BHP Iron Ore Pty Ltd
Ministers North Closure Plan

Revision 1.0

15 September 2025

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Executive Summary

The proposed Ministers North above water table mining operation (Ministers North) is located between BHP's Yandi and Mining Area C mine sites, approximately 80 km north-west of Newman in the Pilbara region of Western Australia (WA). The proposed Ministers North operations comprise above water table mine pits, an overburden stockpile area and associated infrastructure including a haul road and water pipeline connecting Ministers North to the Yandi mine site (the proposed infrastructure corridor) and a land bridge across the Yandi W5 pit. For clarity, proposed disturbance and development for new Ministers North infrastructure within the Yandi tenure are not currently included in the existing Yandi Mine Closure Plan (MCP) and so have been included in this MCP. Ministers North has an expected life up to approximately 2043.

Ministers North was identified in the BHP Pilbara Expansion Strategic Proposal (Strategic Proposal) which was referred to the Environmental Protection Authority (EPA) in 2012 for consideration under Part IV of the *Environmental Protection Act 1986* (EP Act). Having devised a long-term mine development plan, BHP's aim was to consider a more regional approach to environmental management across all of its current and future operations. The Strategic Proposal included new mining operations and future expansions to existing mining operations, and associated infrastructure developments in the central Pilbara.

The Minister for Environment issued Ministerial Statement (MS) 1105 for the Strategic Proposal in July 2019. MS 1105 states that in the event that the EPA declares a future proposal (as identified in EPA Report 1619 and described in Schedule 1 of MS 1105) to be a derived proposal, then the derived proposal may be implemented.

This MCP documents the closure strategies that will be undertaken at Ministers North and will support ongoing engagement with the Banjima People, as the holders of Native Title of the land that underlies the closure planning area, and other relevant stakeholders. In addition, BHP has prepared this MCP to support a request to the EPA that Ministers North be declared a derived proposal. The guidelines for submitting a derived proposal 1(d) (as stated in MS 1105) require that a derived proposal request be accompanied by draft management plans (including an MCP).

This MCP incorporates consideration of these guidelines and, subject to the assessment of Ministers North under Section 45B of Part IV of the EP Act, the requirements of:

- MS 1105;
- Department of Mines, Petroleum and Exploration (DMPE) (previously the Department of Energy, Mines, Industry Regulation and Safety [DEMIRS] *Guideline for Preparing Mine Closure Plans* (DEMIRS, 2025); and
- BHP corporate requirements.

BHP[1] is committed to environmental stewardship. The BHP Charter is the overarching document that articulates the corporate vision and values for which BHP stands. The first value in the Company Charter is:

> *Do what's right (A sustainable future starts with safety and integrity, building trust with those around us).*

The BHP closure and rehabilitation objective is to:

> *Develop a safe, stable, non-polluting and sustainable landscape that is consistent with key stakeholder agreed social and environmental values and aligned with creating optimal business value.*

To guide the development and implementation of mine closure and rehabilitation for the Pilbara operations, BHP has established a set of guiding closure principles which are applied to Ministers North. The guiding closure principles address post-closure land use, land management, safety, landforms, mine planning, ecosystem sustainability, water, decommissioning, contaminated sites, human resources and community assets.

The Ministers North Development Envelope is located on the lands of the Banjima People. BHP has collaborated with the Banjima People throughout the planning process for Ministers North and has taken into consideration the closure principles and outcomes that have been shared. Specifically, BHP has modified the project and closure design to align with Banjima's feedback including mining offset from Khargoonha, backfill priority against Khargoonha with geomorphic design, rehabilitation standard of the Haul Road and use of ethnobotanical species in rehabilitation seed mixes. BHP is committed to continued engagement with Banjima over the project life through the establishment of closure working groups, and with each MCP update. A copy of this MCP has been provided to the Banjima People for their review and comment and feedback has been incorporated where applicable.

[1] A number of terms have been used to refer to the company in this document:

- BHP refers to the BHP group of companies under parent entities BHP Group Limited and BHP Group Plc
- BHP Western Australian Iron Ore (WAIO) refers to the local Western Australian operation
- BHP Billiton Iron Ore Pty Ltd (BHPBIO) is the manager of WAIO and the holder of licences and approvals

Table E1 provides as summary of the key closure information by domain including:

- Key closure risks and issues. This column provides a brief summary of the closure risks associated with each domain. Further information on causes and potential impacts is provided within the body of this MCP.
- The main controls that are being, or will be, implemented to achieve the key outcomes and mitigate the closure risks.
- A summary of knowledge gaps that are still to be addressed.
- The forward work program to address the outstanding knowledge gaps and enable closure planning to be refined and progressed towards execution.

Executive Summary Table 1 – summary of key risks and management approaches

Technical Area	Key Risks and Issues	Management Response / Controls	Key knowledge gaps	Forward work program
Sustainability Flora and Vegetation Soil Characteristics	Revegetation establishment. Loss of culturally significant species.	• Growth media management in accordance with the Growth Media Management Procedure (WAIO, 2022d). • Local provenance native seed (from the local area, but as a minimum from within 100 km of site within the Pilbara Biogeographic Region). • Seed mix in accordance with Appendix F.	• Topsoil availability relative to volume required. • Culturally significant flora. • Develop final completion criteria in collaboration with Banjima People.	• As part of WAIO's embedded rehabilitation planning process, any cleared areas which may be available for a minimum of five years would be investigated for incorporation into the 5-year rehabilitation plan. • Prepare topsoil balance. • Undertake a study in collaboration with the Banjima People to: - Identify cultural keystone species that are significant to the Banjima People - Ensure culturally significant species are incorporated into rehabilitation seed mixes. • This work will be undertaken as part of ongoing collaboration between BHP and the Banjima People. • Continue to review and refine completion criteria taking into consideration improved knowledge to develop more measurable metrics. • Undertake a collaborative process with the Banjima People to further develop completion criteria that address the Banjima Closure Principles and Outcomes.
Landforms Pit Void Overburden Storage Area (OSA) Inpit Storage Area (ISA) Visual amenity	Landform instability (pit voids). Landform instability (OSA/ISA). Final pit wall fails beyond the safety bund or agreed safety bund structure and impacts on geomorphic landforms adjacent Khargoonha.	• Progressive placement of waste into mined out pits where practical (Section 8.5.1). • Design of OSA/ISA to minimise erosion based on waste characteristics and control of surface water. • Waste characterisation and landform erosion modelling (Water Erosion Prediction Project (WEPP), SIBERIA) to optimise final landform design. • Geomorphic landform design will be developed for South Pit ISA (Section 8.5.1).	• Final landform design. • Incorporating geomorphic design principles into landforms.	• Further characterisation of waste to refine the mine model and inform final landform designs. • Detailed closure landform designs (integrating all domains) to be developed based on outcomes of technical studies and assessments. • Validation of design assumptions during operational life of mine. • Geomorphic designs to be developed with regard to site specific information as it becomes available, such as:: - Local climate and rainfall patterns - Material characterisation of overburden and soil conditions - The topography of upstream and downstream catchments. • Geomorphic landform designs will be shared with Banjima People during Closure workshops as outlined in the Ministers North Project Management Plan (PMP) (BHP, 2025c).
Terrestrial Environmental Quality Acid and Metalliferous Drainage (AMD)	Poor geochemical characterisation of overburden and ore, or poor AMD management leads to AMD release from Potentially Acid Forming (PAF) material within OSA and / or low grade stockpiles, impacting surface water quality in local creek lines.	• The risk of AMD is low (Section 3.4.1); the mining model does not predict any AMD Class 1 material as mining is to be carried out only above the water table. Less than 1% of the waste rock may be AMD Class 2 or 3 material which can be managed (with Non Acid Forming [NAF] overburden) and would typically be placed 10 m below the final rehabilitation surface. • There is an insignificant predicted exposure of AMD Class 2 wall rock which represents a very low risk and requires no specific management.	• Validation of AMD in mining model once mining commences.	• Assess the weathering status of AMD2 waste as predicted from the geological model and conduct a focussed geochemical characterisation program if not exclusively associated with the oxidised zone
Hydrology Surface water	Surface water flow and quality does not meet acceptable limits. Permanent landforms impact surface water flows and adversely affect surface water dependent vegetation and GDEs (e.g., Yandicoogina Creek).	• Where the changes to surface water flow present an unacceptable risk to ecohydrological receptors, modify the surface water infrastructure design. • Rock armouring may be employed to prevent erosion. • Surface water modelling, including studies undertaken to determine the local surface water drainage requirements to meet closure requirements. • The Pilbara Water Resource Management Strategy guides and informs planning in the framework of adaptive management.	• Baseline surface water quality data. • Surface water management structures for closure.	• Refine surface water models and hydrological studies to inform the design of surface water management infrastructure necessary for closure. • Collect additional surface water quality data to inform completion criteria.
Post-closure land use Amenity	Post closure land user amenity Failure to incorporate Banjima Closure Principles and Outcomes into landform designs during operations results in visual amenity and cultural heritage outcomes not being met for the Banjima People.	• Post-closure land use to be confirmed through discussions with key stakeholders including adjacent pastoral stations, Banjima People and relevant government agencies via the ongoing stakeholder engagement process.	• Understanding about what post closure land access will be required and how this relates to final landforms.	• Review post closure land use options and define post closure land use performance objectives and requirements for safe access in consultation with key stakeholders and with the Banjima People. .
Land management	Heritage. Failure to incorporate Banjima Closure Principles and Outcomes into landform designs during operations results in visual amenity and cultural heritage outcomes not being met for the Banjima People.	• Identify post closure issues (including ongoing management) through discussion with key stakeholders including the Banjima People through the stakeholder engagement process. • Heritage survey information is used to inform mine planning and design. • Reporting and collaboration with the Banjima People as agreed in the PMP.	• Agreed post closure land use and access requirements.	• Review post closure land use options and define post closure land use in consultation with key stakeholders. • Stakeholder views on cultural heritage outcomes. • The Derived Proposal commits to pursuing opportunities for collaboration between BHP and the Banjima People for ethnobotanical surveys. Rehabilitation planning will consider the implications of the results of any ethnobotanical surveys conducted.

Technical Area	Key Risks and Issues	Management Response / Controls	Key knowledge gaps	Forward work program
Safety Human Health	Access.	• Final landform designs to take post closure safety requirements into account (as per DMPE Guidelines). • Safety bunds confirming to DMPE guidelines (DoIR, 1997) and the outcomes of recent consultation with DMPE on safety bunds. • Options for safe access post-closure will be incorporated into designs in consultation with stakeholders and collaboration with the Banjima People. .	• Misaligned stakeholder requirements.	• Slope stability analysis to inform final safety bund locations for pit faces and mine pits remaining at closure. • Continued discussion with Regulators and Banjima People to enable safe access post mining, including access to sites of cultural significance. • Integration into closure designs where practicable.
Infrastructure Decommissioning	Decommissioning and Rehabilitation.	• Outcomes for decommissioning of infrastructure, including fixed structures, haul road, creek crossings and landbridge have been agreed and documented in the PMP. • Formulate detailed Infrastructure Decommissioning Plans within five years of closure. (Note: infrastructure located at Yandi will be decommissioned in accordance with the Yandi MCP).	-	• Undertake Government and stakeholder consultation to confirm infrastructure decommissioning as part of the post mining land use consultation.

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Abbreviations

Abbreviation	Meaning
ABA	Acid-base accounting
ACH	Aboriginal Cultural Heritage
AER	Annual environmental report
AMD	Acid and metalliferous drainage
AMIRA	Australian Mineral Industries Research Association
ANC	Acid neutralisation capacity
ANFO	Ammonium nitrate fuel oil
ANZG	Australian and New Zealand Guidelines
ANZMEC	Australian and New Zealand Minerals and Energy Council
ARD	Acid rock drainage
ARI	Average recurrence interval
AS/NZS ISO	Australian and New Zealand International Standards Organisation
AWT	Above water table
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016* (WA)
BCM	Bank cubic metre
BHPBIO	BHP Billiton Iron Ore Pty Ltd
BIF	Banded Iron Formation
BNTAC	Banjima Native Title Aboriginal Corporation
BoM	Bureau of Meteorology
BWT	Below water table
CAP	Corporation alignment planning
CEO	Chief Executive Officer
CID	Channel Iron Deposit
CPS	Clearing Permit
CA Act	Contaminated Sites Act 2003
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEED	Department of Energy and Economic Diversification
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety (now DMPE)
DGV	Design Guideline Values
DISER	Department of Industry, Science Energy and Resources
DJTSI	Department of Jobs Tourism Science and Innovation (now DEED)
DMIRS	Department of Mines, Industry Regulation and Safety (now DMPE)
DMPE	Department of Mines, Petroleum and Exploration (previously DEMIRS)
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning Lands and Heritage
DRF	Declared Rare Flora

Abbreviation	Meaning
DSI	Detailed Site Investigation
DTMI	Department of Transport and Major Infrastructure
DWER	Department of Water and Environmental Regulation
EC	Electrical conductivity
EIA	Environmental Impact Assessment
EIGG	Environmental Inorganic Geochemistry Group (at Curtin University)
EPA	Western Australian Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPWRMP	Eastern Pilbara Water Resource Management Plan
ERD	Environmental Review Document
FPIC	Free, Prior and Informed Consent
FWP	Forward Work Program
FY	Financial Year
GARD	Global acid rock drainage
GDE	Groundwater dependent ecosystems
GDV	Groundwater dependent vegetation
GL	gigalitres
GNA	Goldsworthy north area
GPS	Global positioning system
ha	Hectare
HAC	Heritage Advisory Council
HPA	Heritage Protection Areas
IBRA	Interim biogeographic regionalisation for Australia
ID	Identification
ILUA	Indigenous land use agreement
INAP	International Network for Acid Prevention
INSAR	Interferometric Synthetic Aperture Radar
IPCC	Intergovernmental Panel on Climate Change
IP	Initiation Project Stage
ISA	Inpit Storage Area
JV	Joint venture
km	Kilometre
km^2	Kilometre squared
LGIRS	Local Government, Industrial Relations and Safety
LiDAR	Light detection and ranging
LoA	Life of asset
MAR	Mandatory audit report
MAC	Mining Area C
mAHD	Metres above Australian Height Datum
Mbgl	Metres below ground level

Abbreviation	Meaning
MCA	Minerals Council of Australia
MCP	Mine closure plan
M	Mineral lease
ML	Megalitres
MPA	Maximum Potential Acidity
MRF	Mining rehabilitation fund
mRL	Metres reduced level
MS	Ministerial statement
m	Metre
m^2	Metre squared
mg/L	Milligrams per litre
mm	Millimetres
mM^3	Million cubic metres
NAF	Non-acid forming
NAG	Net acid generation
NAPP	Net acid production potential
NMD	Neutral metalliferous drainage
NPI	Non-processing infrastructure
NVCP	Native vegetation clearing permit
OSA	Overburden storage area
PAF	Potentially acid forming
PEAHR	Project environmental and heritage requirements
PEC	Priority ecological community
PFAS	Per- and Polyfluoroalkyl Substances
PGA	Peak ground acceleration
pH	Numeric scale used to specify acidity or basicity
PMF	Probable maximum flood
PMLU	Post Mining Land Use
PMP	Project Management Plan
PRMP	Progressive Rehabilitation Management Plan
PSI	Preliminary site investigation
RAP	Remediation action plan
RGBI	Red, Green, Blue and Intensity
RiWi Act	Rights in Water and Irrigation Act 1914
ROM	Run-of-mine
RUSLE	Revised universal soil loss equation
SAP	Sample analysis plan
SD	Saline Drainage
SRE	Short range endemic
SW	Southwest
TARP	Trigger Action Response Plan

Abbreviation	Meaning
TDS	Total dissolved solids
TEC	Threatened Ecological Community
VAR	Voluntary audit report
WA	Western Australia
WABSI	Western Australian Biodiversity Science Institute
WAIO	BHP's Western Australian Iron Ore operations
WEPP	Water erosion prediction project
WIN	Department of Water and Environmental Regulation's Water information database
ZOI	Zone of Instability

1 Description of Mining Operation

The proposed Ministers North operation is located approximately 15 km south-east of BHP's Yandi Mining Operations (Yandi), 20km north-east of the Mining Area C (MAC) mine site and 85 km north-west of Newman, in the Pilbara region of Western Australia (WA) (Figure 1-1).

1.1 Purpose and scope of this document

This MCP documents the closure strategies that will be undertaken at Ministers North and will support engagement with the Banjima People, as the holders of Native Title of the land that underlies the closure planning area, and other relevant stakeholders.

Ministers North was identified in BHP's Pilbara Expansion Strategic Proposal (Strategic Proposal) which was assessed by the Environmental Protection Authority (EPA) as a Strategic Proposal under the *Environmental Protection Act 1986* (EP Act) and approved by the Minister for Environment under Ministerial Statement (MS) 1105. The location of Ministers North in relation to the boundary of the approved Strategic Proposal is shown in Figure 1-1. The proposed Ministers North Development Envelope and indicative footprint is shown on Figure 1-2.

MS 1105 states that, in the event that the EPA declares a future proposal (as identified in EPA Report 1619 and described in Schedule 1 of MS 1105) to be a derived proposal, the derived proposal may be implemented. MS 1105 requires that a derived proposal request be accompanied by draft management plans including a Mine Closure Plan (MCP). Therefore, the secondary purpose of this MCP is to support a request to the EPA that Ministers North be declared a derived proposal. Subject to the Minister for Environment's identification of relevant conditions under section 45B (3) from the conditions set out in the Statement, this MCP would be used by BHP and its contractors in the implementation of appropriate rehabilitation and mine closure strategies for Ministers North.

Subject to the Part IV (Section 45B) assessment of Ministers North, this MCP incorporates the following:

- Closure and rehabilitation requirements defined in MS 1105. MS 1105 also requires that the MCP includes management-based provisions (outlined in the EPA's *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans)* (EPA, 2018). Appendix A of this MCP provides the environmental objectives, management actions and other requirements specified in Condition 15-3 of MS 1105.
- Department of Mines, Industry Regulation and Safety (DMIRS), now the Department of Mines, Petroleum and Exploration [DMPE]) *Guideline for preparing mine closure plans* (DEMIRS, 2025).
- BHP corporate requirements.

It is intended that this MCP be revised at intervals not exceeding three years. This revision timeline is consistent with the DMPE Guidelines (DEMIRS, 2025) and with BHP's strategic approach to closure planning across its Pilbara assets.

The proposed Ministers North Development Envelope, which is the subject of this MCP, includes a mining area with:

- two above groundwater open pits (North and South)
- one ex-pit Overburden Storage Area (OSA)
- two ore stockpile footprints
- In-Pit Storage Areas (ISAs),
- Various non-process infrastructure for purposes including but not limited to administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, water storage (including turkey's nest) and pumping, fuel storage and transfer, explosives storage, power generation and transmission powerlines, pipelines, and communications
- an infrastructure corridor to transport ore mined at Ministers North to the existing Yandi site for processing (the proposed infrastructure corridor) which includes a haul road, rail line overpass, W5 Pit land bridge, 33kv powerline, and a water pipeline.

The proposed Ministers North Development Envelope intersects the Yandi Development Envelope. Closure planning for the Yandi mining operation is addressed in a separate MCP, however, for clarity, disturbance and development for new infrastructure within the current Yandi tenure (including but not limited to the proposed haul road, water pipelines connecting the Derived Proposal to Yandi, land bridge across W5 pit), are not considered approved under existing Yandi approvals, and as such form part of the Ministers North Derived Proposal and MCP.

Excluded from the scope of this plan are:

- All existing or future Yandi operations and infrastructure that fall within the proposed Ministers North Development Envelope, including processing infrastructure used for Ministers North ore as these will be incorporated into the Yandi MCP (BHP, 2025a).

- The power line within Miscellaneous Licence L47/92 and the Mining Area C rail line which traverses L47/95 (Figure 1-3, Section 1.4). While these traverse the Ministers North tenure, they are used to service other operations and will not be closed until these operations cease.
- Infrastructure associated with the Central Pilbara Hub Surface Water Project to Ministers North.

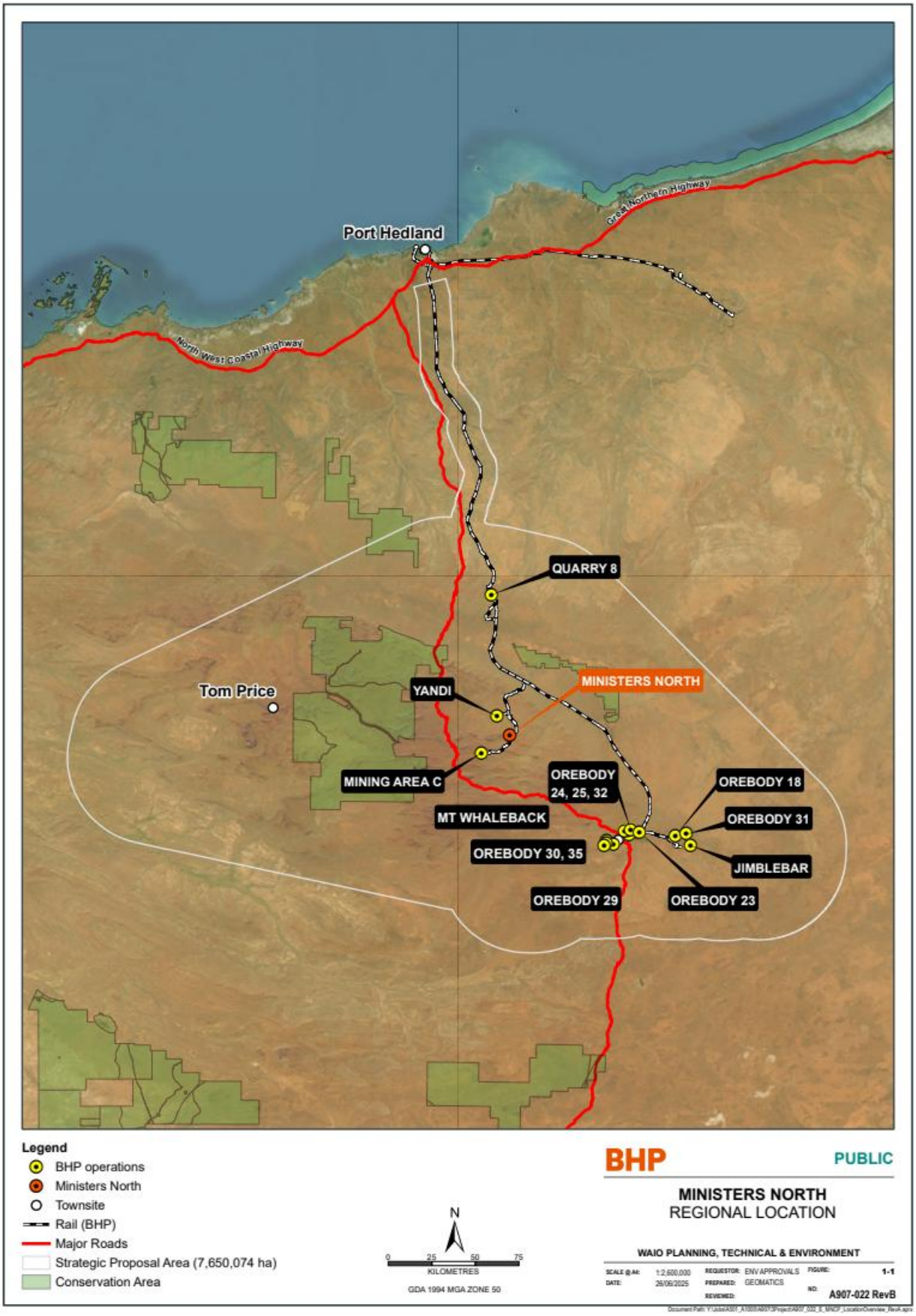


Figure 1-1 Ministers North Regional Location

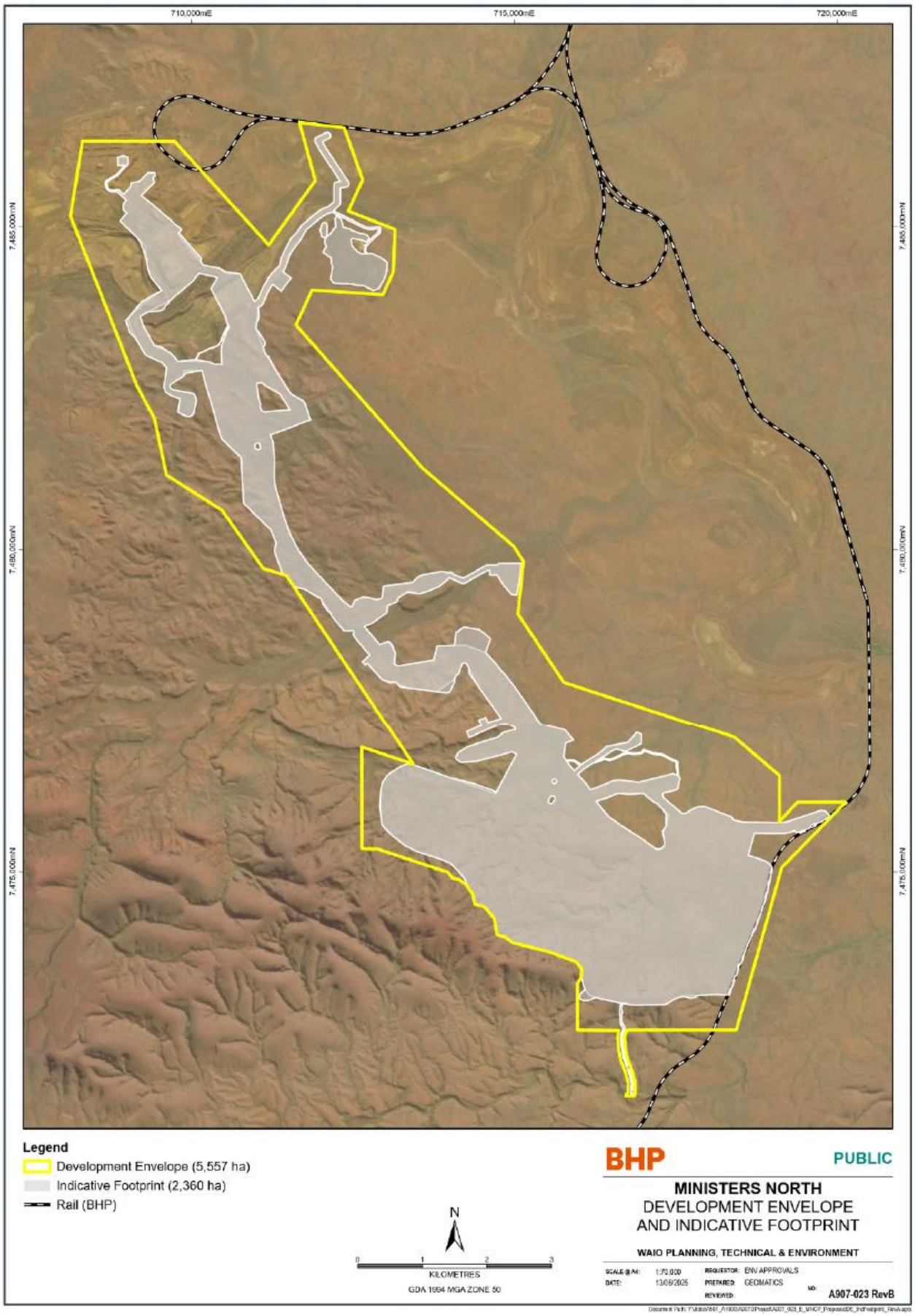


Figure 1-2 Ministers North development envelope and indicative footprint

1.2 Proposed operations

The Ministers North operations are proposed for development approximately 15 km south-east of BHP's existing Yandi Mining Operations. The project is intended to extend existing ore supplies to the Yandi operations and will comprise open pit mining, ore processing and supporting processes (maintenance, fuel, administration) over the life of the mine. Ore will be crushed at the proposed Ministers North mining area and transported via haul road to the existing Yandi ore processing and train loading infrastructure.

The proposed Ministers North operations will be located within a Development Envelope of 5,556.6 ha. The indicative footprint for these operations is 2,360.2 ha, comprising 512.2 ha (approximately 20%) of existing cleared or disturbed land and 1,847.9 ha (approximately 80%) of land to be cleared. The major components of mining infrastructure and activities will include:

- Above water table (AWT) mining at the North Pit and South Pit by conventional open pit methods.
- Stockpiling of ore on a Run of Mine (ROM) pad (including mobile crushing units, if required) prior to transport of ore to the Yandi mining operations for processing.
- Waste rock disposal to a central OSA, and ISAs.
- A transport corridor to connect Ministers North to the existing Yandi Mining Operations, including:
  - A dual lane Haul Road with an overpass over a third-party railway
  - Landbridge over W5 pit (existing approved pit) and
  - A widening of an existing access road crossing over Marillana Creek watercourse and other minor watercourses (includes disturbance to watercourse bed / banks).
- Haul roads and light vehicle access roads to mine areas and other mine infrastructure.
- Borrow pits to supply civil construction works such as construction of roads and the ROM pad.
- Laydown areas for equipment storage and construction.
- Stockpiles for cleared rehabilitation materials (topsoil, subsoil and vegetation).
- Temporary and localised diversion of drainage lines around proposed pits. Drainage diversion features include earthen bunds, swales and/or culverts.
- Water supply pipelines
- Various non-process infrastructure for purposes including but not limited to administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, water storage (including turkey's nest) and pumping, fuel storage and transfer, explosives storage, power generation and transmission powerlines, pipelines, and communications.

BHP is currently backfilling the Yandi W5 mine pit. A land bridge will be constructed over the backfill and will connect to an existing crossing over the Marillana Creek watercourse to enable vehicle movements. This will form part of the Ministers North haul road to the Yandi Mining Operations. The proposed continuation of backfilling of the Yandi W5 pit is excluded from this MCP as it has been included within the Yandi MCP. However, closure of the haul road and the W5 pit land bridge itself has been included in this Ministers North MCP.

Mining operations will be undertaken through standard open pit mining techniques (drill, blast, load, haul). Ore will be transported to the existing Yandi mining operations for processing. Waste rock extracted from the mine pits will be disposed of through a combination of disposal to the Central OSA (approximately 50%) and the in-pit backfilling of the mine pits (approximately 50%). The purpose of the in-pit backfilling is to minimise the extent of ex-pit land disturbance required for OSAs.

1.3 Estimated completion date

Based on BHP's current mine planning, mining at Ministers North is anticipated to yield an estimated 210 Million tonnes (Mt) of 'Brockman' iron formation ore grading an average 61 % iron (Fe) at a production rate of nominally 20 Mt per annum (Mtpa). However, if increased ore supply is required to support BHP's broader Pilbara mining operations, the Ministers North production rate may increase up to 25 Mtpa in some years. This would correspondingly reduce the production rate in other years or alternatively reduce the total mining period.

Based on the current mine plan, it is anticipated that mining at Ministers North will be completed in 2043.

1.4 Tenure and ownership

The proposed Ministers North Development Envelope is situated partly on existing tenure held under the *Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972* (McCamey's State Agreement) and the *Iron Ore (Marillana Creek) Agreement Act 1991* (Marillana State Agreement) (Table 1-1, Figure 1-3 and Figure 1-4). A portion of the proposed Development Envelope (part

of the proposed infrastructure corridor as shown on Figure 1-3) requires two new Miscellaneous Licences, the application for which under the McCamey's State Agreement and the *Mining Act 1978* has been submitted by BHP.

As discussed in Section 1.1, the power line within Miscellaneous Licence L47/92 and the Mining Area C rail line within L47/95 (Figure 1-3) are excluded from the plan and will not be discussed further.

BHP Billiton Iron Ore Pty Ltd (BHPBIO) manages tenure holdings and legal structures on behalf of BHP Iron Ore (Jimblebar) Pty Ltd, as the party to the McCamey's State Agreement (Table 1-1).

Table 1-1 Ministers North Tenement and Mining Activities Summary

Lease	Status	Holder	Legislation
Mining Lease 266SA (M266SA)	Granted	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978 (WA) & Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972 (WA)*
Mining Lease 270SA (M270SA)	Granted	BHP Minerals Pty Ltd Itochu Minerals & Energy of Australia Pty Ltd Mitsui Iron Ore Corporation Pty Ltd	*Iron Ore (Marillana Creek) Agreement* *Mining Act 1978 (WA) & Iron Ore (Marillana Creek) Agreement Act 1991 (WA)*
Miscellaneous Licence 47/1169 (L47/1169)	Pending	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978 (WA) & Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972 (WA)*
Miscellaneous Licence 47/1228 (L47/1228)	Pending	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978 (WA) & Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972 (WA)*

Underlying tenure comprises:

- Unallocated crown land.
- Juna Downs Pastoral Lease held by Juna Station Pty Ltd, a wholly owned subsidiary of Rio Tinto Plc;
- Marillana Creek Pastoral Lease held by BHP Billiton Minerals Pty Ltd, Pilbara Pastoral Co Ltd, Mitsui-Itochu Iron Pty Ltd & Itochu Minerals & Energy of Australia Pty Ltd

The mine operates on the lands of the Banjima People [Determination No. WCD2014/001], with their connection to the land stretching back over 40,000 years (see Section 2.3.2 for further details).

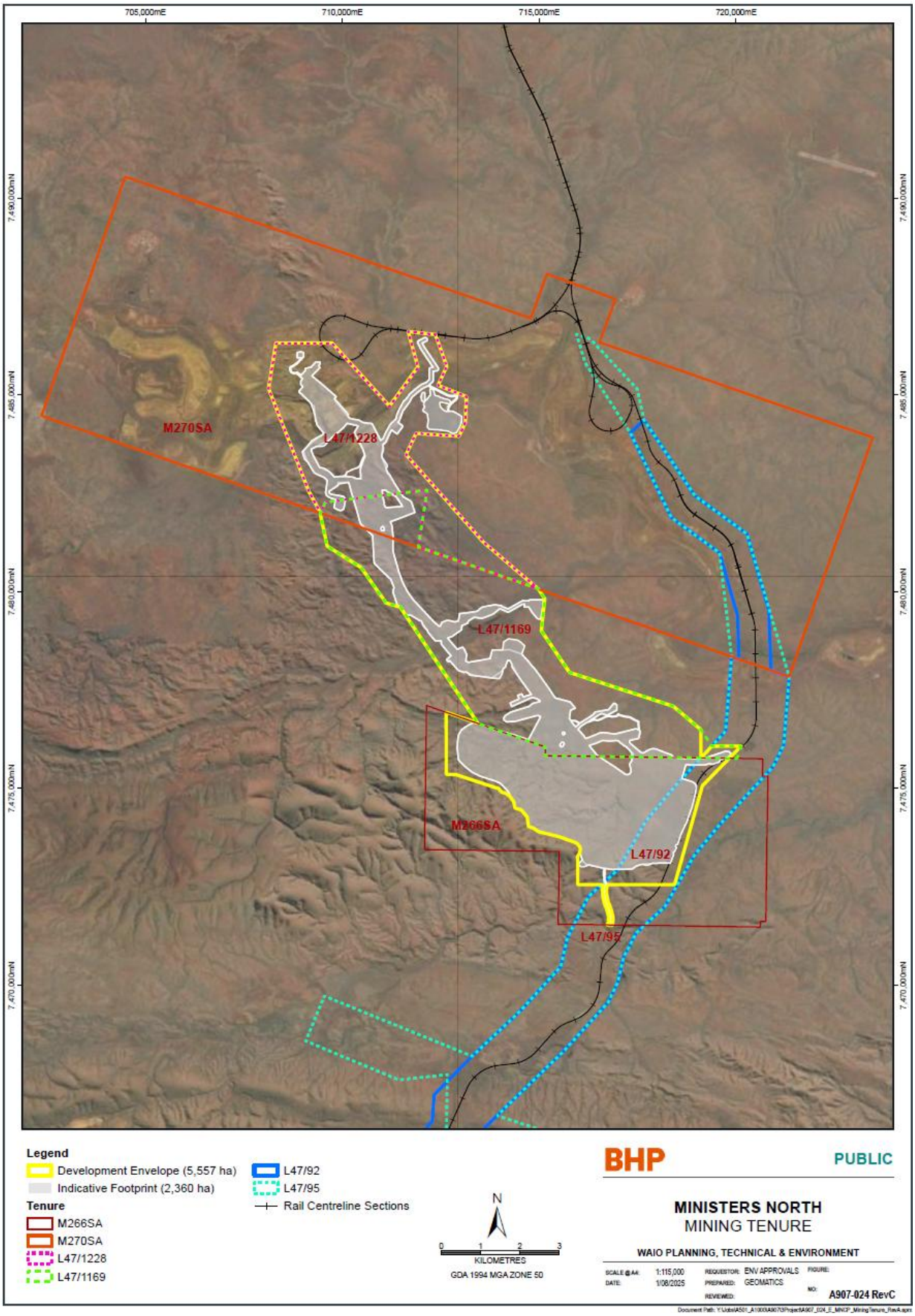


Figure 1-3 Ministers North Tenure Overview

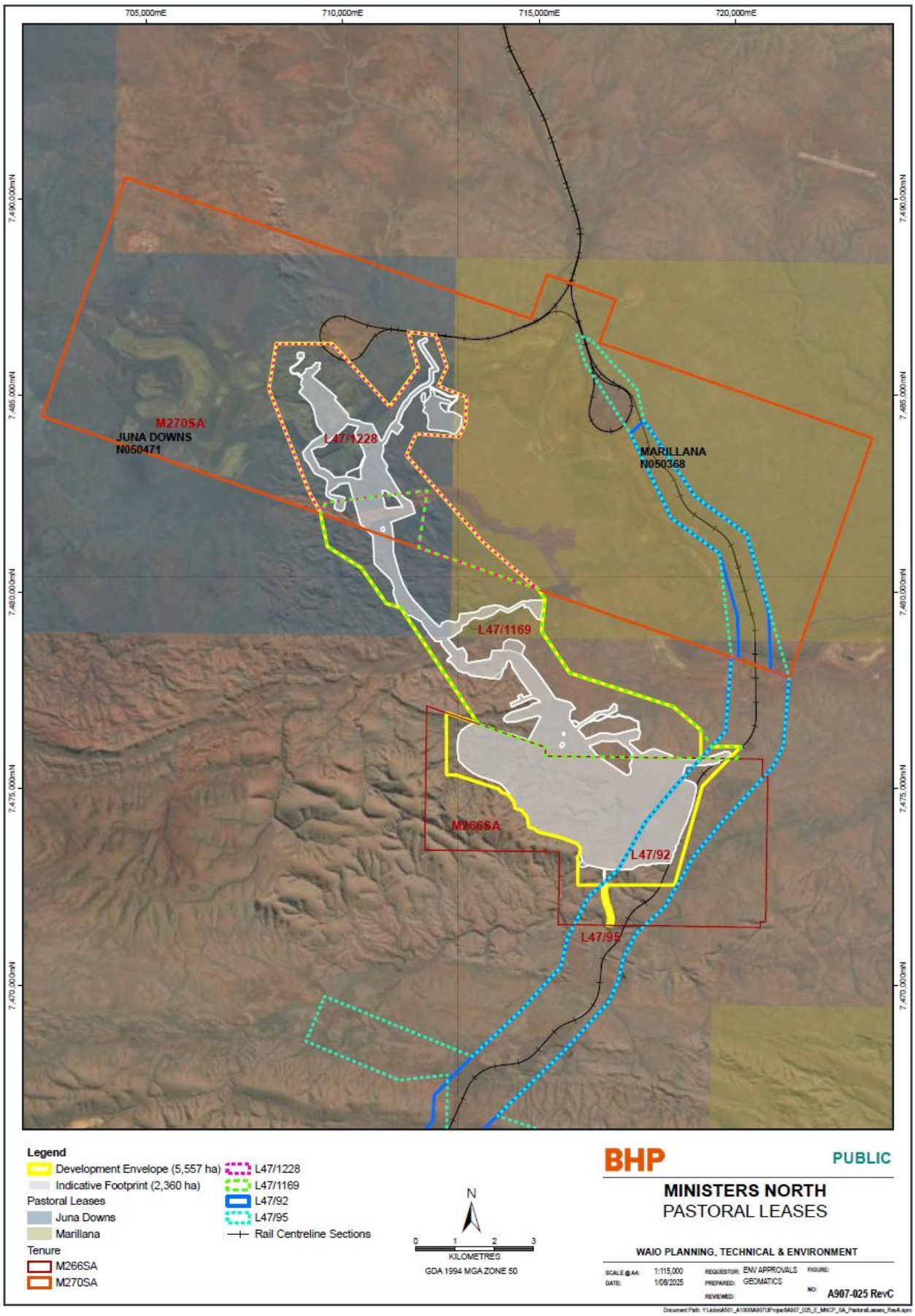


Figure 1-4 Pastoral Leases relevant to Ministers North

2 Identification of closure obligations and commitments

The management measures contained within this MCP have been developed with reference to State government rehabilitation requirements, policies and guidance statements which are summarised below.

2.1 Environmental Protection Act 1986 (Part IV)

The *Environmental Protection Act* (EP Act) provides for the establishment of the EPA, which has the objective of overseeing the prevention, control and abatement of pollution and environmental harm, and the conservation, preservation, protection, enhancement and management of the environment. The EPA has developed policies to assist with achieving its objective. These include policies on the use of the precautionary principle, the principle of intergenerational equity, the principle of the conservation of biological diversity and ecological integrity, principles relating to improved valuation, pricing and incentive mechanisms and the principle of waste minimisation.

Part IV of the EP Act establishes provisions for the EPA to carry out formal Environmental Impact Assessments of proposals which may have a significant impact on the environment and the setting of statutory conditions by the Minister for the Environment.

2.1.1 Ministerial Statements

2.1.1.1 Ministerial Statement 1105

In June 2012, BHP referred its Pilbara Expansion Strategic Proposal for development of future iron ore mining and development of associated mining infrastructure to the EPA. The Strategic Proposal identified all new iron ore mine developments on tenements in which BHP had an interest at the time of assessment, as well as expansion of existing mines within the Proposal's project boundary. The EPA elected to assess Strategic Proposal at the Public Environmental Review level of assessment and the proposal was approved by the Minister for the Environment in July 2019 under MS 1105.

Ministers North was identified as a new mining operation within this Strategic Proposal so a request is being made that the Proposal be declared a Derived Proposal. If determined by the EPA to be a derived proposal, the derived proposal may be implemented, subject to the Minister for Environment's identification of relevant conditions under section 45B(3) from the conditions set out in the Statement. The MS 1105 conditions relevant to closure are listed in Table 2-1. Appendix A of this MCP contains the management actions and reporting commitments required by Conditions 15-3 to 15-5 of MS 1105.

Table 2-1 Ministerial Statement 1105 conditions related to closure and rehabilitation

Condition Number	Closure Condition	How obligation included in MCP
Ministerial Statement No. 1105		
15-1	The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) ensure that the proposal is decommissioned, and the site of the proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.	See Section 8 and Appendix I.
15-2	Within six (6) months from the date of issue of the Section 45A Notice or as otherwise agreed in writing by the CEO, the proponent shall prepare and submit a Mine Closure Plan in accordance with the Guidelines for Preparing Mine Closure Plans, May 2015 (or any subsequent revisions of the guidelines), on advice of the Department of Mines, Industry Regulation and Safety and, where the proposal impacts on land managed pursuant to the *Conservation and Land Management Act 1984*, the Department of Biodiversity, Conservation and Attractions.	This MCP
15-3	The plan required by condition 15-2 shall include provisions to address the following: (1) specify the environmental objectives to be achieved, as specified in condition 15-1; (2) specify the management actions that will be implemented to demonstrate compliance with the environmental objectives specified in condition 15-1. Failure to implement one or more of these management actions represents non-compliance with these conditions; (3) the provisions required by conditions 6-2(11) to 6-2(13); and (4) demonstrate the validity of assumptions used in the Mine Closure Plan and consideration of the effects of breakdown of those assumptions.	This MCP

Condition Number	Closure Condition	How obligation included in MCP
15-4	If monitoring, tests, surveys or investigations indicate non-achievement of management target(s) specified in the Mine Closure Plan, the proponent shall: (1) report the non-achievement in writing to the CEO within twenty-one (21) days of the non-achievement being identified. (2) investigate to determine the cause of the management targets not being achieved. (3) provide a report to the CEO within ninety (90) days of the non-achievement being reported as required by condition 15-4(1). The report shall include: (a) cause of management targets not being achieved; (b) the findings of the investigation required by condition 15-4(2); (c) details of revised and/or additional management actions to be implemented to prevent non-achievement of the management target(s); and (d) relevant changes to proposal activities.	See Section 9.
15-5	In the event that monitoring, tests, surveys or investigations indicate that one or more management actions specified in the Mine Closure Plan have not been implemented, the proponent shall: (1) report the failure to implement management action/s in writing to the CEO within seven (7) days of identification; (2) investigate to determine the cause of the management action(s) not being implemented; (3) investigate to provide information for the CEO to determine potential environmental harm or alteration of the environment that occurred due to the failure to implement management actions; (4) provide a report to the CEO within twenty-one (21) days of the reporting required by condition 15-5(1). The report shall include: (a) cause for failure to implement management actions; (b) the findings of the investigation required by conditions 15-5(2) and 15-5(3); (c) relevant changes to proposal activities; and (d) measures to prevent, control or abate the environmental harm which may have occurred.	See Section 9.
15-6	The proponent shall review and revise the Mine Closure Plan required by condition 15 at intervals not exceeding three (3) years, or as otherwise specified by the CEO, and submit the plan to the CEO at the agreed interval.	This MCP.
15-7	The proponent shall continue to implement the version of the Mine Closure Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 15-2, to meet the objectives of condition 15-1.	Noted.
6-2 (11)	[The Condition Environmental Management Plans shall] specify measurable management target(s) to determine the effectiveness of the risk-based management actions.	Noted.
6-2 (12)	[The Condition Environmental Management Plans shall] specify monitoring to measure the effectiveness of management actions against management targets, including but not limited to, parameters to be measured, baseline data, monitoring locations, and frequency and timing of monitoring.	Noted.
6-2 (13)	[The Condition Environmental Management Plans shall] specify a process for revision of management actions and changes to proposal activities, in the event that the management targets are not achieved. The process shall include an investigation to determine the cause of the management target(s) not being achieved.	Noted.

