process feed if deemed appropriate or removed for offsite disposal at a licensed facility.	(100RH-4000-EN-REP-2001)	9.5

9.5 Infrastructure and Facilities

Design Requirements		Source Document	Section
PORT LANDSIDE			
9.5.1	A dust extraction system will be installed at the sample plant.	(100RH-4000-EN-REP-2001)	6.4
9.5.2	Containment bunds around certain facilities (car dumper, light vehicle washdown, screening plant and septic tanks) will be designed to minimise stormwater entry and be inspected on a regular basis.	(100RH-4000-EN-REP-2001)	9.5

10 Abbreviations

Table 6: Abbreviations

Abbreviation	Definition
AMD	Acid Mine Drainage
AN	Ammonium Nitrate
ANSOL	Ammonium Nitrate in Solution
ANZECC	The Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARI	Assessment on Referral Information
AS	Australian Standard
BOD	Biological Oxygen Demand
Bt	Billion Tonnes
CEO	Chief Executive Officer
Ch	Chainage
COAG	Council of Australian Governments
DEC	Department of Environment and Conservation
DER	Department of Environment Regulation
DWER	Department of Water and Environmental Regulation
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
DMA	Decision-making Authority
DMP	Department of Mines and Petroleum
DMMA	Dredge Material Management Area
DoE	Department of Environment now the Department of Environment and Conservation
DoH	Department of Health
DoW	Department of Water
DSO	Direct Ship Ore
EBoD	Environmental Basis of Design
EIA	Environmental Impact Assessment
EPA	Environment Protection Authority
GD	Ground Disturbance
GDA94	Geocentric Datum of Australia 1994 (coordinates)
GHG	Greenhouse Gas (emissions)
ha	Hectares
HDPE	High Density Polyethylene
HSE	Health Safety and Environmental

Abbreviation	Definition
HV	Heavy vehicle (e.g. haul truck, water truck, digger, excavator, etc)
kL	Kilolitre (measure of volume)
kt	Kilotonne (measure of weight)
km	Kilometre (measure of distance or length)
KPa	A kilopascal (unit of pressure). There are 1,000 Pascal's in 1 kilopascal
L	Litre (measure of volume)
m	Metres (measure of distance or length)
MARPOL	Marine Pollution (International Convention for the Prevention of Pollution from Ships)
MGA	Map Grid of Australia (coordinates)
mg/L	Milligrams per Litre
MHMP	Mangrove Health Monitoring Plan
ML	Mega Litre (measure of volume)
ML/day	Mega Litres per day
Mm3	Million Cubic Metres
MS	Ministerial Statement
MSP	Magnetic Separation Plant
m/s	Metres per second (Measure of Permeability)
Mt	Million Tonnes
Mt/a	Million Tonnes per Annum (measure of production rate)
m3	Cubic Metres (measure of volume)
nm	nanometres
OEPA	Office of the Environment Protection Authority
OHF	Ore Handling Facility
PAF	Potential Acid Forming
PER	Public Environmental Review
PHIC	Port Hedland Industry Council
PHPA	Port Hedland Port Authority
PMF	Probable Maximum Flood
POW	Programme of Works
ppm	Parts Per Million
RH	Roy Hill
RHI	Roy Hill Infrastructure Pty Ltd
RHIO	Roy Hill Iron Ore Pty Ltd
RO	Reverse Osmosis
SC	South Creek
SDP	Sea Dumping Permit

Abbreviation	Definition
SEC	South East Creek
SI	The International System of Units (metric system).
SRE	Short Range Endemics
SRL	Special Rail Licence
SWC	South West Creek
t	Tonnes (measure of weight)
TDS	Total Dissolved Solids
TENGRAPH	Department of Mines and Petroleum Online Service
ToPH	Town of Port Hedland
TPH	Total Petroleum Hydrocarbons
TSF	Tailings Storage Facility
T5 fluorescent	⅝" or 15.875 mm (T16) diametre tube with G5 bipin. New ranges include HE 14-35W and HO 24-80W
T8 fluorescent	1" or 25.4 mm (T26) diametre tube with G13 bipin or single pin or recessed double contact.
WQPN	Water Quality Protection Note
WRD	Waste Rock Dump
WWTP	Wastewater Treatment Plant

11 Definitions

Table 7: Definitions

Term	Definition
Egress matting	A structure that allows fauna to escape from trenches or excavations (e.g. a ramp with matting or wire mesh). Egress structure – this can be rope, matting, mesh, fencing material etc. – anything that will allow fauna to egress from a trench or Turkey's nest (Department of Environment and Conservation, 2009).
Peak flow	The maximum flow through a watercourse which will recur with a 1:100 average recurrence interval storm event (Bureau of Meteorology, 2011).
Turkey's nest	Turkey's nest dams consist of a completely enclosed earth embankment, which is filled by pumping water from a water source (i.e. a groundwater bore). (Department of Agriculture WA, 2005). These dams are often with an impermeable membrane such as polyethylene to prevent water loss by infiltration in the subsurface of the structure

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Table 8: List of Referenced Documents

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