2.1.1.2 Ministerial Statement 679

The proposed Ministers North Development Envelope intersects MS 679 granted for the Yandi operations. The Yandi MCP will apply to the disturbance and activities authorised by MS 679, and the Ministers North MCP will apply to the disturbance and activities authorised by MS 1105 and the s45B Notice issued by the Minister for Environment.

2.2 Environmental Protection Act (Part V)

2.2.1 Part V Environmental Licence

The necessary approvals will be sought under Part V of the EP Act for the Ministers North Development Envelope. Any closure-relevant conditions associated with these approvals will be incorporated into the next iteration of this MCP.

2.2.2 Native Vegetation Clearing Permits

Native Vegetation Clearing Permits (NVCP) are not required as the Ministers North development was assessed and approved under Part IV of the EP Act.

Parts of the Ministers North Development Envelope are concurrent with existing NVCP 7009/3, 8033/1, 8940/1 and 8953/3 approvals granted to BHP under Section 51E of the EP Act for various activities including maintenance, railway construction, mineral exploration, hydrological investigations, geological investigations and other associated activities. To avoid doubt, the environmental management and monitoring measures (including any rehabilitation requirements) that apply under these existing Native Vegetation Clearing Permits are not applicable to Ministers North.

2.3 Other regulatory mechanisms

2.3.1 State Agreement Act

The proposed Ministers North Development is situated on tenure held and/or applied for under the McCamey's State Agreement and Marillana State Agreement and works on these tenements are to be implemented pursuant to approved proposals under the relevant State Agreement Act.

The key requirements of the McCamey's State Agreement in relation to closure are:

- The requirement to carry out a continuous programme of investigation and research including monitoring and the study of sample areas to ascertain the effectiveness of the measures taken for rehabilitation and the protection and management of the environment (Clause 9C (1)); and
- Report to the Minister concerning investigations and research at 3 yearly intervals (Clause 9C(2)).
- Environmental compliance (including closure and rehabilitation) is governed by the applicable environmental legislation.

Upon expiry or termination of the McCamey's State Agreement, except as otherwise determined by the Minister, all buildings erections and other improvements including railway, appurtenances and wharf erected buildings and improvements will become the property of the State. Immediately prior to such expiry or termination, should BHP want to remove any locomotive, rolling stock or electricity generating plant and transmission system or other fixed or movable plant (excluding railway, appurtenances and wharf), notice to the State is required and the State has the option to elect instead to purchase, subject to valuation.

Other stakeholders including, adjacent landholders, will also be consulted regarding the removal of any infrastructure as part of the post closure land use consultations. In the event the State, or other stakeholders (where offered), do not take up an option to purchase, decommissioning plans will be prepared, incorporating the decommissioning, demolition or removal of all remaining fixed site assets.

2.3.1.1 Tenement Conditions

Table 2-2 summarises the current tenement conditions relevant to closure. It is noted that the powerline within L47/92, and the Mining Area C rail line within L47/95 that cross the Ministers North tenure are used to service other operations and are excluded from this MCP. L47/1228 and L47/1169 are pending and so there are currently no conditions applicable. If these Miscellaneous Licences are granted then the applicable conditions will be incorporated into the next iteration of this MCP.

Table 2-2 Closure-related conditions of Mining Leases

Tenement	Condition Number	Condition	How Obligations included in MCP.
M266SA	2	Mining being carried out in accordance with proposals submitted under Clauses 7, 9 or 9A and approved under Clause 8 of the Iron Ore (McCamey's Monster) Agreement Authorisation Act as amended and in accordance with other terms, covenants and conditions of the above Agreement Act or leases or licences issued pursuant to that Agreement.	Noted.
	4	The lessee shall, on completion of the project, rehabilitate the rail spur and before completion of the project, the lessee shall provide, to the satisfaction of the Environmental Protection Authority, a program for that rehabilitation.	Noted.
	5	The lessee shall remove, stockpile and use topsoil from the process site in the rehabilitation of the lease area to the satisfaction of the State Mining Engineer.	Appendix I.
	10	The rights of ingress to and egress from Miscellaneous Licences 47/92, 47/95, 47/182 and 47/183 being at all times preserved to the licensee and no interference with the purpose or installations connected to the licences	Noted.
	11	No interference with the transmission line or the installations in connection therewith, and the rights of ingress to and egress from the facility being at all times preserved to the owners thereof	Noted.

Tenement	Condition Number	Condition	How Obligations included in MCP.
M270SA	1	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled "Iron Ore (Marillana Creek) Agreement Act 1991 Project Proposal" dated March 1991 and retained on Mines Department File No: 1632/90 as amended by additional proposals approved under Clause 10 or 11 of the *Iron Ore (Marillana Creek) Agreement* or by detailed environmental reports approved under Clause 14 or by condition 3 of this Mining Lease.	Noted.
	4	At least six months prior to decommissioning the project or part thereof, the lessee submitting a decommissioning programme to the State Mining Engineer for his approval in consultation with the Environmental Protection Authority.	Section 8.7.

New tenure (separate miscellaneous licences for the proposed infrastructure corridor and ground disturbance) would be applied for under the State Agreements and the *Mining Act 1978* and granted by Proposal and held pursuant to the McCamey Monster State Agreement. Once granted, the additional closure related conditions from these licences would be incorporated into future iterations of the MCP.

2.3.2 Native Title and cultural heritage

Ministers North tenure (M266SA) is located within the boundary of the Banjima Native Title Determination [WCD2014/001].

As outlined in BHP's Indigenous Peoples Policy Statement (BHP, 2022b), BHP has ambitions to create long-term relationships with Indigenous Peoples, based on trust and mutual benefits. The foundation of this relationship with the Banjima People is formalised through the Comprehensive Agreement signed by BHP and the Banjima Native Title Aboriginal Corporation (BNTAC) in 2015, and associated registered Indigenous Land Use Agreement (ILUA). This Comprehensive Agreement includes a heritage protocol supporting the identification of Aboriginal cultural heritage and cultural values within the determination area and the management of BHP's activities to minimise impacts on Aboriginal cultural heritage and protect Aboriginal cultural heritage values from significant harm.

It also includes the following commitments relevant to closure and rehabilitation:

- Traditional Owners will be engaged to inform the rehabilitation programme based on their holistic understanding of 'healthy country'
- The integrity of, and access to, places of cultural significance will be maintained in the closure design – including and encompassing the restoration and rehabilitation of cultural values and landscapes after mine closures.
- Salvaged artefacts may be returned to Country post-closure as per the wishes of the relevant Traditional Owner group.

Through the ILUA that BHP holds with BNTAC, the Parties have agreed how BHP is to conduct its business within the Banjima Native Title Determination. In no way have these rights been extinguished by BHP Business.

Representatives of both BHP and Banjima meet throughout the year, including at the Heritage Advisory Council (HAC). The HAC forum is an important part of the relationship between BHP and the Banjima people, which enables sharing of information, feedback from recent engagements and identification and discussion of concerns and decision-making in relation to Aboriginal cultural heritage and environment matters.

Where there is the potential for closure works to impact on sites of cultural significance, the provisions of the current Aboriginal Heritage legislation will also apply.

BHP is committed to continued collaboration with the Banjima People in relation to rehabilitation and maintaining the integrity of, and access to, places of cultural significance.

BHP developed a Project Management Plan (PMP) (BHP, 2025c) for the Ministers North project with Banjima Traditional Owners through BNTAC. The Ministers North PMP identifies and sets out the agreed management of Aboriginal Cultural Heritage and Social Surroundings values affected by, or in proximity to, the Ministers North operation. It documents the outcomes of consultation between BNTAC and BHP and was endorsed by the Banjima HAC in May 2025.

The PMP outlines agreed management actions that have informed closure strategies included in this MCP and requires that BHP will collaborate with the Banjima People and BNTAC to develop future updates to the Mine Closure Plans for the Ministers North Operations. In doing so, BHP will have regard to Banjima's Closure Principles (Appendix H) and BHP's Closure and Legacy Management Global Standard (BHP, 2024a).

The PMP states that BHP will prepare a draft Mine Closure Plan (this MCP) for Ministers North Operations for submission with the Derived Proposal for Ministers North. The draft plan has addressed feedback to date from Banjima (Table 4-2).

Development of the PMP is further discussed in Section 3.1.5 and a summary of the commitments in the PMP that are relevant to closure are summarised in Table 2-3.

Table 2-3 Ministers North Project Management Plan closure related management action

Topic	Management Action
Haul Road	Rehabilitation of the haul road will be designed to meet agreed post mining land use requirements and will seek to blend into the surrounding topographic form and shape. The following principles will be incorporated: • Reinstatement of natural waterways / drainage paths / surface water flows. • Removal of haul road fill material if no longer required for post mining land use. • Road cuttings would remain in place. • Remainder will be reprofiled and contoured to natural topography where possible.
Closure	BHP will collaborate with the Banjima People and BNTAC to develop future updates to the Mine Closure Plans for the Ministers North operations. In doing so, BHP will have regard to Banjima's Closure Principles (Appendix H) and BHP's Closure and Legacy Management Global Standard (BHP, 2024a). Mine Closure Plans will include the following commitments: • Implement a geomorphic[1] design on the southern pit wall of South Pit against Khargoonha. • Central OSA (if required at closure) to be blended with southern pit landform. • Progressive rehabilitation and pit backfill. • Surface water management will be designed, so no pit lake will form post closure. • Topsoil to be stockpiled pre-mining for use in rehabilitation, and to avoid a volume deficit at closure. • Haul road to be rehabilitated, including removal of culverts and all other infrastructure associated with the haul road, with the aim of returning land to pre-disturbance drainage and topography where possible. • Potential use of ethnobotanical species in rehabilitation seed mixes and/or the propagation of ethnobotanical species for planting in rehabilitation areas • Undertake a climate change resilience assessment on proposed closure strategies. • Undertake an assessment of cumulative closure impacts / opportunities for Ministers North and BHPs Yandi operations[2]. As part of the mine waste strategy, BHP will: • Prioritise backfilling of the southern pit against Khargoonha (Section 8.5.1. • Ensure final pit voids are a minimum of 5 m above the groundwater table (564 mAHD 2018 to 560 mAHD 2025) to prevent the formation of pit lakes. • Optimise backfill to minimise ex-pit OSAs – the backfill strategy is a core principle for the mine plan, schedule and sequencing, to minimise surface disturbance and OSAs where possible. There will be no constraints to in-pit backfill where remnant below water table ore remains at the end of the life of the Ministers North operations. Backfill in these areas will be to the same standard as all other pit locations at Ministers North.
Rehabilitate	BHP will collaborate with the Banjima People through BNTAC to identify post-mining land use. BHP will collaborate with the Banjima People in relation to ethnobotanical values, and this may include the identification and use of ethnobotanical species in rehabilitation seed mixes and / or the propagation of ethnobotanical species for planting and rehabilitation areas.

[1] In the context of Closure, a geomorphic approach refers to an engineered design of landforms based on natural systems and the principles of geomorphology, rather than using traditional, linear, and angular engineered designs (BHP, 2025d).

[2] Preliminary work will undertaken by BHP in collaboration with Banjima with outcomes and actions integrated into future Mine Closure Plans.

2.3.3 Contaminated Sites Act 2003

The *Contaminated Sites Act 2003* (CS Act) regulates the reporting, management and remediation of contaminated sites. Under the Act, remediation of contaminated sites is the responsibility of the polluter or current site owner. Reporting and management of contaminated sites occurs throughout operations, and BHP has reported known and suspected contamination targets at Ministers North to the Department of Water and Environmental Regulation (DWER) in general accordance with the Act. BHP also provides regular updates to DWER as sites are investigated and remediated. Section 3.5 provides information on the known or potentially contaminated sites within the proposed Ministers North Development Envelope, but associated with the Yandi operation, with further information on BHPs processes for management of contaminated sites provided in Appendix I-11.

2.3.4 Rights in Water and Irrigation Act 1914

Ministers North is within the footprint of the Pilbara Groundwater Area which has been established to protect, manage and regulate water under the *Rights in Water and Irrigation Act 1914* (RiWI Act). There is no proposal to abstract groundwater at Ministers North and all water supply will be sourced from other BHP sites or third parties. Groundwater is abstracted at Yandi and MAC, under groundwater licenses as described in the relevant MCPs, and may provide water supply source for Ministers North. Permits will be required for disturbance of creek beds and banks. Any closure requirements associated with these permits will be incorporated into future revisions of this MCP.

2.3.5 Commonwealth EPBC Strategic Approval

BHP has a strategic approval (the Commonwealth Strategic Approval) under the *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act). The BHP Billiton Iron Ore Pilbara Strategic Assessment Program (BHP Billiton, 2017) was endorsed by the Minister for the Environment and Energy on 11 May 2017 and an Approval Decision (with conditions) for taking actions in accordance with the Program was issued on 19 June 2017. Relevant Program Matters are Matters of National Environmental Significance and all activities within the scope of the strategic approval must be taken in accordance with the endorsed Program. BHP has assessed the Derived Proposal in accordance with the Pilbara Strategic Assessment Assurance Plan and Offsets Plan and the Pilbara Strategic Assessment Program. BHP has determined the Ministers North proposed action to be a Notifiable Action with a requirement to prepare and submit a Validation Notice to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) prior to implementation of the Ministers North proposed action.

2.4 BHP business guidance

BHP is committed to environmental stewardship. The BHP Charter is the overarching document that articulates the corporate vision and values and what BHP stands for. The Charter defines BHP's values as follows:

Do what's right (A sustainable future starts with safety and integrity, building trust with those around us).

Seek better ways (Listening to learn and inspiring challenge is how we drive progress).

Make a difference (The accountability to act, create value and have impact is on each of us, every day).

These commitments provide the starting point from where the mine closure and rehabilitation policy and procedures begin. The remaining values are integrity, respect, performance, simplicity and accountability.

A series of Global Standards (previously *Our Requirements* documents) that underpin the Charter have been developed, which describe the performance requirements and accountabilities for definitive business obligations, processes, functions and activities. Compliance with these documents ensures minimum standards are met for all BHP operations. The Global Standards considered relevant to Mine Closure include those listed in Table 2-4.

Table 2-4 BHP global standards relevant to mine closure

Global Standard	Purpose
Closure and Legacy Management (BHP, 2024a)	This Global Standard outlines the minimum requirements for closure and legacy management to achieve the optimised closure outcomes and closure objectives identified in the closure strategy for each BHP-operated site/asset.
Environment (BHP, 2024b)	This Global Standard outlines the minimum requirements for managing our environmental risks and complying with our environmental obligations using effective environmental management systems. We acknowledge the nature of our operations can impact the natural environment. We also depend on obtaining and maintaining access to natural resources such as land and water. The purpose of this Global Standard (together with our Climate Change Global Standard) is to demonstrate Our Charter value of Sustainability by helping to address the global environmental challenges of climate change and nature loss, while working to continuously improve our environmental performance.
Climate Change (BHP, 2024c)	This Global Standard outlines the minimum requirements to manage climate-related risk. We acknowledge the nature of our operations can impact the natural environment. We also depend on obtaining and maintaining access to natural resources such as land and water. The purpose of this Global Standard (together with our Environment Global Standard) is to demonstrate Our Charter value of

Global Standard	Purpose
	Sustainability by helping to address the global environmental challenges of climate change and nature loss, while working to continuously improve our environmental performance and management of environmental impacts, meet our goals, targets and commitments and be environmentally responsible.
Community and Indigenous Peoples March 2025 (BHP, 2024d)	This Global Standard outlines the minimum requirements governing BHP's communication and engagement with external community stakeholders and partners and BHP's commitments to respecting human rights, including Indigenous peoples' rights.
Social Value and Sustainability (BHP, 2024e)	This Global Standard outlines the minimum requirements for meeting our sustainability targets, goals and commitments, developing social value plans, and undertaking social value assessments for BHP-operated assets and making social investments at BHP. Social value is BHP's positive contribution to society and is about creating mutual benefit for BHP, our shareholders, Indigenous partners and the broader community. Social investment is our voluntary contribution towards projects or donations with the primary purpose of contributing to the resilience of the communities where we operate and the environment, aligned with our broader business priorities.
Corporate Alignment Planning (BHP, 2023b)	The Corporate Alignment Planning (CAP) process is fundamental to creating alignment across the organisation; it guides the development of plans, targets and budgets to help us decide where best to deploy capital and invest resources with the fundamental aim of delivering sector leading operational performance, financial returns and social value. The CAP process has two discrete phases: it starts with directional planning to understand the strategic options and growth plans to maximise long-term value of our assets; then moves into delivery planning, which focusses on short and medium-term plans to deliver against the agreed strategic objectives. We regularly review our strategy against the constantly changing external environment to capture the risks and opportunities presented and cascade any changes through our planning processes. The intent of the CAP process and deliverables is to facilitate robust discussion, informed decision-making and disciplined delivery of quality planning outcomes
Risk Management (BHP, 2025d)	Through the delivery of best-in-class risk management, we protect what BHP has today and grow value for tomorrow. The identification and management of risks is central to achieving our strategic objectives. An essential element of effective risk management is to have an enterprise view so that the full risk exposure can be prioritised, and the aggregate impact from cumulative risks can be understood. As such, BHP operates to one Risk Framework for all risks

The procedures and standards referenced in this document are periodically updated and where there is a difference between the procedure referenced in this plan and the controlled version in BHP's document system, the version in the document system takes precedence.

3 Environmental data, analysis, and implications for closure

Consistent with the adaptive management approach in the Closure Guidelines (DEMIRS, 2025), BHP has commissioned studies at existing Pilbara operations that will inform mine closure planning for Ministers North. These studies and further work specific to Ministers North, such as materials characterisation, consideration of contaminant pathways and potential impacts to environmental receptors, will be progressively implemented and refined over several years through stages of testing and field trials, data analysis and implementation planning. This information will provide a basis to refine completion criteria and performance indicators for closure monitoring and performance.

The following section provides a summary of details on the biophysical environment and social context of Ministers North. The information in this section was originally prepared under the previous Guideline for Preparing Mine Closure Plans (DEMIRS, 2025) but has been adapted to the extent practicable, given the MCP has been submitted during the transition between the two sets of guidelines.

This MCP represents the knowledge base and designs developed through preliminary closure studies associated with Ministers North. Given the site is still in the planning phase, there are knowledge gaps that require further study and assessments to inform closure designs. BHP is also engaged in a program of consultation about this MCP with the Banjima People who are the Traditional Owners of land on which the Ministers North Development Area sits. The closure measures included within this MCP are informed by collaborative engagements with the Banjima People and seek to respect their values and objectives for post mining land use. It is anticipated that this collaboration will continue as the MCP is further refined and collaboratively developed.

Planning for closure is not a linear process. As the knowledge base matures and assumptions are tested, changes are made to closure designs to respond to new information. These changes may, in turn, require further assessment / modelling iterations to identify potential implications for closure outcomes and other aspects of the closure designs to inform optimisation processes. Changes to mine plans as the mine life progresses also need to be factored into closure studies and designs.

Given the variables outlined above, the knowledge base and designs in this MCP represent a snapshot in time and will be updated as collaboration with the Banjima People and subsequent design studies progress. These updates will be reported in future updates of the MCP.

3.1 Environmental and Social Setting

3.1.1 Climate

3.1.1.1 Existing climate

Ministers North is located in the Pilbara region of Western Australia where the climate is semi-arid to arid and characterised by irregular rainfall and hot summers. Tropical lows and cyclones dominate the Pilbara's climate in the summer wet season. Cyclonic systems deliver widespread rain across the region, with rainfall occurring mostly between December and March. During the spring to autumn months, however, a semi-permanent low pressure system influences the formation of convective thunderstorms of varying size and intensity, producing heavy localised rainfall over short periods (Charles, et al., 2013).

The Marillana rainfall station (Bureau of Meteorology [BoM] ID 005009) is located approximately 38 km away from Ministers North and opened in 1936. The long-term average annual rainfall recorded at this station is 324 mm (Table 3-1). However, annual rainfall in the region is highly variable due to the influence of cyclonic events and thunderstorms, with large rainfall events contributing several hundred millimetres of rain in one event. Landfalling tropical cyclones provide approximately 20% of the mean summer wet season rainfall with the relative contribution of thunderstorms to Pilbara rainfall estimated at around 50% and possibly higher in drier years (MWH, 2016). These events provide significant fresh water supplies for ecosystem health.

Table 3-1 Monthly Average Rainfall Marillana [BOM ID 005009]

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	79.1	68.9	49.1	23.6	21.2	20.4	14.0	5.6	3.1	5.3	10.4	27.8	324.1
Highest	355.0	331.4	294.5	126.4	123.6	198.0	174.2	57.2	54.7	41.1	104.9	203.6	832.4

Source: BoM (2024)

Temperature data from the Newman Aero (BoM ID 007176), approximately 100 km from Ministers North, indicate that mean maximum temperatures in the summer months from November to February exceed 37°C and maximum temperatures above 42°C are common. Mean maximum and minimum temperatures in winter (June to August) are between 23 to 26°C and 6 to 8°C, respectively (Table 3-2).

Table 3-2 Temperature at Newman Aero

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean maximum (°C)	39.1	37.4	35.9	32.1	27.2	23.0	23.2	26.3	30.6	35.2	37.5	39.4
Mean minimum (°C)	25.1	24.1	22.3	17.6	11.9	7.6	6.5	8.2	12.4	17.7	21.1	24.3

Source: BoM (2024)

Annual average evaporation potential is far in excess of the annual average rainfall, as are evaporation potentials in all individual months. The average annual pan evaporation rate at Ministers North is more than 3,200 mm, which is an order of magnitude higher than the average annual rainfall (MWH, 2016). As a result, there is commonly a large moisture deficit in the environment.

3.1.1.2 Climate change

BHP accepts the current view of the Intergovernmental Panel on Climate Change (IPCC) that warming is unequivocal, human influence is clear and physical impacts are unavoidable (IPCC, 2023). BHP believes the world must pursue the aims of the Paris Agreement with increased levels of national and global ambition to limit the impacts of climate change. BHP's' Climate Transition Action Plan (BHP, 2021) sets out the strategic approach to achieving our long-term greenhouse gas emissions reduction goals and the Climate Change Global Standard (BHP, 2024c) focuses on climate change risk management and strategies. These include operational greenhouse gas emissions reduction by using and investing in low emissions technology, supporting emissions reduction in our value chain, promoting product stewardship and increasing our resilience to physical climate change impacts.

Climate change is a complex issue, with inherent uncertainty about the timing, pace, and severity of possible impacts. Risks from climate change to the stability of landforms, mobilisation of contaminants and re-vegetation are some of the identified vulnerabilities considered in closure planning.

Australia's climate has warmed on average by 1.74 +/- 0.24°C since national records began in 1910, leading to an increase in the frequency of extreme heat events. For the Northern Rangelands, mean temperatures have increased by about 1.0 °C since 1910 (DWER, 2021). Rainfall and streamflow have increased across parts of northern Australia since the 1970s. Year-to-year variability is strongly influenced by the El Niño Southern Oscillation. There has been a decrease in the number of tropical cyclones observed in the Australian region since 1982. In the coming decades northern Western Australia can expect to experience:

- Continued warming, with more extremely hot days and fewer extremely cool days
- More intense short-duration heavy rainfall events
- Fewer tropical cyclones but a greater proportion to be of high intensity, with ongoing large variations from year to year; (BOM & CSIRO, 2022).

By 2030, the mean annual warming across all emissions scenarios in the Northern Rangelands is proposed to be about 0.6 to 1.4 °C above the climate of 1986–2005 (DWER, 2021). Commonwealth Scientific and Industrial Research Organisation (CSIRO) projections suggested that mining companies (as well as local communities) would need to adapt practices to improve water use efficiency and to cope in the hotter extremes.

Given the high level of uncertainty associated with the direction and likely magnitude of rainfall change, BHP conducts sensitivity analyses to understand the impacts of changes in rainfall to proposed closure designs where this may be critical to the design (e.g. flood protection bunds). For example, Stantec (2024) incorporated future climate into the surface water modelling study, specifically, the 1 in 10,000 Annual Exceedance Probability (AEP) closure conditions analysis includes a Climate Change uplift consideration and was adopted as per the *Draft Updates to the ARR2019 Climate Change Guidelines* ((BHP, 2025b).

Given the multi-faceted nature of the challenge, BHP has undertaken an integrated and system-wide study to identify the climate vulnerabilities in the production system, assess the material climate risks and evaluate the effectiveness of existing controls in the face of a changing climate. Where necessary, new controls have also been identified to strengthen climate resilience.

3.1.2 Geological overview

Regional Geology

The Pilbara region comprises a portion of the ancient continental Western Shield that dominates the geology of Western Australia and comprises pre-Cambrian, Proterozoic and Archaean rocks. The Pilbara Craton dates to the Archaean and includes some of the oldest rocks in the world. It is overlain by Proterozoic rocks deposited in the Hamersley and Bangemall Basins. The Hamersley Basin which occupies most of the southern part of the Pilbara Craton can be divided into three stratigraphic groups; the Fortescue, Hamersley and Turee Creek Groups. Of the three groups, the Hamersley Group is the most relevant to Ministers North.

The Hamersley Group formed approximately 2,300 to 2,800 million years ago, is approximately 2.5 km thick, and conformably overlies the Fortescue Group. It consists of a sequence of Banded Iron Formation (BIF), dolomites, shales, and acid volcanics, and is intruded by dolerite sills and dykes. It contains both the Brockman Iron Formation and the Marra Mamba Iron Formation, which provide most of the iron ore deposits in the Pilbara.

Local Geology

The Ministers North deposit lies north of a small ridge in the Hamersley Range. The deposit is associated with the Wirriba Anticline which runs through the centre of the deposit in a northwest - southeast orientation. The anticline is a convex, sub-surface geological fold. The hinge of the anticline does not host mineralisation as the primary outcropping unit is the non-prospective Mount McRae Shale (Figure 3-2).

The oldest geology in the fold is the Mt Sylvia Formation and occurs at depth, and the youngest is the Weeli Wolli Formation, which is exposed in the northern part of the deposit. Table 3-3 provides a generalised overview of the stratigraphy of the Ministers North deposit. Most of the proposed mine pits are associated with the Brockman Iron Formation, which consists of an alternating sequence of BIF, shale and chert. Mineralisation occurs within the Dales Gorge and Joffre Members of the formation, with the majority hosted by the D2/D4 units which are located above the Mt Sylvia and Mt McRae Shale Formations. Mineralised ore occurs on both the north and south sides of the anticline (Figure 3-1).

Mineralisation on the southern limb occurs primarily in the Dales Gorge Member within the strata-bound D4/D3 mineralisation in the west and D2 mineralisation towards the east. Similarly, within the northern limb, mineralisation primarily occurs within the strata-bound Dales Gorge Member. It is not unusual for the entire sequence to be mineralised (Mine Waste Management, 2024).

Weathering of exposed rock has led to the development of a layer of hard cap about 20 m thick across the whole area of the proposed mine pits, mostly overlying the Dales Gorge and Joffre Members. There is detrital cover above the southern side of the anticline. This is more extensive in the large valley to the east of the anticline and the Ministers North deposit, where there is also a small amount of channel iron deposit (CID) material. A small area of carbonate-rich turbidite occurs in the deposit and lies between two of the four Mt McRae Shale sub-units. The orebody itself is structurally simple and has no significant faults.

The sulphur-bearing Mt Whaleback Shale Member is present across the northern limb of the anticline.

Table 3-3 Generalised stratigraphy of Ministers North

STRATIGRAPHY			Description
Group	**Formation**	**Member**	
Hamersley Group	Weeli Wolli	Weeli Wolli	Banded iron-formation (commonly jaspilitic), pelite, and numerous metadolerite sills
	Brockman Iron	Yandicoogina Shale	A sequence of interbedded chert and shale intruded variably by dolerite sills in its upper part in some areas. It often appears cherty in outcrop.
		Joffre	Planar bedded to poddy BIF with only minor shale interbeds.
		Whaleback Shale	Two zones: • A main upper zone (WS3) comprising numerous mesobands of chert and shale. • A lower zone consisting of four alternating macrobands of shale and BIF (WS1/WB1/ WS2/WB2).
		Dales Gorge	Alternating planar-bedded assemblage of 17 BIF and 16 S macro-bands and forms the dominant ore horizon in this formation.
	Mount McRae Shale	Colonial Chert	Thin bedded shale and chert with some dolomite and BIF.
	Mount Sylvia	-	Thin-bedded shale, chert and dolomite with BIF bands.

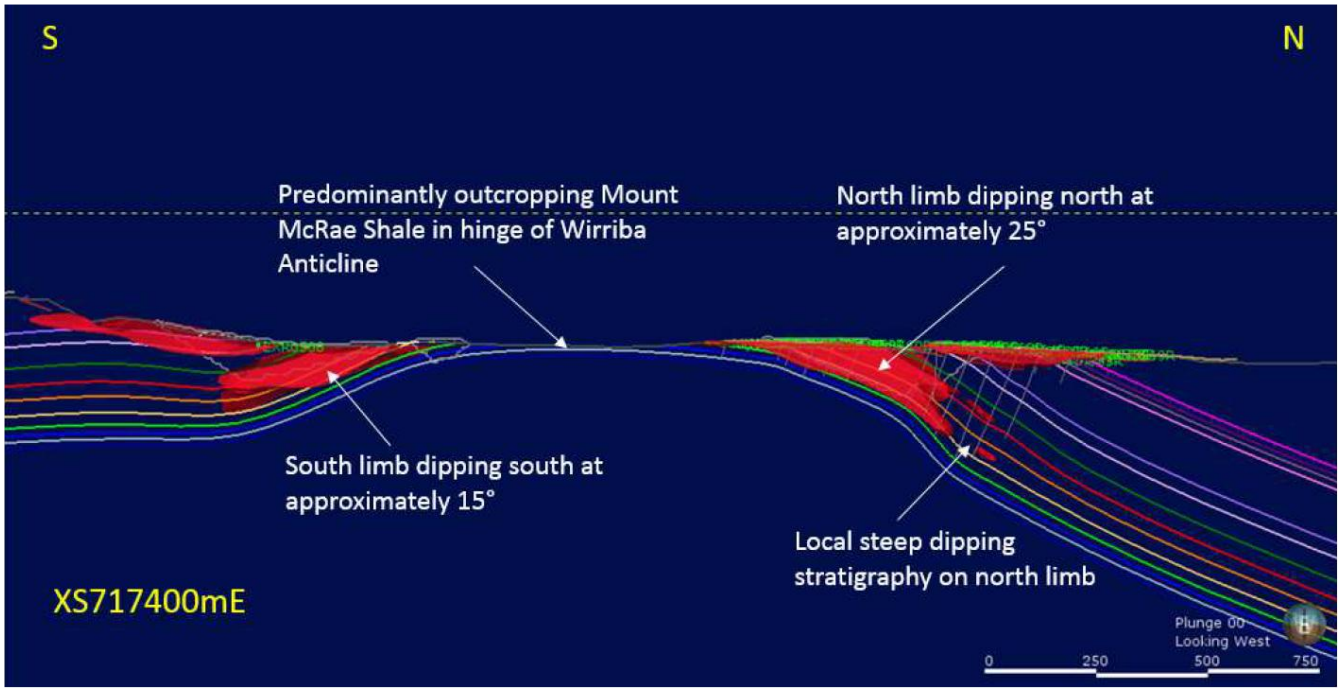


Figure 3-1 Wirriba Anticline cross section

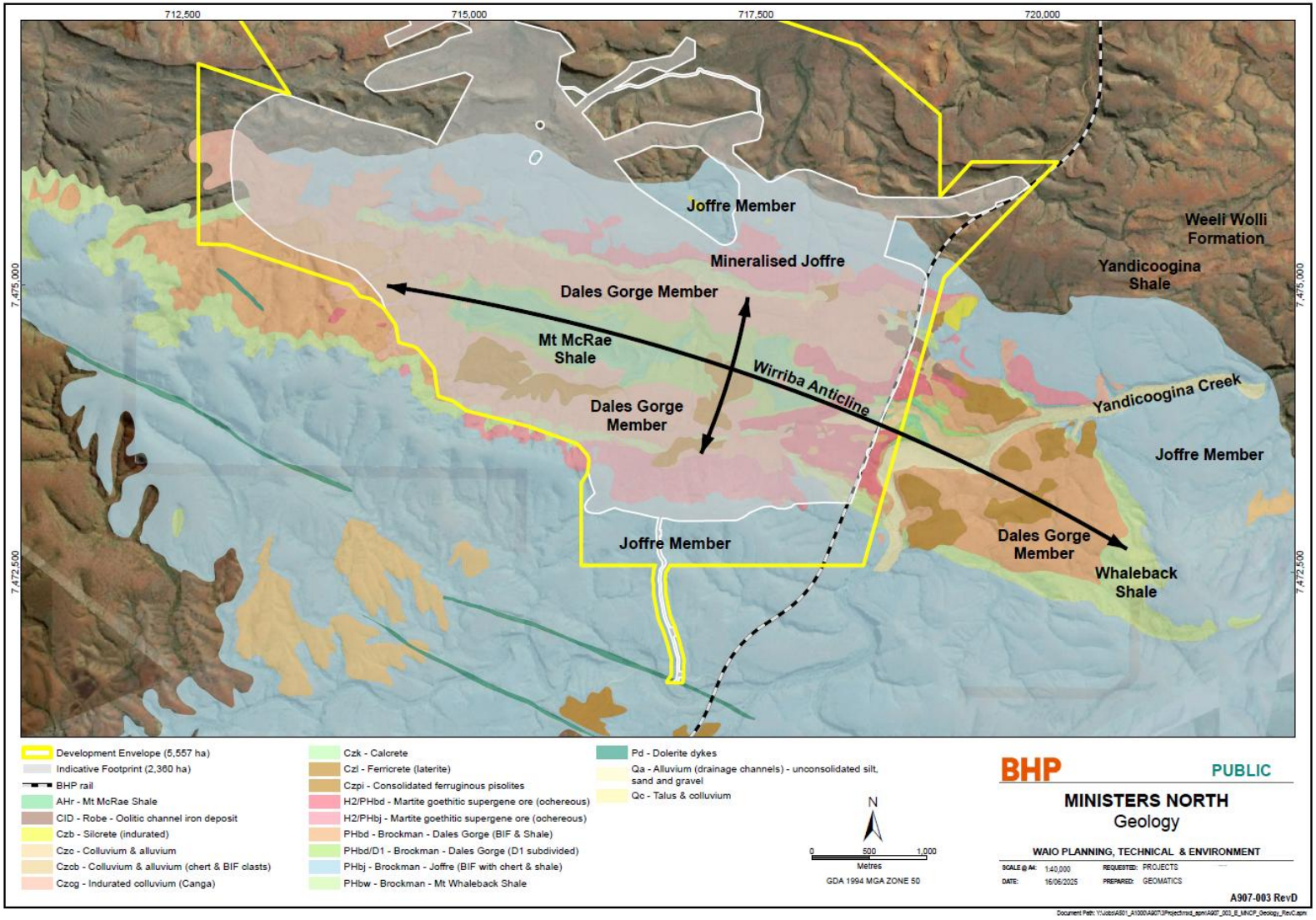


Figure 3-2 Ministers North Local Geology

3.1.3 Seismicity

A probabilistic seismic hazard assessment was conducted on selected BHP operations in the Pilbara during 2012 (Meynink Engineering Consultants, 2012). The assessment was based on area seismic sources as no evidence of recent fault activity was recognised close to the BHP operations in the Pilbara during the preliminary neotectonic observations. The observations show that an inferred segmented fault system appears to run across the area; however, there is no indication of recent fault activity.

The Meynink (2012) study estimated peak ground accelerations at representative locations for representative materials likely to be encountered at BHP's Pilbara operations. While there was no specific assessment for Ministers North, peak ground accelerations were estimated for Yandi (which lies to the north) and Mining Area C (which lies to the south) (Table 3-4). Meynink (2012) concluded that in the Australian context, the peak ground acceleration values estimated from the study correspond to a low to moderate seismic hazard.

Despite the Meynink study not confirming the existence of recent faults in BHP Pilbara operations, recent observations at Mining Area C have confirmed a significant fault structure traversing the north wall of C Pit, showing clear cross cutting relationships and displacement of the Detritals sequence. This fault traverses the entire Detritals stratigraphic sequence (>100 metres in thickness) and breaks through the Quaternary Detrital surface colluvium unit at the current surface, where recent tension cracking as a result of mine site blasting activities, can also be observed. This implies relatively recent re-activation of basement fault structures in the Pilbara region that affect the youngest Quaternary aged deposits (<2Ma). However, these observations have not given BHP reason to believe that the seismic hazard is significantly higher than the Meynink (2012) assessment.

Table 3-4 Estimated peak ground accelerations for representative areas and materials

Representative Location	Probability of Exceedance	Peak Ground Acceleration (g)			
		Tertiary Sediments (vs^{30} 500 m/s)	Moderately Weathered Rock (vs^{30} 760 m/s)	Shale (vs^{30} 865 m/s)	Fresh BIF (vs^{30} 1800 m/s)
Central Pilbara Hub (Mining Area C)	2%	0.214g	0.195g	0.188g	0.137g
North Pilbara (Yandi)					
Central Pilbara Hub (Mining Area C)	5%	0.118g	0.105g	0.101g	0.074g
North Pilbara (Yandi)		0.119g			
Central Pilbara Hub (Mining Area C)	10%	0.073g	0.064g	0.062g	0.045g
North Pilbara (Yandi)		0.074g	0.065g		

Notes: [1] Equivalent to 2,475 years return period
[2] Equivalent to 975 years return period
[3] Equivalent to 475 years return period
Source: Meynink Engineering Consultants (2012)

3.1.4 Land systems

Land systems across much of the grazing and pastoral lands of Western Australia were surveyed, described and categorised during a series of surveys conducted by the Department of Agriculture. Ministers North lies within the Pilbara Region, which was surveyed in the period between 1995 and 1999, by van Vreeswyk et al. (2004), with the results published in Technical Bulletin No. 92.

The proposed Ministers North mining area is situated entirely within the Newman Land System (Figure 3-3 and Table 3-5). This comprises an upland landscape unit comprising rugged plateaux, ridges and mountains with steep scree sloped and gently inclined lower slopes associated with the Hancock Range (Golder, 2015). There are moderately-spaced dendritic tributary drainage patterns of narrow valleys and gorges that feed into the major drainage line known as Yandicoogina Creek. The Newman Land System is widespread and extensive in terms of the area it covers within the Hamersley subregion (Biota, 2017).

Table 3-5 Land systems of Ministers North

Land System	Description
Boolgeeda	Stony lower slopes, level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. A common system in shallow valleys below hill systems such as Newman and Rocklea.
Newman	Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, the second largest system in the survey area and prominent in southern parts (e.g. Ophthalmia Range, Hamersley Range), relief up to 450 m.
McKay	Hills, ridges, plateaux remnants and minor breakaways of sedimentary and meta sedimentary rocks, relief up to 100 m.

Land System	Description
Robe	Conspicuous chains of limonite mesas and buttes with steep breakaway faces, source of iron ore as pisolitic limonite, relief up to 50 m.

Source: van Vreeswyk et al. (2004)

The proposed infrastructure corridor to Yandi traverses the Robe, McKay and Boolgeeda land systems (Figure 3-3 and Table 3-5). The Robe and McKay systems includes features with relief up to 50 m and 100 m, respectively. The Boolgeeda Land System includes stony lower slopes and stony plains, and commonly occurs below hill systems such as the Newman Land System.

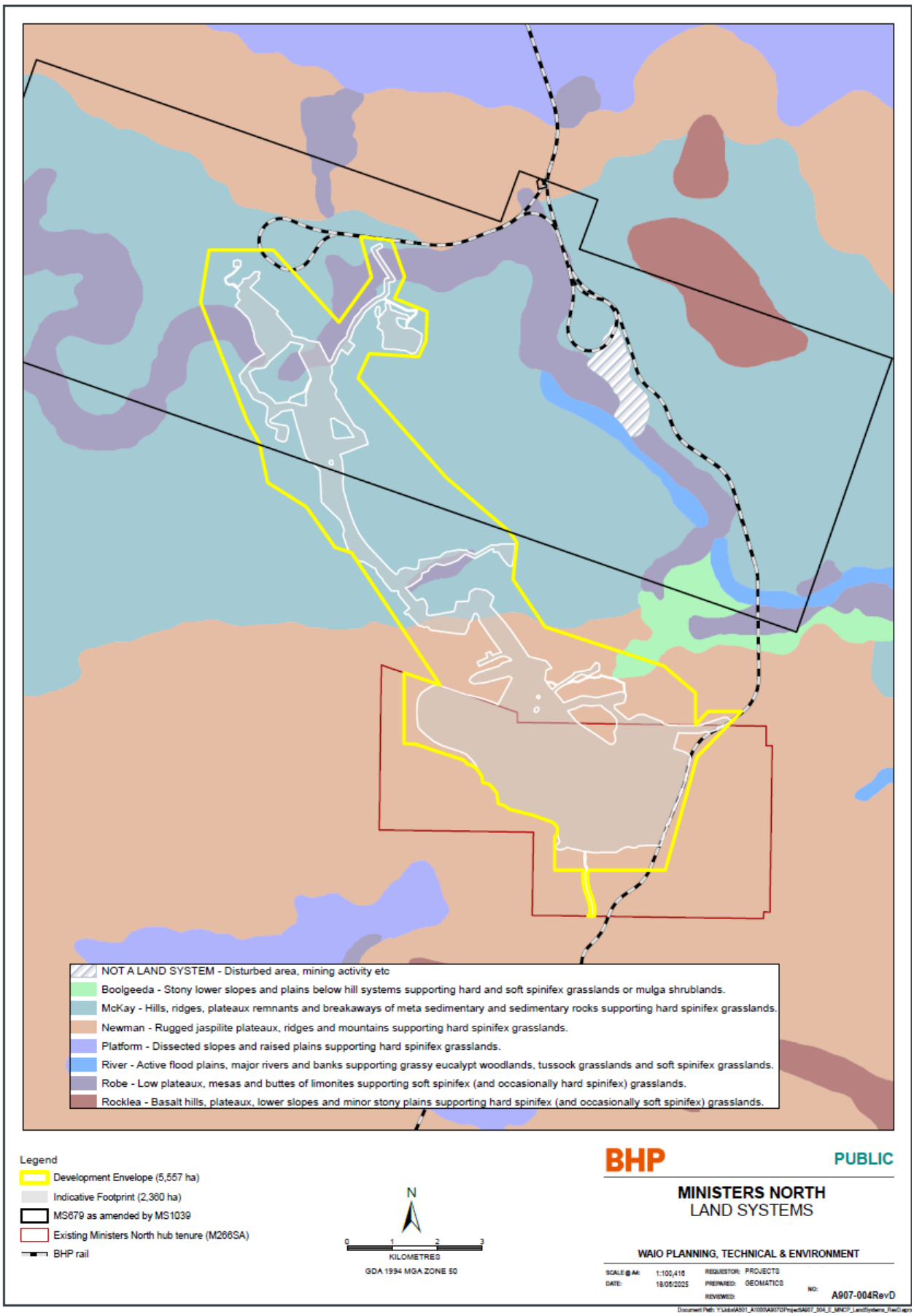


Figure 3-3 Ministers North Land Systems

3.1.5 Cultural Heritage

Comprehensive archaeological and ethnographic surveys have been undertaken over the proposed Development Envelope and the entirety of the indicative mine footprint. These surveys have consisted of baseline surveys for exploration, as well as broader area baseline surveys across tenure. A full description of the survey effort is outlined in the Ministers North Derived Proposal Request (BHP, 2025b).

BHP, the Banjima People and BNTAC have been conducting Aboriginal Cultural Heritage (ACH) investigations together (including surveys and engagements) in and around the Ministers North area since the 1980's. The full list of documentation that has informed understanding of ACH values is outlined in the Ministers North PMP (BHP, 2025c). As a result of the surveys and the engagement outlined in Section 4, heritage sites have been recorded and cultural values have been identified within the proposed Ministers North Development Envelope. Out of respect for the wishes of the Banjima People, the locations of the recorded Aboriginal heritage sites are not provided in this MCP. However, they are documented in the Ministers North PMP. Strict internal processes and procedures are used to manage all potential Aboriginal heritage impacts (see Appendix I-9).

Management measures specific to ACH within the Ministers North Development Envelope have been developed in collaboration with the Banjima People and are outlined in the Ministers North PMP (BHP, 2025c). Where a project is unable to avoid impact to an Aboriginal heritage site, BHP will consult further with the Banjima People regarding mitigation, salvage of cultural material, research and educational opportunities, before seeking ministerial consent to disturb under the current Aboriginal heritage legislation. All salvaged cultural material will be stored and conserved on Country at a facility agreed to by the Banjima People, to be repatriated in accordance with the wishes of the Banjima People upon closure of the operations.

3.1.5.1 Cultural values

BHP is committed to the long-term protection and conservation of cultural heritage places and values through the development of Heritage Protection Areas (HPA). HPAs are areas containing Aboriginal Cultural Heritage that has significant cultural value and which BHP has agreed will be protected from impacts from mining activities for the duration of tenure.

In collaboration between BHP and Banjima, one HPA has been identified in relation to Ministers North and the agreed management measures are outlined in the Ministers North PMP (BHP, 2025c). The cultural heritage area named 'Khargoonha' occurs in proximity to Minister North. Khargoonha is an elevated and isolated ridge landform adjoining the western side of the Ministers North mining area that measures approximately 12 km in length (east to west) and 4 km in width (north to south), with a topographic elevation ranging from approximately 750 metres above Australian Height Datum (mAHD) to 1,080 mAHD (peak). The Khargoonha landform is generally consistent with the numerous other elevated ridge landforms of the broader Hamersley Ranges which extend for more than 250 km in length (east to west) and have a peak elevation of > 1,200 mAHD.

Khargoonha has been identified by the Banjima People to be of cultural heritage significance. The boundary for Khargoonha was provided to BHP by the Banjima People in 2015 as part of discussions for a Comprehensive Agreement, with this boundary later reaffirmed in 2022 by the Banjima People through an ethnographic Aboriginal heritage survey (BHP, 2025b).

In addition to HPAs, Banjima cultural values are also identified in the Banjima Yurlubajagu Strategic Plan (BNTAC, 2019) and the Ministers North PMP (BHP, 2025c) and include:

- **Water**
  - It is an important cultural responsibility to keep water in Country pure.
  - Permanent water (*yinda*), which is otherwise scares in the region, is of particular importance and *yinda* water and gorge springs are culturally significant places of the highest order. Milimbirinha is an important *yinda* where Wirlawali (Weeli Wolli Creek) meets the Manggurdu (Fortescue River and floodplain) and from where that water goes underground to Jindawirrinha (Millstream). Banjima believe that if the Milimbirinha is harmed the water would dry up.
  - An important cultural responsibility is for Banjima to protect Manggurdu (Fortescue River and floodplain) health, condition, water flows, *yinda* waters and gorge springs which connect saltwater people, freshwater people and red water (claypan) people, including the Martu desert people to the east with Nyiyaparli, Banjima and Yindjibarndi.
  - Jilbana means places where food can grow strong on Banjima country. Jilbanas are known to flourish around the y*indas* and throughout Karijini.
- **Fire**
  - Appropriate fire regimes are important to produce a mosaic of unburnt and burnt patches that protect cultural heritage places, bring fresh plants and replenish food and medicines on-Country.
- **Access to Country**
  - Is critical to enable Banjima people to manage Country and maintain culture.
- **Cultural Assets**
  - Throughout the Fortescue catchment, there are cultural assets such as middens, burial sites, petroglyphs, medicinal plants, fishing and food gathering sites and lore grounds.
- **Plants and animals of cultural significance**

- The Banjima Yurlubajagu Strategic Plan identifies several plants and animals of cultural significance. An on country ethnobotanical survey (Walsh, 2024) also identified plants and animals of cultural significance. Animals of cultural significance identified in the strategic plan are outlined in Table 3-6 along with their Latin names where these have been identified from social surrounds engagements.
- The Banjima Closure Principles and Outcomes (Appendix H) includes an objective to return Mandu (bush meats), medicine plants and bush tucker (plants).

Table 3-6 Animals of importance to Banjima People

Banjima name	Translation / common name	Latin name
Bardagurra or thurrgi	Bush turkey / Australian bustard	*Ardeotis australis*
Garlaya	Emu	*Dromaius novaehollandiae*
Gangguru, *birrunmarra*	Types of kangaroo	-
Bajarri	Hill kangaroo	-
Bajiwanarra / barlgarranyungu	Euro	*Macropus robustus*
Yujurli, *gurrumanthu*	Goanna	*Varanus* spp.
Gardandarri	Ducks	-
Gulhamba	Freshwater perch	-
-	Native honeybee	*Trigona* and *Austroplebeia spp*.

Source: BNTAC (2019)

During the Ministers North Social Surroundings Workshop held in September 2024, discussion was held in relation to preliminary closure objectives, principles and goals. These have subsequently been formalised in the Banjima Mine Closure Objective, Principles and Outcomes (Appendix H) which were issued to and acknowledged by BHP in March 2025.

Caring for plants and animals is part of the Banjima's role and responsibility as Traditional Owners. A request has been made for plant species of cultural significance (bush tucker and medicinal plants) to be documented and used in rehabilitation seed mixes at Yandi. A similar request was made by the Banjima during an ethnobotanical survey conducted at Ministers North in May 2024. During that survey, it was determined that at least 126 cultural or heritage plant species occurred or were likely to occur at Ministers North or in its vicinity, with a total of 26 species recorded during the survey. These include but are not limited to:

- Kartajiparra/Gawiwarnda (Cork hopbush, *Tribulus suberosus*) – medicine for cuts, also stuns fish.
- Mathangura/Marrayin (Lemon Grass, *Cymbopogon ambiguous*) – medicine for colds and toothaches.
- Barlgarringu (Pilbara Bloodwood, *Corymbia hamersleyana*) –medicine for cuts and sores, food (bush coconut or bush apple), sugar bag and shade.
- Garrany/Bard-deedee (Fire Wattle, *Acacia inaequilatera*) – food (green raw or cooked seeds), medicine to cool the body and use as fly repellent, and burnt bark paint.
- Thurlayiku (Snake vine, *Tinospora smilacina*) – medicine for headaches and broken bones, and fibre for carrying.
- Bajirla (Wild Passionfruit, *Capparis spinosa* subsp. *nummularia*) – food (fruit).
- Burdardu (Northern Sandalwood, Bush Plum, *Santalum lanceolatum*) – food (fruit and seeds) and medicine.
- Marduwari (Bulrush, *Typha domingensis*) – food (roots) and pillow from seed fluff.

A full list of the plants is provided in Appendix G-2. Knowledge of these species of cultural significance will inform the final seed mix for rehabilitation at Ministers North. An indicative seed mix, based on that proposed for Yandi, is provide in Appendix G-1.

3.1.6 Existing land uses

At a regional level, the primary land use in the Ministers North area is low intensity grazing, with iron ore mining being the dominant industry.

The current land use for areas not directly affected by mining in the vicinity of the Minister North proposal is low intensity grazing and Unallocated Crown Land.

There is some tourism in the region, with the Karijini National Park located approximately 50 km to the west of Ministers North and the Warlu Way (a 400 km driving trail connecting the coast to Newman) passing within 50 km of the proposed Development Envelope.

The Ministers North mine itself is proposed for development on the land of the Banjima People (Section 2.3.2) who have historically used this area for a range of traditional uses and continue to do so.

3.1.7 Landscape and visual amenity values

Ministers North is located within low intensity pastoral land and mining tenements on Vacant Crown Land. A landscape and visual impact assessment conducted by GHD and 360 Environmental (2015) concluded that visual impact was a low risk for most of the Ministers North area, with the exception of the very north eastern portion of the proposed Development Envelope which was considered to have a moderate potential to visually impact viewpoints along Weeli Wolli Creek. This area is outside the indicative disturbance footprint. The region is largely undeveloped and primarily used for pastoral purposes, mining and some transport (via the rail access road being used as an alternate route to the Great Northern Highway). No areas were found during the study where there was a significant risk of visual amenity impacts. The only viewpoints identified during the study with relevance to Ministers North were:

- Weeli Wolli Creek Swimming Hole;
- Weeli Wolli Creek 2 0 Grey's Crossing; and
- The existing Ministers North radio tower.

It should be noted that the GHD and 360 Environmental (2015) review focused on viewpoints that are readily accessible to the public and did not specifically consider landscape views relevant or significant to the Banjima People.

Subsequent to the visual impact assessment, cultural heritage values of significance to the Banjima People have been established through ongoing consultation and collaboration between BHP and BNTAC on Ministers North (Section 4) and are articulated in the Banjima People Closure Objectives document (Appendix H) and the Ministers North PMP (BHP, 2025c). Potential impacts were also identified through the Social Surroundings Consultation (ACHM, 2024), which established that a larger Khargoonha exclusion zone would have the least visual amenity impact while a smaller exclusion zone would result in a higher impact.

In relation to visual impacts, a key outcome of this collaboration is an agreement to adopt geomorphic design principles across the southern pit wall areas of South Pit and southern side of the Central OSA, in proximity to Khargoonha. Khargoonha is an elevated and isolated ridge landform adjoining the western side of the mining area and has been identified by the Banjima People to be of cultural heritage significance. Geomorphic design aims to develop functionally stable and self-sustaining landforms, replicating the intricate shapes and processes in stable natural landscapes that have evolved over extended periods (BHP, 2025c). Environmentally, this process replicates natural landforms and drainage systems to guide water over the landscape while effectively reducing sediment. However, it also enables the landform to visually blend with the surrounding landscape, thereby protecting the visual amenity of the surrounds.

Further work is required to consider visual impacts in a closure context and aspects of importance to the Banjima People.

3.2 Baseline Data

A summary of technical studies that have informed the baseline understanding of this MCP is provided in Table 3-7.

Table 3-7 Technical Studies

Baseline Subject	Document Reference	Reg ID if previously submitted	Updated since last submission Yes/No	Linked Appendix
Fauna	Ministers North Consolidated Targeted Significant Vertebrate Fauna Surveys. (Astron, 2025)	N/A	No	Appendix J
	Ministers North Subterranean Fauna Survey. (Bennelongia Environmental Consultants, 2024)			
	Ministers North and Yandicoogina Creek Short-range Endemic Invertebrate Fauna Survey. (Biologic, 2020c)			
	Ministers North Short-range endemic invertebrate survey. (Biologic, 2016)			
	Ministers North to Yandi Corridor SRE Invertebrate Fauna Survey. (Biologic, 2018)			
Flora & Vegetation	Vegetation Survey and Impact Assessment, Yandicoogina Creek. (Onshore Environmental, 2018a)			

Baseline Subject	Document Reference	Reg ID if previously submitted	Updated since last submission Yes/No	Linked Appendix
	Ministers North to Yandi Corridor Flora and Vegetation Survey. (Onshore Environmental, 2018b)			
	Ministers North and Yandi Vegetation Association and Condition Mapping. (Onshore Environmental, 2020)			
Flora & Vegetation	Ministers North Targeted Significant Flora & Vegetation Assessment. (Spectrum Ecology Pty Ltd, 2023)	N/A	No	Appendix J
	Ministers North Miscellaneous Licence Area Amendments Surveys and Yandicoogina Creek Detailed Flora and Vegetation Assessment. (Biologic, 2020a)			
	Ministers North Detailed Flora and Vegetation Survey. (Biota, 2017)			
Aquatic ecosystem	Ministers North: Yandicoogina Creek Aquatic Ecosystem Surveys. (Biologic, 2020b)			
Water	Ministers North Aquifer Numerical groundwater modelling. (BHP, 2024g)			
	Ministers North Trucking Surface Water Environmental Impact Assessment. (Stantec, 2024)			
	Marillana Creek Flow Study. Unpublished report prepared for BHP Billiton Iron Ore. (MWH, 2016)			
	Ecohydrological Conceptualisation of the Marillana Creek Region. (Golder, 2015)			
Visual amenity	BHP Billiton Iron Ore's Strategic Proposal - Landscape and Visual Impact Risk Assessment. (GHD & 360 Environmental, 2015)			
Landform	Overburden Storage Area Closure Design Analysis. (Landloch, 2016)			
Materials Characterisation	Acceptable Erosion Rates for Mine Waste Landform Rehabilitation Modelling in the Pilbara, Western Australia. (Landloch, 2018)			
	AMD Risk Assessment Update. Ministers North. (Mine Waste Management, 2024)			
Completion Criteria	BHP WAIO Rehabilitation Completion Criteria. (Syrinx Environmental, 2019)			
	BHP Rehabilitation Improvement Projects. Revised Completion Criteria Operational and GNA Sites. (Syrinx Environmental, 2023)			

Notes: DEMIRS (2025) Table 3 includes the column 'Updated since last submission y/n'. As this is the first submission of this MCP, that column has been removed and all documents have been provided.

3.2.1 Flora and vegetation

3.2.1.1 Summary

Ministers North is located within the Hamersley subregion (PIL3) of the Pilbara bioregion as defined by the Interim Biographic Regionalisation for Australia (IBRA) and is characterised by mountainous areas of Proterozoic sedimentary ranges (ironstone ranges) and plateaux dissected by gullies and gorges. Mulga low woodland over bunch grasses on fine-textured soils dominates in valley floors, while skeletal soils of the ranges are dominated by snappy gum over *Triodia brizoides.*

A total of 35 vegetation associations have been described and mapped within the Ministers North Development Envelope. None of these have any affiliation with Federal or State listed Threatened Ecological Communities (TECs), or State listed Priority Ecological Communities (PECs).

No threatened flora species listed under the *Biodiversity Conservation Act 2016* (WA) (BC Act), or the EPBC Act have been recorded in the Ministers North Development Envelope, but seven DBCA-listed priority flora species have been recorded in the area.

More than 40 introduced flora species have been recorded at Ministers North. None of these species are 'declared plants' under the *Biosecurity and Agriculture Management Act 2007* (WA) (BAM Act) or are species on the Department of Biodiversity, Conservation and Attractions (DBCA)'s Pilbara Region Priority Alert list. BHP manages introduced flora species at Ministers North in accordance with its Weed Management Procedure (WAIO, 2020a).

3.2.1.2 Regional setting

Ministers North is located within the Hamersley subregion of the IBRA Pilbara bioregion (DSEWPaC, 2012) (Figure 3-4). The Hamersley subregion is characterised by mountainous areas of Proterozoic sedimentary ranges (ironstone ranges) and plateaux dissected by gullies and gorges. Mulga low woodland over bunch grasses on fine-textured soils dominates in valley floors, while skeletal soils of the ranges are dominated by snappy gum over *Triodia brizoides* (Kendrick, 2002).

Original regional vegetation mapping undertaken by Beard (1975) was refined by Shepherd et al. (2002), who confirmed the two vegetation associations present within the Ministers North area as:

- Vegetation Association 18, which is described as "low woodland; mulga (*Acacia aneura*)'; and
- Vegetation Association 82, which is described as "hummock grassland, low tree steppe; snappy gum over *Triodia wiseana".*

Neither of these associations are considered to be regionally significant.

3.2.1.3 Local Flora and Vegetation

BHP has been undertaking biological surveys on most of its Pilbara tenements since the 1990s with numerous flora and vegetation surveys conducted within, and adjacent to, the proposed Ministers North Development Envelope. A full description of the survey effort associated with Ministers North is provided in the Ministers North Derived Proposal Request (BHP, 2025b).

A total of 35 Vegetation Associations have been mapped within the Development Envelope (Figure 3-5 and Figure 3-6) with the most dominant being *Triodia* Hummock Grassland occurring on foot slopes, hillcrests and hill slopes.

Most of the vegetation within the proposed Ministers North Development Envelope has been rated by Spectrum Ecology (2023) as being in excellent condition which is consistent with the findings of the 2016 BHP assessment of the Strategic Proposal. Poorer vegetation condition is primarily related to the occurrence of cattle grazing and introduction of weed species. A field survey of Yandicoogina Creek conducted by Onshore Environmental (2018a) ranked vegetation condition for almost all the riparian vegetation along the main drainage channels surveyed as good.

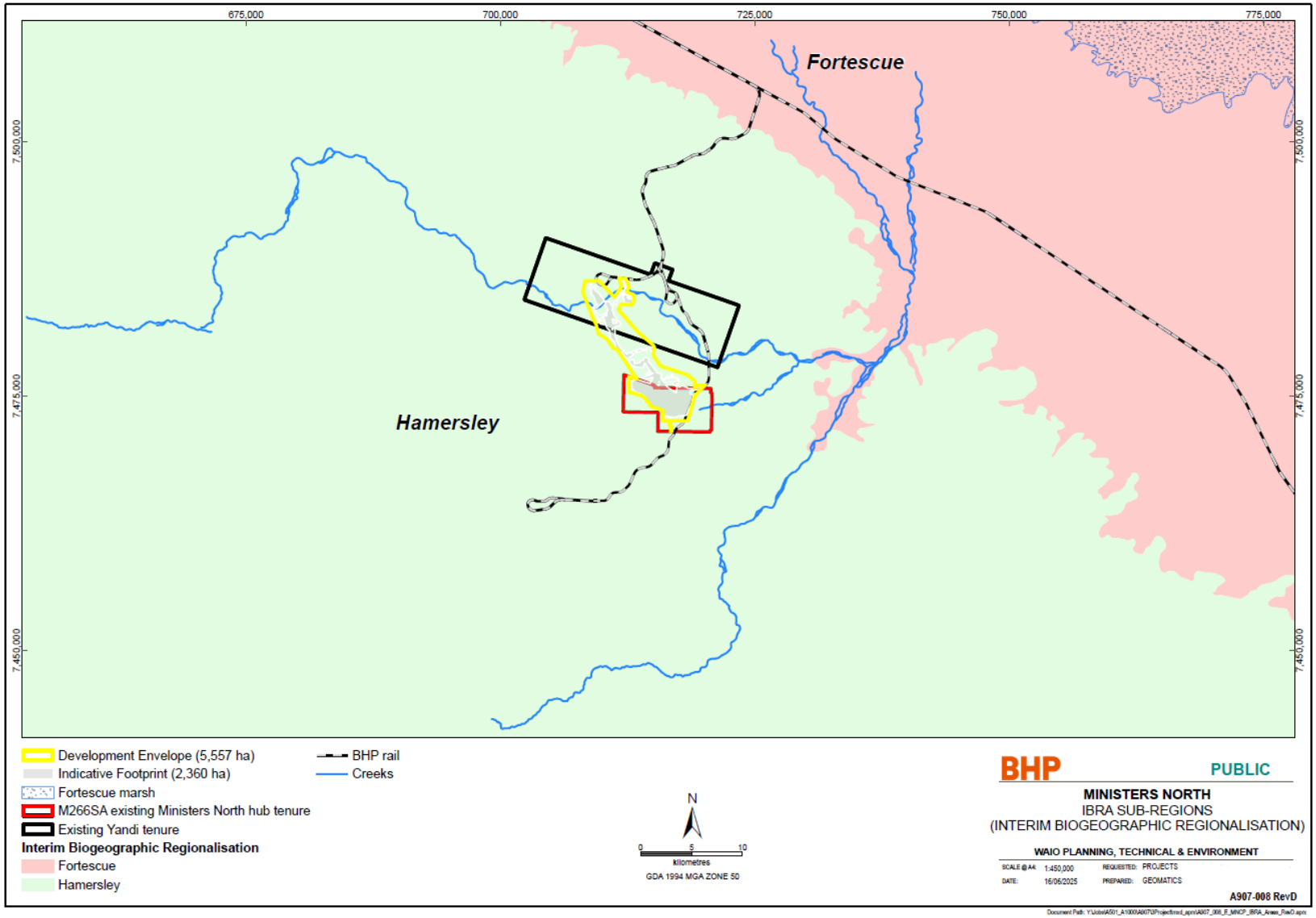


Figure 3-4 IBRA sub-regions

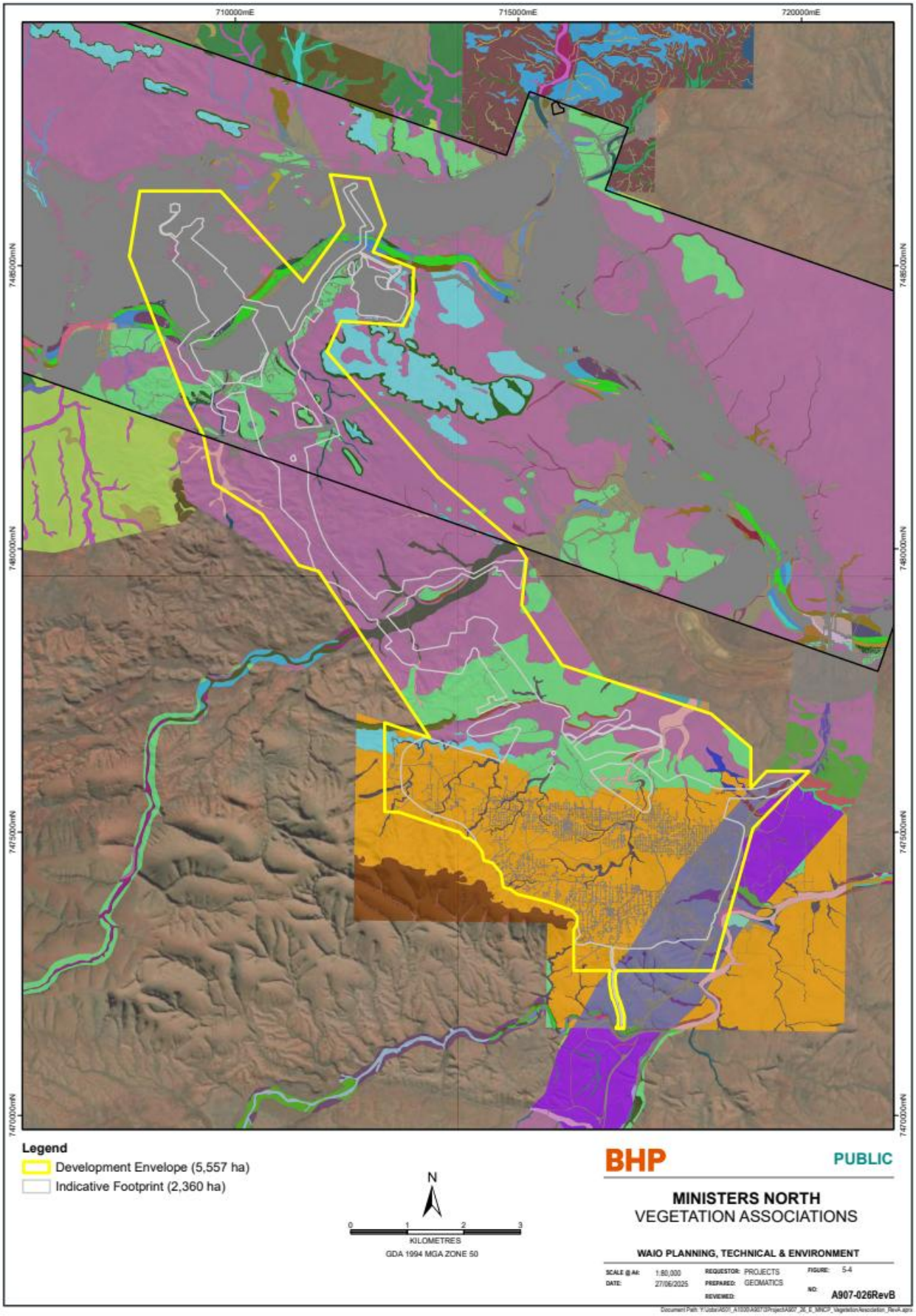


Figure 3-5 Ministers North Vegetation Association (refer to Figure 3-6 for legend)

Figure 3-6 Vegetation map legend

3.2.1.4 Flora of conservation significance

No Threatened Flora species listed under the BC Act or the EPBC Act have been recorded in the proposed Ministers North Development Envelope. Eight priority flora species have been recorded as listed in Table 3-8 in order of Priority ranking (Figure 3-7). All species are represented within the broader locality (<40 km of the study area) (Onshore Environmental, 2018b; Biologic, 2020a; Biota, 2017).

Table 3-8 Priority Flora species recorded at Ministers North

Scientific Name	Priority Status [1]
Aristida lazaridis[3]	3
Ipomoea racemigera [3]	3
Eremophila naaykensii[2]	3
Fimbristylis sieberiana	3
Gymnanthera cunninghamii	3
Rostellularia adscendens var. *latifolia*	3
Sida sp. Barlee Range (S. van Leeuwen 1642)[3]	4
Acacia bromilowiana	4

Source: Biota (2017); Onshore Environmental (2018a; 2018b); Biologic (2020a)

Notes: 1. DBCA (2024).

2. Previously named *Eremophila* sp. Hamersley Range (K. Walker KW 136).

3. Previously classified as P3.

3.2.1.5 Threatened or Priority Ecological Communities

None of the vegetation associations identified for the proposed Ministers North Development Envelope comprise formally recognised Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) (Onshore Environmental, 2018a; Onshore Environmental, 2018b; Biologic, 2020a; Biota, 2017). The nearest PEC is the Priority 1 '*Weeli Wolli Spring Community*', the buffer zone of which is situated 3.6 km to the southeast of Ministers North. The Priority 1 '*Fortescue Marsh (Marsh Land System)*' PEC lies approximately 50 km north of Ministers North, but is surrounded by fringing vegetation that occurs to the north of the Development Envelope (Figure 3-7).

Onshore Environmental (2020) identifies the mapped Vegetation Association MA EcrEvMa AcpAamAthe TydCyv, which occurs within parts of the Yandicoogina Creek and the Marillana Creek, and has affinities to the DBCA-classified PEC named *"Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region"* (DBCA-P2). This PEC is currently known to occur sporadically throughout the Pilbara, with several occurrences in Karijini National Park. These vegetation associations occur adjacent to but not within the Development Envelope of the Derived Proposal.

Recent detailed vegetation mapping of Yandicoogina Creek (Biologic, 2020b) described three vegetation associations that have been identified to have affinities with the Priority 2 ecological community '*Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region*':

- Eucalyptus mid open woodland (MA Eco EuaTtSogl AtpGoroCule) described as a mid open woodland (to mid woodland) of *Eucalyptus camaldulensis* subsp. *obtusa* (with occasional *Melaleuca argentea*) over high to mid open tussock grassland of *Eulalia aurea*, *Themeda triandra* and *Sorghum plumosum* with high sparse shrubland of *Acacia tumida* var. *pilbarensis*, *Gossypium robinsonii* and *Cullen leucanthum* on red/ brown sandy clay loam on major drainage lines;
- Eucalyptus mid open woodland (MA EcoMa AtpCuleGoro TtEuaSopl) described as, Mid open woodland of *Eucalyptus camaldulensis* subsp. *obtusa* and *Melaleuca argentea* over high open shrubland of *Acacia tumida* var. *pilbarensis*, *Cullen leucanthum* and *Gossypium robinsonii* over high to mid open tussock grassland *Themeda triandra*, *Eulalia aurea* and *Sorghum plumosum* on brown silty clay loam on major drainage lines; and
- Melaleuca mid woodland (MA MaEco CyvTydFis TtEua) described as, Mid woodland of *Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *obtusa* over high to low open sedgeland of *Cyperus vaginatus*, *Typha domingensis* and *Fimbristylis sieberiana* over mid sparse tussock grassland of *Themeda triandra* and *Eulalia aurea* on black clay loam on major drainage lines.

The Eucalyptus mid open woodland (MA Eco EuaTtSogl AtpGoroCule) extends more broadly along Yandicoogina Creek, but only the portion associated with permanent pools (see Section 3.2.2) is considered to have affinities with the PEC.

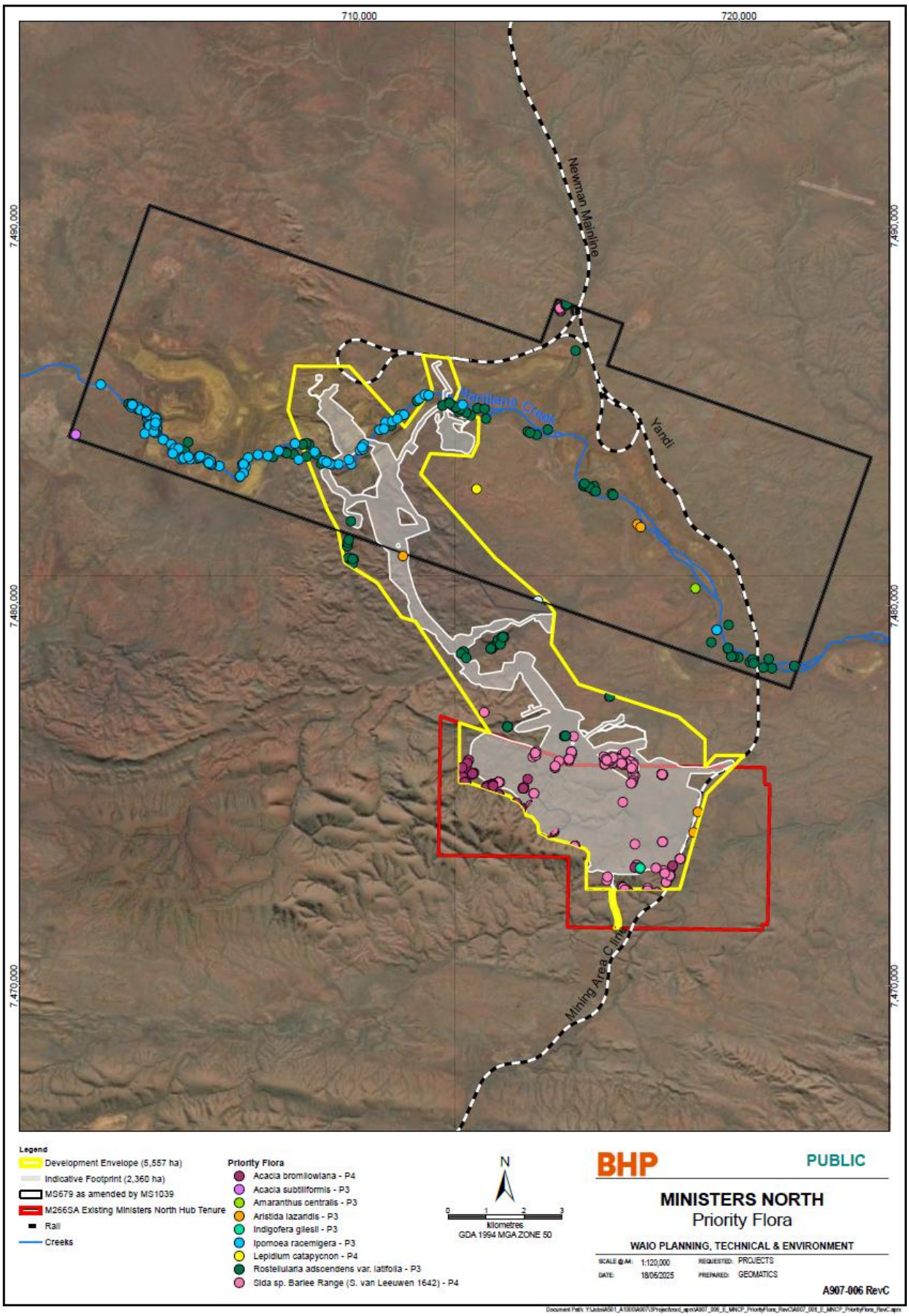


Figure 3-7 Ministers North Priority Flora

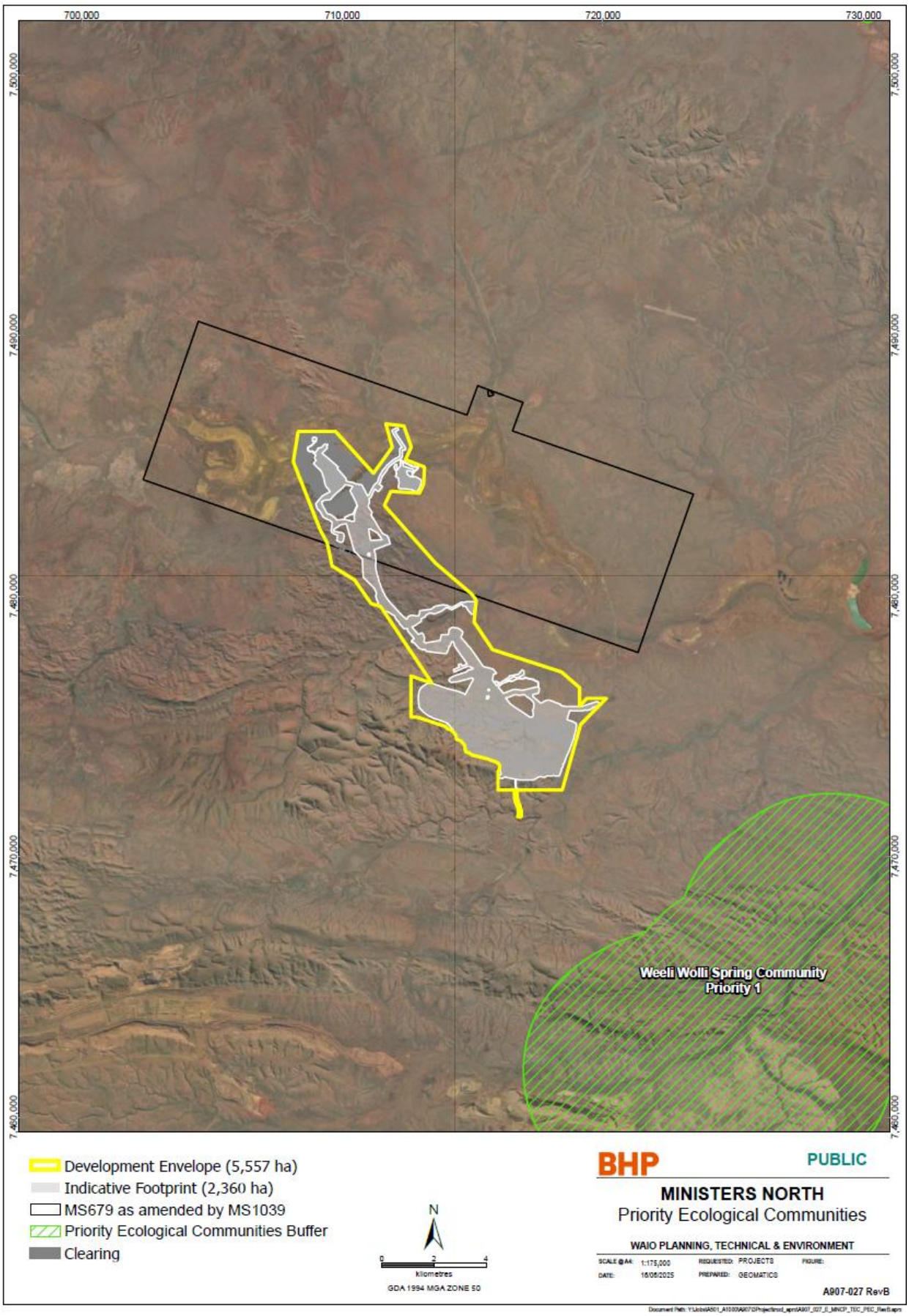


Figure 3-8 Ministers North Priority Ecological Communities

3.2.1.6 Riparian Vegetation

Riparian vegetation occurs within the Development Envelope in the form of vegetation present along major and minor watercourses, and around permanent and semi-permanent pools. A total of seven of the riparian vegetation associations in the Development Envelope represent DBCA "ecosystems at risk" as they are all associated with major ephemeral water courses in the Hamersley subregion and are under threat from grazing and introduced flora (BHP, 2025b).

Several of the riparian vegetation associations mapped within the Development Envelope are also considered to potentially be Groundwater Dependent Vegetation (GDV) and are discussed further below.

3.2.1.7 Groundwater Dependent Vegetation

Drainage lines within and in the region surrounding the Development Envelope have the potential to support GDV (i.e. vegetation that may be reliant on groundwater for part or all water requirements). GDV is typically characterised by the presence of flora species that rely on groundwater and are known as phreatophytes. Phreatophytes may be classified as either obligate (confined to habitats with permanent access to groundwater) or facultative phreatophytes (can utilise groundwater to satisfy a portion of their ecological water requirements) depending on their reliance on groundwater. Dominant facultative phreatophytes of the riparian zone in the Pilbara are *Eucalyptus camaldulensis*, *Eucalyptus victrix* and the dominant obligate phreatophyte is *Melaleuca argentea.*

Biota (2017) and Biologic (2020b) identified a number of vegetation associations with potentially groundwater dependent vegetation within the proposed Ministers North Development Envelope:

- *Eucalyptus* open woodland which occurs in the southern section of Yandicoogina Creek.
- *Melaleuca argentea* open forest which occurs in the northern section of Yandicoogina Creek.
- Open Forest of *Eucalyptus camaldulensis* and *Eucalyptus victrix* over Sedges of *Cyperus vaginatus.*
- Open Tussock Grassland of *Sorghum plumosum*, *Themeda triandra* and *Eulalia aurea* which occurs on brown sand in major drainage lines in the north western and central sectors of the proposed infrastructure corridor.

Onshore Environmental (2018a) also conducted a survey of groundwater dependent vegetation along Yandicoogina Creek both upstream and downstream of Ministers North. Six of the ten vegetation associations along the main drainage channel of Yandicoogina Creek upstream and downstream of Ministers North support groundwater dependent vegetation (i.e. *Melaleuca argentea, Eucalyptus camaldulensis* and *Eucalyptus victrix*):

- Three *Eucalyptus* Woodland associations.
- *Sorghum* Tussock Grassland.
- *Eulalia* Tussock Grassland.
- *Themeda* Open Tussock Grassland.

One vegetation association (Woodland of *Eucalyptus camaldulensis* and *Melaleuca argentea* over Open Tussock Grassland of *Themeda triandra, Eulalia aurea* and *Sorghum plumosum* over Open Sedges of *Cyperus vaginatus*, *Typha domingensis* and *Eleocharis geniculata*) supported zones of permanent pooling scattered throughout the mapped extent of this unit. The open sedge stratum was restricted to these permanent pools (Onshore Environmental, 2018a).

3.2.1.8 Sheet-flow Dependent Vegetation

Sheet-flow is laminar (thin, flat), non-channelised and low-velocity surface water runoff that can occur on relatively flat or low-gradient land areas. The interception of sheet-flow by infrastructure can result in water accumulation upslope (temporary ponding/pooling) and water loss downslope. Modelling of sheet-flow (as a type of surface water flow) is typically not undertaken as a result of the low land gradients and small catchment areas applicable (rather than broad topography and large catchments) and the need for consideration of ordinary rainfall events (rather than peak rainfall events).

'Mulga' is the common name for the native flora taxon *Acacia aneura*, however, this common name can also be applied to closely-related *Acacia* taxa that may co-occur such as *Acacia ayersiana*, *Acacia minyura* and *Acacia paraneura*. Mulga occurs across the Chichester, Fortescue and Hamersley subregions of the Pilbara IBRA Bioregion, and is acknowledged to be dependent on water sheet-flow. Of the two regional Vegetation Associations in the area of the Derived Proposal and surrounds, it is noted that Vegetation Association 18 is described as *"low woodland; mulga (Acacia aneura)"*.

The recent biological surveys do not identify any vegetation associations containing Mulga and do not suggest any mapped local Vegetation Associations as being sheet-flow dependent (BHP, 2025b).

3.2.1.9 Weeds and declared plants

No 'declared plants' listed under the BAM Act, or DBCA Pilbara Region Priority Alert Weeds, or species listed as Weeds Of National Significance have been recorded within the proposed Ministers North Development Envelope (DBCA, 2019; Onshore Environmental, 2018b; Biologic, 2020a; Biota, 2017).

A total of 41 introduced flora were recorded in biological surveys for the Development Envelope and surrounds (BHP, 2025b) with 25 recorded within the Development Envelop (Figure 3-9). The majority of introduced flora taxa records were located outside of the Development Envelope and associated with the Yandicoogina Creek and Marillana Creek within / adjacent to BHP's Yandi mining operations and associated rail, and adjacent to third-party mining operations (BHP, 2025b).

All but one of the weed species occurring at Ministers North commonly occur within the Pilbara. The exception is **Melinis repens* which has been recorded from the Kimberley to the south-west of Western Australia, but is currently known from a limited number of populations within the Pilbara (Biota, 2017).

3.2.1.10 Ethnobotanical flora

An on country ethnobotanical survey was undertaken at Ministers North in collaboration with the Banjima People in 2024 (Walsh, 2024). The intent of the survey was to identify plant species of cultural significance across Ministers North. At least 126 cultural or heritage plant species were found (26 recorded in the survey) or are likely to occur in the Ministers North area and vicinity (BHP, 2025b). Twenty one useful plants were found during the survey and the remaining 112 plants were identified through a desktop review of documents relevant to the area. A list of the plants, and their significance to the Banjima People, is provided in Appendix I.

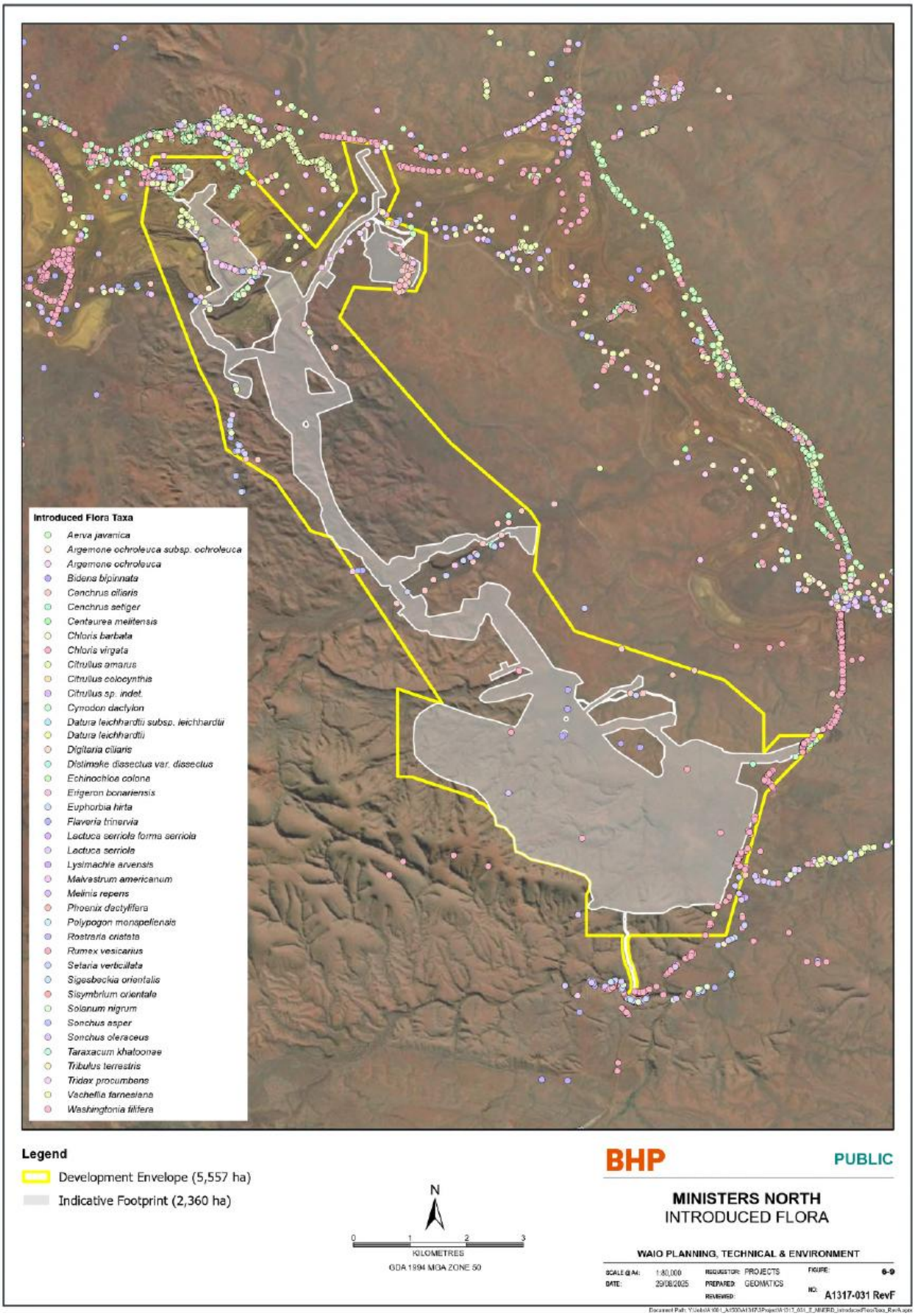


Figure 3-9 Ministers North Introduced Flora

3.2.2 Fauna

A full description of the fauna survey effort associated with Ministers North is provided in the Ministers North Derived Proposal Request (BHP, 2025b).

3.2.2.1 Fauna habitats

Biological surveys identified 13 broad fauna habitat types within the Development Envelope (Table 3-9 and Figure 3-10).

The dominant fauna habitat type identified within the Development Envelope was the Hillcrest / Hillslope (3,495.8 ha) followed by Drainage Area/Floodplain (243.8 ha). Minor Drainage Line (142 ha), Gorge/Gully (152.5 ha), and Breakaway/Cliff (82.8 ha), whilst more restricted in extent, support a number of significant fauna (BHP, 2025b).

Critical habitat uses comprise denning/roosting, shelter, foraging and dispersal. Supporting habitat is mainly used for foraging.

Significant microhabitats are present in the survey area, with Astron (2025) reporting that 14 caves and 10 surface water features were recorded during recent surveys. The caves provide potential roosting habitat for the Ghost Bat and Pilbara leaf-nosed Bat (Figure 3-11), with some providing occasional, rather than regular occupancy or being transitional roosts (Astron, 2025). The 10 pools were located in Gorge/Gully or Major Drainage Line habitats.

3.2.2.2 Terrestrial vertebrate fauna

Astron (2025) reports that 111 vertebrate fauna species have been recorded within the habitats present in the survey area. These comprise 21 mammal species, 64 bird species, 25 reptile species and one amphibian species.

Of relevance to closure implementation is the presence of cattle (**Bos taurus*) as these could affect rehabilitation success.

3.2.2.3 Significant vertebrate fauna

Biological surveys undertaken for the Development Envelope have identified the presence of Threatened Fauna species:

- Ghost Bat (*Macroderma gigas*) – listed as Vulnerable under the BC Act and EPBC Act.

Two additional Threatened Fauna have been recorded in proximity to the Development Envelope:

- Northern Quoll (*Dasyurus hallucatus*) – listed as Vulnerable under the BC Act and EPBC Act.
- Pilbara Olive Python (*Liasis olivaceus barroni*) – listed as Vulnerable under the BC Act and EPBC Act.

The assessment of the Strategic Proposal (BHP Billiton Iron Ore, 2016) documented 11 known DBCA classified Priority Fauna that have the potential to occur within the area of the Strategic Proposal. Surveys have identified one of the Priority Fauna taxa within the Ministers North Development Envelope:

- Western Pebble-mound Mouse (*Pseudomys chapmani*) -listed as Priority 1 by DBCA

Biological surveys identified Western Pebble-mound mouse to be locally common, with more than 100 records of Western Pebble-mound mouse occurring within and outside the Development Envelope. Western Pebble-mound mouse was most abundant within the Hillcrest / Hillslope fauna habitat type (BHP, 2025b).

The assessment of the Strategic Proposal also documented one known Specially Protected Species from within, or having a potential to occur within, the area of the Strategic Proposal:

- Peregrine Falcon (*Falco peregrinus*).

The Peregrine Falcon occurs in most habitat types, apart from treeless and waterless desert and dense forests, and is widespread but uncommon throughout Australia. The Derived Proposal area contains suitable nesting, foraging, and perching habitat within the Major Drainage Line, Breakaway/ Cliff, and Gorge/ Gully habitats. Only one individual Peregrine Falcon has been observed within the Development Envelope during surveys (BHP, 2025b).

Threatened and Priority fauna species recorded within the proposed Ministers North Development Envelope are listed in Table 3-10, with record locations shown on Figure 3-11.

Table 3-9 Fauna habitat within Ministers North proposed development envelope

Habitat Type	Extent within Survey Area	Habitat Description	Habitat for Conservation-significant Vertebrate Fauna Species
Hillcrest/Hillslope	~62.9%	Characterised by large open rocky areas with open grasslands, predominantly *Triodia* hummock grasslands with emergent *Eucalyptus* trees and mixed shrubs.	• Critical habitat for the Ghost Bat (*Macroderma gigas*). • Supporting habitat for the Northern Quoll (*Dasyurus hallucatus*), Ghost Bat and Pilbara leaf-nosed bat (*Rhinonicteris aurantia*). • Also provides habitat for the Western Pebble-mound Mouse (*Pseudomys chapmani*) and Pilbara Barking Gecko (*Underwoodisaurus seorsus*).
Gorge/Gully	~2.7%	Semi-enclosed rock formations in association with rocky hills, drainage lines and breakaways. *Eucalyptus/Corymbia* trees over mixed shrubs, *Triodia* spp. and tussock grassland.	• Critical habitat for the Northern Quoll, Ghost Bat and Pilbara Olive Python (*Liasis olivaceus barroni*). • Supporting habitat for the Pilbara leaf-nosed Bat and Ghost Bat. • Habitat for other conservation-significant species: Peregrine Falcon (*Falco peregrinus*), Pilbara Flat-headed Blind Snake (*Anilios ganei*), Pilbara Barking Gecko (*Underwoodisaurus seorsus*).
Drainage Area/ Floodplain	~4.4%	Drainage areas and floodplains tends to be associated with rivers and major drainage lines having wide valley floors. They usually have alluvial sands or clay loams supporting open to sparse low woodlands and shrublands over grasses.	• Critical habitat for the Ghost Bat. • Supporting habitat for the Ghost Bat, Northern Quoll and Pilbara leaf-nosed Bat.
Major Drainage Line	~2.4%	Large drainage channel over 10 m in width in association with gorges, floodplains, rocky hills. Presence of tall *Melaleuca* and *Eucalyptus* trees over mixed shrubs and tussock and *Triodia* spp. grasses	• Critical habitat for the Ghost Bat, Northern Quoll and Pilbara Olive Python. • Supporting habitat for the Ghost Bat and Pilbara leaf-nosed Bat. • Habitat for other conservation-significant species: Peregrine Falcon.
Medium Drainage Line	~0.1%	Medium drainage channel often with thick *Acacia* growth along banks.	• Critical habitat for the Ghost Bat. • Supporting habitat for the Pilbara Olive Python, Northern Quoll, Ghost Bat and Pilbara leaf-nosed Bat. • Habitat for other conservation-significant species: Peregrine Falcon.
Minor Drainage Line	~2.6%	Minor drainage channel often with thick *Acacia* growth along banks.	• Critical habitat for the Ghost Bat. • Supporting habitat for the Pilbara Olive Python, Northern Quoll, Ghost Bat and Pilbara leaf-nosed Bat.
Undulating Low Hills	~1.0%	Low stony hills and slopes with dissected valleys and drainage on stony soils.	• Critical habitat for the Pilbara leaf-nosed Bat. • Habitat for other conservation-significant species: Western Pebble-mound Mouse and Pilbara Flat-headed Blind Snake.
Breakaway/Cliff	~1.5%	Exposed rock formations often associated with Hillcrest/Hillslope, Gorge/Gully, Drainage Lines or Floodplains.	• Critical habitat for the Northern Quoll and Pilbara Olive Python. • Supporting habitat for the Ghost Bat and Pilbara leaf-nosed Bat. • Habitat for other conservation-significant species: Peregrine Falcon and Pilbara Flat-headed Blind Snake.
Boulders/Rockpiles	~0.5%	Basalt outcrops in association with Minor Drainage Lines and rocky hills with *Eucalyptus/Corymbia* trees over mixed shrubs, *Triodia*	• Represent supporting habitat for Northern Quoll and Pilbara Olive Python, but are shallow and not extensive enough to provide critical denning habitat for these species. • Habitat for other conservation-significant species: Pilbara Barking Gecko.

Habitat Type	Extent within Survey Area	Habitat Description	Habitat for Conservation-significant Vertebrate Fauna Species
		spp. and tussock grassland.	
Mulga Woodland Habitat	>0.1%	Mulga Woodland habitat comprises stands of mulga (*Acacia aneura*) over clay or stony substrates. Differs from other plains by having a monoculture of mulga compared to a diversity of other Acacia species	• May provide critical foraging habitat for Ghost Bat where it occurs within <12 km of Category 2 roost caves (and supporting habitat when outside of the 12 km buffer).
Sand Plain Habitat	>0.1%	Characterised by relatively deep sandy soils supporting dense spinifex grasslands and sparse shrubs.	• Does not provide critical or supporting habitat for significant fauna identified in proximity to the Derived Proposal.
Sandy / Stony Plain	0.1%	This habitat is characterised by large hummock *Triodia* grasses or stands of *Acacia* or other shrubs over clay or stony substrates. Common throughout the Pilbara region and provides habitat for a wide spectrum of fauna species. Contains logs, tree hollows, thick undergrowth, leaf litter, soft soil (burrows), and old Triodia.	• Provides critical foraging habitat for Ghost Bat where it occurs within 12 km of critical roosting habitat. Otherwise, provides supporting habitat for Northern Quoll, Ghost bat and Grey Falcon.
Wetland	<0.1%	Differs from surface water features as they are generally a larger water body that supports their own distinct ecosystem and aquatic fauna assemblages. Due to their rarity in the Pilbara region, these habitats generally have elevated significance.	• Provides critical foraging habitat for Pilbara Olive Python and supporting habitat for Northern Quoll. • Critical foraging habitat for Ghost Bat (when within 12 km of critical roosting habitat).
Cleared / Disturbed (including Rehabilitated Areas)	20.8%	N/A	N/A

Source: Astron (2025), BHP (2025b)

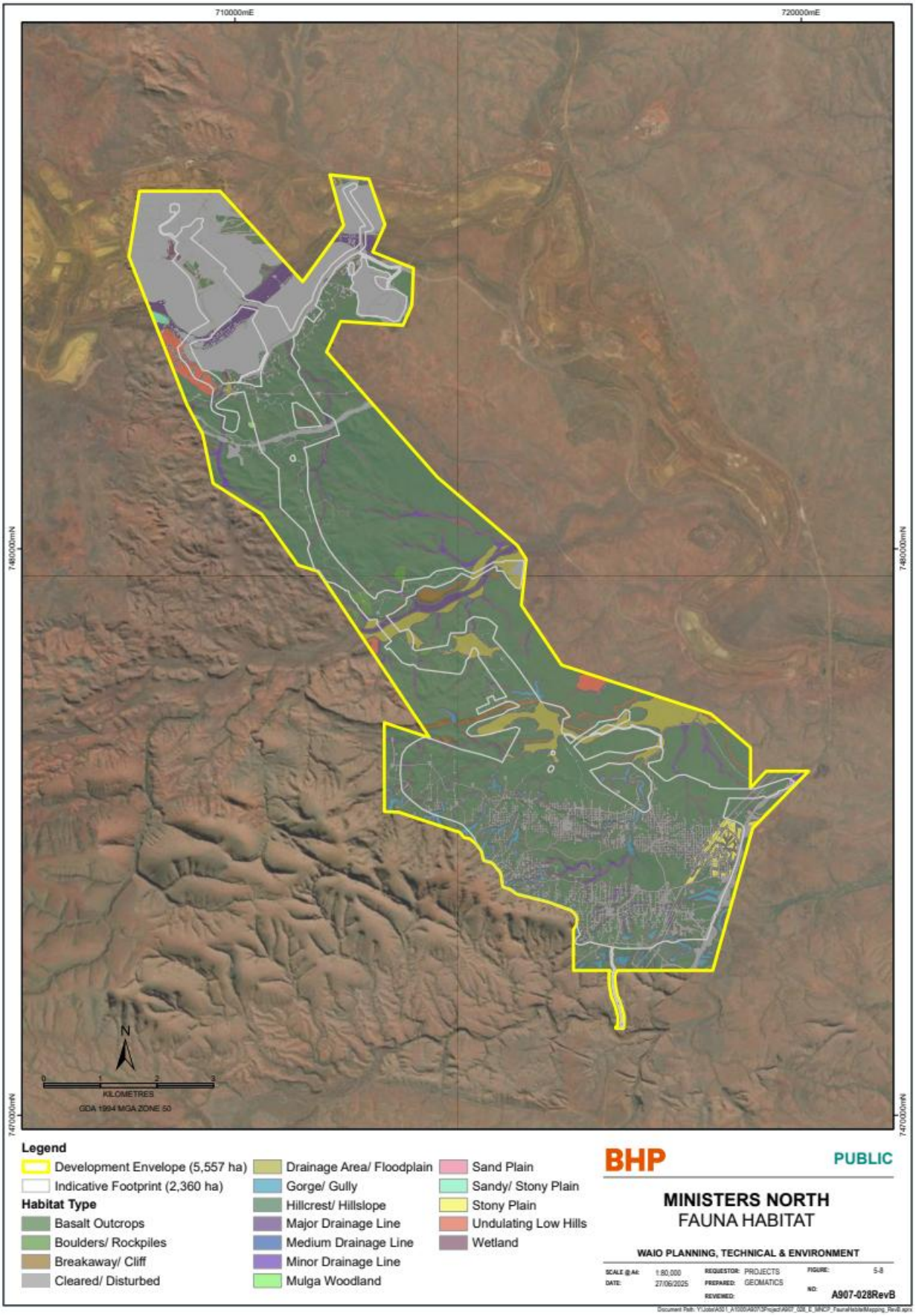


Figure 3-10 Ministers North Fauna habitats

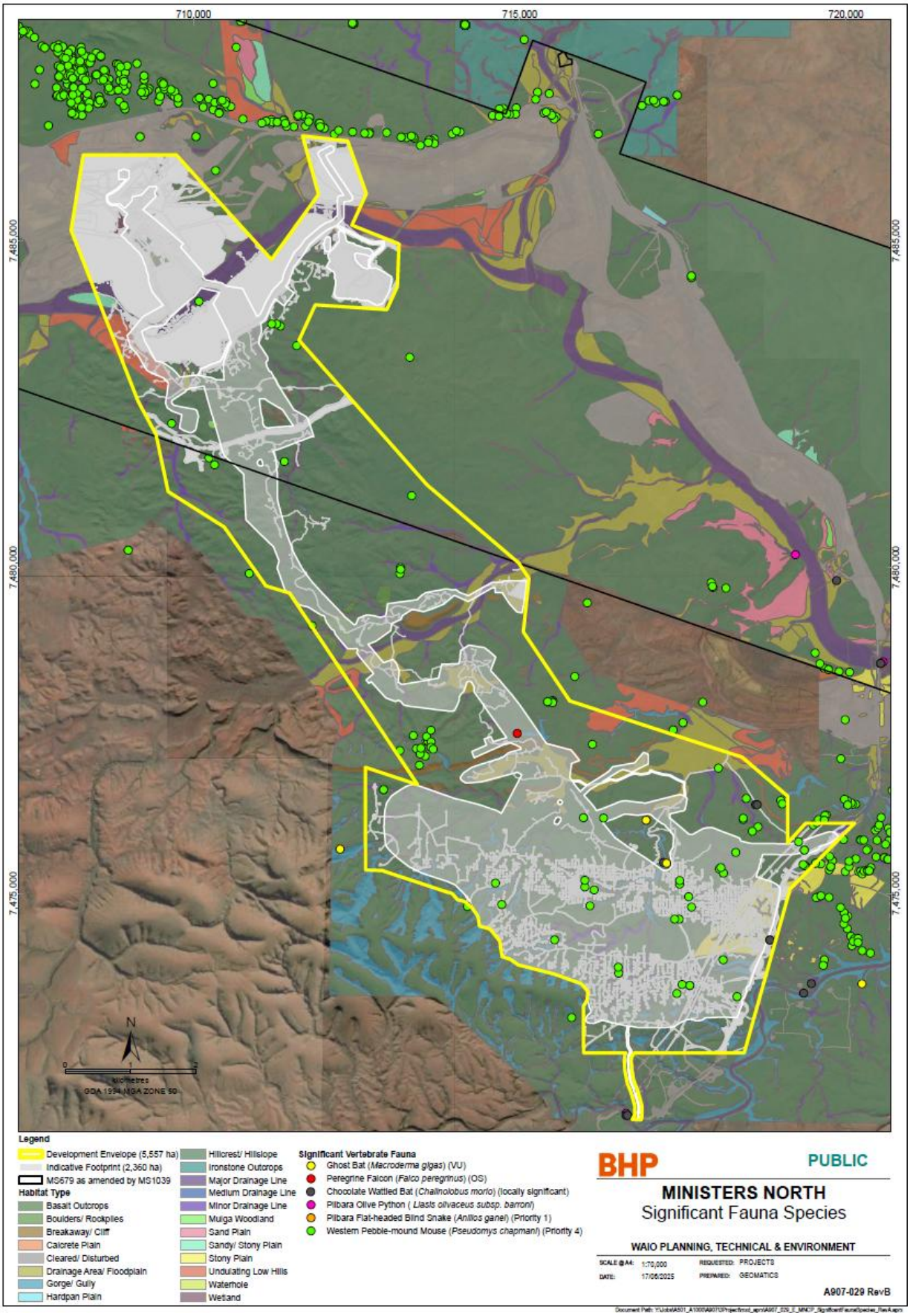


Figure 3-11 Ministers North Significant Fauna Species

Table 3-10 Threatened and Priority Fauna species recorded within the Ministers North proposed development envelope

Scientific Name	Common Name	Conservation Status[1]	Comment
Threatened Species			
Macroderma gigas	Ghost Bat	BC Act VU EPBC Act VU	Occurring in rocky landscapes along gorge and gully formations and roosting within caves with warm, humid microclimates. They prefer an "apartment block" of roost sites concentrated within close range and where water is accessible. Prior to the Astron survey, the closest record was approximately 1.2 km from the Survey Area, but the majority were clustered 16 km to 30 km south of the area. Ghost bat evidence was detected during the survey.
Falco peregrinus	Peregrine Falcon	BC Act OS	Cosmopolitan, will hunt in any habitat, soaring at height or from a perch, often near cliffs. Nests on rocky ledges in tall, vertical cliff faces and tall trees associated with drainage lines. One record from inside the Survey Area and another less than 10 km south-east. High chance of occurring along major drainage lines with large trees.
DBCA Priority Species			
Anilios ganei	Pilbara Flat-headed Blind Snake	P1	Little information is available on this species, but it is believed to be associated with moist gorges and gullies. Suitable habitat is common throughout the Survey Area.
Pseudomys chapmani	Western Pebble-mound Mouse	P4	Gentle rocky slopes, hills and spurs with small pebble surface cover and sparse vegetation. This species distribution has contracted to the inland Pilbara away from the coastal Pilbara, Murchison, and Gascoyne. Known to occur both within and in close proximity to the Survey Area. One recently active pebble-mouse mound was recorded during the Astron survey.

Source: Astron (2025)

EN – Endangered, VU – Vulnerable, OS – Other Specially Protected Species; DBCA classification P1 – Priority 1 (poorly known species); P4 – Priority 4 (rare, near threatened and other species in need of monitoring)

3.2.2.4 Subterranean fauna

A full description of the subterranean fauna survey effort associated with Ministers North is provided in the Ministers North Derived Proposal Request (BHP, 2025b).

Stygofauna

The geology of the proposed Ministers North mining area is structurally simple and characterised by folds with no significant faults (Section 3.1.2), and the water table is deep, except in the southeast of the area (Section 3.2.3.3). From a geological perspective, the proposed Ministers North mining area is generally not prospective for stygofauna and sampling revealed a depauperate stygofauna community.

BHP's understanding of stygofauna values at Ministers North has been developed across a number of surveys conducted from 2009. Desktop review of available information identified a relatively depauperate stygofauna community. This has been supported by a recent three-season field survey by Bennelongia which collected 117 specimens of stygofauna taxa representing only six species. These specimens were predominantly collected in the eastern part of Ministers North where groundwater is shallower, and none are potentially restricted to the mining area (Bennelongia Environmental Consultants, 2024).

Troglofauna

Most of the Ministers North deposit consists of an alternating sequence of BIF, shale and chert. The BIF is subdivided into four members: the Dales Gorge Member, the Joffre Member, the Mt Whaleback Shale Member and the Yandicoogina Shale Member. The Ministers North orebody is primarily located within the mineralised Dales Gorge Member of the BIF.

Within the BIF at Ministers North, weathering of exposed rock has led to development of a layer of hardcap which is about 20 m thick across the whole deposit and contains numerous cavities. Some of these cavities are filled with clay material, but most are empty and provide suitable habitats for troglofauna.

BHP's understanding of troglofauna values at Ministers North is based on surveys conducted from 2009. The troglofauna community in the proposed Ministers North mining area and its immediate surrounds is relatively rich. To date, 75 taxa have been recorded at Ministers North, of which 48 species are only known from this study area. However, most of the species potentially restricted to the mine pits are likely to have larger distributions than currently recognised and are unlikely to be restricted to the survey area (Bennelongia Environmental Consultants, 2024).

None of the troglofauna taxa recorded at Ministers North are listed as 'Threatened Fauna' under the EPBC Act or the BAM Act or are classified by the DBCA as 'Priority' species.

No specific avoidance measures for troglofauna values are proposed for the Derived Proposal, given there are no species at high risk of impact (BHP, 2025b).

3.2.2.5 Short range endemic species

Short Range Endemic (SRE) invertebrate fauna surveys have recently been conducted within, and adjacent to, the proposed Ministers North Development Envelope and are described in the Ministers North Derived Proposal Request (BHP, 2025b).

Desktop assessments identified 59 species that have previously been identified as either Confirmed or Potential SREs from a 30 km radius. Field assessments collected more than 180 invertebrate specimens including two confirmed SRE invertebrate taxon known from within proximity to the Derived Proposal (albeit outside of the Development Envelope). These two taxa are:

- the Mouse Spider (*Missulena faulderi*)
- the Centipede *Antichiropus pendiculus* (P1).

As a result of all surveys for the Derived Proposal, 54 potential/uncertain SRE's have been recorded within the Development Envelope, of which 37 occur within the Indicative Footprint.

No "Confirmed" SRE species are known from within the Development Envelope and none of the invertebrate fauna taxa recorded within the Development Envelope are listed under the EPBC Act or BC Act

The majority of the potential SRE invertebrate fauna species recorded within the proposed Development Envelope appear closely associated with the leaf litter microhabitats of Yandicoogina Creek and the gorge/gully habitat type. Other potential SRE invertebrate fauna species are known to occur from deep soils of drainage areas, and from rocky microhabitats within hillcrest/hillslope habitats (Figure 3-12) (Biologic, 2016; 2018; 2020c).

3.2.2.6 Aquatic fauna

No aquatic fauna sampling has been undertaken within the ephemeral creeks or surface water pools within the Development Envelope. Aquatic fauna sampling has, however, been undertaken within Marillana Creek and east of the Development Envelope at Yandicoogina Creek as described in the Ministers North Derived Proposal Request (BHP, 2025b).

In summary, a diverse range of aquatic fauna has been recorded within the pools of Yandicoogina Creek including 250 invertebrate taxa and three freshwater fish species (Western Rainbowfish, Pilbara Tandan and Spangled Perch). The majority of species recorded are widespread or known from other creeks and catchments; however, at least 11 aquatic invertebrate species are of

conservation interest as they are either new species, are potentially restricted or are listed on the International Union for the Conservation of Nature (ICUN) Redlist. None of the invertebrate or vertebrate aquatic fauna recorded from Yandicoogina Creek are listed under the EPBC Act or BC Act, or listed as Priority fauna by DBCA.

Of the taxa recorded during surveys, 16% were identified as taxa directly dependent on groundwater (stygobites), highlighting the groundwater connection within Yandicoogina Creek.

Surveys within Marillana Creek have recorded over 488 native aquatic invertebrate taxa (across zooplankton, hyporheic, rehydrate and macroinvertebrate lists), and three freshwater fish species (Western Rainbowfish, Pilbara Tandan and Spangled Perch). The majority of taxa recorded were associated with the pools at Flat Rocks or the Yandi mine discharge point and are considered common species, with broad distributions (including the freshwater fish species); however, at least eight invertebrate species are of conservation interest as they are either new species, are potentially restricted to Marillana and/or Yandicoogina Creek, or are listed on the ICUN Redlist (note this doesn't include species potentially restricted to the Flat Rocks pools). This includes IUCN Redlist listed dragonflies/damselflies; *Eurysticta coolawanyah* (listed as Vulnerable), *Ictinogomphus dobsoni* (listed as Near Threatened) and *Hemicordulia koomina* (listed as Vulnerable). In addition, at least five stygal/SREs are of interest as they are considered SREs with potentially restricted ranges including; the amphipods *Paramelitdae* sp. B, *Paramelitdae* sp. D and *Chydaekata* sp., the isopod *Pygolabis weeliwolli*, and the ostracod *Gomphodella alexanderi*.

All recorded stygal SREs and epigean species have distributions which extend outside the Development Envelope.

None of the invertebrate or vertebrate aquatic fauna recorded from Marillana Creek are listed under the EPBC Act or BC Act, or listed as Priority fauna by DBCA.

Rivers of the Pilbara tend to be ephemeral due to the region's aridity, so permanent water sources in the region are relatively scarce and restricted to springs and permanent pools, which indicates the importance of the survey area in the broader Pilbara region (Biologic, 2020b). In particular, Biologic (2020b) found that one permanent pool in the Survey Area (YC4) supported a notably high diversity of aquatic invertebrates that was considered to be comparable to the Weeli Wolli Spring Priority PEC and Skull Springs. Further, permanent springs in shaded gorges and riverbeds support a suite of mesic-adapted species that are otherwise rare in the region (Biologic, 2020b).

3.2.2.7 Groundwater dependent aquatic ecosystems

Ecosystems that rely on groundwater for some or all of their water requirements are classified as Groundwater Dependent Ecosystems (GDEs). The three key types of GDEs within inland Australia are:

- Aquatic ecosystems that rely on the surface expression of groundwater. This includes surface water ecosystems that have a groundwater component, such as rivers, wetlands and springs.
- Terrestrial ecosystems that rely on the subsurface presence and proximity of groundwater. This includes GDV.
- Subterranean ecosystems such as stygofauna communities in aquifers (Section 3.2.2.4).

GDE's within the Derived Proposal area include:

- Yandicoogina Creek/ Yandicoogina Gorge (presence of permanent and semi-permanent pools, presence of GDV *Eucalyptus camaldulensis, Eucalyptus victrix* and *Melaleuca argentea*) [east of the Development Envelope]
- Marillana Creek (GDV associated with the creek – presence of *E. camaldulensis*, *E. victrix* and *M. argentea*)
- Mungadoo Creek (GDV associated with tributary to Marillana Creek – presence of potential groundwater dependent species *E. victrix*)
- Central Tributary (GDV associated with tributary to Marillana Creek – presence of potential groundwater dependent species *E. victrix*)

An area along Yandicoogina Creek (excluded from the Development Envelope) appears to have high ecological values, with traits and characteristics similar to other spring sites in the Pilbara as it exhibits affinity with the Pilbara PEC (Biologic, 2020b). The upper reaches of Yandicoogina Creek comprise a relatively broad, un-defined channel, however, in the mid to lower reaches, the creek flows through a gorge system and becomes well defined. The groundwater appears to intercept the surface through this section, forming a series of seeps and pools (of which two pools are identified as permanent) along approximately 3.5 km of the creek (BHP, 2025b).

Characteristics of Yandicoogina Creek include a regionally significant forest of the groundwater dependent tree, *Melaleuca argentea*, a high diversity of aquatic macroinvertebrates, several stygofauna species that are unique to the gorge, and significant habitat for conservation significant species.

Ephemeral surface water flows in Marillana Creek support riparian vegetation characterised by *E. camaldulensis, E. victrix* and *M. argentea*.

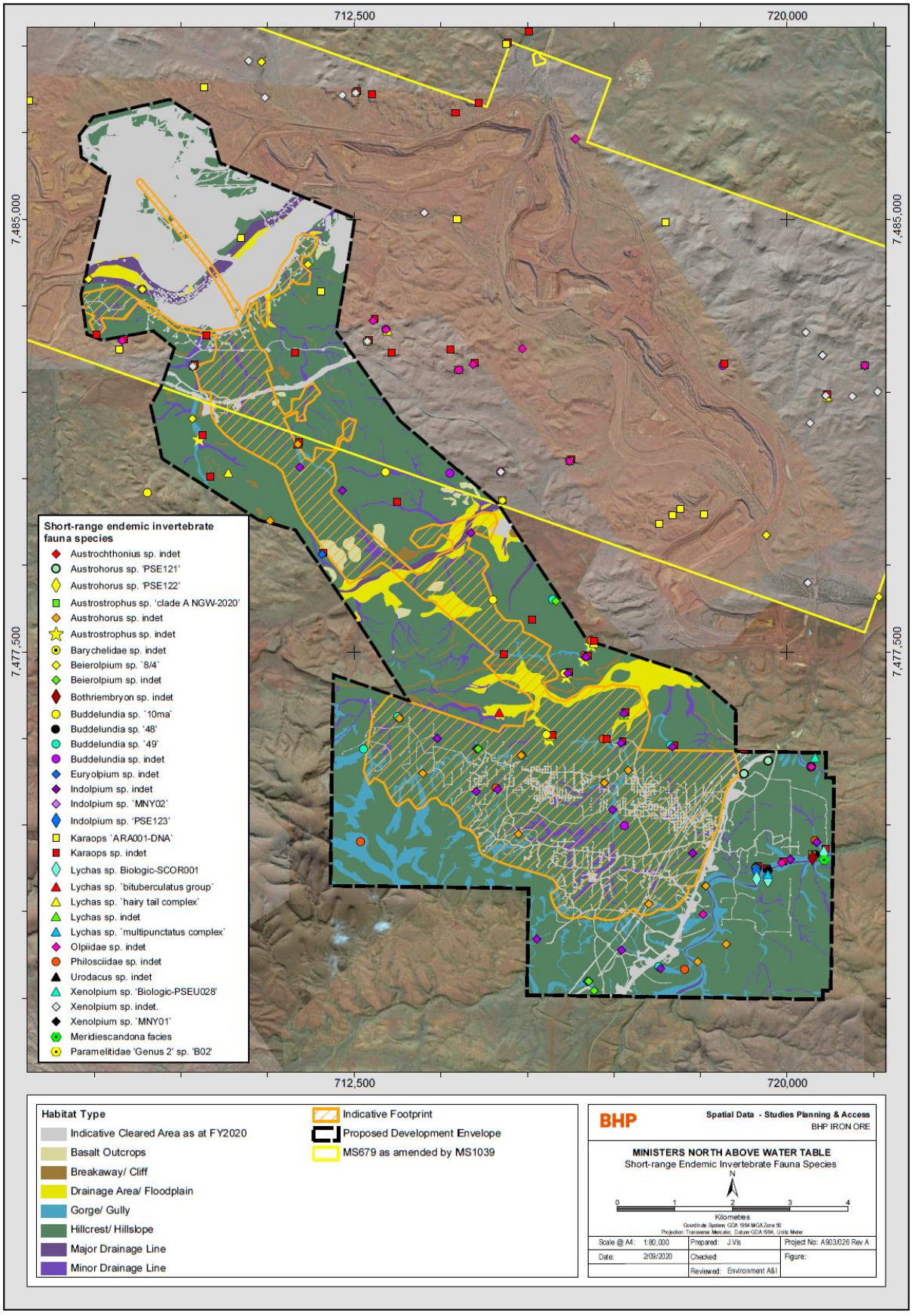


Figure 3-12 SRE Invertebrate Fauna Species Ministers North

3.2.3 Surface water

3.2.3.1 Regional hydrology

At a regional scale, Ministers North is located within the Weeli Wolli catchment and the Marillana Creek sub-catchment of the Upper Fortescue River catchment (Figure 3-14). The Marillana Creek sub-catchment occupies an area of about 2,050 km^2, while the Weeli Wolli Creek catchment covers an area of 4,100 km^2. In turn, the Weeli Wolli Creek catchment forms part of the broader Upper Fortescue River Catchment which has a catchment area of 16,281 km^2. However, these two systems are only connected during flooding associated with intense cyclonic events.

Fortescue Marsh is the drainage terminus for the Upper Fortescue River Catchment. This is a brackish to saline wetland with a width of between 3 and 10 km that extends for about 100 km along the Fortescue Valley (MWH, 2016; Golder, 2015). The Fortescue Marsh water balance is dominated by surface water inputs. The largest source of surface water inflow to Fortescue Marsh is the Fortescue River which contributes, on average, 42% of inflow. Weeli Wolli Creek (which receives water from Marillana Creek) contributes approximately 18% of mean annual inflow (MWH, 2016). Flooding of Fortescue Marsh is generally associated with cyclonic rainfall and runoff in the summer months, with large-scale inundation events estimated to occur every five to seven years on average, during which more than 20% of the Marsh is inundated. Floodwaters may persist for several months providing breeding and foraging habitat for waterbirds and other biota before evaporating - leading to salt accumulation (BHP Billiton Iron Ore, 2016).

DWER operate a streamflow gauging station at Weeli Wolli Creek – Tarina (708014) in the Weeli Wolli Creek catchment, approximately 11 km east of the Development Envelope. Total annual discharge from the stream varies, from a maximum of 88,490 megalitres (ML) / annum (a) in 1999 to a minimum of 244 ML/a in 1994 (excluding years in which 0 ML/a were recorded) (BHP, 2025b). Tarina Gauge streamflow gauging station shows continuous baseflow year-round, which is a result of mine surplus water being discharged to irrigate areas of the downstream Weeli Wolli Spring to sustain the surface expression of water at the spring and sustain pools (BHP, 2025b).

Marillana Creek is a naturally ephemeral creek, however, there are a number of semi-permanent and permanent pools upstream of the BHP Yandi mine site. The confluence of Marillana Creek and Weeli Wolli Creek is approximately 17 km downstream of the proposed Development Envelope. DWER operate a streamflow gauging station at Marillana Creek - Flat rocks (708001), located upstream of existing mining activities by BHP (and other parties) in the Marillana Creek catchment. Streamflow data indicates that flow in Marillana Creek is driven by cyclonic rainfall events with little to no flow outside these events. Total annual discharge from the stream varies widely from a maximum of 144,500 ML/a in 1975 to a minimum of 5.8 ML/a in 2023 (BHP, 2025b).

3.2.3.2 Local hydrology

Ministers North is located along a catchment divide (Figure 3-15). At the local scale within the proposed Development Envelope, the northern local catchments (Central Tributary catchment and Mungadoo Tributary catchment) drains via minor drainage lines in a northerly direction towards Marillana Creek. These local tributary catchments have an area of approximately 50 km^2 (Central) and 24 km^2 (Mungadoo). The Central Tributary occurs across an elevation range of 568 - 1080 mAHD and the Mungadoo Tributary occurs across an elevation range of 550 - 940 mAHD (Stantec, 2024).

The southern local catchment (Yandicoogina Creek catchment) drains in a south-easterly direction to Yandicoogina Creek. Yandicoogina Creek (a tributary of Marillana Creek) is approximately 42 km in length (Stantec, 2024) and flows in a northeasterly direction east of the proposed Development Envelope (partially intersecting). The upper reaches of Yandicoogina Creek comprise a relatively broad, un-defined channel, however, in the mid to lower reaches, the creek flows through a gorge system and becomes well defined, occurring across an elevation range of 563 - 1060 mAHD. Yandicoogina Creek joins Marillana Creek approximately 10 km downstream of the proposed Development Envelope.

As with most of the rivers and creeks in the Pilbara, creeks in the Ministers North catchment are ephemeral and only flow after large rainfall events which occur typically between December and March. Large stream flows are typically associated with rain-bearing depressions of high intensity rainfall. Streamflow in the smaller flow channels is typically short in duration and ceases to flow hours after the rainfall passes. In the larger river channels which drain the larger catchments, runoff can persist for several weeks and possibly months following major rainfall events such as those resulting from tropical cyclones (Golder, 2015).

3.2.3.3 Surface water quality

Monitoring of the pools in Yandicoogina Creek in the 2019 dry season and 2020 wet season indicated that the water quality within the pools was generally good and characterised by fresh (355 mg/L to 425 mg/L Total Dissolved Solids (TDS)), clear waters, with low dissolved oxygen saturation, neutral pH (6.8-7.7) and generally low dissolved metals concentrations (Appendix E-1). While nitrogen levels were generally low, isolated occurrences of elevated nitrogen were noted at both Yandicoogina Creek and reference sites. Elevated total phosphorus and boron concentrations were also noted at all Yandicoogina Creek and reference sites (Appendix E-1).

Two surface water monitoring sites are located along Marillana Creek and are monitored following rain events for physical parameters, nutrients, metals and total recoverable hydrocarbons. In Financial Year (FY) 2023 and FY 2024, there were no significant rain events to generate enough volume for sampling to be undertaken (BHP, 2025b), but three samples were collected

in FY 2022. These results show that surface water generated in Marillana Creek was slightly alkaline with pH between 7.5 and 7.8 and samples were fresh with an average TDS of 206 mg/L.

Water quality sampling undertaken in the pools of Yandicoogina Creek (east of the Development Envelope) during aquatic fauna surveys (Biologic, 2020b) found that water quality was generally good and characterised by fresh, clear waters, with low dissolved oxygen saturation, neutral pH, and generally low nitrogen.

BHP undertakes regular monitoring of surface water in Marillana Creek (of which Yandicoogina Creek is a tributary). Water quality results from ambient water sampling conducted for Yandicoogina Creek are summarised in Appendix E-2.

Several water quality characteristics confirmed the connection between Marillana Creek and groundwater, including ionic composition dominated by calcium cations and hydrogen carbonate anions, as well as a lack of seasonal variation in electrical conductivity (EC) (Biologic, 2020b).

At closure, potential impacts to surface water quality can arise from erosion of the OSA and deposition of sediments in waterways, or contaminated seepage arising from Potentially Acid Forming (PAF) stored within the OSA. As no overburden is classified as Acid and Metalliferous Drainage (AMD) 1 (PAF) and less than 1% of waste rock is AMD Class 2 or 3 material (Section 3.4.1), the risk of contaminated seepage from the OSA is considered low and is not expected to require management following closure of the mine.

Contamination may arise during operations from the handling and storage of hydrocarbons and environmentally hazardous materials. All chemicals and hydrocarbons are used and stored in accordance with the Hydrocarbon and Hazardous Materials Management procedure (WAIO, 2019a) and would be investigated and remediated according to the risk based program agreed with DWER (Section 4), but no hydrocarbon-affected soil will be bioremediated at Ministers North. Instead, a bioremediation pad at the Yandi Mining Operations will be used.

3.2.3.4 Flood modelling

A surface water impact assessment for Ministers North was conducted by Stantec in 2024 to assess the flood impacts for a range of life of mine conditions as well as closure scenarios for the 1 in 10,000 Annual Exceedance Probability (AEP) event inclusive of climate change uplift estimates (Stantec, 2024).

Hydraulic modelling was developed for the 50% AEP, 20% AEP, 10% AEP, 5% AEP, 1% AEP, and 1 in 10,000 AEP (with climate change uplift) flood events under four scenarios, as follows:

- Baseline condition, as reflected in the 2024 digital elevation model.
- LoM conditions with the mine pits, OSA, stockpiles, transport corridor from Ministers North to Yandi, and associated infrastructure in place.
- Closure condition, with the transport corridor to Yandi and stockpiles removed.
- Rail closure condition, with the BHP railway removed.

In general, it was found that flow depths are increased upstream of the proposed haul road embankment, OSA and stockpiles, and decreased downstream. Where landforms block flow paths, ponded water would be subject to infiltration and evaporation, though this was not modelled. Where culvert crossings are provided, the upstream afflux is temporary as the flows recede by the end of the simulation. Further, it was found that the loss in regional catchment area based on the pits is approximately 0.35% for the Weeli Wolli Creek catchment and 0.64% for the Marillana Creek catchment (Stantec, 2024).

Stantec (2024) has recommended the use of sediment basins during use of the proposed transport corridor between Ministers North and Yandi, but recognises that, following closure, sediment ponds would fill over time and eventually become ineffective. Consequently, the intention is that exposed slopes would be rehabilitated and vegetation established while the sediment ponds are still in use. Further, all rock protection would be removed, and the affected area restored to its natural surface level during closure works.

Changes to surface water flows

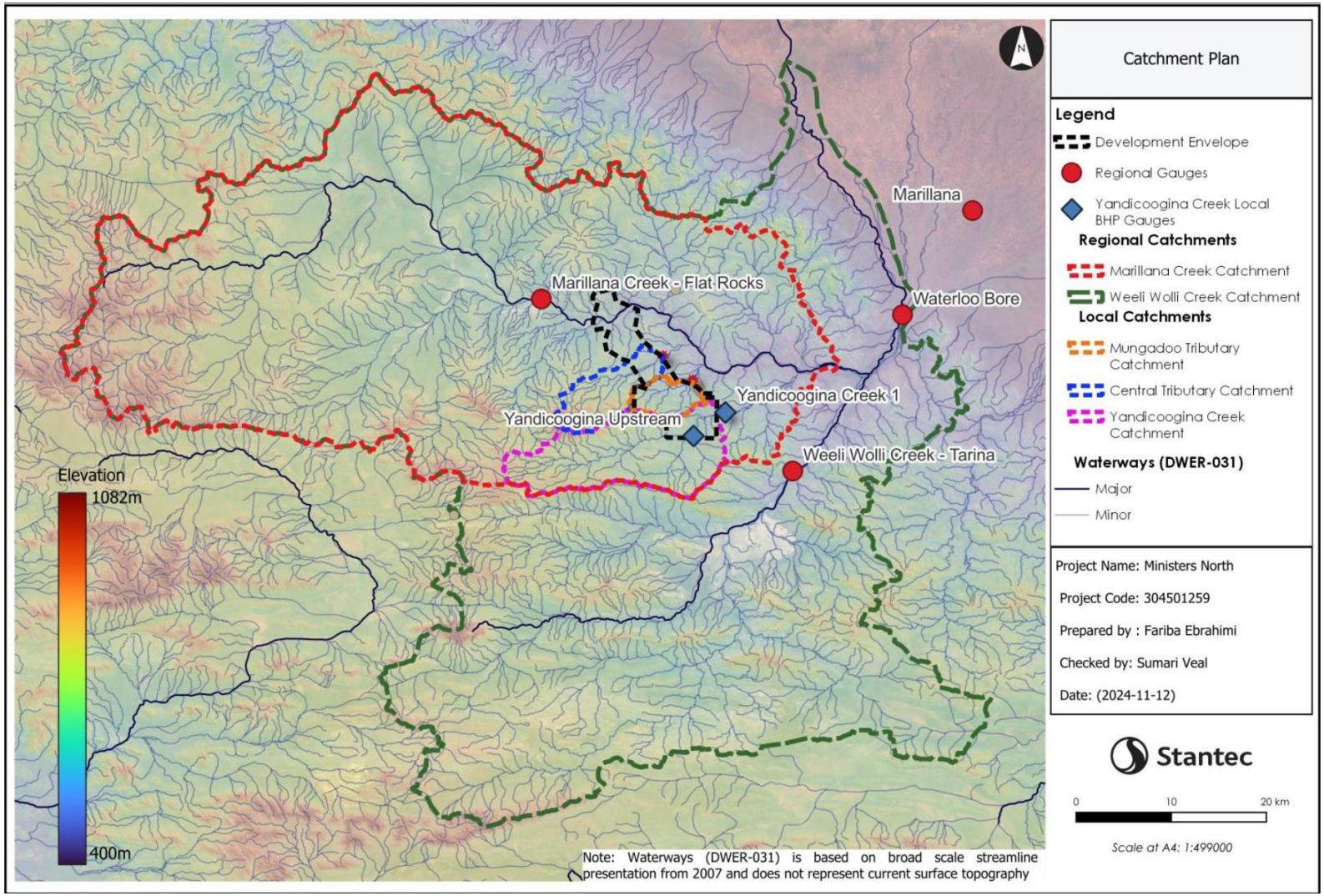
The proposed landforms and pits for Ministers North are generally located on higher ground near the catchment divide with small contributing catchment areas (Figure 3-13) which reduces the risk of significant pit inundation and creek capture (Stantec, 2024). Landforms are expected to be internally draining and concentrated flow paths intersected by pit shells would enter mine voids. Following closure, flow entering mine voids would remain in the voids. The maximum catchment area resulting in concentrated inflow is approximately 25 ha, and Stantec (2024) estimated that this may result in approximately 8 ML of water draining into the pits in a 1 in 10 year rainfall event.

The most significant potential change to hydrology at Ministers North is the removal of catchment areas contributing to downstream receptors. The indicative footprint of the Ministers North mining area is west of the existing railway line and mostly within the northern catchments (particularly Mungadoo Tributary). It does not encroach on the Yandicoogina Creek floodplain, so the main channel flow path is unaltered. South pit is the nearest pit to Yandicoogina Creek, but it is over 500 m away and separated from the creek by the rail line and over 40 m of elevation between the pit crest and the creek.

The pits and OSA within the proposed Development Envelope are primarily located near the catchment divide between the northern and southern catchments where there are no major watercourses (Figure 3-15, Section 3.2.2). An upper limit percentage reduction of 0.64% was observed by Stantec (2024) for the Marillana Creek Catchment, along with an upper limit percentage reduction of 0.35% for the Weeli Wolli Creek Catchment. The changes in peak flow rate, time to peak, and flow volume are not considered by Stantec (2024) to be significant on a regional scale, with the following conclusions being drawn in relation to comparative peak flows and volumes:

- The change in total cumulative volumes at the Yandicoogina Creek outlet is negligible between Baseline, LoM and Closure in the 1% AEP. There is approximately 20,000m^3 difference in the 50% AEP Baseline to LoM and Closure due to the inclusion of the pits which equates to a volume reduction of approximately 2%.
- The Central Tributary 50% Baseline and Closure cumulative volume differences are negligible. The total 50% AEP LoM cumulative volume reduction is approximately 5% relative to the baseline volume due to the inclusion of the Light Vehicle (LV) SME Trucking haul road and stockpile. The cumulative 1% AEP flow volume in the Mungadoo Tributary is approximately 1,660,000 m^3. This volume is reduced by more than half in the LoM and Closure scenarios. Similarly, the 50% AEP cumulative volumes for the LoM and Closure are less than half the 230,000 m^3 cumulative baseline volume.
- The changes in the Mungadoo Tributary catchment peak flows and volumes are due to the pits and OSA consisting of 30% of the local catchment area.
- The changes in the Marillana Creek peak flows are negligible given the steady inflow condition.

Linear infrastructure (haul roads and water supply pipeline) would traverse a number of creeks and drainage lines, including the Marillana Creek (at the Yandi operations) and therefore has the potential to cause ponding and/or reduction of downstream flows during operations. At closure, it is expected that these flows would be reinstated.



Source: Stantec (2024)

Figure 3-13 Regional catchment plan in relation to Development Envelope

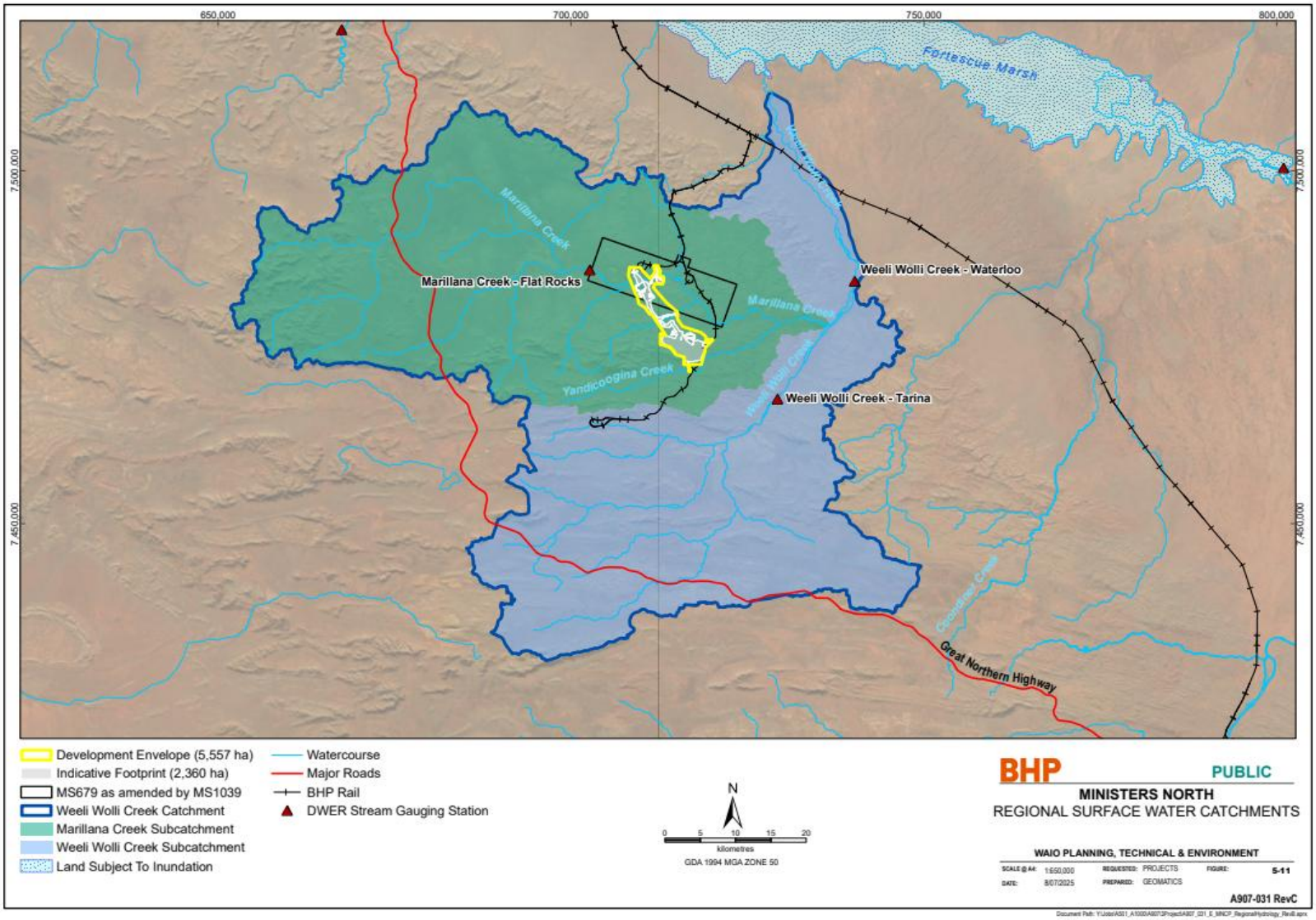


Figure 3-14 Regional Surface Water Catchments

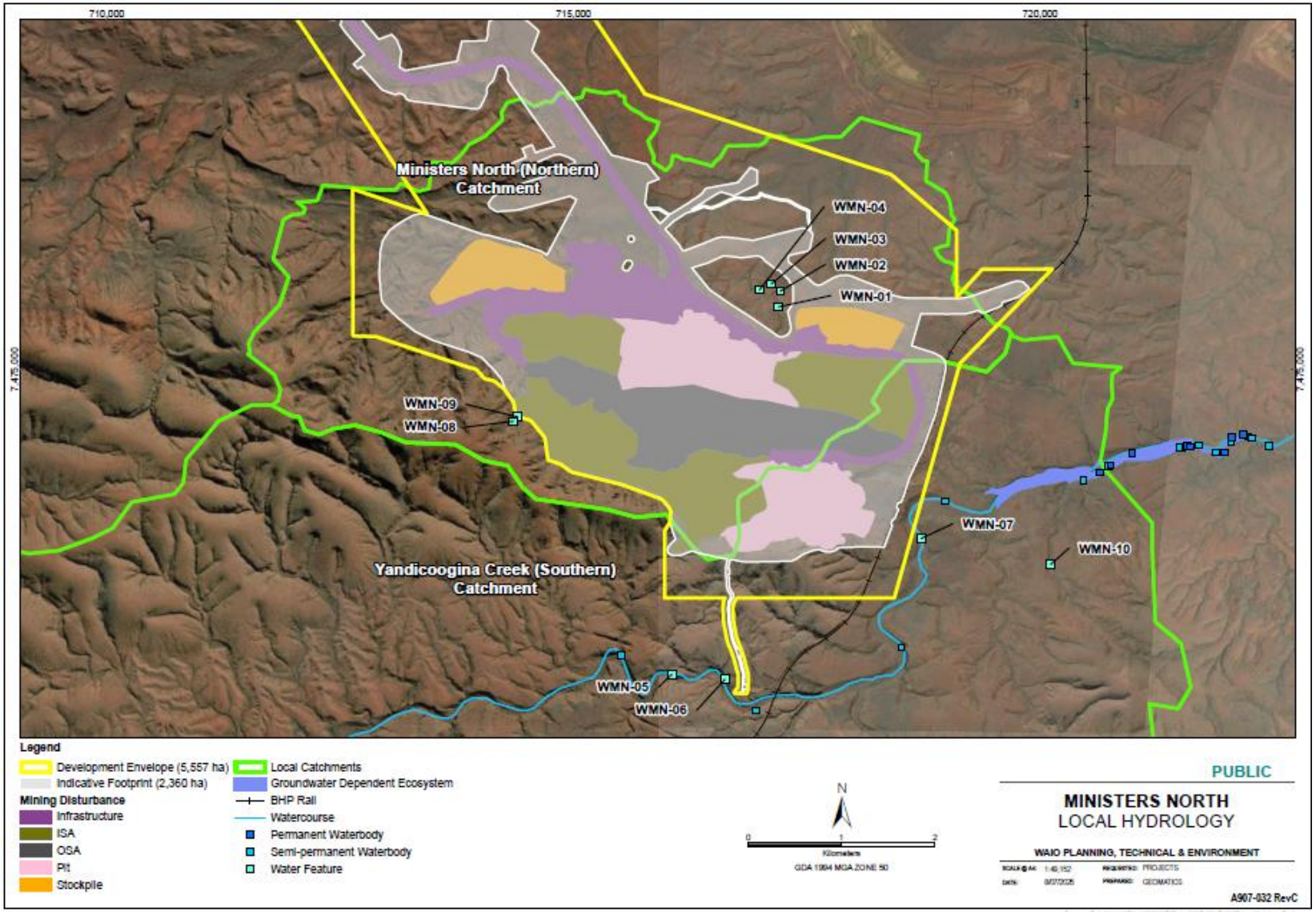


Figure 3-15 Local Hydrology

3.2.4 Groundwater

The Ministers North orebody is hosted within the mineralised Dales Gorge Formation of the Brockman Iron Formation and forms the dominant aquifer system beneath the proposed Ministers North mining area. Groundwater is present within and surrounding the orebody such that it constitutes a fractured rock aquifer. An anticline hinged in the Mt McRae Shale dividing the orebody has resulted in a preferential flow path forming along-strike of the orebodies controlled by the lower permeability units (i.e. McRae Shale, unmineralised Joffre and Weeli Wolli formations) that sit adjacent to the Dales Gorge members. The Keystone Fault is a prominent regional structural feature that is steeply dipping and propagates Northeast – Southwest and has displaced the stratigraphy up to 60m along the fault plane (BHP, 2024g).

Approximately 29% of the known Ministers North orebody is located below the local groundwater table, however, mining will only occur above the water table. Therefore, no groundwater dewatering is required to access the ore for mining.

3.2.4.1 Groundwater levels and flows

Groundwater level monitoring undertaken by BHP in 2017 indicated a relatively flat water table that intersects the incised Yandicoogina Creek valley in the east of the project area. The predicted water level elevation at Ministers North ranges from 566 metres Reduced Level (mRL) in the southwest of the Ministers North deposit to 553 mRL in the east, but throughout most of the drilled orebody zones, the measured water levels range between 564 mRL (over most the orebody) and 562 mRL near the Yandicoogina Creek discharge zone. This is very flat, despite the significant topographic variability across the area. As a result of the topographic variability, the measured depth to groundwater ranges from 40 metres below ground level (mbgl) in the incised creeks near the centre of the deposit to 155 mbgl under the high country in the south of the deposit.

During on-ground investigations and surveys in proximity to Ministers North in 2017-2019, BHP identified an area on Yandicoogina Creek that contains pools that are potentially groundwater-dependent. This suggests that the water table is as high as the ground surface in the base of the valley.

The flat groundwater gradient suggests only very slow groundwater movement through the area. Groundwater contours inferred from measured groundwater levels suggest that there is a general groundwater flow from west to east through the area with a component of northerly flow, particularly in the north of the area.

Monitoring from 2018 to 2022 indicating that groundwater levels across the Ministers North aquifer have been in a steady and mostly consistent decline during that period. Periods of groundwater level rise have been observed following rainfall events, but these seasonable peaks do not interrupt the long-term declining trend.

Mining at Ministers North will be above the groundwater table and so no dewatering of groundwater is required. While there may be some recharge to groundwater from rainfall collected in mine voids, this is not expected to alter the local water balance or groundwater quality significantly as the inflow volumes are predicted to be limited, and it is likely that existing surface drainage over the orebody already provides some recharge.

3.2.4.2 Recharge and discharge

Inflow to the groundwater system is provided via rainfall recharge to the creek alluvium and Ministers North aquifer.

The current conceptual model is that water stored in the Brockman aquifers discharges via the Yandicoogina Creek valley. This conclusion is based on observations of groundwater dependent vegetation and persistent pools in Yandicoogina Creek downstream of the point where the elevation of the creek bed is similar to groundwater levels observed in nearby bores. The water bodies in the discharge zone range from seepages (often under sedges) to large pools.

3.2.4.3 Groundwater quality

There are two bores used to periodically supply water for rail operations within the proposed Development Envelope. These bores are located on the northern limb of the anticline described in Section 3.1.2 (Figure 3-16). Groundwater quality data have been collected from these bores since 2009 (Appendix E-3). A number of additional monitoring bores have been installed across the regions for the purpose of developing numerical groundwater models. However, long term water quality data is not available from those bores.

Data collected between 2009 to 2019 (Appendix E-3) indicate that:

- average pH is slightly basic (7.3 – 8.1)
- average EC is 486 µs/cm which is fresh
- Chromium concentrations are slightly above Australia and New Zealand Guidelines (ANZG) design guideline value (DGV) 95% level of protection of species.
- The remaining analytes are within the 95% protection of species DGV (where available)

At Ministers North, the concentrations and diversity of Per- and Polyfluoroalkyl Substances (PFAS) compounds is low/limited. While there are exceedances of the current Freshwater 99% ANZG Toxicant DGV, concentrations would be below the proposed draft Freshwater 99% Toxicant DGV (0.0091 µg/L), and on most occasions, an order of magnitude lower (BHP, 2025b). The ambient concentrations of PFAS detected is not unexpected and is likely from exploration drilling practices at the time which would

have included fire suppression systems change outs on drill pads and potentially contaminated source water for drilling and drill muds which may have contained PFAS compounds.

As a result of mining, changes to groundwater quality may occur where PAF material is exposed. However, assessment of Acid and Metalliferous Drainage (AMD) risk indicated that Ministers North has a low risk of generating AMD (Section 3.4.1). Consequently, the risk to groundwater quality following mine closure is considered low.

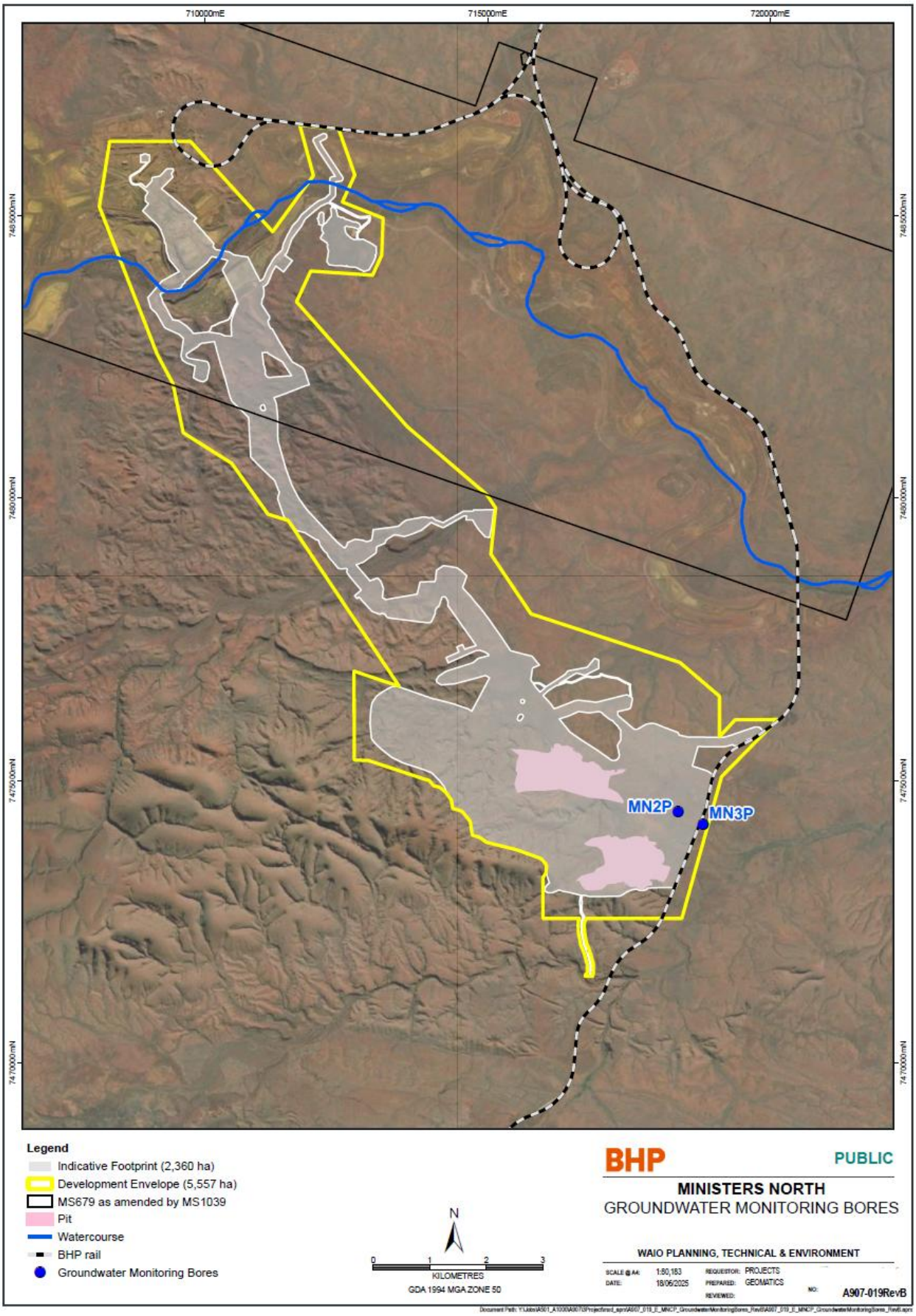


Figure 3-16 Location of Groundwater Monitoring Bores

3.2.5 Ecohydrological assets

Ecohydrology provides an understanding of relationships between hydrological regimes and ecosystems. An ecological asset which has a degree of regional water dependency is referred to as an ecohydrological receptor. An ecohydrological receptor might be sensitive to changes in regional groundwater and/or surface water. In contrast, ecological assets which do not have a regional water dependency, such as ecological systems which rely on direct rainfall or local perched aquifer systems away from mining areas, would not be affected by the construction, operation and closure of a mine.

The key ecohydrological assets within the proposed Ministers North Development Envelope are the pools along Yandicoogina Creek and riparian vegetation within the Development Envelope, as outlined below:

- Yandicoogina Creek/ Yandi Gorge - presence of permanent and semi-permanent pools, and presence of GDV *Eucalyptus camaldulensis*, *Eucalyptus victrix* and *Melaleuca argentea* east of the Development Envelope.
- Marillana Creek - GDV associated with the creek (presence of *Eucalyptus camaldulensis*, *Eucalyptus victrix* and *Melaleuca argentea)*.
- Mungadoo Creek - GDV associated with a tributary to Marillana Creek (presence of potential groundwater dependent species *E. victrix*).
- Central Tributary - GDV associated with a tributary to Marillana Creek (presence of potential groundwater dependent species *E. victrix*).

The Development Envelope is not located within a Public Drinking Water Source Area (PDWSA), with the nearest PDWSA located approximately 55 km to the south-east to service the Newman town site.

Sediment from erosion of constructed landforms such as the OSA could impact on the quality of water within the Yandi pools if erosion occurs prior to or following mine closure. However, supply of groundwater to the pools is unlikely to be impacted by mining at Ministers North as proposed mining operations are above the water table.

Due to the location of Ministers North high in the catchment, changes to catchment flows are unlikely to impact downstream riparian vegetation. However, sediment from erosion of the OSA, stockpiles or ROM could impact riparian vegetation immediately downstream of these landforms.

3.3 Operational Data

As Ministers North is still in the planning phase, no operational data is available at this stage. A discussion on operational data will be included in future versions of this MCP.

3.4 Materials Characterisation

Materials at BHP Pilbara sites are characterised according to their geological, geochemical, and physical characteristics. This characterisation process allows BHP to identify material types and manage their disposal appropriately, including segregation and selective disposal of PAF overburden and selective placement of beneficial overburden. This approach is consistent with the Leading Practice Sustainable Development Program for the Mining Industry *Mine Closure* and *Preventing Acid and Metalliferous Drainage* handbooks (DISER, 2016a; 2016b). The BHP overburden classification system is outlined in Appendix B.

3.4.1 Geochemical characterisation

In accordance with the BHP AMD Management procedure (BHP, 2022a), an AMD risk assessment has been conducted for Ministers North (Mine Waste Management, 2024). This involved a review of BHP's geological assay database and the results of environmental geochemical test work conducted on samples collected from the Ministers North stratigraphic units. Assay data in the geological assay database (which include sulphur, calcium and magnesium concentrations) were available for the lithologies identified in Table 3-11. The key stratigraphy relevant to AMD risk present at Ministers North is the Mt McRae Shale, including associated turbidities. This stratigraphy can be acid generating and was logged in drill core from both the North and South pits (Mine Waste Management, 2024).

Table 3-11 Lithologies logged within the Ministers North pits

Lithological category	Abbreviation
Surface scree	SZ
Vuggy Breccia	VB2
Gravelly Siltstone	GS3
Siltstone	ST3

Lithological category	Abbreviation
Brockman Iron formation, Joffre Member	J1, J2
Brockman Iron Formation, Whaleback Shale	W
Brockman Iron Formation, Dales Gorge Member	D1, D2, D3, D4
Brockman Iron Formation, Colonial Chert Member	D1
Undifferentiated Turbidites	TRB
Mt McRae Shale	RU

Source: Mine Waste Management (2024)

A total of 77,790 sulphur assay samples, comprising 29,044 samples for the North deposit and 48,746 samples for the South deposit, were available for assessment. Mine Waste Management (2024) found that the proposed pit shells for the North Pit and South Pit deposits contain minimal Sulphur with approximately 97.2% of all samples with <0.1 wt%S and approximately 98.4% with Total Sulphur <0.2 wt%S. A total of 1,023 samples have Sulphur greater than 0.5 wt%S and 704 samples exceeding 1 wt%S, with most high Sulphur samples associated with the Mt McRae Shale and Whaleback Shales units.

Environmental geochemical (Acid-Base Accounting [ABA]) test work was conducted for 57 samples collected during exploration drilling at Ministers North (Table 3-12). The sampling protocol was risk-based and thus was skewed towards higher sulphur samples as these are more likely to be acid generating compared to lower sulphur materials (Mine Waste Management, 2024).

Table 3-12 Summary of Acid-Base Accounting (ABA) test work results as a function of stratigraphic units

Stratigraphy	No of Samples	Median of ABA Values				AMD Classification	
		Total sulphur (%)	ANC[1] (kg H_2SO_4/t)	Net Potential Ratio	NAPP (kg H_2SO_4/t)	NAF (no. samples)	PAF (no. samples)
J1	2	0.025	<0.5	0.9	0.7	2	0
W	5	0.042	<0.5	0.1	1.3	3	2
D4	4	0.005	<0.5	0.7	0.1	4	0
D3	3	0.012	<0.5	3.3	0.0	3	0
D2	5	0.009	<0.5	0.4	0.3	5	0
D1	2	0.005	<0.5	1.0	0.1	2	0
TRB	19	0.039	770.1	204.0	-765.3	19	0
RU	17	0.015	1.6	2.0	-0.3	15	2

Source: Mine Waste Management (2024).
Notes: [1]ANC – Acid Neutralisation Capacity

Based on the ABA test work findings (Table 3-12), Mine Waste Management (2024) concluded that:

- The Joffre and Dales Gorge Members (excluding D1) have low potential of both acid generation and neutralisation, with all J1, D2, D3 and D4 samples classified as Non-acid Forming (NAF).
- Of the five Whaleback Shale (W) samples tested, three samples had negligible sulphur (<0.1 wt.%) and two samples had moderate to high sulphur (0.5-1.2 wt%S; 15.3-36.8 kg H_2SO_4/t).
  - The three low sulphur samples were classed as NAF.
  - two moderate to high sulphur samples were classified as PAF due to negligible Acid Neutralising Capacity (ANC). However, both of these samples were collected from 548-555 mAHD and are not expected to be intercepted by mining.
- The two Colonial Chert (D1) samples produced similar results to the other Dales Gorge Member samples. These samples were classified as NAF due to the low overall capacity to generate acidity (Maximum Potential Acidity (MPA) <3 kg H_2SO_4/t).
- Of the 17 samples from the Mt McRae Shale – Upper (RU) tested, 15 samples had lower total sulphur (<0.01 - 0.11 wt%S) and were classed as NAF. Two samples had total sulphur greater than 0.15 wt% (at 2.2 wt%S and 5.2 wt%S) and were classified as PAF. Sulphur speciation test work conducted on these two samples suggested that pyrite is the likely sulphide mineral, but both samples were collected from below the base of the proposed pit shell.
- The acid generating potential for the 19 Undifferentiated Turbidites (TRB) samples was low to moderate (0.11 - 0.58 wt%S) and low to high ANC (<0.5-944 kg H_2SO_4/t) and were classed as NAF and represent a potentially good neutralising source provided that sulphur is low (e.g. no risk of Neutral Metalliferous Drainage (NMD) or Saline Drainage (SD)).

Based on the mining model material balance and the environmental test work results, the risk of AMD from waste rock or wall rock exposures resulting from the Ministers North above water table development has been assessed as low. In addition, the risk of generating adverse NMD or saline drainage associated with neutralisation of oxidation products has been assessed as unlikely (Mine Waste Management, 2024).

Mine Waste Management (2024) summarised the following in relation to overburden characteristics:

- More than 99% of the total waste rock volume is classified as AMD Class 0 (NAF) and no waste or ore blocks are classified as AMD Class 1.
- Only 0.2% of the total waste rock volume (132,800 m^3) is classified as AMD Class 2, with most of this material (88%) being Whaleback Shale. Most of this material (~95%) occurs approximately 70 m above the estimated groundwater table (approximately 566 mRL), with the remaining material (~5%) occurring at the estimate groundwater level. This material has been assessed as having a low AMD risk.
- A very small amount of AMD Class 3 waste rock (6,600 m^3) is predicted to occur at Ministers North. This represents <0.1% of the total waste rock to be generated at Ministers North and has been assessed as representing a low AMD risk with respect to both material volume and acid generating potential.

The total exposed area of the pit shells is approximately 7 Mm^2, with virtually the entire surface expected to be NAF - AMD Class 0 (>99.9%) (Table 3-13). A very small exposure of AMD Class 2 waste rock may occur on the northeast wall of the South Pit, but this likely reflects non-acid generating sulphates (e.g. gypsum-type sulphur). The predicted exposure is equivalent to <0.1% of the overall surface. This represents a very low AMD risk as it is unlikely that the insignificant predicted exposures of AMD Class 2 wall rock would influence pit drainage quality, with the water quality signature likely to be controlled by the AMD Class 0 waste rock which comprises more than 99.9% of the pit shell (Mine Waste Management, 2024).

Table 3-13 Surface area of exposed pit wall per AMD class

AMD Class	Approximate Total Area (m^2)	Proportion of Total Area (%)
0	7,098,000	>99.9%
1	-	-
2	3,000	<0.1%
3	-	-
Total	**7,101,000**	**100%**

Source: Mine Waste Management (2024)

BHP's classification system is conservative for AMD Class 2 and 3 as it is based on the assumption that all sulphur is associated with sulphides, artificially increasing the Net Acid Production Potential (NAPP) value, and the AMD hazard of these waste types. Specifically, it is known that sulphur in the oxidised zone is not associated with sulphides but is associated with non-acid generating sulphates such as gypsum or barite, and/or sparingly soluble acid sulphate salts (alunite). The latter have a much lower capacity for acidity generation compared to pyrite and thus pose a much smaller environmental hazard, if present in the oxide zone. Therefore, with the consideration to non-acid generating sulphate, it is likely that the AMD Class 2 and 3 materials identified at Ministers North represent an even lower AMD risk than predicted (Mine Waste Management, 2024).

The risk of generating adverse NMD or saline drainage associated with neutralisation of oxidation products has been assessed by Mine Waste Management (2024) and is considered to be unlikely. Generally, the deposit contains very little sulphur and therefore the opportunity for neutral metalliferous or saline drainage to form as a result of sulphide oxidation is negligible (Mine Waste Management, 2024).

3.4.2 Physical characterisation

As discussed in Section 3.1.2, the Ministers North deposit is located within the Brockman Iron Formation. BHP has conducted material characterisation and erosion simulations and field studies on waste types from the Brockman formation, and associated stratigraphic units, across the Pilbara operations (Landloch, 2016). The waste material classes in Table 13-1 have been derived from the results of this material characterisation program.

Erosion analyses are informed by physical modelling including rainfall simulation and overland flow conducted under laboratory conditions using predicted rainfall events based on local rainfall data. Laboratory simulation of rainfall and analysis of overland flow is undertaken over a range of gradients to quantify:

- Interrill erodibility;
- Rill erodibility;
- Critical shear; and
- Effective hydraulic conductivity.

These data are then used in numerical modelling to assess how well a specific waste rock type (or blends of waste types) behave under surface flow conditions. Numerical modelling tools used include Water Erosion Prediction Project (WEPP) model, SIBERIA landform evolution model and the Revised Universal Soil Loss Equation (RUSLE). The variability of the erosion modelling inputs for different materials commonly found at BHP's Pilbara sites is illustrated in Figure 3-17.

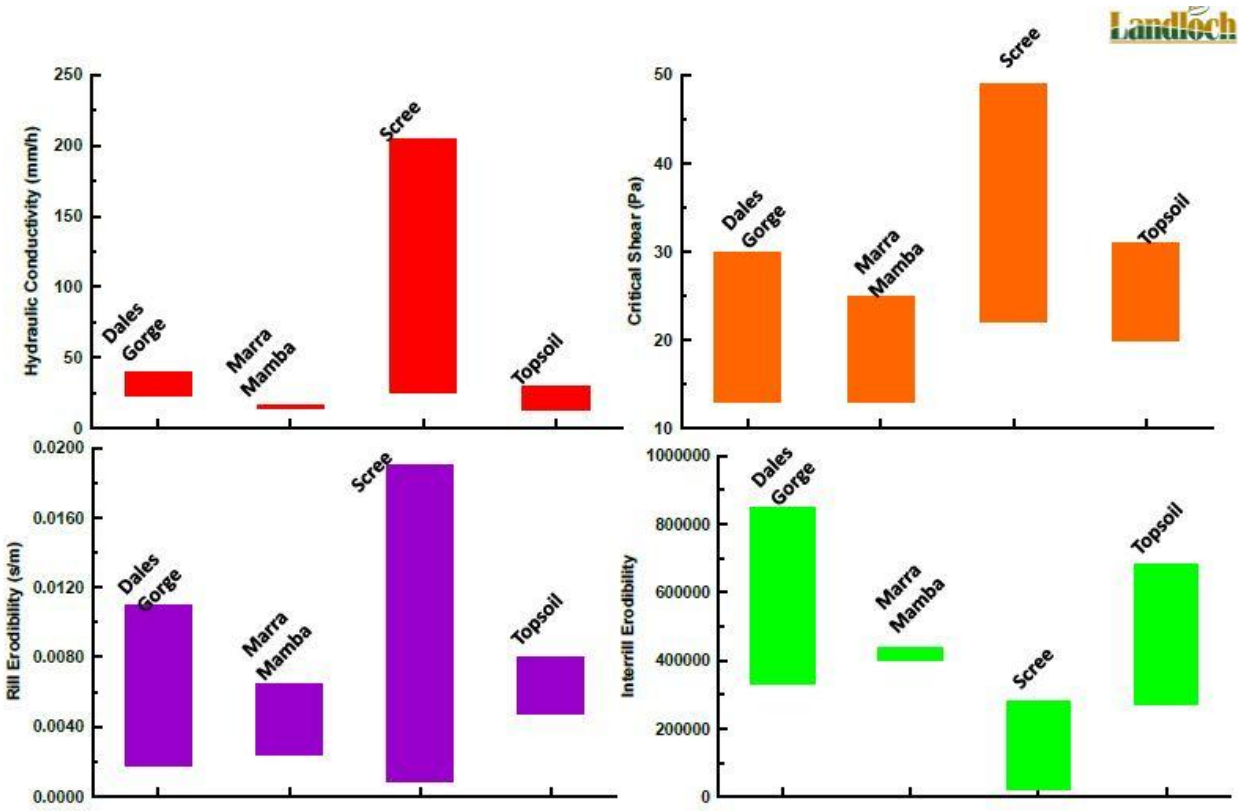


Figure 3-17 Variability in WEPP erodibility parameters for wastes and soils of BHP's Pilbara Operations

SIBERIA modelling (Landloch, 2016) has been used to analyse the performance of alternative landform design options including:

- Design profiles (linear slopes, concave slopes and bench and berm designs);
- Slope heights and angles; and
- Waste types including mixes (i.e. rockier material, growth media).

Outcomes of modelling corroborate that erosion is a function of the rock size distribution (well graded), slope grade and height. The application of concave slopes and augmentation of additional rock percentage to poorer performing waste material both successfully improve performance.

A WEPP model sensitivity analysis (Landloch, 2016) has shown that erosion performance is most sensitive to critical shear (rock size) which is a measure of the shear stress applied by concentrated flows at which particles begin to detach. Given that approximately 85% or more of all erosion on steeply sloping mine slopes is caused by concentrated flows contained within rills and gullies, critical shear is a key parameter.

At the early stage of mine planning such as has occurred for Ministers North, OSA footprints and waste material placement plans are defined based on the materials classifications outlined in Table 13-1. The Mine Closure Design Guidance Technical Process Instruction (WAIO, 2022e) outlines how different waste types can be used and where they can be placed within an OSA. (Different waste types are described in Appendix B-2). For example, WMAT 1 wastes can be placed anywhere, with a preference given to use on the final surface of an OSA as rock armour. WMAT 2 and 3 must be placed beneath WMAT 1 wastes due to low erosion resistance. The procedure also identifies different indicative OSA slope designs based on broad material class. This informs the "tip to" design of an OSA. Over the life of the mine, more detailed characterisation of available waste types is conducted which is used to refine OSA designs for closure. Section 3.4.3 outlines the volume of different classes of waste material at Ministers North based on current mine planning information.

3.4.3 Volume and availability

The overburden classification types and estimated quantities to be mined over the proposed Ministers North Life of Asset (LoA) are presented in Table 3-14. All mining will occur above the water table. Approximately 30% of the overall overburden balance is

WMAT 1 (competent) overburden which is expected to be extracted at reasonably consistent levels throughout the LoA, subject to mine planning. Initial estimates of the surface area of the ex-pit OSA is in the order of 0.6 Mm^2, and therefore, it is expected that there would be more competent waste than required to surface the ex-pit OSA if used at 1 m thick in accordance with the Mines Closure Design Guidance Technical Process Instruction (WAIO, 2022e). In addition, up to 18 Mm^3 of more erodible wastes (Class 2 and 3) may be placed within ISAs, thereby minimising the potential for sediment from erosion to impact surrounding areas.

As mining progresses, handling of overburden and refinement of landform designs (particularly in relation to geomorphic design[3] of the southern wall of the South Pit and the southern extent of the Central OSA) will be informed by materials characteristics data collected from overburden as it is extracted during mining.

Table 3-14 Ministers North LoA overburden quantities to be mined above water table

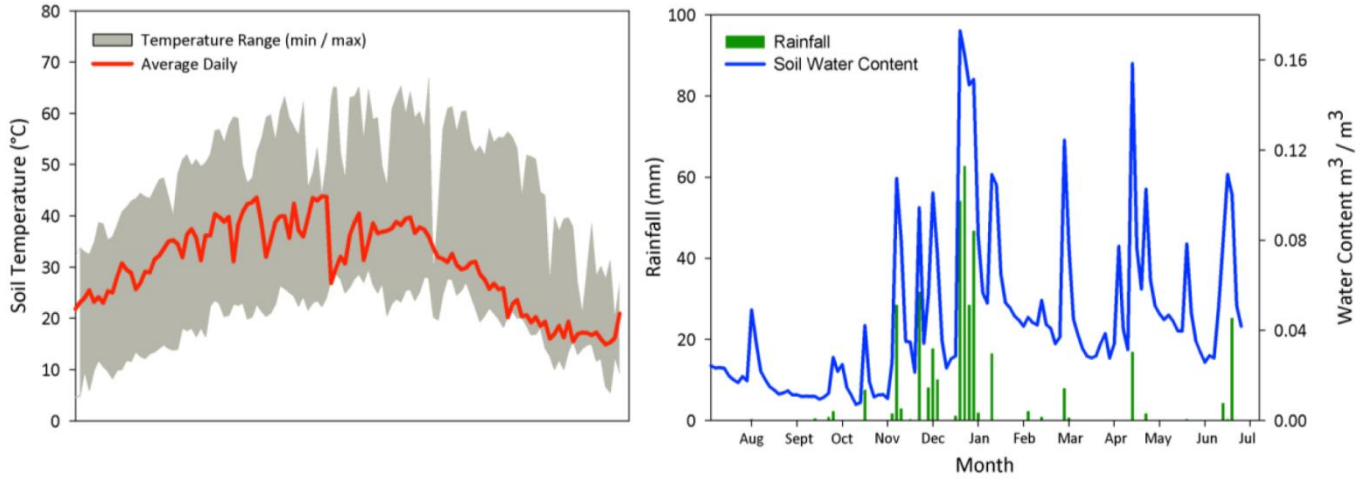
AMD Class 1 (AMD1)	0
AMD Class 2 and 3 (AMD2 and AMD3)	0.57
Inert Material Class 1 (competent) – WMAT1	27
Inert Material Class 2,3 - (WMAT2, WMAT3)	59
Fibrous	0.02
Total	**86**

3.4.4 Pilbara soil environment

Site specific soil data has not been analysed but is indicative of the broader soil profiles across the Pilbara region. The Pilbara soil environment generally encountered at other nearby BHP sites is summarised below (Figure 3-18):

- Soil temperatures range from a low of 5°C during winter to over 65°C during summer.
- Soils experience intermittent periods of wetting and drying, which occurs more frequently during the summer months (December to March).
- During intense summer rainfall events soil temperatures drop with the influx of soil moisture (for example, from 65°C to 25°C when fully saturated).
- Following a large rainfall event, due to high evaporation rates, soil dries quickly (with soil moisture rarely persisting in the top 5 cm of the soil profile beyond one week).
- Lower evaporation rates from May to August mean that smaller rainfall events that occur during this time can lead to relatively high soil moisture levels, but these increases in soil moisture are short-lived due to evaporation.

[3] In the context of mine closure, geomorphic design refers to an engineered design of landforms based on natural systems and the principles of geomorphology, rather than using traditional, linear, and angular engineered designs. Geomorphic design aims to develop functionally stable and self-sustaining landforms, replicating the intricate shapes and processes in stable, natural landscapes that have evolved over extended periods. This process replicates natural landforms and drainage systems to guide water over the landscape while effectively reducing sediment.



Notes: Recorded during 2013/2014 at a depth of 3-5 cm below the soil surface at a site in the Pilbara near Newman, WA

Source: Erickson et al. (2016)

Figure 3-18 Relationship between soil temperature, rainfall and soil moisture content

Temperature and soil moisture are inter-related and influence germination and establishment in the field. The majority of species will germinate over a wide temperature range (10 to 35°C), but require ample moisture, which is characteristic of cyclone rain events (with at least four rain events occurring within a 10-day period). Germination for most species occurs in spring and summer (December to March) in correspondence with the highest moisture levels in the Pilbara (Restoration Seedbank Initiative, 2020a; 2020b; 2020c).

3.4.5 Soils characteristics

The most recent and detailed mapping of WA's Rangelands and Arid interior was collated by Tille (2006) into a hierarchy of soil-landscape mapping units. Ministers North is in the Fortescue Province, an area that occupies 160,050 km^2. The Fortescue Province contains ten soil-landscape zones. Ministers North is located within the Hamersley Plateaux Zone, which covers approximately 44,450 km^2 and is described by Tille (2006) as:

> *'Hills and dissected plateau (with some stony plains and hardpan wash plains) on sedimentary and volcanic rocks of the Hamersley Basin (Ophthalmia Fold Belt). Stony soils with Red shallow loams and some Red/brown non-cracking clays and Red loamy earths.'*

The soils associated with the dominant land systems intersected by the proposed Ministers North Development Envelope (Newman and McKay) are outlined in Table 3-15.

Soils across the study area are already substantially disturbed due to long-term pastoralism and vegetation clearance (BHP, 2025b).

3.4.6 Topsoil balance

Topsoils will be recovered and stored in accordance with the Growth Media Management Procedure (WAIO, 2022d). Topsoil volumes recovered would depend on the topsoil depths in the areas cleared, but an initial estimate of the topsoil likely to be recovered is 1.5 Mm^3. The volume of topsoil required at closure is influenced by the final landform design. Initial estimates are that topsoil requirements may be in the order of 1.4 Mm^3. The topsoil balance will be refined as mine plans are finalised and recovered topsoil depths are known.

Across BHP's Pilbara operations generally there is a shortage of topsoil, and ongoing investigations are assessing the suitability of various waste types at these sites as growth media to be used during the rehabilitation process. This effort is captured under a unifying database (the Growth Media Atlas). Assessment involves testing potential growth media material along with relevant analogue material for chemical, fertility and physical analytes. As new areas are identified for rehabilitation and more soil samples are collected, the Growth Media Atlas will continue to develop and expand. A comparison of the plant available nutrients and structural attributes of alternate growth media material with nearby analogue systems informs rehabilitation planning and the need for soil ameliorants or fertilisers. Learnings from this programme would be applied to Ministers North as appropriate.

Management of soils is addressed in Appendix I-5.

Table 3-15 Soil associations of the Newman and McKay land systems

Soil description	Landform Unit where soil is found							
	Plateaux, ridges, mountains, hills and breakaways		Lower slopes		Stony plains		Narrow drainage floors with channels	
	Newman	McKay	Newman	McKay	Newman	McKay	Newman	McKay
Stony soils These soils are very shallow to shallow (<25 – 50 cm) and skeletal or poorly developed. They vary depending on the parent rock. Soils formed on basalt, shale or metamorphic rocks range from fine sandy loam to loam or clay loam. Generally acidic to neutral. Some may be alkaline. Soils formed on granite rage from loamy coarse sand to sandy loam and are acidic to weakly acidic.	✓	✓	On upper margins	-	✓	-	-	-
Red shallow loams These shallow loams often overly weathered rock. The thin (1 – 10cm) topsoil ranges from sandy loam to clay loam and overlie thin to medium (10 – 30cm) subsoils of sandy clay loam or clay loam.	✓	-	-	✓	✓	Minor	✓	-
Red shallow sands These soils are uniform textured coarse sands or medium textured sands overlying weathered granite, sandstone or red brown hardpan at shallow (25-50 cm) depth. Mostly neutral and non-saline topsoils and subsoils. The soils are mostly acidic to neutral and non-saline. Those occurring on or with dolerite, shales and basalts tend to be alkaline.	Some	-	-	-	-	-	-	-
Red shallow sandy duplex soils Have thin to medium (10 – 20 cm) topsoils of loamy sand to sandy loam overlying medium (10 – 30 cm) subsoils of sandy clay loam to light clay. The soils contain very few to few coarse fragments and soil colour is primarily dark reddish brown to red. Soils reaction is dependent on location in the landscape unit with those on hillslopes or hillcrests trending to weakly acidic or neutral, those within drainage tracts, alluvial or stony plains generally neutral and those within saline plains, calcrete or areas dominated by basalt trending to alkaline.	-	-	-	-	-	Minor	-	-
Red loamy earths Red loamy earths soils exhibit thin to medium (10-30 cm) loam to clay loam topsoils overlying thick (30-60 cm) clay loam to light clay subsoils. The soils are dark reddish brown in colour, non-calcareous, non-saline and neutral to slightly alkaline.	-	-	On lower margins	-	Some	-	✓	✓
Red deep loamy duplex soils These deep (>100 cm) soils have thin to medium (10 – 30 cm) topsoils of loams or light sandy clay loams overlying thick (>60 cm) subsoils of clay loams or light to medium clay. Soil surfaces have either a mantle of stone or cryptogram crusts. Soils are dark reddish brown to dark red and few coarse fragments. Topsoils are mostly neutral, and subsoils are alkaline to occasionally strongly alkaline. Some subsoils are calcareous.	-	-	-	-	-	✓	-	-
Channels with riverbed soils Soils either poorly developed or occur as a minor component of the area. The poorly developed soils are juvenile or recent alluvial deposits associated with active drainage channels, levees, or flood plains of major and minor creek or river systems. Soil depth varies. Soils exhibit sediment layers of coarse loose sand, clayey sand, silty sand and silty clay often with layers containing water-worn rocks, boulders and pebbles. Juvenile soils are mostly weakly acidic to neutral (pH 6.0-7.5) and non-saline.	-	-	-	-	-	-	✓	✓

Source: van Vreeswyk (2004)

3.5 Contaminated sites

There are 11 known or potentially contaminated sites within the proposed Ministers North Development Envelope. These are all associated with the existing Yandi operations and are located in the northern portion of the proposed infrastructure corridor. These sites are all managed via the Yandi MCP (BHP, 2025a) and are not addressed further in this MCP. There are no known or potential contaminated sites within the portion of Ministers North that lies south of the Yandi Development Envelope.

As Ministers North will not be dewatering, water supply for construction and operations will be provided from external sources including but not limited to Yandi (BHP, 2025b). Therefore, potential for contamination from these sources has been considered.

Baseline PFAS sampling across Yandi mine, Ministers North and Yandicoogina Gorge has identified PFAS at trace levels only (marginally at or above the lowest 99% ecological guidelines). There is potential for migration of PFAS contaminants to occur with the transport of water across sites. Despite the low risk of PFAS contamination, as a precautionary measure, BHP has proposed monitoring at the source and local reinjection areas for the Yandicoogina Gorge supplementation trial which has subsequently been conditioned under DWER Licence L6168/1991/11. Additional investigations are ongoing for Ministers North and BHP commits to manage PFAS accordingly.

Any contamination arising during the course of the Ministers North operation would be managed in accordance with the Contaminated Sites Management Procedure (WAIO, 2023c) and investigation would be prioritised in accordance with risk, as discussed with DWER.

3.6 Other closure related data

As Ministers North is still in the planning phase, there is no other closure related data to report at this stage. Research and studies from other sites, relevant to closure planning for Ministers North are described in Section 8.3 and Appendix F and are also reported in Western Australian Iron Ore (WAIO) Annual Environmental Reports (AER).

3.7 Data analysis and implications for mine closure

The knowledge base for Ministers North is described throughout Section 3 and is based on the most current available information. The knowledge base informs all aspects of closure planning including, the environmental and social setting that influences post mining land uses, the identification of risks that will need to be managed at closure, and the closure activities that will need to be implemented to mitigate those risks.

This section provides an analysis and interpretation of the key environmental data and how it has informed the understanding of closure risks and potential mitigation measures.

Data gaps have also been summarised in this section (Table 3-16) and will be addressed in the forward work program (Table 12-1).

3.7.1 Analysis

3.7.1.1 Climate

Rainfall and evaporation affect the growing conditions for vegetation and severe rainfall events can cause erosion. An understanding of climatic conditions is critical to the design of permanent engineered structures and the design of revegetation programs. Changes in climate may affect the performance of these treatments. Climate change predictions have been incorporated into modelling undertaken for this MCP, recognising that there is an inherence level of uncertainty associated with climate change projections.

No major knowledge gaps have been identified that would influence closure outcomes. However, BHP is in the process of updating climate change predictions to 2090 based on the latest generation of climate models. Relevant data will be incorporated into future revisions of the MCP. Using this updated data, a climate change resilience assessment will be undertaken on proposed closure strategies as detailed designs are developed.

3.7.1.2 Land Systems

Land systems influence soil type, vegetation type and structure. Through collaborative interactions with Banjima, BHP has committed to applying geomorphic design principles to closure landforms in proximity to Khargoonha. The adoption of geomorphic design principles will require a detailed and site specific understanding of the characteristics of the adjacent topography, soil type, surface water flow systems and vegetation complexes that the constructed landform will need to integrate into. Although it is understood that Khargoonha sits within the Newman Land System (Section 3.1.4), a detailed understanding of the land characteristics specific to Khargoonha is required.

Understanding of land systems also informs the development of rehabilitation programs, including revegetation.

3.7.1.3 Landscape and visual amenity

Visual amenity, particularly in relation to Khargoonha, has been identified as an important issue to the Banjima People and BHP has committed to utilising geomorphic design principles to protect the visual amenity of the area.

A broader visual amenity assessment of the project area was undertaken during early planning of Ministers North (Section 3.1.7), however, the study did not specifically consider landscape views relevant or significant to the Banjima People. Ongoing collaboration will be undertaken with the Banjima People to ensure visual amenity associated with landscape views are considered in detailed design of final landforms.

3.7.1.4 Flora and vegetation

BHP has undertaken flora, vegetation and fauna surveys across the Ministers North Development Envelop and surrounds and has developed a good understanding of the current characteristics. Future revegetation programs will be informed by the baseline data that has been collected prior to mining. In addition, a preliminary understanding of plants that have significance to the Banjima People was obtained through an on country ethnobotanical survey conducted in 2024 (Walsh, 2024). Further work is required, in collaboration with the Banjima People, to ensure culturally significant species are incorporated into rehabilitation program (and seed mixes). This will include further identification of cultural keystone species.

3.7.1.5 Water

Most of the surface water across the Development Envelop occurs as ephemeral flows associated with storm events (Section 3.2.3). There is therefore a paucity of baseline data associated with streamflow velocity and volume and quality. Knowledge of surface water flows, particularly associated with flood events, influences final landform designs. This may relate to erosion and erosion control, impacts of overland flow regimes (reducing or concentrating) or sedimentation of receiving environments.

Preliminary modelling has been conducted to inform conceptual design of operational and closure structures. Closure responses incorporated into the MCP include a commitment to remove the haul road, including culverts and other infrastructure, to ensure a

return to pre-mining flow regimes along the route. Further data collection and refined modelling will be required throughout the mine life to inform detailed design of final closure landforms.

3.7.1.6 Materials characteristics

The characteristics of waste rock removed during mining will influence the management measures undertaken throughout the mine life and the design of closure landforms. Both geochemical and physical characteristics inform the treatment of overburden. Comprehensive materials characterisation has been undertaken at Ministers North, based on the geological assay database and the results of environmental geochemical test work conducted on samples collected from the Ministers North stratigraphic units. An AMD risk assessment was conducted on this data (Section 3.4.1) and found that the risk of AMD from waste rock or wall rock exposures is low. In addition, the risk of generating adverse NMD or saline drainage associated with neutralisation of oxidation products was also assessed as unlikely.

Ministers North is located within the Brockman Iron Formation (Section 3.4.2). BHP has conducted material characterisation and erosion simulations and field studies on waste types from the Brockman formation, and associated stratigraphic units, across the Pilbara operations. Physical characterisation data from these studies has informed the conceptual closure designs developed for Ministers North.

Geochemical and physical characterisation will continue to be undertaken on waste as it is incurred during mining, and the outcomes will inform detailed design of final closure landforms. This will be of particular relevance to the geomorphic design against Khargoonha (Section 8.5.1).

A preliminary topsoil balance has been developed based on projected disturbance footprints and conceptual designs for rehabilitation. The topsoil balance will continue to be updated as the site is constructed and as landform designs are finalised.

3.7.2 Knowledge gaps and further work

Knowledge gaps identified during assessment of baseline data are summarised in Table 3-16, together with the implication of not having this information. Proposed forward works to address the knowledge gaps is provided in Table 12-1 of Section 12.3.

Table 3-16 Knowledge gaps requiring further work from assessment of baseline

No.	Aspect	Knowledge Gap	Implications of not having information
1	Visual amenity	BHP has committed to applying geomorphic design principles to closure landforms in proximity to Khargoonha. Although it is understood that Khargoonha sits within the Newman Land System (Table 3-5), a detailed understanding of the land characteristics specific to Khargoonha is required to support the geomorphic design and construction process. This will also require and understanding of site-specific information such the material characteristics and soil conditions, hydraulic factors, topography of upstream and downstream catchments and essential flow paths.	The intent of geomorphic design is to create functionally stable and self-sustaining landforms that replicate the intricate shapes and processes in stable, natural landscapes that have evolved over extended periods. Detailed characterization of the surrounding landscape is required to inform the geomorphic design.
2	Visual amenity	The landscape views relevant or significant to the Banjima People have not been fully assessed. Consultation with the Banjima People to date has resulted in a commitment to incorporate geomorphic design into some of the landforms in proximity to Khargoonha. Detailed designs associated with these landforms will be developed based on the site-specific characteristics associated with the landforms and though ongoing collaboration with the Banjima People.	Completion criteria associated with post mining land use and the values of the Banjima People cannot be developed without an understanding of landscape views that are relevant or of significance to them. Although there has been consultation regarding protection of Khargoonha, further discussions are required.
3	Pit stability	Zone of Instability (ZOI) of pit voids has not been assessed.	The ZOI informs the location of final structures such as OSA, abandonment bunds and surface water infrastructure. The location and designs associated with these structures remains conceptual until ZOI is understood.
4	Revegetation	A preliminary understanding of plants that have significance to the Banjima People was obtained through an on-country ethnobotanical survey conducted in 2024 (Walsh, 2024). Further work is required, in collaboration with the Banjima People, to ensure culturally significant species are incorporated into the rehabilitation program (and seed mixes). This will include further identification of cultural keystone species.	If species of cultural significance are not incorporated into rehabilitation programs, then the final rehabilitated landscape may not meet the post mining land use expectations of the Banjima People.

No.	Aspect	Knowledge Gap	Implications of not having information
5	Surface water	Baseline surface water data is limited because of the ephemeral nature of the water systems in the region. The baseline data has been used to inform preliminary modelling of surface water behaviour. However, additional data will need to be collected, such as: • Additional surface water quality information to inform completion criteria. • Updated surface water modelling to support final closure designs. • Requirement for, and design of, minor surface water diversion, flood protection bunding and erosion controls for the closure landform.	There is a high level of uncertainty in models such as flow or flood modelling where input (baseline) data for the model is limited.

4 Stakeholder engagement

BHP recognises the importance of engaging with relevant stakeholders. The ability to build relationships and work collaboratively and transparently with our host communities is critical to the Company's long-term success. BHP has established a comprehensive consultation program to support ongoing, effective dialogue with stakeholders potentially impacted by, or interested in, the implications of the Company's operations. This approach is consistent with BHP's Charter that states a commitment to supporting communities and the BHP Code of Business Conduct that articulates how this underpins how the Company does business:

> *"Our ability to build relationships and work collaboratively and transparently with our host communities is critical to our long-term success. Our aim is to be the company of choice, valued and respected by the communities in which we operate. We do this by engaging regularly, openly and honestly with people affected by our operations, and by taking their views and concerns into account in our decision-making."*

BHP is committed to Free, Prior and Informed Consent (FPIC) as outlined in BHP's Indigenous Peoples Policy Statement (BHP, 2022b). The policy statement recognises FPIC as an important process to safeguard the collective rights of Indigenous Peoples and commits to carrying out informed and good faith consultation and providing the support necessary to strengthen the capacity of BHP and Indigenous Peoples to participate effectively in consultations. As such, development of Ministers North is being undertaken in collaboration with the Banjima People through BNTAC, as described in Section 3.1.5.

BHP has also initiated a consultation program relating to Ministers North with government agencies (both State and local) and landowners and Traditional Owners based on interest and proximity to the project location. The objectives of the program are to address the requirements of MS 1105 *Guidelines for submitting a derived proposal*: specifically, 1 (e) stakeholder engagement by:

- Providing information and the opportunity to comment to government agencies and other stakeholders who may potentially be interested in proposed activities (including closure and rehabilitation) at Ministers North;
- Identifying the key issues and concerns of government agencies and other stakeholders in regard to the design and management of activities (including closure and rehabilitation) at Ministers North;
- Discuss objectives for the development of Ministers North and its ultimate rehabilitation and closure.

Subject to the Part IV assessment process the consultation program would continue to:

- Periodically provide updated information and results of the development and closure planning process to government agencies and other stakeholders as more information comes to hand; and
- Allow for adjustments to the design and/or management of any proposed activities to accommodate concerns or issues raised by government agencies and other stakeholders, where relevant.

4.1 Stakeholder identification and engagement

BHP's locally based Community and Indigenous Affairs team are active members of Pilbara communities and through continued community engagement they have established:

- Supportive working relationships between BHP and local Pilbara communities;
- An environment conducive to productive dialogue;
- An understanding of key issues and concerns of the community in relation to developments in the area; and
- An avenue to share key project information as it becomes available.

As part of the broad consultation program for Ministers North, BHP will continue to consult with identified stakeholders on closure related issues during each project phase (pre-approval, operations, rehabilitation and post closure) to ensure that legal requirements, risks and internal and external stakeholder expectations for the closure of Ministers North are taken into account at an appropriate time and as far as practicable.

Development of the Ministers North proposal is being undertaken in collaboration with the Banjima People through BNTAC. BHP has an ongoing relationship with the Banjima People which is formalised through a Comprehensive Agreement and associated registered ILUA. The Comprehensive Agreement includes a heritage protocol supporting the identification of heritage and cultural values within the determination area and the management of BHP's activities to minimise impact on cultural heritage and protect cultural heritage values from significant harm.

Representatives from both BHP and the Banjima Traditional Owners meet regularly through the established HAC. This forum is an important part of the relationship between BHP and the Banjima Traditional Owners which enables sharing of information, feedback from recent engagements and identification and discussion of concerns and decision making in relation to matters including heritage and environment. BHP maintains an ongoing relationship with BNTAC through regular communication and the pathways prescribed in the Comprehensive Agreement.

BNTAC has developed mine closure objectives, principles (i.e., ethical and behavioural values) and outcomes (i.e., end-state values) for closure of all mines across the Banjima Native Title Determination Area. The objectives, principles and outcomes

(Appendix H) inform ongoing collaboration between BHP and the Banjima People. Specifically, in relation to the Ministers North Derived Proposal, BHP has consulted with Banjima Traditional Owners in relation to the current Derived Proposal through on country Social Surroundings engagements in May 2024, September 2024 and April 2025. The purpose of the on country engagements was for BHP to better understand the broader social, cultural and heritage values of their lands, to understand and respond to any concerns in relation to the potential impacts of the Derived Proposal, and to work together to identify priorities for avoidance and management.

BHP has prepared a Project Management Plan (PMP) (confidential) in consultation with Banjima Traditional Owners through BNTAC. The Ministers North PMP identifies and sets out the agreed management of Aboriginal Cultural Heritage and Social Surroundings values affected by, or in proximity to, the Ministers North Operation.

The Ministers North PMP documents the outcomes of consultation and was developed by BHP in consultation with BNTAC in April 2025, endorsed by the Banjima Heritage Advisory Council in May 2025, and finalised in June 2025. Finalised copies of the Ministers North PMP have been provided to BNTAC, BHP, and the Banjima Heritage Manager.

In accordance with DMPE (DEMIRS, 2025), BHP considers the key stakeholders for closure at Ministers North to be post-mining owners or managers, including Traditional Owners and relevant regulators. Given the project is still at the referral phase, the focus of consultation at this time is with the Banjima and regulators.

Subject to proposal approval, closure specific consultation would increase as the project approaches the cessation of mining (nominally within five years of closure) with a broader range of stakeholder groups such as those listed below.

Landowners and managers

- Traditional landowners Banjima People; and
- Juna Downs and Marillana Creek Pastoral Station Managers.

Government agencies:

- EPA;
- Department of Water and Environmental Regulation (DWER);
- Department of Mines, Petroleum and Exploration (DMPE) (previously DEMIRS);
- Department of Local Government, Industry Regulation and Safety (LGIRS) (previously DEMIRS);
- Department of Planning Lands and Heritage (DPLH);
- Department of Biodiversity, Conservation and Attractions (DBCA);
- Department of Energy and Economic Diversification (DEED) (previously DJTSI);
- Shire of East Pilbara;
- Department of Transport and Major Infrastructure (DTMI);
- Main Roads Western Australia;
- Department of Health;
- Heritage Council of WA;
- Department of Primary Industries and Regional Development (DPIRD);
- Pilbara Development Commission; and
- (Federal) Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Local Governments and politicians:

- Shire of East Pilbara;
- Local Member for the Pilbara;
- Minister for Environment;
- Minister for Water;
- Minister for Mines and Petroleum;
- Minister for Heritage;
- Minister for Local Government; and
- Minister for Regional Development

Communities/Local and Regional Groups:

- Newman Community Consultative Group;
- Newman Chamber of Commerce and Industry;

- Wildflower Society of WA;
- Conservation Council of WA;
- Greening Australia;

Other:

- Employees and contractors.

An indicative program for consultation to be conducted in advance of the next closure plan update (three-yearly cycle) is shown in Table 4-1.

Table 4-1 Stakeholder consultation program

Stakeholders	Timing	Communications
Banjima Native Title Aboriginal Corporation (BNTAC) and Banjima people[4]	Two days twice per year plus special meetings to address urgent matters if required	Implementation committee meetings Address Banjima comprehensive agreement implementation including employment, business development, closure and health / wellbeing of Banjima community as well as a number of other matters.
	Subject to business needs, but recently has been two days quarterly	Heritage Advisory Committee Forum to discuss heritage related matters and projects, including Cultural Heritage Management Plans. This would include matters such as repatriation of cultural artefacts post-closure.
	Two times per year	**HAC Closure sub-committee** A sub-committee of the HAC will meet routinely to workshop mine closure. The workshops will be used as a forum for BHP and BNTAC to collaborate on future development of the MCP for the Ministers North Operations, having regard to capturing the intent of the Banjima Closure Principles and Outcomes (Appendix H). The MCP will be refined in collaboration with the Banjima People throughout the mine life. The workshops will also be used to discuss other closure-specific issues in further detail with the aim of informing the closure approach for Ministers North including: • Landform designs including visual amenity • Post mining land use requirements for safe access, including access to sites of cultural significance. • Rehabilitation outcomes and completion criteria.
	Ongoing as part of regular stakeholder consultation (nominally associated with any new development proposals, at a minimum with each MCP update).	Progressive rehabilitation and technical studies update. Post-closure land use considerations.
Pastoral Station managers	Ongoing as part of regular stakeholder consultation (nominally associated with any new development proposals, at a minimum with each MCP update).	MCP update briefing including: • Post-closure land use studies; • Completion criteria; • Progressive rehabilitation; and • Technical studies update

[4] It should be noted that there are high demands on Banjima time for consultation with several different proponents in the Pilbara. Engagement on closure matters for Ministers North are subject to the constraints for the Banjima Native Title Aboriginal Corporation (BNTAC)/Banjima calendars.

Stakeholders	Timing	Communications
DBCA, DMPE, DWER, DPLH	As required	As required

4.2 Stakeholder engagement register

Table 4-2 summarises the stakeholder consultation undertaken for the Ministers North proposal and other consultation on mine closure that has relevance to this MCP.

Table 4-2 Summary of stakeholder consultation relevant to closure and rehabilitation of the proposed Ministers North operations

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
Regulators					
6 March 2019	Completion criteria	DMIRS (now DMPE) & DBCA	BHP presented and discussed the sustainability section of the draft rehabilitation completion criteria for BHP's Pilbara operations.	Meeting attendees generally happy with the approach proposed and the detail. During the meeting, it was noted that weeds will require addressing.	**BHP Response** Weeds incorporated into criteria.
30 July 2019	Mine closure planning	DMIRS (now DMPE) & DJTSI (now DEED)	BHP presented and discussed progress against commitments to mine planning for Whaleback, but the comments are relevant to other sites.	DMIRS expects that results of testing and modelling of field trials be provided in AER and MCP. Landscape modelling should cover a range of climatic scenarios and be validated with field trials and ongoing monitoring.	**BHP Response** This monitoring and modelling is being undertaken with results provided in AER and MCP.
6 February 2020	Safety bunds	DMIRS (now DMPE)	BHP discussed safety bunds with DMIRS in relation to the Mount Goldsworthy site, but the principles of the conversation are relevant to other sites. The upcoming MCP for the Ministers North proposal was also noted.	OSAs may be considered to form part of safety bunds on a case by case basis, but OSAs with slopes of 20° are not sufficient to be a deterrent to the public and will not control void access. Staggered large boulders have been used in creek beds.	**BHP Response** Incorporate principles of safety bund discussion into safety bund planning for all sites.
29 May 2020	Pre-referral meeting	DWER – EPA Services	Ministers North	Derived Proposal submission	-
18 August 2020	New MCP submission (Ministers North)	DMIRS (now DMPE)	Ministers North	Sought advice re timing of engagement to discuss future Derived Proposal submission for Ministers North and associated MCP preparation.	**DMIRS Response** Preference is to meet (if required) after the MCP has been submitted.
21 March 2022	Closure & approvals program	DMIRS (now DMPE)	Briefing and feedback from DMIRS on current closure and environment upcoming approvals	Noted upcoming changes to legislation, upcoming approvals and MCP updates and priorities.	**DMIRS Response** BHP to provide a list of MCPs currently under review and a priority list for assessment, with reasons for priorities. **BHP Response** Priority list provided and meeting organised.
13 March 2023	Quarterly meeting	DMIRS (now DMPE)	Briefings on several MCPs and overarching approach to closure outcomes and completion criteria	BHP provided an overview of: • BHP's closure vision and guiding principles which are consistent across all sites • Closure outcomes and post-closure land uses with the primary land use(s) generally being a natural outcome of native vegetation for pastoral use or managed resource protection. It was noted that BHP is currently working with Traditional owners to progress further detail in MCPs as they mature. • Provided an overview of typical criteria and how they are linked to the landform, post-mining land use and closure risks and how the criteria are spilt into performance indicators and completion criteria.	**DMIRS Response** BHP is following the right process with respect to development of completion criteria and DMIRS likes the approach but requires clarity on what they are actually being asked to approve. **BHP Response** Consider presentation of completion criteria in MCPs.
25 July 2023	Telephone call	DMIRS (now DMPE)	Site codes and MCP cover page information	Request to provide site codes on the front page of MCPs and instead of providing other details required by the Statutory Guidelines for Mine Closure Plans on the following page, move these to the first cover page.	**BHP Response** Cover page changed.
19 December 2024	Meeting	DEMIRS	Meeting was focused on closure of GNA, but topics relevant to other WAIO sites (site security, abandonment bund placement and infrastructure removal depth) were discussed.	Abandonment Bunds - DEMIRS provided in-principle acknowledgement that abandonment bunds tied into OSAs could be considered by DEMIRS using a risk based approach, provided that they are not trafficable by vehicles. Infrastructure depth - DEMIRS acknowledged that a risk-based approach to the depth of infrastructure removal could be considered providing that: • The post mining land use is stable • There is no unearthing of below ground services / infrastructure • Stakeholders such as Traditional Owners have been consulted.	**Discussion only**
13 August 2025	Pre-lodgement information sessions for Ministers North MCP	DMPE and BHP	Ministers North MPC	BHP presented an overview and key details of the Ministers North MCP. Closure risks and controls were discussed.	**Discussion only.** BHP committed to submitting the Ministers North MCP in 2025.
8 September 2025	Closure Workshop	BNTAC closure representatives, BHP and DMPE Closure representative	BNTAC presentation of the Banjima Closure Principles and Outcomes	BNTAC presented the Banjima Closure Principles and Outcomes to the DMPE. DMPE noted they were generally aligned with the principles and outcomes. The potential non-alignment between Banjima outcomes and abandonment bund requirements was raised as an issue. DMPE responded that a revised Safety Bund guidelines is currently being drafted and that the revision will outline where / how exceptions to the abandonment bund requirement could be applied. The timeframe for release of the updated guideline is unknown.	**BNTAC** There is potential for misalignment between the Banjima Closure Outcomes and the DMPE safety bund guidelines. **DMPE Response** A new guideline is being drafted and will address how exceptions to the guideline can be applied.
Landowners and Managers					
Not documented	Rehabilitation update	Juna Downs and Marillana Creek Station Lessees	Provide an overview of the Closure and Rehabilitation Regional Management Strategy	Overview of the Minister's North Infrastructure Development Envelope	No response required

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
Traditional Owners					
15 July 2021	Banjima HAC	Banjima	Banjima HAC	Introduction of Ministers North Mining Proposal. Proposal to co-develop a section 16 application to enable further investigation and research into locations of ACH within the Mining Area, and better understand the cultural landscape.	**Banjima People Response** Banjima consultants sought feedback on direction for next steps with proceeding with the section 16 application. **BHP Response** BHP to provide Banjima consultants access to previous heritage reports to assist in the development of the section 16 program.
20 April 2022	Banjima HAC	Banjima	Banjima HAC	Provided a further overview of the Ministers North proposal, aligned with the ramp down of Yandi and the intention to utilise the existing infrastructure at Yandi to process Ministers North ore.	No specific responses.
21 November 2022	Banjima HAC	Banjima	Banjima HAC	Consultation over refined Ministers North Mine Plan design. Confirmation that a Section 16 permit had been granted by the Registrar. Consultation over potential management measures for Khargoonha	**Banjima People Response** Discussions need to be holistic and include rehabilitation discussions, cumulative impact to Banjima country, and opportunities for Banjima People. **BHP Response** BHP to provide Section 16 permit to BNTAC and Banjima Heritage Manager. BHP to further review Ministers North mine plan and identify engineering and mitigation options to reduce cumulative impact
21 March 2023	Banjima HAC	Banjima	Banjima HAC	BHP presented revised Ministers North Mine Plan design. Consultation over potential management measures for Khargoonha.	**Banjima People Response** Banjima HAC members indicated that this would need to be discussed with BNTAC offline and advice would need to be provided at a later date. **BHP Response** BHP to seek feedback at future meetings.
23 June 2023	Banjima HAC	Banjima	Banjima HAC	Discussed details of Ministers North including Khargoonha standoff distance. Progressive backfill of mining pits in proximity to Khargoonha to ensure timely rehabilitation was discussed (and supported by HAC members) Banjima HAC members confirmed that visual and aesthetic impacts to Khargoonha and the surrounding landscape to be considered.	**BHP** Action to develop a visualisation that illustrates mine sequence and progressive backfill at Ministers North.
26-27 September 2023	Banjima HAC	Banjima	Banjima HAC	Discussed the Ministers North Khargoonha standoff distance. BHP provided a presentation of visualisation of progressive backfilling principal near Khargoonha.	**BHP** Closure Plan including further progressive backfilled areas will be part of a video to be presented at next years Social Surrounds for Ministers North.
20-24 May 2024	On Country ethnobotanical survey at Ministers North	BNTAC/Banjima	Rehabilitation	Engagement during the ethnobotanical survey included a site visit to the Yandi nursery for a rehabilitation overview. At least 126 cultural or heritage plant species have been found or are likely to occur in the Ministers North area and vicinity. These plants were identified in a desk top survey and a 3-day on-ground reconnaissance with five Banjima women plus BHP staff and the ethnoecology consultant. Twenty-one useful plants were found on the reconnaissance and the remaining 112 plants were identified from books and reports relevant to the area.	**Banjima People Response** Banjima recommended: • Resolving labelling of plants and seeds with Banjima name(s). • Salvaging seed stock of cultural species before clear felling. **BHP Response** • Several species of cultural significance are currently included in seed mixes (Appendix G) and consideration will be given to how a greater diversity of culturally significant species can be included in future rehabilitation programs.

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
21-23 May 2024	On Country social surroundings consultation	BNTAC/Banjima	Social surroundings consultation on Banjima Country in relation to the Central Pilbara Hub Surplus Water and Ministers North proposals.	Social surroundings consultation activities related to the Ministers North proposal comprised: • Proposal overview presentation. • Followed the indicative pipeline route between MAC and Ministers North. • Visited the Ministers North lookout. BHP showed the Banjima representatives the locations of the northern and southern pits as well as the central OSA.	**Banjima People Response** Concerns raised regarding the potential for the proposals to result in significant impacts on Banjima Country including permanent and irreversible impacts. Examples given include: • Pit voids. • Artificial waste rock landforms. • Changes to surface water quality and quantities entering the catchments and subsequent impacts on all biota reliant on surface water quality and quantity. These include changes to surface water regimes due to permanent diversion structures being left in place at closure. • Potential duration on groundwater regimes (including contamination) and subsequent impacts on vegetation, terrestrial fauna and subterranean fauna. • Loss of access to Country (pit voids blocked off with abandonment bunds, waste rock landforms and other infrastructure left at closure). • Loss of visual and general amenity. It was identified that the key characteristics of the Minsters North proposal remained uncertain at the time of this engagement, making it difficult for the Banjima representatives to develop a clear position on the proposal as a whole and further information was requested. In relation to mine closure and final landforms, BHP stated that in the order of 50% of waste material would be backfilled into pit voids, but no further information was available on whether land bridges and other surface water impacting features would remain in the landscape post-closure. While the Proposal's key characteristics are still conceptual, the provision of information about them is critical for Banjima to develop an informed view of the Proposal. In relation to closure planning, the Banjima representatives asked about: • Whether the OSA height at Ministers North would be representative of undulating topography of local surrounds; • Proposed closure outcome for OSA; • Proposed closure outcome for pit(s); • Closure animation; • The closure plan to be submitted with the proposal and how detailed this would be; and • What would be the closure objectives and how the site would look when BHP leaves the site. The Banjima recommended that BHP prepare and present a 3D model of the likely mine closure scenario for Ministers North.
5 September 2024	Banjima HAC (Perth)	BNTAC/Banjima	Banjima HAC	Consultation over mine plan and management measures for ACH identified as Harmed by the Mine Plan. BHP representatives provided an overview of factors considered when designing the Ministers North project to reduce impacts to environmental values. BHP representatives sought to further discuss the stand-off zone that Banjima had previously requested be implemented around ethnographic site Khargoonha.	**BNTAC/Banjima People Response** Banjima representatives confirmed that water management is of great importance to them. Banjima consultants sought further information on the proposed Ministers North waste management, rehabilitation and closure strategies. Banjima representatives and Banjima consultants informed BHP that the Khargoonha stand-off zone it should now be referred to the Agreement Modernisation (Amod) Process. **BHP Response** BHP representatives confirmed that there will be no pit lakes at closure as all Ministers North mining will be above water table. All parties agreed that closure including management of ex-pit waste storage, would be a good topic to discuss on ground during the Social Surroundings engagements.

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
23-27 September 2024	Site visit and presentations	BNTAC/Banjima	Ministers North social surroundings engagement	The Ministers North Proposal overview was presented, and a site visit was undertaken to view the Ministers North area from the communications tower south of the south pit. Purpose of this engagement was to continue conversations with the Banjima People on the Ministers North project that commenced in May 2024 and to understand the social surroundings values of the area. Consultation activities comprised: • Project presentations and animation. Presentation included preliminary closure values, principles and goals; backfill strategy; rehabilitation of rock dumps; and post-closure land use. • Site visit to view mine overview and Khargoonha. • Site visit to view project footprint and proposed creek crossings. In addition, the Yandi nursery and spinifex trial plot were visited. BHP asked if its understanding of the Banjima closure values were correct or if there was further information to improve the company's understanding.	**BNTAC/Banjima People Response** Banjima is developing Principles for Closure. There is high-level alignment with these. Further consultation is scheduled to occur during the Closure workshop on 30 October 2024. Banjima requested further detailed information on all elements of the Proposal that will interfere with water, such as land bridges, creek crossings and other constructed landforms and infrastructure, including BHP's plans for these elements at closure (i.e. remove/rehabilitate/restore, etc.). Banjima's preference was for all waste rock from Ministers North be transported to BHP's Yandi mine to be used as backfill for pits to prevent the formation of pit lakes and it was recommended that the western OSA be removed from the project. It was also recommended that BHP should consider alternatives to concave slope designs, such as geomorphic design[5] for closure landforms, as concave slopes are likely unsuitable for the Proposal. Further, it was also noted that Banjima does not support the management of PAF material via encapsulation. Banjima representatives were impressed by the tree nursery, seedbank and spinifex farm, and felt that the site visit provided good insight into rehabilitation practices. The importance of seed being collected from the Ministers North project area was advised. Banjima has identified a preference for traditional "bush medicine" plants to be incorporated into the rehabilitation strategy. **BHP Response** BHP confirmed that it would aim to include Banjima knowledge and culture into closure planning/design to improve that work. Ministers North pits will be backfilled to a minimum of 5 m above the water table. BHP will evaluate geomorphic designs for Ministers North closure. BHP to remove land bridge and culverts at closure. BHP to investigate feasibility of additional routes and will hold a technical workshop with Banjima consultants to discuss these further.

[5] In the context of mine closure, geomorphic design refers to an engineered design of landforms based on natural systems and the principles of geomorphology, rather than using traditional, linear, and angular engineered designs. Geomorphic design aims to develop functionally stable and self-sustaining landforms, replicating the intricate shapes and processes in stable, natural landscapes that have evolved over extended periods. This process replicates natural landforms and drainage systems to guide water over the landscape while effectively reducing sediment.

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
30 October 2024	Banjima Closure Principles Workshop #1	Banjima representatives / BNTAC and consultants	First engagement with Banjima representatives, BNTAC and their consultants on closure principles and outcomes.	BNTAC provided a presentation on preliminary Banjima closure objectives, principles and outcomes. These have been developed for the purpose of socialising with the Banjima people and their key stakeholders. Following sufficient engagement, the objectives, principles and outcomes will be finalised and formally communicated for consideration by proponents within their planning and applications. Key aspects covered by the closure objectives, principles and outcomes were: • Ideas for collaborative engagement on closure including quantification and communication of risks and liabilities. • Consideration of cumulative impacts and opportunities within the Banjima Native Title Determination area including prioritisation of repurposing of existing disturbed land for future development rather than disturbance of new land. • Communication of long-term planning for mining operations. • Maintaining surface water quality and no saline pit lakes. • Visual amenity. • Post-closure access and management of cultural materials and sites. • Ex-pit storage of overburden. • Management of waste and contaminated sites. • Return of environmental diversity, Mandu (bush meats) and medicine and bush tucker plants. • Flexibility of land capability to support future economic development. BNTAC expressed the need for earlier engagement in mine planning, development and study timing, with BNTAC and Banjima engagements to occur during Initiation Project Stage (IPS). BHP provided a presentation on BHP's approach to closure planning and post mining land use principles which include considerations of land capability, compatibility with surrounding land uses and mine plans, supporting infrastructure and economic sustainability of a land use and pathways to relinquishment	**BHP Response** BHP: • Acknowledged the presentation of the preliminary principles and outcomes for consideration and further future discussion. • Committed to sharing the Life of Asset plan with Banjima and BNTAC in future engagements. **BHP / BNTAC Responses** • The conversation was beneficial, and that the momentum should not be lost on the topic. • Regular (twice a year with Banjima) dedicated sessions on closure.
20 November 2024	Banjima Closure Principles Workshop #2	Banjima representatives / BNTAC and consultants	Second engagement with Banjima representatives, BNTAC and their consultants on closure principles and outcomes. This was a follow up meeting to the workshop on 20th October and included: • Sharing BHPs Life of Asset plan across Banjima country and a discussion on timing of the developments and how the mines will be developed. • Discussion on the ongoing routines to talk through closure principles. • Initial discussions on post mining land uses preferred by the Banjima people.	Key points raised which are relevant to the closure of Ministers North are as follows: • BNTAC consultants presented their ideas for potential post-mining land uses associated with water and power. • The Banjima people expressed a strong view on the need for the restoration of natural and cultural values post mining, but did not express a strong position on other post mining land use outcomes. • Transition land uses should be targeted and support restoration towards post mining land use. These land uses could include recycling opportunities (tyres, belts scrap), and rehabilitation project work to support closure outcomes.	**BNTAC Consultant Response** Appreciated the information shared on Life of Asset planning. **BHP / BNTAC Responses** There was general agreement that the next engagement should be on site to review rehabilitation and discuss closure landforms.
29 January 2025	Technical workshop to discuss haul road alternatives	Banjima consultants	Haul road alignment	BHP presented a number of alterative routes including potential alignment in proximity to the Rio rail, along with overall disturbance footprint and consideration of Khargoonha. Banjima consultants acknowledged that the presented alternative alignments achieved avoidance of heritage sites and other environmental values. However, neither option presented addressed the initial feedback from Banjima in avoiding impact to the valley as a whole. Greater consideration for overall assessment including closure outcomes should be provided (including potential to utilise waste from Ministers North for backfilling of Yandi mine).	**BHP Response** BHP acknowledges there is currently not alignment on the proposed haul route. BHP will continue discussions with Banjima in relation to the haul road. BHP will develop closure water management solutions (integration with Yandi mine pit lakes resolution) to put forward to Banjima at a future HAC meeting.
21 March 2025	Email to BHP	BNTAC on behalf of Banjima representatives	Banjima Board and HAC endorsed Banjima Mine Closure Objective, Principles and Outcomes	A final version of the of the Banjima Mine Closure Objective, Principles and Outcomes was provided to key BHP representatives (Appendix H).	**BHP Response** BHP acknowledges the finalised Banjima closure principles which will inform future discussions and updates to the MCP.
7-9 April 2025	On country social surroundings	Banjima	Ministers North Project Consultation to inform on the overall Project Description (previously referred to as on-country Social Surroundings) engagement at Ministers North was	Priority topics discussed included updates and refinements to the mine plan from earlier engagements (e.g., removal of Western OSA), updates on the consideration of multiple haul road alignments, consideration of Khargoonha standoff distance, updates on water management and closure outcomes.	Consultation was used to support the development of a Project Management Plan (PMP) to support the Ministers North Project

Date	Description of Engagement	Stakeholders	Topic	Engagement Summary	Response
			held with representatives of the Banjima People and BHP.		
5-6 May 2025	Meeting	Banjima	Banjima HAC	Ministers North Project Management Plan presented for Banjima HAC review and feedback following review by BNTAC and their Technical Consultants	**BNTAC/Banjima People Response** Banjima representatives and advisors raised a number of queries and suggestions regarding the Yandicoogina Gorge Trigger Action Response Plan (TARP); the use of ANFO products used by drill and blast; opportunities for Banjima involvement in monitoring to build capacity; the closure management plan; and BHP's long-term commitment to not pursuing below water table mining at Ministers North. **BHP Response** BHP representatives confirmed that the PMP would be updated to include the feedback and suggestions and advised that the final Yandicoogina TARP and Ministers North closure plan will be included in the Ministers North Part IV Environmental Review Documentation (ERD).
23 May 2025	Banjima Closure Workshop #3	Banjima members, BNTAC staff and consultants	Third closure workshop held with Banjima and BHP	Introduction to new BNTAC closure consultant. Discussion relevant to closure at Ministers North included knowledge share requests and alignment of Mine Closure Plans to Banjima closure objectives, principes and outcomes.	Action Register developed to track actions agreed with BHP. Next closure workshop to be scheduled in agreement with Banjima.
26 May 2025	Meeting	Banjima HAC	Final review of the Ministers North Project Management Plan	Ministers North Project Management Plan endorsed by the Banjima Heritage Advisory Council via final resolution. The Project Management Plan includes a number of measures related to rehabilitation and closure.	**BNTAC/Banjima People Response** Ministers North PMP endorsed by the Banjima Heritage Advisory Council via formal resolution. **BHP Response** Finalised copies of the Ministers North PMP to be provided to BNTAC, BHP, and the Banjima Heritage Manager.
August 2025	Draft MCP shared	BNTAC	Draft Ministers North MCP presented to Banjiam via BTAC for comment.	A draft version of the Ministers North MCP was issued to BNTAC for review and comment ahead of submission of the final document to the regulator. BNTAC technical advisors provided comments and recommendations. The issues raised were addressed in the final version of the MCP, including incorporation into forward work programs, where applicable.	**BNTAC** Comments and recommendations issued to BHP on 3 September 2025. BHP Response Response is being prepared and will be presented at the HAC on 22 September.

5 Post mining land use

As discussed in Section 7.1, BHP's overarching closure and rehabilitation objective is to develop a safe, stable, non-polluting and sustainable landscape that is consistent with social and environmental values informed by stakeholder consultation and aligned with creating optimal business value. This objective and associated guiding principles for mine closure (see Section 7.1) set the framework for post mining land use planning and have been taken into account in the consideration of the possible land use options for Ministers North described below. Of particular relevance is the guiding principle which states that the post closure land use should be sustainable and consider, *inter alia*, local land management practices and ongoing management requirements as well as the capability and constraints associated with the land post-mining.

5.1 Status of post mining land use planning

BHP commenced investigation of post-mining land uses in 2019 with a strategic opportunity assessment of its central and eastern Pilbara operations. Since that time, several other studies have been conducted, and consultation with BNTAC and the Banjima People about land use planning for other mines has commenced. In addition, BNTAC has developed a document that outlines Banjima's desired objectives, principles and outcomes for closure (Appendix H) and this information will inform post-mining land use planning.

Post-mining land use transition planning in a remote location is a multi-year process that requires consideration of the development of an ecosystem of businesses through ongoing discussion, that will enable a critical mass of self-sustaining economic activity to be achieved over time. Since post-mining land use planning across the Pilbara is an ongoing discussion, BHP has taken the approach of working towards an interim land use that is consistent with the underlying tenure (Section 1.4) which is predominantly pastoral and unallocated crown land, and has used the outcomes of studies conducted to date to develop closure designs that do not preclude potentially viable land uses.

The provisional post mining land use outlined in Section 5.2 has been based on current land uses and the underlying tenure, however, land use opportunities may be considered in further detail as the mine life progresses.

5.2 Provisional post-mining land use

The post mining land use (PMLU) for Ministers North will be determined through stakeholder consultation and through collaboration with the Banjima People through BNTAC. In advance of the post mining land use being agreed for Ministers North, BHP will assume that the post mining land use(s) would align with current land uses and underlying tenure. The proposed Ministers North Development Envelope is located predominantly on Vacant Crown Land with some intersection of pastoral leases at the northern end of the proposed infrastructure corridor. In those areas of Vacant Crown Land, the provisional post mining land use would be ' *natural environments for managed resource protection*' and where the proposed Development Envelope overlies pastoral land, the land use would be '*a relatively natural environment for pastoral grazing purposes'* (Table 5-1 and Figure 5-1). These land use classifications align with the Australian Land Use and Management Classifications (Australian Collaborative Land Use and Management Program Partners, 2016).

Table 5-1 Provisional post-closure land use by site domain

Domain	Post closure land use
OSA	Natural environments for managed resource protection.
Mine Voids	Areas may not support a specific post-closure land-use due to ingress/egress restrictions. Further assessment is required over the life of mine.
Infrastructure	Natural environments for managed resource protection where the Ministers North Development Envelope does not overlie a pastoral lease. Relatively natural environments for pastoral grazing purposes where the Ministers North Development Envelope overlies a pastoral lease.

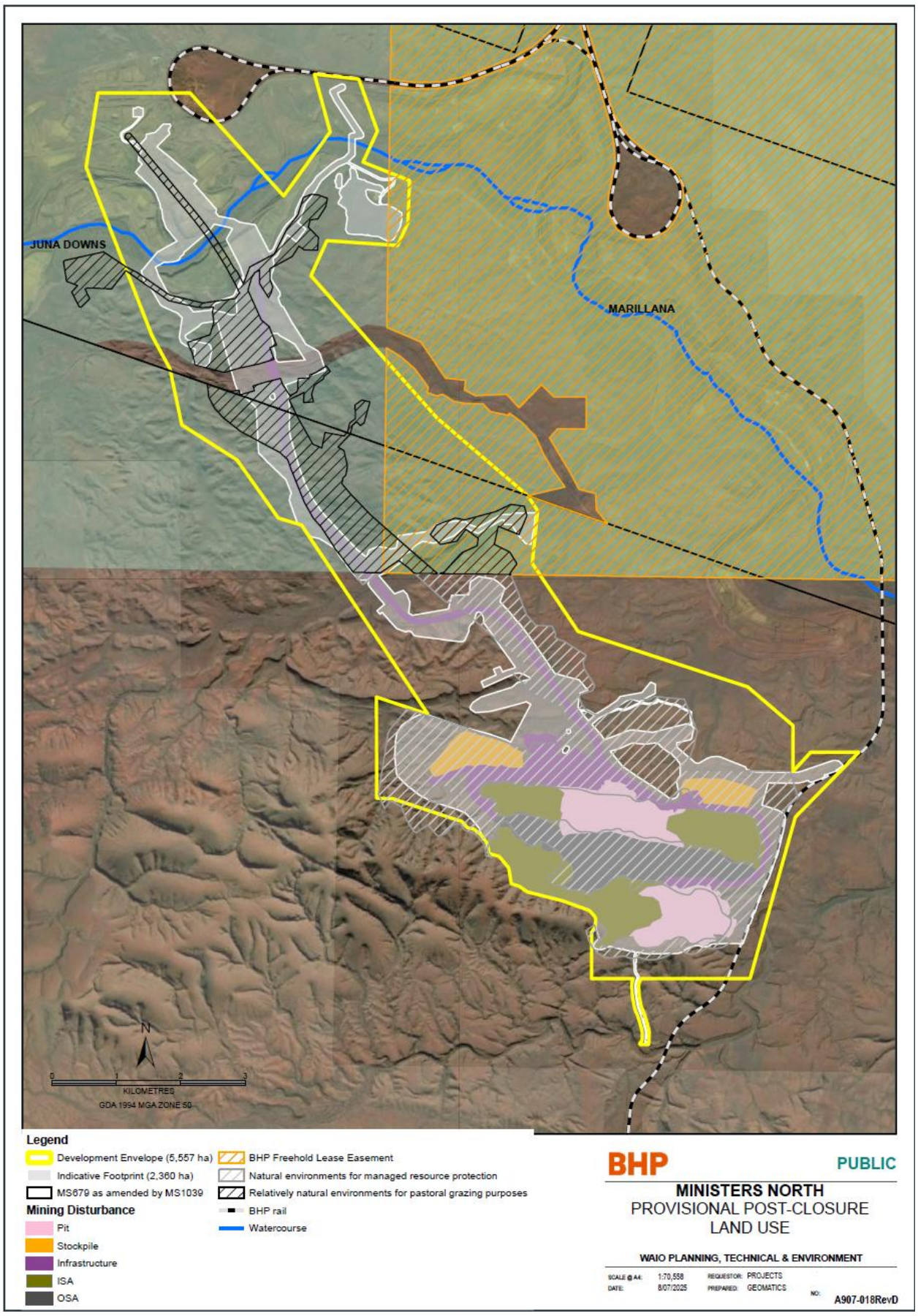


Figure 5-1 Provisional Post Closure Land Uses

6 Closure risk assessment

The successful planning and execution of sustainable closure and rehabilitation in the Pilbara requires a holistic, long-term view of landscape scale outcomes coupled with progressive operational level activities that implement or preserve options toward meeting the outcomes.

Applying adaptive management, BHP utilises a suite of modelling and assessment tools to assist in identifying closure issues and guide the application of management approaches to address them. Monitoring programs provide data and information to support and inform the progressive development of the mine closure strategy for a site (Figure 6-1).

Given the pre-approval phase of Ministers North, the focus at this stage of the MCP is on developing an understanding of the closure issues and ensuring processes are in place to address knowledge gaps and develop appropriate closure strategies.

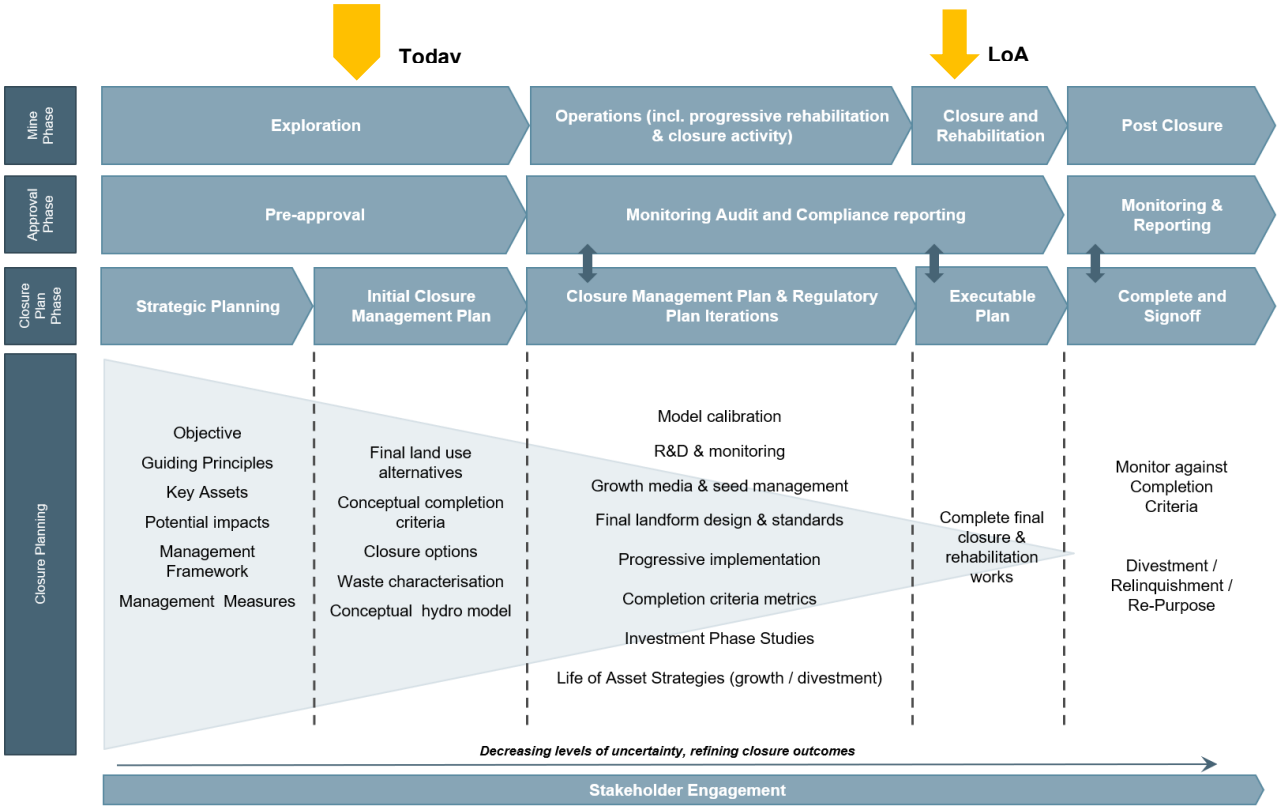


Figure 6-1 Closure planning over Ministers North lifecycle

6.1 Identification of closure risks

A closure planning risk workshop was conducted on 22 January 2025 to develop a risk register for Ministers North (Table 6-1). Participants comprised BHP personnel with expertise in mine planning, surface hydrology and closure planning. In accordance with DMPE (DEMIRS, 2025) guidance, the risks outlined in Table 6-1 only consider environmental risks. Within the definition of environment, BHP has also incorporated consideration of potential impacts to the community (e.g. in relation to safety of the site post-closure and impacts to sites of cultural significance). The risk matrix used to assess and prioritise risks is provided in DMPE (DEMIRS, 2025).

Responsibilities for closure risk mitigation and management are addressed in BHP's internal processes and procedures. The Planning function (including Resource Planning and Exploration teams) in conjunction with the Environment Rehabilitation and Biodiversity team would lead integration of closure management requirements into the Ministers North mining operations plans as part of the business planning process (as outlined in Section 2.4). Implementation of the risk mitigation measures incorporated into the closure plan would be the responsibility of the Ministers North operations team.

Risk management measures will be refined progressively (in line with the adaptive management approach).

The risk register in Table 6-1 has been structured to meet the DMPE (DEMIRS, 2025) guidelines and has been structured in accordance with the example provided in Table 5 of the guideline.

Table 6-1 Ministers North closure risk assessment

Risk	Key Environmental Factor	Category Aspect (s)	Domain & features	Risk Pathway	Phase of mine life[6]	Inherent Risk			Risk Treatment	Residual Risk			Environmental or closure outcome	Comment
						Consequence	Likelihood	Risk		Consequence	Likelihood	Risk		
R 1	Rehabilitation & Mine Closure	Physical & Geotechnical Stability	OSA	Poor knowledge of physical characteristics of surface material leads to erosion or weathering event that exposes buried waste rock and releases waste rock and/or sediment onto downslope areas, with impacts to adjacent vegetation and increased sediment loads in creek lines.	Cl	Moderate	Possible	Medium	Materials characterisation information is incorporated into mining models (Table 13-1, Appendix B). The Mines Closure Design Guidance Procedure (WAIO, 2022e) informs OSA design. Landform design is based on materials characterisation and the outcomes of erosion modelling (Section 8.5.2). Use of ISAs (Section 8.5.1) minimises ex-pit OSA footprints and facilitates the management of wastes more susceptible to erosion. The Master Area Design Review Process enables verification that closure design guidance has been incorporated into mine plans. Rehabilitation works include construction supervision and post-construction inspections.	Minor	Unlikely	Low	1.0 Constructed landforms are physically and geotechnically stable, have minimal erosion and support native revegetation and / or the post mining.	Use detailed characterisation of materials representative of those found at Ministers North and erosion modelling, to inform landform designs, as required (Appendix I-4 and Section 12.3). Detailed closure landform designs (integrating all domains) to be developed based on the outcomes of technical studies and assessments. Geomorphic design of critical landforms adjacent heritage areas (Section 8.5.1 and 8.5.2).
R 2	Rehabilitation & Mine Closure	Physical & Geotechnical Stability	Mine voids	Final pit wall fails beyond the safety bund or agreed safety bund structure and impacts on geomorphic landforms adjacent Khargoonha.	Cl	Major	Possible	High	Safety bund designs to meet DMPE guidelines (DoIR, 1997) (Section 8.5.1) and considering the outcomes of recent consultation (Section 4.2). Pit wall stability to meet a static Factor of Safety (FoS) of 1.5 (Section 7.2.2). The Master Area Design Review process verifies that geotechnical design guidance has been incorporated into pit and safety bund designs. The Mines Closure Design Guidance Procedure (WAIO, 2022e) informs closure designs (Appendix I-4). In-pit waste materials can be used to buttress pit walls if required (Sections 8.5.1).	Major	Rare	Medium	2.0 The placement of mined materials / infrastructure in relation to excavations will be such that the final footprint after rehabilitation is not located within the potential ZOI.	Detailed slope stability analysis to inform final safety bund locations for mine voids remaining at closure (Appendix I-4 and Section 12.3).
R 3	Rehabilitation & Mine Closure	Geochemical Stability	OSA, mine voids	Poor geochemical characterisation of overburden and ore, or poor AMD management leads to AMD release from PAF material within OSA and / or low grade stockpiles, impacting surface water quality in local creek lines.	Cl	Minor	Unlikely	Low	Materials characterisation information is incorporated into mining models (Table 13-1, Appendix B-1). Geochemical testing and AMD risk assessment conducted (Section 3.4.1). AMD 2 and AMD 3 wastes (if identified in the future) managed as a mixed waste, but not placed with 10 m of the final rehabilitation surface (Appendix I-1). AMD Management Standard (BHP, 2022a) (Appendix I-1). Reactive Ground and AMD Potential: Mining Design and Dumping Procedure (WAIO, 2021a) (Appendix I-1). Reactive Ground: Drilling Identification and Demarcation Procedure (WAIO, 2017a) (Appendix I-1). Mines Closure Design Guidance Procedure (WAIO, 2022e) (Appendix I-1). Assessment of compliance to plan (Appendix I-1).	Minor	Rare	Low	4.0 Constructed landforms are geochemically non-polluting.	Overburden has been identified as predominantly AMD0 (Section 3.4.1)

[6] Phases of mine life: C = Construction Phase, Op = Operational Phase, C&M = Care and Maintenance Phase, Cl = Closure Phase

Risk	Key Environmental Factor	Category Aspect (s)	Domain & features	Risk Pathway	Phase of mine life[6]	Inherent Risk			Risk Treatment	Residual Risk			Environmental or closure outcome	Comment
						Consequence	Likelihood	Risk		Consequence	Likelihood	Risk		
R 4	Rehabilitation & Mine Closure	Surface Water	OSA, mine voids	Permanent landforms impact surface water flows and adversely affect surface water dependent vegetation and GDEs (e.g., Yandicoogina Creek).	CI	Rare	Unlikely	Low	Surface water assessment and modelling to inform closure strategy, including sensitivity testing (Appendix I-2). Master Area Design Review process to verify that closure design guidance has been incorporated into designs. Flood protection and diversion designs which may be required for closure incorporate consideration of extreme rainfall events post-closure (Appendix I-2).	Rare	Unlikely	Low	6.0 Surface drainage patters, flows and characteristics are reinstated in a manner consistent with the regional drainage function and / or post-mining land use.	Hydrological studies would be carried out and appropriately designed infrastructure would be developed where mine plans indicate the need for flood protection or surface water realignment.(Appendix I-2 and Section 12.3).
R 5	Rehabilitation & Mine Closure	Surface Water	Transport Corridor	Features within the Transport Corridor impact surface water flow resulting in impacts to surface water dependent vegetation.	CI	Rare	Unlikely	Very low	Closure strategy (Section 8.5.5) is that all features within the Transport Corridor will be decommissioned and removed at closure. Culverts and fill will be removed to the extent that drainage lines are reinstated.	Rare	Unlikely	Low	6.0 Surface drainage patterns, flows and characteristics are reinstated in a manner consistent with the regional drainage function and / or post-mining land use.	Closure strategy for the transport corridor is to remove all infrastructure and reinstate drainage lines (Section 8.5.5).
R 6	Rehabilitation & Mine Closure	Physical Safety	All	Inadvertent access to unsafe areas causes injury or fatality to humans.	CI	Major	Likely	Extreme	Design and install reasonable duty of care control measures including safety bunds conforming to DMPE guidance (DoIR, 1997) and the outcomes of recent consultation with DMPE on safety bunds (Sections 4.2 and 8.5.1). Regular monitoring and maintenance of security measures during the post-closure monitoring and maintenance period (Section 9.2.7.1). Mines Closure Design Guidance Procedure (WAIO, 2022e) includes guidance on safety bunds. Infrastructure (as an attraction) would be removed (Section 8.5.2). Final landform design engineering to allow for sustainable safe access to places of agreed Traditional Owner significance and to accommodate the post-mining land use (Section 5.2).	Major	Unlikely	High	12.0 The rehabilitated landscape is made safe to humans and animals.	Detailed slope stability analysis to inform final safety bund locations for mine voids remaining at closure (Sections 8.5.1 and 12.3). Consultation with stakeholders on post-closure land use requirements and safe access (Sections 4.2 and 12.3).
R 7	Rehabilitation & Mine Closure	Land Contaminatio	All	Identified areas of contamination have not been managed during operations or the contaminated sites classification under the CS Act is not suitable for the agreed post mining land use.	D. CI	Minor	Possible	Medium	Contaminated Sites Register and risk-based schedule for investigation and remediation (if required) (Section 3.5). Mines Closure Design Guidance Procedure (WAIO, 2022e) (Appendix I-4).	Minor	Rare	Low	5.0 All environmentally hazardous chemicals, rubbish and contaminated materials have been removed, treated, managed and disposed in a manner consistent with the post mining land use.	Investigation of suspected contaminated sites (Appendix I-11 and Section 12.3).
R8	Rehabilitation & Mine Closure	Landscape	All	Failure to incorporate Banjima Closure Principles and Outcomes into landform designs during operations results in visual amenity and cultural heritage outcomes not being met for the Banjima People.	Op, CI	Major	Likely	Extreme	Banjima Closure Principles and Outcomes communicate Banjima expectation (Appendix H). Project Management Plan provides guidance on project specific requirements (Section 2.3.2) including commitment to collaborate on closure designs. Closure Planning Workshops held between BNTAC and BHP twice per year (Table 4-1).	Major	Rare	Medium	3.0 Constructed landforms are designed with consideration of visual amenity, cultural values and local topography.	Forward Work Program (FWP) includes program of collaboration through BNTAC, including gaining an understanding of visual amenity and the consideration of visual impacts in a closure context and aspects of importance to the Banjima People.

6.2 Risk assessment implications for mine closure

The implications for mine closure have been considered and integrated into the implementation of closure activities in Section 8. Table 6-1 provides cross references to where risk treatments are addressed in this MCP.

7 Closure outcomes and completion criteria

7.1 Closure outcomes

The BHP overarching corporate closure and rehabilitation objective is to:

> *Develop a safe, stable, non-polluting and sustainable landscape that is consistent with key stakeholder agreed social and environmental values and aligned with creating optimal business value.*

This is supplemented with the closure objective outlined in Condition 15-1 of MS 1105 which is to ensure that the site is decommissioned, and rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

To further guide the development and implementation of mine closure and rehabilitation, BHP has established a set of guiding closure principles which are applied to Ministers North:

- **Informed planning and design**: Rehabilitation and decommissioning requirements are considered at a mine deposit and regional scale, upfront and integrated into mine plans to achieve optimal business value and a sustainable post-closure land use.
- **Sustainable post-closure land use**: Post-closure land use and rehabilitated areas are informed by stakeholder expectations and consider the following:
  - Local land management practices;
  - Ongoing management requirements (e.g. roads and tracks);
  - Closure landform integration, including visual impacts, landform stability (physical and geochemical) and hydrological regimes;
  - Local baseline conditions (e.g. flora, vegetation, fauna and fauna habitat);
  - Ecosystem resilience in terms of flora, vegetation, fauna, and surface and groundwater regimes;
  - Infrastructure transfer or decommissioning;
  - Management or remediation of contaminated sites; and
  - Amenity.
- **Safety**: All mine rehabilitation and decommissioning is planned so that the risks to health and safety of people within BHP's area of influence are minimised. Unauthorised public access risk would be managed through the implementation of controls in accordance with regulatory requirements and consideration of industry guidance.
- **Effective stakeholder engagement**: Transparent and proactive stakeholder engagement occurs for all planned activities that may impact surrounding communities, including consideration of communities impacted by closure.

The objective and guiding closure principles provide the foundation for developing site specific completion criteria for Ministers North as outlined in Section 7.2. BHP is in the process of reviewing the closure outcomes to ensure they align with the standard closure outcomes provided in the updated Guideline for Mine Closure Plans (DEMIRS, 2025). The review process was not complete at the time of preparing this MCP and so both the existing BHP Closure Outcomes and the DMPE Standard Closure Outcomes have been included in Table 7-1 as an interim measure. Revised Closure Outcomes will be included in the next revision of this MCP.

7.2 Completion Criteria

Completion criteria are defined in the DMPE (DMIRS, 2021) Mine Closure Completion Guideline as *providing the basis on which successful rehabilitation and mine closure are determined and so enable formal acceptance that rehabilitation and closure obligations agreed to in an approved MCP have been met*. The DMPE guideline has been developed for rehabilitation and closure obligations under the Mining Act 1978. However, in the absence of specific guidance for rehabilitation and closure obligations arising from a Part IV EP Act approval, it can provide a general template for achieving completion of these sites and be submitted in support of a request for withdrawal of a Ministerial Statement under Section 47A of the EP Act.

The process of 'completion' is a pre-cursor to, but separate from, the process to relinquish or surrender tenure (discussed further in Section 9.5). Once completion has been achieved, monitoring, inspection and any maintenance activities can be reduced from those necessary to achieve and demonstrate completion and would be commensurate with those required post relinquishment. Following completion or withdrawal of a Ministerial Statement under the EP Act, DEMIRS / DWER can also determine that submission of AERs and MCPs is no longer required. The DMPE (DMIRS, 2021) guideline provides for progressive completion reporting and sign-off as portions of mine disturbance are rehabilitated and completion criteria achieved. Given the long life of the Ministers North mine, the timeframe between completion of certain areas and relinquishment of tenure may be significant. Section 9.5 deals with completion reporting and relinquishment, and the intervening period (referred to as post-completion).

Several terms have been used in this section to define the time between operations and completion as follows:

- Operations refers to the time when active mining or processing operations are occurring. Most of the planning for closure occurs during this time.
- Execution refers to the phase where closure and rehabilitation activities are conducted. Progressive closure execution may occur during the operational phase following cessation of mining / processing in a particular area.
- Post-closure refers to the time following execution of closure and rehabilitation where the success of closure and rehabilitation is being monitored and maintenance / rectification of areas not on track to meet completion criteria might occur.
- Completion refers to the time where achievement of completion criteria can be demonstrated and sign-off achieved.
- Post-completion refers to the period following completion but prior to relinquishment of tenure.

Completion criteria are the measures against which achievement of closure objectives and guiding principles can be assessed. BHP continues to actively review and improve its completion criteria based on new information and techniques. Section 8.3.1l summarises some of the research and monitoring that has been used to inform the completion criteria outlined in Section 7.2.

Recent studies informing completion criteria include a review of vegetation completion criteria by Syrinx Environmental (2019; 2023) and guidance on acceptable erosion landforms in the Pilbara by Landloch (2018). The criteria developed by Syrinx and Landloch have been incorporated into those presented in Section 7.2. The full suite of criteria will be further refined based on new knowledge gathered during the life of the mine, and these refinements will be presented in future iterations of this plan.

In recognition that progressive closure is desirable to reduce the impacts of mining, BHP closes and rehabilitates landforms where this is practical and can be accommodated within mine plans. As discussed above, completion criteria will be refined over the life of the mine. The completion criteria applicable to landforms rehabilitated at various times may, therefore, be different as criteria changes in response to new knowledge. Future revisions of the criteria will focus on developing additional measurable metrics based on site specific data. A work program is also currently underway to develop measurable metrics to align with the DMPE closure objectives outlined in the most recent revision of the guidelines for developing mine closure plans (DEMIRS, 2025). This improvement activity is captured in Section 12.3 of this MCP.

7.2.1 Approach

BHP recognises that closure outcomes are controlled by planning, design and execution activities. Closure criteria, for its Pilbara operations therefore, include both leading performance indicators describing the activities and designs necessary to achieve desired outcomes (e.g. landforms have been designed and constructed to take account of waste characteristics affecting stability), as well as lagging indicators (completion criteria) which describe closure outcomes to be achieved (e.g. total hummock grass cover to be 14-25%).

Closure and rehabilitation objectives and criteria are based on the land uses applicable to a particular area, in recognition of the fact that the land is altered fundamentally from its pre-existing condition. The completion criteria for Ministers North are based on an assumed outcome of a combination of *'natural environments for managed resource protection*' and *relatively natural environment for pastoral grazing purposes* (Section 5.2).

The purpose of the completion criteria is to ensure areas will display self-sustaining characteristics suitable to the post-mining land use and give Government regulators confidence that, to the maximum possible extent, they can be managed in the long term according to the intended land use (or uses), using normal management practices without the input of additional resources.

The criteria outlined in Section 7.2.2 have been divided into three stages. The first two stages are performance indicators that are aimed at providing assurance that completion criteria will be met and guide appropriate planning and execution of closure:

- **Stage 1 Planning**: Describes criteria that must be met to confirm that the necessary planning and operating procedures have been developed and agreed with regulators and other stakeholders.
- **Stage 2 Execution**: Describes criteria that must be met to confirm that rehabilitation operations have been implemented according to the above agreed planning and operating procedures. The assessment method for this would be by reviewing and auditing closure execution records, and site inspections as required.
- The **Stage 3 Completion Criteria** are the criteria which, when met, indicate that closure and rehabilitation has achieved an acceptable standard and is suitable for the agreed post-closure land use. These are the criteria that would be measured to support an application for relinquishment.

In line with the Western Australian Biodiversity Science Institute (WABSI) completion criteria framework (Young, et al., 2019), BHP has correlated the inherent risk ratings relevant to each set of criteria to assist in prioritising focus on those criteria of the most importance.

7.2.2 Completion criteria and performance indicators

The completion criteria for Ministers North are presented in Table 7-1. For clarity, column headings are designed to broadly align with WABSI guidelines (Young, et al., 2019) for completion criteria and as follows:

- **Category:** a key theme or element of rehabilitation that needs to be addressed in order to meet closure objectives.

- **Criterion Objective:** The purpose or objective of the particular criterion. As defined in (Young, et al., 2019), the closure objective provides a clear indication on what the proponent commits to achieve at closure.
- **DMPE Closure Outcome:** The standard closure outcomes, as defined in the 2025 Closure Plan guidelines (DEMIRS, 2025) are provided here for completeness but will be updated with BHP specific closure outcomes prior to the next revision of this MCP.
- **Domain:** Areas of similar operational land uses that have similar closure requirements and to which a particular completion criterion relates. Additional information relating to closure implementation for each closure domain is provided in Section 8.5.
- **Performance Indicator**: A level of performance through planning and execution that provides assurance that completion criteria would be met.
- **Completion Criteria:** An agreed standard or level of performance which demonstrates successful closure of a site for that particular objective.
- **Verification Procedure:** The method used to confirm that the identified standard for the criterion has been achieved. As outlined by DMPE (2021), verification may rely on quantitative measurements or could be a process of certification, for example, compliance with an approved design. Verification processes have been identified for the planning, execution and completion phases of closure. The completion phase is the phase during which a completion report would be developed to support sign-off against completion criteria in accordance with DMPE (2021).
- **Monitoring Method:** The monitoring method column cross references the relevant section of the MCP that describes the monitoring methods that will be applied to assess achievement of each completion criterion.

Consistent with the WABSI completion criteria guidance (Young, et al., 2019), completion criteria can incorporate qualitative measures as well as quantitative numerical targets. Young et al (2019) identifies three types of criteria which have been used in the development of the criteria outlined in Table 7-1:

- P - installed/built as planned - for example, habitat features have been installed/constructed as planned/designed.
- C - categorical - a feature is present or absent, or an activity has been achieved or not. For example, overburden materials with adverse geochemical properties are not exposed on the OSA.
- Q - quantitative - the attribute can be measured and compared against a numerical target. For example, total hummock grass cover to be 14-25%.

The qualitative categorical and installed/built as planned criteria can be measured by audit, inspection or survey whereas quantitative criteria would typically be measured through a specific environmental monitoring program. These monitoring and measurement / verification programs are described in Section 9.

7.2.3 Progressive signoff

The principle of progressive signoff will be adopted where appropriate, to recognise areas where the development of rehabilitation has reached acceptable standards and facilitate the transition to a post-mining land use. In these instances, criteria that change over time will not be applied retrospectively.

Table 7-1 Ministers North closure criteria

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
C1 Post-closure land use								
C1.1 Post-closure Land Use	Post-closure land use has been determined in consultation with relevant stakeholders.	No equivalent DMPE outcome.	All	Post closure land use has been defined in consultation with key stakeholders (C). Specific rehabilitation objectives have been developed to ensure that, when met, areas would fulfil the post-mining land use requirements. These have been developed in consultation with end land users/owners (C). Mine closure designs have been developed to meet rehabilitation objectives (C).	Mine closure execution is conducted in accordance with designs (P).	Monitoring, inspection and/or survey reports that the rehabilitation objectives have been substantially met. These are the measures that agreed final land use has been met (C).	**Planning** Documented approval of land use performance. objectives with end land users/owners and administering authority. Mine closure design review. **Execution** As-constructed report, or post-construction survey or inspection report. **Completion** Post-closure monitoring and survey reports. Post closure land user/owner provides written acceptance of condition of land.	9.2.1 Closure completion audit and inspection
C2 Safety								
C2.1 Safety	There are no unsafe areas where members of the general public could gain inadvertent access.	The rehabilitated landscape has been made safe to humans and animals	All	Hazards that could endanger the safety of any person or animal have been identified and designs have been developed to eliminate or mitigate them (C).	Safety bunding which meets the DMPE guidelines (DoIR, 1997) is in place to prevent inadvertent access to voids (P). Mine closure execution is conducted in accordance with designs (P).	Residual safety and health hazards have been identified and controlled in accordance with regulatory requirements and consideration of industry guidance (C).	**Planning** Mine closure design review. DMPE endorsement via MCP updates. **Execution** As-constructed report, or post-construction survey or inspection report. **Completion** All sites are assessed as acceptable with regards to safety by the District Mines Inspector.	9.2.7.1 Public safety monitoring
C3 Landforms								
C3.1 Visual Amenity	Visual amenity of constructed landforms is compatible with that of local Pilbara landforms.	Constructed landforms are designed with consideration of visual amenity, cultural values and local topography.	All except mine voids	Within the constraints imposed by aspects such as the physical nature of the materials available, tenement boundaries, and proximity to water courses, landforms have been designed to blend into the surrounding landscape (C). Visual impacts, design constraints and solutions have been discussed with stakeholders, where visual impact is a key concern (C).	Mine closure execution is substantially in accordance with designs (P).	Landforms have been substantially constructed in accordance with the designs defined in consultation with stakeholders to minimise visual impact (P).	**Planning** Mine closure design review. Visual impact design mitigations have been defined in consultation with stakeholders where visual impact is a key concern. **Execution** Report on rehabilitation works confirms landform has been substantially constructed according to BHP relevant procedure. **Completion** Rehabilitation inspections confirm earthworks have substantially met final landform design criteria.	9.2.1 Closure completion audit and inspection

[7] Verification procedures may be updated as part of the continuous improvement process.

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
C3.2 Geotechnical Stability	Constructed landforms are safe and geotechnically stable.	The placement of mined materials / infrastructure in relation to excavations will be such that the final footprint after rehabilitation is not located within the potential ZOI. The rehabilitated landscape is made safe to humans and animals.	All	Post-mining landforms have been designed to: • Account for waste characteristics affecting stability (physical and chemical) and the zone of instability of the void (C). • Address the safety risks identified in criterion 2.1 and prevent inadvertent access to voids (C). • Achieve a Static FoS of ≥1.5 (C). Conform to the relevant BHP and DMPE guidelines for structural stability (e.g. residual voids are left as ROM where geotechnically stable) (C).	Landforms conform to DMPE guidelines for structural stability (C). Safety bunding which meets the DMPE guidelines (DoIR, 1997) is in place to prevent inadvertent access to voids (P). Mine closure execution is conducted in accordance with designs (P).	Ex-pit landforms show no significant slumping or failure of accessible constructed slopes or berms (C). No unacceptable hazards to humans or wildlife have developed through erosion, subsidence, or otherwise (C). As-constructed landforms achieve a Static FoS of ≥1.5 (C).	**Planning** Mine closure design review against DMPE guidelines. DMPE endorsement via MCP updates **Execution** Report on landform construction methods, and any additional maintenance works undertaken. Rehabilitation inspections (including those undertaken on maintenance earthworks) confirm earthworks have substantially met final landform designs. **Completion** Results of inspections of the rehabilitated landforms conducted over time, with monitoring conducted after each significant rainfall season. Rehabilitation monitoring results (including erosion monitoring). Report on performance in relation to design criteria and DMPE guidelines.	9.2.7 Landform and erosion monitoring
C3.3 Geochemical Stability	Materials with poor chemical properties do not compromise rehabilitation (landforms stability and revegetation) or water quality.	Constructed landforms are geochemically non-polluting.	OSA, mine voids	Material characterisation has been conducted to identify materials with poor physical or chemical properties (C). An overburden storage plan is developed for the OSA and incorporated into the life of mine plan prior to the commencement of ex-pit dumping activities (C).	All overburden placement in the OSA has been undertaken in accordance with the overburden storage plan (P). Mine waste or wall rock exposures likely to give rise to AMD have been appropriately managed (C). Mine closure execution is substantially in accordance with designs (P).	No evidence of mineral scalds within rehabilitation areas (C). No exposed waste materials with adverse geochemical properties on the OSA (C).	**Planning** Material characterisation reports available for review. OSA design guidance defines acceptable locations for overburden types. **Execution** Survey reports and mining records show waste has been substantially placed in designated locations. **Completion** Visual inspections identify no adverse materials at the surface of landforms.	9.2.7 Landform and erosion monitoring
C3.4 Surface Stability	The constructed surface is stable and showing no signs of significant erosion or release of sediment causing adverse impacts to drainage lines.	Constructed landforms are physically and geotechnically stable, have minimal erosion and support native revegetation and / or post-mining land uses.	OSA	Post-mining landform designs have been informed by, and take account of: • Overburden characteristics (physical and chemical) (C). • Erosion modelling. Modelled average annual erosion rates for OSAs are ≤6 t/ha/yr and maximum erosion rates ≤12 t/ha/yr (Q). • Outcomes of rehabilitation monitoring of other similar landforms (C). • Surface water movement (C). An overburden storage plan has been developed for the OSA and incorporated into the life of mine plan prior to the commencement of ex-pit dumping activities (C). Appropriate surface treatments have been identified given landform design and available construction materials (C).	Mine closure execution is substantially in accordance with designs (P). Surface treatments (including ripping) are undertaken to rehabilitated surfaces to maximise water infiltration, to reduce erosion potential, and support establishment of vegetation (C). Mine overburden material likely to provide a poor growth medium (e.g. dispersive and incompetent material), has been placed appropriately in OSA or backfilled pits (C). Rock armouring is present as required; and no areas are exposed to the risk of significant erosion (C).	Slope surfaces are stable, with no dispersive material on the surface; rock armouring is present as required; and no areas are exposed to the risk of significant erosion which may be defined as having (C): • Channelised flow resulting in extensive active gullies; • Failure of banks, berms or bunds; and • Evidence of ongoing significant sheet erosion (including large accumulation of silt at base of slope, exposed subsoil, poor seedling establishment). The average rate of erosion of slopes, flats and crests of OSA measured at completion is <6t/ha/yr (Q). The erosion rate at any point on a slope does not exceed the target threshold average rate by more than 100% (Q).	**Planning** Mine closure design review. DMPE endorsement via MCP updates. **Execution** Report on landform construction methods, and any additional maintenance works undertaken. Rehabilitation inspections (including on maintenance earthworks) confirm earthworks have substantially met final landform designs. **Completion** Visual assessment and monitoring, taking into account slope, available materials and vegetation cover, and relevant research projects on surface stability of comparable rehabilitated landforms. Rehabilitation monitoring results (including erosion monitoring) indicate gullies and rills are stabilising.	9.2.7 Landform and erosion monitoring
C4 Sustainability								

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
C4.1 Growth Media	A suitable growth medium has been identified to facilitate plant establishment and growth.	Rehabilitated land is consistent with agreed reference vegetation communities and / or with the post-mining land use.	All where revegetation is planned	Topsoil stockpiles have been mapped, volumes calculated and the relevant plans and databases have been prepared, updated and maintained (C). Available topsoil is assessed against topsoil required for rehabilitation and alternate sources of growth media are identified where there is a deficit of topsoil (C). Material identified for placement on the outer surface of landforms has been assessed for its suitability as a growth medium and takes into consideration depth and characteristics required to support sustainable vegetation development including structure, water holding capacity, and elements that might affect plant growth or survival (C).	Soil stripping has been undertaken in accordance with the relevant BHP Rehabilitation Standards and Procedures (P). Topsoil stockpiles have been managed following the relevant BHP Rehabilitation Standard and Procedures (P). Where available and appropriate to meet the landform design requirements, topsoil has been used to provide a suitable medium for plant establishment and a source of propagules (P). Topsoil/growth medium has been placed in accordance with rehabilitation plans (P).	Landforms substantially support target vegetation communities and the associated agreed post-closure land use (C).	**Planning** Topsoil reconciliation information. **Execution** Report on landform construction. Rehabilitation inspections confirm earthworks have substantially met final landform designs. **Completion** Rehabilitation monitoring results reported in AER.	9.2.2 Rehabilitation monitoring methodology
C4.2 Provenance	Vegetation is locally endemic.	Rehabilitated land is consistent with agreed reference vegetation communities and / or with the post-mining land use.	All where revegetation is planned	Seed requirements for rehabilitation have been identified and appropriate quantities of seed collected from local provenance areas to support the five-year rehabilitation plan (C).	Revegetation has used local provenance native seed from the Hamersley IBRA sub-region (C).	-	**Planning** Seed database. **Execution** Site rehabilitation report including seed mix summary.	-
C4.3 Vegetation Development	Vegetation is suited to the final landform and agreed post-closure land use.	Rehabilitated land is consistent with agreed reference vegetation communities and / or with the post-mining land use.	All where revegetation is planned	Rehabilitation plans and target seed mixes are designed to return target vegetation communities and take into account the results of rehabilitation monitoring and trials (C).	Rehabilitation is substantially executed in accordance with plans (P).	**Land use: Relatively natural environments for pastoral grazing purposes** % bare ground (Q): • Hills, slopes, dry plains ≤50%. • Drainage lines and floodplains ≤ 20%. Perennial and annual native species richness within >50% of rehabilitated sites (number of species per 50x50 m plot) (Q) achieves target % for each target vegetation type. At least one dominant species from each strata present (see Appendix D) (Q). >50% common species present (Q). Plant cover achieves target % for each strata and vegetation type (see Appendix D) (Q).	**Planning** Review of rehabilitation monitoring results, and related rehabilitation monitoring procedures. Research reports and findings from trials. **Execution** Rehabilitation execution completion report. Site inspection to confirm rehabilitation has been substantially conducted in accordance with the plan. **Completion** Monitoring of vegetation re-establishment using the relevant BHP rehabilitation monitoring procedures. Monitoring results reported in AER and indicate that completion criteria have been substantially achieved.	9.2.1 Rehabilitation monitoring methodology

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
						Land use: Natural environments for managed resource protection % bare ground (Q): • Hills, slopes, dry plains ≤50%. • Drainage lines (excluding channel bed) ≤20%. • Floodplains ≤ 20%. Perennial and annual native species richness (number of species per 50x50 m plot) (Q) achieves target % for each target vegetation type. At least one dominant species from each strata present (see Appendix D) (Q). >70% common species present (Q). Plant cover achieves target % for each strata and vegetation type (see Appendix D) (Q).		
C4.4 Resilience (Reproductive capacity)	Demonstrated capacity of the site to recover from fire, drought and other disturbances.	The rehabilitated ecosystem has function and resilience indicative of the target ecosystem and post-mining land use.	All where revegetation is planned	Rehabilitation techniques are informed by trials, research and monitoring of rehabilitated areas (C).	Rehabilitation is substantially executed in accordance with plans (P).	Demonstrated capacity of flora to reproduce as evidenced by seedling recruitment and vegetative production (C).	**Planning** Review of progress and performance from rehabilitation monitoring results, and related rehabilitation monitoring procedures. Research findings from trials on representative rehabilitated areas investigating post-disturbance recovery of revegetation. **Execution** Rehabilitation execution completion report. Site inspection to confirm rehabilitation has been substantially conducted in accordance with the plan. **Completion** Rehabilitation monitoring results reported in AER. Survey data to include type, age and extent of seedling recruitment and vegetative production.	9.2.2 Rehabilitation monitoring methodology
C4.5 Weeds	DBCA priority list weed species to be managed so as not to cause unacceptable risk to surrounding environments.	The rehabilitated ecosystem has function and resilience indicative of the target ecosystem and post-mining land use.	All where revegetation is planned	Weeds have been monitored and risk-based control plans developed which are compatible with the agreed post mining land use (C).	The requirements of the Weed Management Procedure have been substantially implemented (P). Populations of weeds have been monitored and controlled based on risk (P).	Priority alert weed species are not present (C), or if present, cover is less than or equal to the surrounding areas (regional baseline) (Q). No new priority alert weed species introduced (C).	**Planning** Review of weed monitoring undertaken to assure compliance with the Weed Management Procedure. **Execution** Review of weed control undertaken to assure substantial compliance with the Weed Management Procedure. Report on weed monitoring and control records. **Completion** Measurement of weed abundance. Surveys and comparison with regional baseline data.	9.2.3 Weed monitoring
	Total weed cover to be typical for each site and landform and reflect final land use.	The rehabilitated ecosystem has function and resilience indicative of the target ecosystem and post-mining land use.				**Land use: Relatively natural environments for pastoral grazing purposes** Total weed cover: • Drainage lines, floodplains <20%. • Upland hills, slopes and flats <20%. • Buffel grass cover: • Drainage lines, floodplains <10%. • Upland hills, slopes and flats <5%.		

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
						Land use: Natural environment for managed resource protection Total weed cover: • Drainage lines, floodplains <15%. • Upland hills, slopes and flats <5%. • Buffel grass cover: • Drainage lines, floodplains <10%. • Upland hills, slopes and flats <5%.		
C4.6 Fauna	Vegetated areas provide fauna habitat	Rehabilitated areas provide habitat for native fauna, including Mandu, indicative of the target ecosystem and post-mining land use.	All where revegetation is planned	Rehabilitation plans include return of fauna habitats (C). Fauna habitat designs are based on the results of research and trials (C).	Fauna habitats have been constructed into rehabilitation areas (C).	-	**Planning** Rehabilitation plans incorporating fauna habitats. Outcomes of research and trials. **Execution** Report on habitat construction. **Completion** Rehabilitation inspections confirm that habitats have been constructed in accordance with designs.	9.2.1 Closure completion audit and inspection
C5 Hydrology								
C5.1 Surface Water	Rehabilitation drainage patterns have been established and impacts on natural surface water flows are acceptable at key receptors.	Surface drainage patterns, flows and characteristics are reinstated in a manner consistent with the regional drainage function and / or post-mining land use.	All where relevant	Post-closure surface water impacts (including erosion and changes to flows and quality) have been identified and closure designs developed to mitigate these impacts (C). Landforms have been designed to be resilient to extreme rainfall and flood events (C).	Mine closure execution is substantially in accordance with designs (P).	Downstream environmental receptors are not significantly affected by changes to quantity and quality of streamflow (Q).	**Planning** Surface water assessment and modelling reports. Design review. **Execution** Report on landform construction. **Completion** Post-completion surface water flow and quality monitoring reports. Validation reports for surface water model predictions. Site inspection to verify no unplanned impacts on surrounding natural drainage patterns or landform failures.	9.2.6 Surface water and groundwater monitoring
C5.2 Groundwater	Mining-related impacts on groundwater (levels and quality) have been minimised.	Groundwater levels and characteristics reflect original levels and characteristics and / or support the target ecosystem and post-mining land use.	All where relevant	Post closure groundwater impacts have been identified and closure designs have been developed to mitigate these impacts (C).	Mine closure execution is substantially in accordance with designs (P).	There are no unacceptable, physical impacts at key receptors as a result of BHP's Pilbara operations (C). Groundwater levels and quality have been maintained to acceptable levels at key receptors as a result of BHP's Pilbara operations (C).	**Planning** Groundwater assessment and modelling reports. Design review **Execution** Report on landform construction. **Completion** Post completion groundwater monitoring and groundwater model validation report.	9.2.6 Surface water and groundwater monitoring

Category	Criterion objective	DMPE Standard Closure Outcome	Domain	Performance indicators		Completion (Stage 3)	Verification procedure[7]	Monitoring method
				Planning (Stage1)	Execution (Stage 2)			
C6 Decommissioning								
C6.1 Infrastructure	Infrastructure has been decommissioned and removed where transfer to a third party is not agreed	No infrastructure left on site unless agreed by post-mining land manager(s) / owner(s).	All where infrastructure exists	Agreement has been reached with Government and stakeholders (including post mining land holder) regarding whether any infrastructure is required to remain post-mine closure (C). The agreement includes condition of infrastructure at transfer (C). Waste disposal requirements and locations have been defined in consultation with key stakeholders and incorporated into mine closure programs (C). All infrastructure is de-energised and inadvertent access controlled following closure, and prior to demolition (C).	Demolition has been conducted in accordance with the demolition plan (P). Remaining infrastructure condition has been assessed and made good to meet stakeholder agreements (P). Waste disposal plans have been implemented (P).	Infrastructure not required has been removed (and recycled/reused where practicable) (C). Stakeholders agree to the transfer of infrastructure ownership and accept ongoing responsibility for maintenance of the infrastructure (C).	**Planning** Documented agreement of infrastructure to be removed and standard of demolition (including extent to which concrete foundations and buried services would be removed). Documented agreement on infrastructure to remain and condition of infrastructure at transfer. **Execution** Demolition contractor's report against agreed standard. Condition assessment report of remaining infrastructure. Waste disposal records. **Completion** Site inspection report and documented transfer of infrastructure to stakeholders.	9.2.1 Closure completion audit and inspection
C7 Contaminated sites								
C7.1 Contaminated Sites	Contaminated sites have been documented and managed to achieve a classification commensurate with the post mining land use.	All environmentally hazardous chemicals, rubbish and contaminating materials have been removed, treated, managed and disposed in a manner consistent with the post-mining land use.	All where relevant	Contaminated sites have been identified, investigations undertaken and, where required, remediation action plans developed (C). Remediation action plans would be approved by a contaminated sites auditor (C).	Implementation of the approved remediation action plan (P). Validation sampling shows remediation has achieved remediation criteria (Q).	Contaminated sites classification issued by DWER is consistent with the post-mining land use (C).	**Planning** Preliminary Site Investigation (PSI), Sampling and Analysis Plan (SAP), Detailed Site Investigation (DSI) and Remediation Action Plan (RAP) – produced by a contaminated site consultant and reviewed by an independent auditor. **Execution** Reports produced by remediation contractor including validation sampling and waste disposal records. **Completion** Contaminated sites auditor produces Voluntary Audit Report (VAR) or Mandatory Audit Report (MAR). Completion audit of DWER contaminated sites classification relative to agreed post-mining land use.	9.2.1 Closure completion audit and inspection
C8 Cultural value								
C8.1 Cultural Value	Protection of cultural values, and access to sites of cultural importance has been incorporated into mine closure planning in consultation with the Traditional Owners.	Constructed landforms are designed with consideration of visual amenity, cultural values and local topography.	All where relevant	In consultation with the Banjima People: • Provisions for safe access to sites of importance have been incorporated into closure designs (C). • Requirements for repatriation of cultural artefacts have been identified (C).	Mine closure execution is substantially in accordance with designs for the protection of cultural values (P). Cultural artefacts have been repatriated in accordance with stakeholder requirements (P).	Stage 2 performance indicators have been met (C).	**Planning** Mine closure designs have incorporated safe access to sites of cultural importance identified during consultation. Documented agreement regarding the repatriation of cultural artefacts. **Execution** As constructed report. Confirmation by Banjima representative that artefacts have been repatriated.	9.2.1 Closure completion audit and inspection
C9 Land management								
C9.1 Land Management	Long-term management requirements have been addressed.	No equivalent DMPE outcome.	All	Rehabilitated landforms are designed to achieve land management requirements post closure that are aligned to agreed post mining land use (C). Where active management is likely to be required, post mining land use representatives agree on level of effort/resources required to actively manage the site post-closure (C).	Mine closure execution is substantially in accordance with designs (P).	At the time mine closure is considered complete; site land management requirements are aligned to the agreed post mining land use (C). Where specific management actions are required, these will have been transferred to the agreed post mining land holder with adequate provisions for this additional management (C).	**Planning** Closure design review. Sustainability and long-term management requirements are identified in the monitoring and research reports. **Execution** Report on landform construction and rehabilitation execution. **Completion** Monitoring reports. Documented agreement with stakeholders of measures for providing additional active management post-closure.	9.2.1 Closure completion audit and inspection

8 Closure implementation

Taking into account the identified closure issues and acknowledging the further studies, investigations and design work that would occur during the life of the mine, this section describes how Ministers North would be rehabilitated and closed in a manner that is consistent with the mine closure objectives, guiding principles and completion criteria outlined in Section 6.2, and addresses the DMPE guidelines (DEMIRS, 2025).

The closure implementation strategies defined below are based on experience across BHP's Pilbara operations and on the Closure and Rehabilitation Standard (WAIO, 2023b).

8.1 Domain model

To facilitate effective mine closure planning, Ministers North has been divided into physically distinct domains and features (Table 8-1). The domains comprise features that have similar rehabilitation and closure requirements and are shown on Figure 8-1. Figure 8-1 shows the indicative footprints of areas to be disturbed.

Table 8-1 Domains and features of Ministers North

Domain	Feature
OSA/ROM pad/stockpiles	Central ex-pit OSA
	In-pit Storage Areas
	Stockpiles
	ROM pad
Mine voids	North Pit and South Pit
Infrastructure	Administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, water storage (including turkey's nest) and pumping, fuel storage and transfer, explosives storage, pipelines, and communications.
	Power generation and transmission powerlines
	Water storage and transfer facilities (including water supply pipelines from Yandi)
	Main access road and transport corridor to Yandi, haul roads and access tracks
	Surface water infrastructure including earthen bunds, swales and/or culverts
Haul Road	Haul Road
	Rail line overpass
	W5 Pit Landbridge

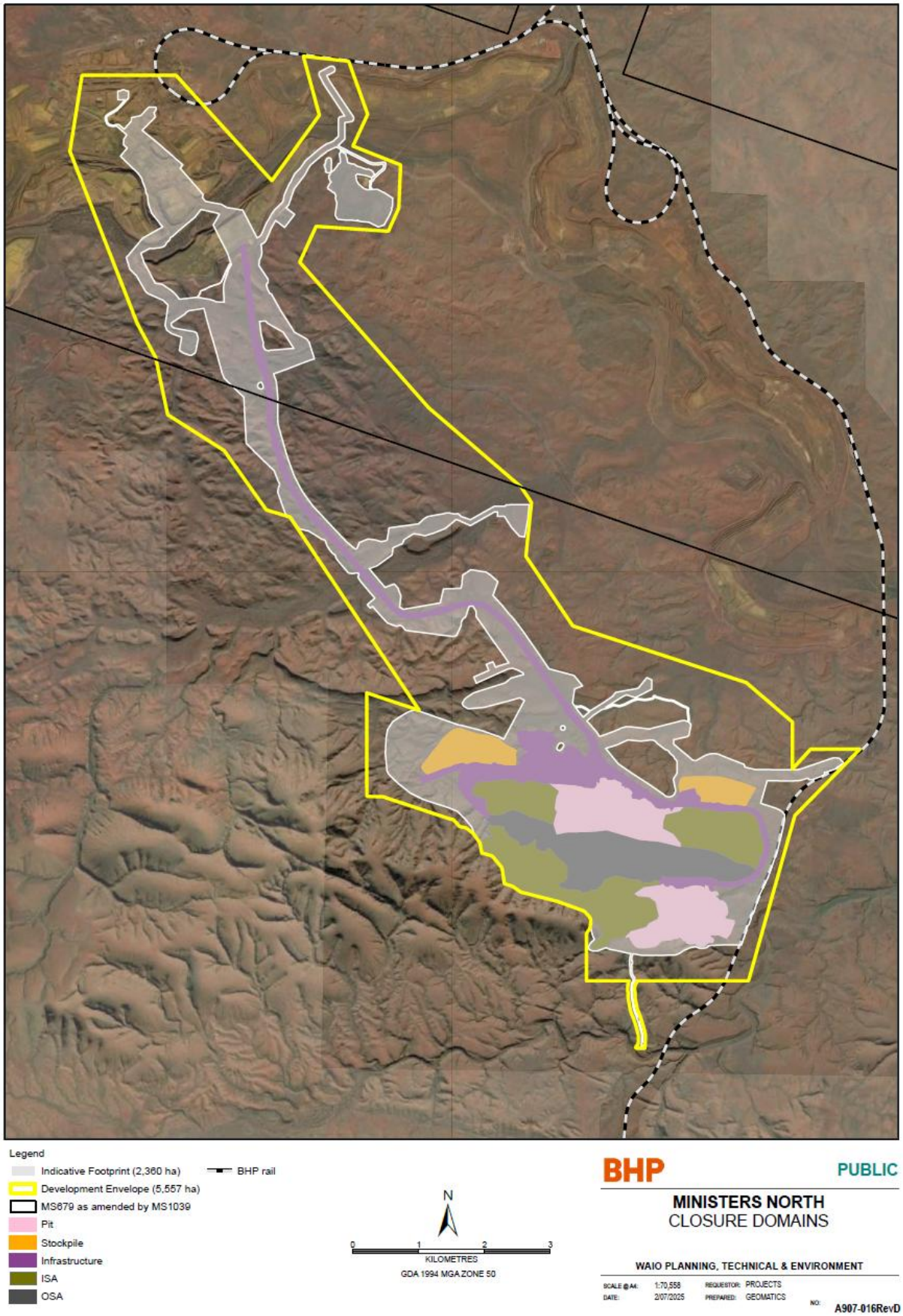


Figure 8-1 Ministers North Closure Domains

8.2 Closure work schedule

The planned Ministers North mining operation is limited to two mine pits and one OSA. Therefore, progressive rehabilitation opportunities early in the mine life will be limited to areas such as borrow pits associated with construction. The implementation schedule for closure of Ministers North will depend on approval and construction timeframes, and long-term mine plans. However, based on an assumed closure date of 2043, progressive rehabilitation of the OSA would commence in approximately 2035, with progressive void backfill occurring earlier as part of mining operations. A preliminary implementation schedule is provided in Table 8-2 and will be further refined in the light of updated mine plans and as closure planning progresses.

Table 8-2 Rehabilitation and closure tasks register

No.	Domain	Works to be undertaking	Responsible Role	Timing	Status
Operational and progressive rehabilitation					
1	Borrow Pits	Rehabilitate	Construction Manager	Indicative 2027 - 2030	Not started
2	Closure materials	Stockpile soil during clearing	Construction Manager / Mine Manager	Indicative 2027 - 2030	Not started
3	Pit voids	Progressive backfill of pit voids during mining	Mine Manager	Indicative from 2032	Not started
4	Pit void	Implement geomorphic design of southern wall of South Pit as pushbacks are complete.	Mine Manager	Indicative 2035 - 2043	Not started
4	OSA	Progressive rehabilitation of completed sections of OSA	Mine Manger	Indicative 2035 - 2043	Not started
Decommissioning and closure tasks					
5	Infrastructure	Decommission and demolish infrastructure	Closure Manager	Indicative 2043 - 2050	Not started
6	Infrastructure	Undertake contaminated sites assessment	Closure Manager	Indicative 2043 - 2050	Not started
7	Infrastructure	Rehabilitate infrastructure footprint, including hard stands and roads.	Closure Manager	Indicative 2043 - 2050	Not started
8	Infrastructure	Remove and rehabilitated rail crossing.	Closure Manager	Indicative 2043 - 2050	Not started
9	Infrastructure	Remove W5 landbridge material that sits above the surrounding pit backfill. Rehabilitate.	Closure Manager	Indicative 2043 - 2050	Not started
10	OSA	Finalise rehabilitation of OSA if not completed during operational phase	Closure Manager	Indicative 2043 - 2050	Not started
11	Mine Void	Install abandonment bund	Closure Manager	Indicative 2043 - 2050	Not started
12	Roads	Remove and rehabilitate remaining roads	Closure Manager	Indicative 2043 - 2050	Not started
Post closure monitoring and maintenance					
13	All	Undertake monitoring to maintain compliance and assess progress towards achievement of completion criteria.	Closure Manager	Indicative – from 2050	Not started
14	All	Undertake maintenance as required to maintain compliance, ensure safety and allow ongoing monitoring.	Closure Manager	Indicative – from 2050	Not started

8.3 Research, investigations and trials

BHP has undertaken research projects and progressive rehabilitation at several of its Pilbara Operations, which enable learnings from one project area to be applied to new areas through the adaptive management approach (Section 9.2). BHP has also prepared a Rehabilitation Report which outlines the Company' progress towards rehabilitation for the Pilbara mining operations.

Appendix F provides a summary of historical research findings and current research projects. The outcomes of monitoring, research and trials are reported in further detail in the AERs for BHP's Pilbara operations. Additional ongoing external research programs, including the Pilbara Seed Atlas and Restoration Seed Bank Initiative through the Botanic Gardens and Parks Authority, continue to provide input to improving rehabilitation success across BHP's Pilbara Operations.

In assessing its Strategic Proposal, BHP considered that rehabilitation with native vegetation to a condition rating of 'Good' or better could be achieved within a period of 15 years following cessation of mining activities. Since the Strategic Proposal assessment was developed, BHP's approach to mine closure planning and rehabilitation success has continued to evolve (Section 8.3.1).

8.3.1 Vegetation completion criteria research

8.3.1.1 Syrinx completion criteria study

Syrinx (2019) conducted a study to develop vegetation completion criteria for BHP's Pilbara sites (Appendix B). The outcomes of this study form the basis for the vegetation criteria outlined in Section 7.2 although targets and species lists have been refined since 2019, based on monitoring data (Syrinx Environmental, 2023).

The Syrinx (2019) study included an assessment of:

- The appropriate scale to which the reference completion criteria should be selected and applied.
- The type of metrics that are most appropriate for use in the Pilbara based on a literature review and review of baseline and reference site data.
- The timescale appropriate for measuring success.

A summary of the study outcomes is provided below. The outcomes of this study form the basis for the vegetation criteria outlined in Section 7.2, although targets and species lists have been refined since 2019 based on monitoring data (Syrinx Environmental, 2023).

8.3.1.2 Reference selection

Baseline and reference data were analysed across several scales (regional, hub, site and ecosystem). The data showed that:

- The site, hub and regional scales do not provide a meaningful basis of assessment for most attributes, because they are geographic and not climatic or ecological boundaries.
- Both land systems and vegetation types are key influencing variables in the Pilbara region. Comparisons using land systems is complex and does not tease out the key ecological differences useful to determining the appropriate reference scale for measuring rehabilitation success.

Vegetation at the broad scale (e.g., shrub-steppe, low woodland etc.) was, therefore, considered to be the logical reference unit for criteria. Across BHP's Pilbara operations, there are a variety of terrestrial and wetland ecosystems. The term ecosystem is applied at various scales, and in WA has been used at the scale of a specific community (e.g., wetland communities associated with Weeli Wolli Spring) as well as at the broader vegetation scale (e.g., spinifex grasslands) or geomorphic scale (e.g., claypan).

In terms of rehabilitation, the specific pre-mining environment is generally significantly altered and does not necessarily form the appropriate target ecosystem for future rehabilitation. As such, the following major vegetation types defined in Beard et. al. (2013) were used by Syrinx (2019) as the target ecosystems for rehabilitation:

- Three types of spinifex grasslands:
  - **Grass-steppe** comprising a hummock grassland without emergent trees or shrubs which is classified according to the dominant spinifex species (*Triodia* spp.). A variety of herbs may be present between the hummocks, and the species composition of this component is dependent upon the amount and season of rainfall. Grass-steppe is not common and in general occurs as patches on rocky outcrops rather than in wide expanses.
  - **Low Tree-steppe** comprising a hummock grassland with an overstorey of scattered low trees and a spinifex layer dominated by *Triodia wiseana*.
  - **Shrub-steppe** comprising *Triodia* spp. with an open overstorey of shrubs such acacia, grevillea and mallee eucalypts. It is the characteristic vegetation of the interdunal swales and desert sandplains that receive less than 250 mm rainfall per annum, and on stony ground under higher rainfall conditions.
- **Low Woodlands** including open low woodland and sparse woodland. The *Acacia aneura* s.l. (mulga) low woodland, open low woodland and sparse woodland type is typical of the valley plains in the Pilbara Bioregion. It has an understorey of shrubs of *Eremophila* spp. and *Senna* spp. and annuals such as *Ptilotus nobilis*[8].

[8] Since the 2019 study this classification has been revised and is most likely *Ptilotus exaltatus*.

- Riparian Woodland. Bunch grasslands which comprise riverine sedgeland / grassland with trees and are associated with drainage lines. In the Pilbara the trees are mainly Eucalyptus victrix (coolibah) and E. camaldulensis (river gum) over mixed sedges from the families Cyperaceae and Restionaceae, and grasses (Aristida spp. and Eragrostis spp.).

Rehabilitation will therefore establish one of these five major vegetation types. Selection of the requisite target ecosystem will consider the adjacent vegetation communities (e.g., Riparian Woodland in riparian corridors), the substrate and landform (e.g., Low Tree-steppe on OSAs). The target species lists have been refined since the 2019 study, based on monitoring data (Syrinx Environmental, 2023), and are provided in Appendix B.

8.3.1.3 Metrics

The most appropriate attributes for measuring completion success were defined on the basis of a literature review and naturalness, resilience and habitat value were identified as the key characteristics of importance. The most significant variables relevant to resilience (soil stability, pattern, richness) were found to be vegetation cover, species composition and buffel grass (*Cenchrus ciliaris*) cover, and those relevant to naturalness and habitat were structure and pattern.

The key attributes capturing the objectives of naturalness, resilience and habitat connectivity were concluded to be:

- Bare ground;
- Vegetation types;
- Indicator species;
- Plant cover;
- Species richness;
- Reproductive capacity (resilience); and
- Weed invasiveness.

The approach to setting specific targets for the attributes was based on:

- The closure objectives, which are not seeking replication of nature, but conformity with naturalness, resilience of rehabilitated landscapes, and habitat connectivity.
- The variability within the Pilbara, which does not favour the use of averages for ecological targets, but ranges that capture the typical variability based on vegetation types and landform (weeds attributes).
- Disturbance impacts, such as from existing pastoral activities, road and rail corridors, townships etc, as well as wider climate influences, that have resulted in modifications to the pre-European condition.

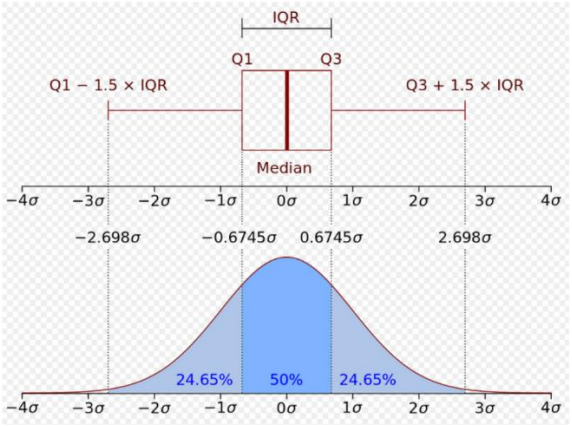
In general, the targets applied to the attributes include:

- Minimum or maximum values, derived from reference sites (weeds, bare ground);
- Presence / absence data (indicator species); and
- Ranges (species richness, vegetation cover).

To best capture natural variability of vegetation covers within individual vegetation types, the ‘typical’ cover ranges for each stratum were determined for each of the major vegetation types based on data from reference sites. For each vegetation type and each stratum (tree, shrub, *Triodia*, other grasses, herb) ranges were determined using the interquartile range (IQR) statistical approach which accounts for variability. This approach divides a data set into four equal groups (by count of numbers), each representing a fourth of the distributed sampled population (Figure 8-2).

- Q1 (lower quartile) is the "middle" value in the first half of the rank-ordered data set and is equal to the 25th percentile of the data.
- Q2 (middle quartile) is the median value in the set and is equal to the 50th percentile of the data.
- Q3 (upper quartile) is the "middle" value in the second half of the rank-ordered data set and is equal to the 75th percentile of the data.

The interquartile Q1-Q3 range is defined as the difference between the largest and smallest values in the middle 50% of a set of data (Figure 8-2). Because of the natural variability of the Pilbara, and because the objectives are based around naturalness and resilience, and are not attempting to replicate natural vegetation communities, this approach effectively targets the ‘middle-range’ and is considered appropriate for application to all quantitative targets.



Source: Syrinx (2019)

Figure 8-2 The interquartile range (IQR) statistical approach adopted for setting cover targets

Buffel grass and BHP weed data were used as the basis for selecting weed targets. Buffel grass is the most significant weed in the Pilbara in terms of cover and extent. This species is not confined to mining operations and is seen by many pastoralists as an important component of pastoral lands. In 2016, the CSIRO (Webber, Batchelor, & Scott, 2016) aggregated data from 630 flora and vegetation reports which showed that buffel grass was widespread and known from nearly 12,000 locations. This included occurrences within lands managed for conservation. Given the wide spread of this weed, setting a blanket criterion of 'no buffel grass' within rehabilitation areas is not practical.

An analysis of data across BHP's sites indicated that the average weed cover across all hubs is approximately 5.3 % with buffel grass being the dominant weed.

Baseline weed cover values combined with BHP rehabilitation data have been used to set practical and appropriate completion targets. If the cover of buffel grass declines regionally with tighter eradication controls, these targets would shift accordingly. The occurrence of buffel grass correlates with landform more than vegetation type and is particularly dominant in drainage lines and floodplains at most sites. Separate targets have, therefore, been applied to hills, plains and drainage lines / floodplains to reflect this.

The target metrics have been refined since the 2019 study, based on monitoring data (Syrinx Environmental, 2023), and are provided in Appendix B. The metrics include modifiers for different land uses, so that land that will be managed for resource protection must achieve higher species richness indices than land rehabilitated for pastoral grazing, for example.

8.3.1.4 Timescale

To assess the appropriate timescales to use, data from all rehabilitation plots were aggregated into classes based on the age of rehabilitation, and assessed for *Triodia* cover, given this species is the major component of most of the target vegetation groups and has typically been considered as the most important plant genera in terms of naturalness. The data suggested that measurement of a site against completion criteria after 15 years, and 20 years would not be an unreasonable time point for final assessment. Even with a sequence of good rainfall years and improvements in rehabilitation methods, it is unlikely that any site will be ready for assessment against completion criteria before 10 years, since even if some areas do attain the required metrics at this time, the site would need to sustain this during a poor climatic period and fire event to demonstrate resilience of the rehabilitation.

This MCP for Ministers North incorporates the learnings from the earlier analysis of rehabilitation success and the more recent work in refining the criteria.

8.4 Progressive rehabilitation

All areas of new land disturbance at Ministers North will be rehabilitated with native vegetation or low intensity grazing pasture, with the exception of the mine pit open voids. The rehabilitation works will include on-contour ripping of compacted areas and respreading of the rehabilitation materials (vegetation, topsoil and subsoil) that were removed and stockpiled during the initial vegetation clearing.

Backfilling of overburden into pit voids will occur throughout the mine life as access becomes available.

Progressive rehabilitation and ongoing performance assessment would be carried out in areas where mining operations have been completed and further disturbance is unlikely. Where areas are identified as available for rehabilitation, they would be incorporated into the five-year rehabilitation plan for the site. Five-year rehabilitation plans are required to be prepared and updated annually as part of the CAP process (BHP, 2023a) outlined in Section 2.4. The plans align with the five-year mine plans and identify no-regret areas available for final landform earthworks and rehabilitation within the five-year period.

The main components of the progressive rehabilitation program are described in the Rehabilitation Standard (WAIO, 2023b) and will be reported annually within the AER.

8.5 Closure designs

Standard closure methods commonly applied across WAIO sites are outlined in Appendix I. These methods will be adopted at Ministers North as appropriate. Closure strategies specific to the closure features at Ministers North are outlined in this section.

8.5.1 Mine voids

Two above water table mine pits will be developed at Ministers North. These are the North Pit and the South Pit (Figure 8-3). Based on the current Ministers North mine plan, BHP proposes to backfill the North and South pits with NAF (AMD0) material, which will consume approximately 50% of the overburden generated. The base of the remaining voids, after backfill, will be at least 5 m above the groundwater table to reduce the potential for impact to underlying groundwater quality. The groundwater table has been recorded at between 564 mAHD in 2018 and 560 mAHD in 2025 (BHP, 2025b). No permanent pit lakes will form after closure.

Backfilling of the South Pit will be prioritised in pushbacks against Khargoonha (Figure 8-4) and a geomorphic designed[9] will be implemented on the southern pit wall of the South Pit against Khargoonha. The intent of the geomorphic design is to reestablish natural surface water flow paths and to visually blend in with the existing natural topography.

Safety bunds are required to be established around final pit walls in accordance with DMPE recommended practice (DoIR, 1997). Through consultation with the Banjima People, it is recognised that there is a concern that abandonment bunds may restrict access to land post closure. BHP, BNTAC and DMPE discussed the potential conflicting objectives and constraints of the existing abandonment bund guidelines at a meeting in May 2025 (Section 4.2). The guidelines are currently being updated to accommodate flexibility with regard to access and surrounding landforms. BHP will maintain a watching brief on the release of the new guidelines. Under the current guidelines, the bunds would be a minimum 2 m high with a base width of minimum 5 m and constructed at least 10 m away from the edge of the area known to contain potentially unstable rock mass as per recommended practice.

The final locations for safety bund placement will be determined once closure designs have been finalised, to allow consideration of the effects of backfill on pit wall stability and any pit wall slopes that are reprofiled. Consideration will also be given to post closure access by Traditional Owners, in collaboration with the Banjima People, noting that BHP will also be legally required to comply with DMPE guidelines for the placement of abandonment bunds. Bund interaction with surface water flows and surface water management infrastructure, and the stability of bunds located over unconsolidated material will also be assessed to inform the final design.

[9] In the context of mine closure, a geomorphic approach refers to an engineered design of landforms based on natural systems and the principles of geomorphology, rather than using traditional, linear and angular engineering designs.

Geomorphic design aims to develop functionally stable and self-sustaining landforms, replicating the intricate shapes and processes in stable natural landscapes that have evolved over extended periods. The process replicates natural landforms and drainage systems to guide water over the landscape while effectively reducing sediment.

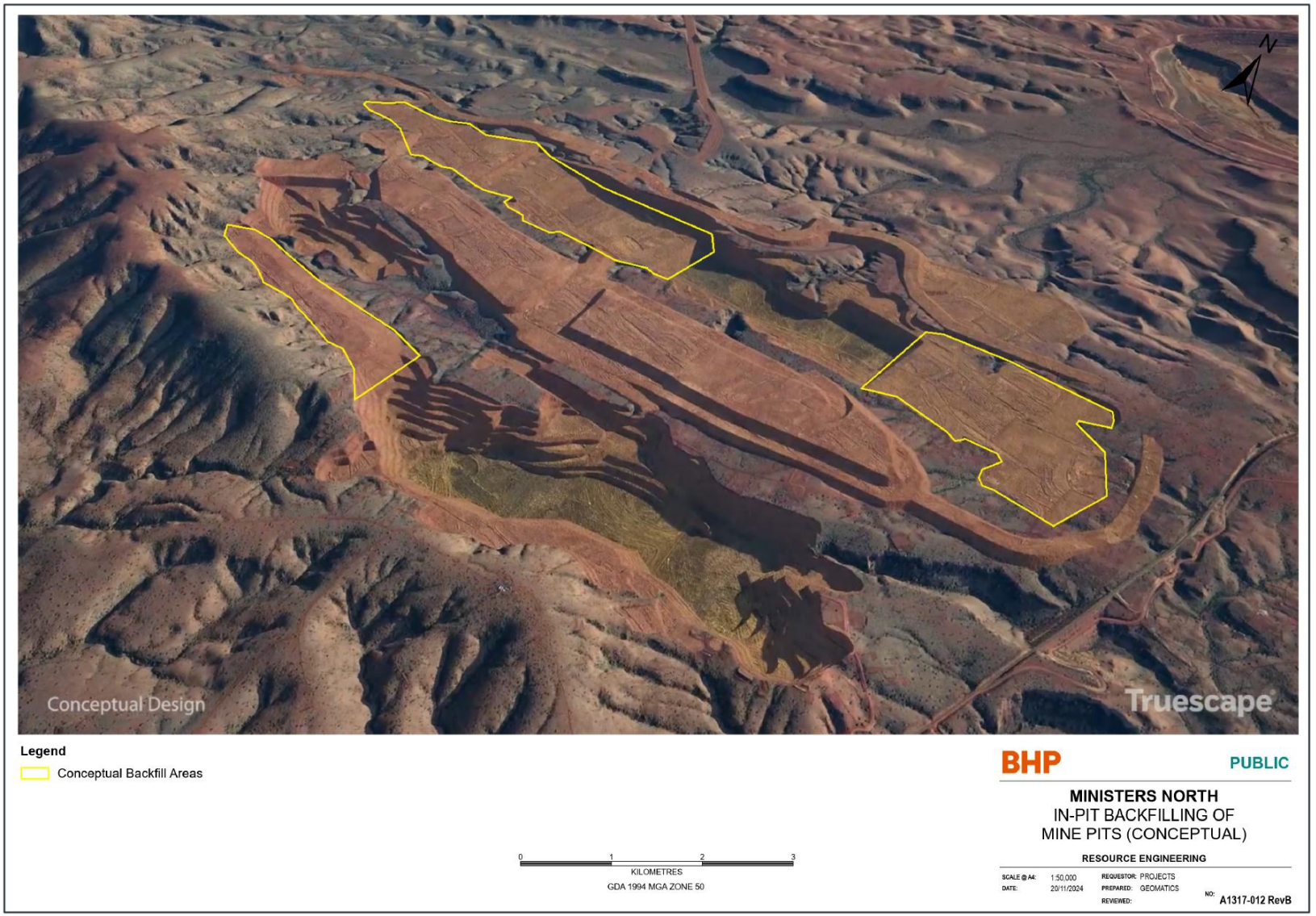
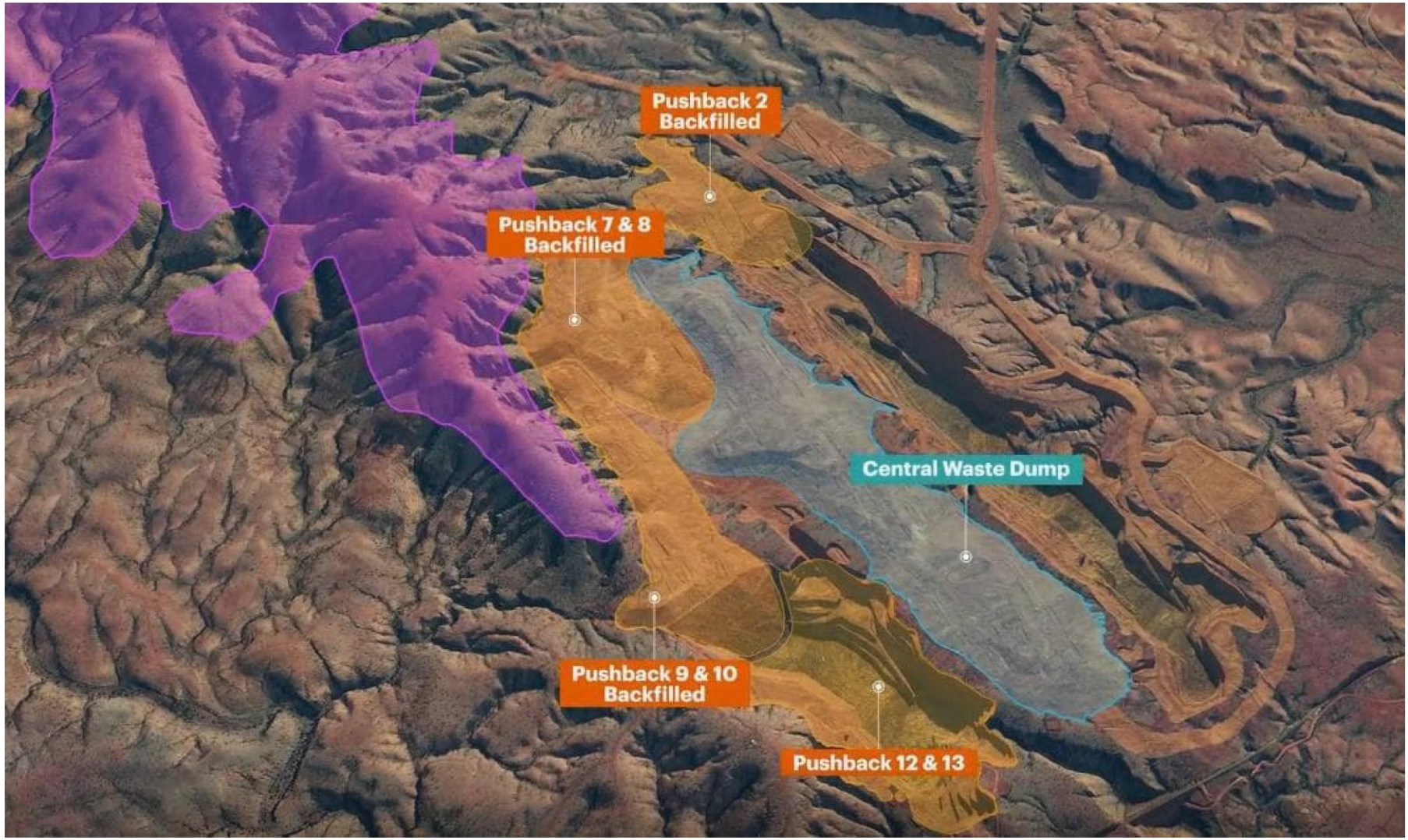


Figure 8-3 In-pit backfilling of mine pits (conceptual)



Source: BHP (2025c)

Figure 8-4 Pit backfilling prioritised against natural landform

8.5.2 Overburden Storage Areas

Approximately 50% of overburden generated during mining will be backfilled into the mine voids. The remaining 50% of overburden will be stored in the Central OSA (Figure 8-4). No other OSAs are currently proposed.

At this early stage of mine planning, conceptual landform designs (Figure 8-4) have been prepared for the proposed mine based on materials characterisation data incorporated into mine planning block models and representative slope geometries provided in the Mines Closure Design Procedure (WAIO, 2022e) for different classes of materials (Appendix I-4). Landform designs will be refined as the mine plan is further developed within the indicative footprint (Figure 8-1) and the Central OSA will be designed to blend with the South Pit landform (BHP, 2025b).

Conceptually, a hybrid design will be adopted for the Central OSA with approximately 60% of the landform comprising a concave design. The remainder of the OSA will be blended with the southern pit landform, adjacent to the Khargoonha heritage area. The detailed design will be further developed in consultation with TOs as materials characterisation data is collected and landform evolution modelling is completed.

Portions of the Central OSA and the South Pit ISA will be constructed based on geomorphic principles. The designs will be developed with regard to site specific information as it becomes available, such as:

- Local climate and rainfall patterns, including climate change scenarios
- Material characterisation of the overburden and soil conditions for construction, stability and suitability
- The topography of upstream and downstream catchments, relief points and essential flow paths.

Landform designs will be shared with the Banjima People for review and comment prior to adoption.

8.5.3 Stockpiles

Topsoil stockpiles will be consumed during rehabilitation of disturbance areas and so will be removed as closure execution is finalised.

Any remaining temporary ore stockpiles will be transported off site for processing or will be rehandled and backfilled into the pit void.

8.5.4 Infrastructure

Decommissioning plans will be prepared to guide the decommissioning, demolition and removal of all fixed site assets at Ministers North. Decommissioning of infrastructure at Yandi, that is also used as part of the Ministers North operation, is included in the Yandi MCP (BHP, 2025a). Decommissioning plans will include provisions for:

- Safe removal of residual hydrocarbons and chemicals, and de-energising and cleaning equipment prior to demolition.
- Demolition and removal of:
  - Ore processing facilities;
  - BHP's office buildings and minor equipment;
  - Other non-processing infrastructure (NPI);
  - Fuel farms; and
  - All above ground power generation and supply infrastructure.
- Break up and removal of all concrete slabs, foundations and footings associated with Ministers North infrastructure.
- Removal of underground services..
- All other wastes will be removed from site for disposal at appropriate facilities.

The water supply pipeline between Ministers North and Yandi will be decommissioned and removed.

Following the removal of infrastructure and access tracks, re-profiling of the land surface, additional surface treatments and revegetation works would be implemented in accordance with the standard rehabilitation procedures described in the Rehabilitation Standard (WAIO, 2023b).

8.5.5 Haul Road

The Haul Road will be rehabilitated (Figure 8-5), including removal of culverts, the railway overpass (Figure 8-6) and all other infrastructure associated with the Haul Road, with the aim of returning land to pre-disturbance drainage and topography where possible. Rehabilitation of the Haul Road will be designed to meet agreed PMLU requirements and will seek to blend into the surrounding topographic form and shape. This will include the reinstatement of natural water ways / drainage paths / surface flows and removal of Haul Road fill material if surplus to requirements for post mining land uses.

Road cuttings will remain in place and the remainder of the disturbance footprint will be reprofiled and contoured to blend with the natural topography as much as possible.

The Haul Road land bridge that is proposed to be installed on backfill in the W5 Pit at Yandi will be pushed down and reprofiled to blend with the surrounding backfill material. Surface treatment of the remaining footprint of the land bridge will be aligned with the methodology used for the surrounding W5 Pit backfill.

Figure 8-5 Conceptual Haul Road culvert creek crossing during operation and post-rehabilitation

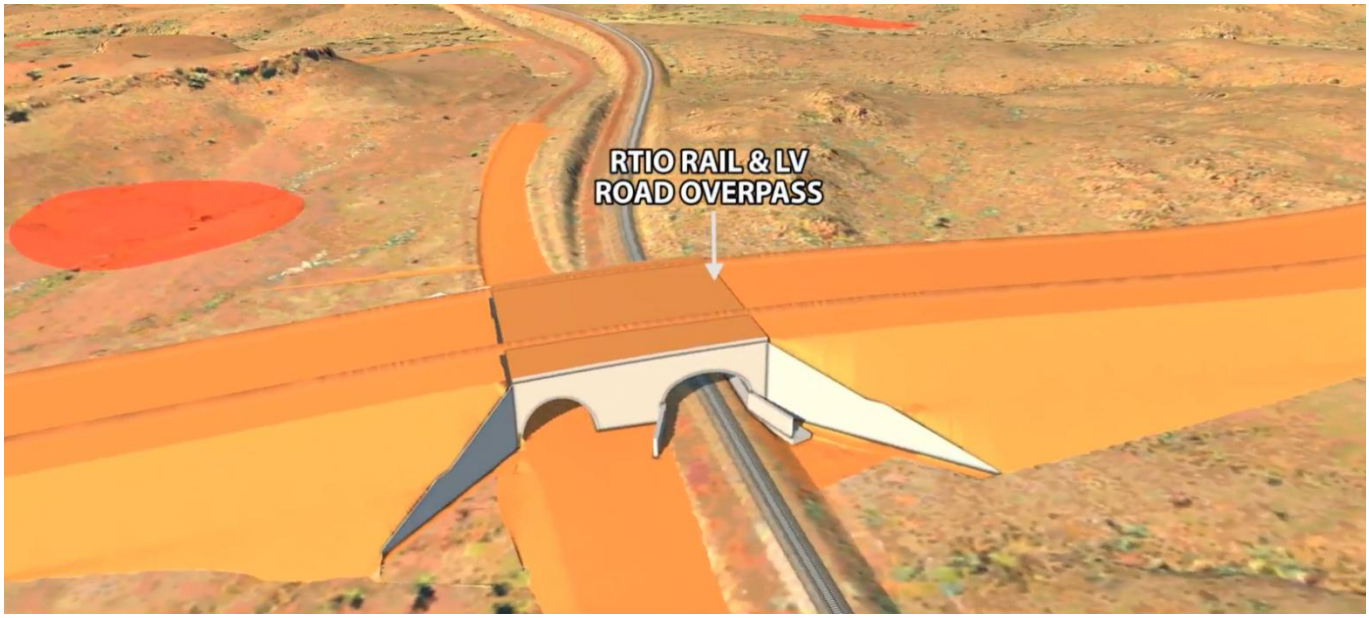


Figure 8-6 Conceptual Haul Road overpass over third party railway line

8.6 Contingencies for premature or early closure or suspension of operations

BHP is required to review a range of risks associated with the closure of its facilities annually as assessed using the risk processes described in the Risk Management Global Standard (BHP, 2025d). One of these risks is unexpected or unplanned closure. In the event that unplanned or unexpected closure occurs, the site would be decommissioned and rehabilitated in line with the objectives and strategies outlined in this document. In the absence of more detailed information, the overall objective under this scenario would be to make landforms such as the OSA secure and non-polluting following decommissioning and decontamination activities, with application of topsoil prioritised for these areas.

In the rare event of unplanned closure, the existing OSA would be assessed on a case-by-case to develop a final design commensurate with the incomplete geometry and available waste rock on site to re-contour to meet acceptable erosion outcomes.

Annual cost provisioning for closure in line with the closure cost estimating methodology outlined in Section 10 provides an understanding of the current closure liability, with present closure obligation costs representing an unplanned or unexpected closure scenario.

8.7 Decommissioning and execution

In accordance with Condition 4 of M270SA, at least six months prior to decommissioning of the project, a decommissioning program will be submitted to the State Mining Engineer for approval in consultation with the Environmental Protection Authority.

9 Closure monitoring and maintenance

9.1 Monitoring program overview

Across its Pilbara mining operations, BHP has implemented monitoring programs to evaluate the performance of rehabilitated mine landforms and to assess whether they have met the site completion criteria or are showing satisfactory progress towards meeting these criteria. These programs would be expanded as areas of Ministers North are rehabilitated and would be refined based on monitoring results and rehabilitation success.

Monitoring events would be undertaken in line with the process outlined in this section, with the outcomes informing rehabilitation strategies, facilitating refinement of completion criteria and directing maintenance and remedial action plans consistent with the adaptive management approach (Section 9.2), and demonstrating performance against completion criteria in preparation for rehabilitation signoff.

In some instances, achievement of completion criteria would be verified by audit or inspection rather than by monitoring over a period of time. Section 9.2.1 provides further details of the means to verify achievement of these criteria.

9.2 Adaptive management

The concept of adaptive management is a structured, procedural, iterative approach to decision making (Figure 9-1). It allows incremental improvement in the success of mine closure techniques by review of rehabilitation monitoring data and integration of findings into forward work programs and future closure and rehabilitation designs. The adaptive management approach allows for continual evaluation of preferred mitigation controls so that they are progressively improved and refined, or entirely alternate solutions adopted.

This adaptive management approach would be applied to Ministers North and associated closure issues taking into consideration the results of rehabilitation and trials from BHP's other Pilbara Operations and best practice rehabilitation techniques used elsewhere in the mining industry.

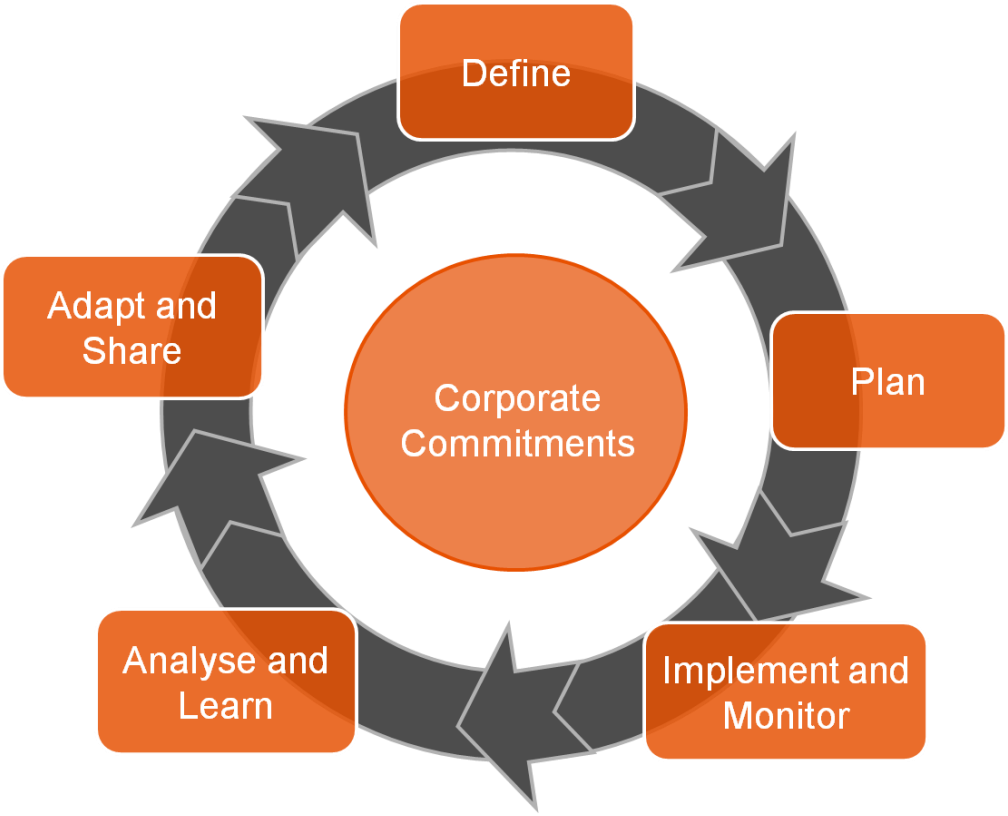


Figure 9-1 BHP's adaptive management approach

9.2.1 Closure completion audit and inspection

Table 9-1 outlines those completion criteria (Table 7-1) that would be verified through a completion audit and inspection rather than from the monitoring processes discussed in Sections 9.2.2 to 9.2.8. This section focuses only on completion criteria. Other interim audits and inspections would be conducted to confirm that planning and execution criteria were met.

Table 9-1 Completion audits and inspections

Category	Completion Criteria	Means of Verification
C1.1 Post-closure land use	Monitoring, inspection and/or survey reports that the rehabilitation objectives have been substantially met.	Completion audit of: • Post-closure monitoring and survey reports. • Written acceptance of condition of land from post-closure land user/owner.
C3.1 Visual amenity	Landforms have been substantially constructed in accordance with the designs defined in consultation with stakeholders to minimise visual impact.	Inspection and audit confirm that the final landform has substantially met visual impact design criteria.
C4.6 Fauna	Fauna habitats have been constructed into rehabilitation areas.	Rehabilitation inspections confirm that habitats have been constructed in accordance with designs.
C6.1 Infrastructure	Stakeholders agree to the transfer of infrastructure ownership and accept ongoing responsibility for maintenance of the infrastructure.	Completion audit of documented transfer of infrastructure to stakeholders.
	Infrastructure not required has been removed (and recycled/reused where practicable).	Completion audit of: • Demolition contractor's report against agreed standard. • Site inspection report following demolition.
C7.1 Contaminated sites	Contaminated sites classification issued by DWER is consistent with the post-mining land use.	Completion audit of DWER contaminated sites classification relative to agreed post-mining land use.
C8.1 Cultural values	Mine closure execution is substantially in accordance with designs for the protection of cultural values.	Completion audit of as constructed report relative to designs to protect cultural values.
	Cultural artefacts have been repatriated in accordance with stakeholder requirements.	Completion audit of confirmation by Banjima People representative that artifacts have been repatriated
C9.1 Land management	At the time mine closure is considered complete, site land management requirements are aligned to the agreed post mining land use.	Completion audit of: • Post-relinquishment land use management plan. • Closure strategy achieved as demonstrated by achievement of post-mining land use criterion.
	Where specific management actions are required, these will have been transferred to the agreed post mining land holder with adequate provisions for this additional management.	Completion audit of the documented agreement of additional active management measures required post-completion.

9.2.2 Rehabilitation monitoring methodology

9.2.2.1 Monitoring objective

Monitoring will be used to assess whether initial vegetation establishment has been successful, rehabilitation is developing satisfactorily and is ready for signoff.

The completion criteria against which the results of the monitoring program outlined in this section would be assessed are outlined in Table 9-2.

Table 9-2 Rehabilitation completion criteria

Category	Domain	Completion criteria
C4.1 Growth media C4.3 Vegetation development	All where revegetation is planned	Landforms substantially support target vegetation communities and the associated agreed post-closure land use.
		Land use: Relatively natural environments for pastoral grazing purposes % bare ground: • Hills, slopes, dry plains <50%. • Drainage lines and floodplains (excluding channel bed) <20%. Perennial and annual native species richness within >50% of rehabilitated sites (number of species per 50x50m plot) achieves target % for each target vegetation type At least one dominant species from each stratum present (see Appendix D). >50% common species present. Plant cover achieves target % for each stratum and vegetation type. **Land use: Natural environments for managed resource protection** % bare ground: • Hills, slopes, dry plains <50%. • Drainage lines and floodplains (excluding channel bed) <20%. Perennial and annual native species richness within >50% of rehabilitated sites (number of species per 50x50m plot) achieves target % for each target vegetation type At least one dominant species from each stratum present (see Appendix D). >70% common species for the target vegetation type present. Plant cover achieves target % for each stratum and vegetation type (see Appendix D).
C4.4 Resilience (reproductive capacity)		Demonstrated capacity of flora to reproduce as evidenced by seedling recruitment and vegetative production.

9.2.2.2 Monitoring method and frequency

To maintain quality control at all stages of the rehabilitation processes (e.g. execution of rehabilitation works, maintenance and monitoring), activities will be completed in line with WAIO's suite of procedures (WAIO, 2024; 2022c; 2023a) which provide guidance on aspects such as:

- Rehabilitation audit and inspection during execution;
- Rehabilitation data capture; and
- Rehabilitation monitoring.

Rehabilitation monitoring is conducted generally in accordance with WAIO's Rehabilitation Monitoring Technical Process Instruction (WAIO, 2024). This procedure was updated in March 2024 to incorporate the remote sensing techniques that BHP has been trialling since 2020.

Remote sensing is conducted every two years. Plot based ground sampling is also conducted biennially to collect data that cannot be captured by remote sensing. A brief description of each method is provided below.

Remote Sensing

Four band (Red, Green, Blue and Intensity (RGBI)) aerial imagery is captured at the end of the Pilbara wet season at 0.1 m ground sample distance. An orthorectified, mosaiced, and colour balanced image is then produced and assessed using machine learning algorithms. Following classification of the data via the machine learning algorithms, a thorough, visual quality assessment is carried out to identify any classification errors. Identified errors are manually corrected and used to retrain and improve the machine learning algorithms. Remote sensing currently captures the following data:

- Bare ground
- *Triodia* cover
- Shrub cover
- Tree cover
- Herb cover
- Tussock grass cover
- *Cenchrus* cover (*C. ciliaris* and *C. setiger*)
- *Aerva javanica* cover
- *Calotropis procera* cover

- *Acacia aneura* complex cover
- Total area of weeds identified
- Total area of vegetation cover.

Plot based sampling

Plot based sampling is aligned with the guidelines set out by the EPA for Level 2 Flora and Vegetation Surveys (EPA, 2016), and comprises assessment of the following attributes within a 50 m x 50 m plot:

- Species richness.
- Evidence of flowering and seed production and variable aged plants.

Photographs are also taken from the corner of each plot.

Permanent plots are sampled every two years, generally six to eight weeks after the wet season (during April to June).

The location of quadrats is decided by random stratified sampling, and plots are placed at representative locations throughout the survey area to cover a mixture of landforms, geology, elevation, slope, aspect, surface or groundwater expressions, and soil types. The number of 50 m x 50 m quadrats is determined by the area of rehabilitation (Table 10-3). The total quadrat area (1 quadrat = 0.25 ha) must be equal or greater than 1% of the sum total of all rehabilitated areas.

Table 9-3 Number of plots required for each rehabilitated area

Size of rehabilitated area	Number of quadrats required
< 10 ha	0 plots
10 – 25 ha	1 plot
25 – 50 ha	2 plots
50 – 75 ha	3 plots
> 75ha	4 plots

9.2.2.3 Corrective action

Should ongoing monitoring indicate that completion criteria cannot be met, the appropriate maintenance and/or remedial work would be undertaken. Depending on the cause of the deficiency, remedial actions could include, but not be limited to, reseeding, application of ameliorants/fertiliser and/or rework of an area. Further monitoring would be subsequently undertaken on repaired areas to demonstrate compliance with relevant criteria.

9.2.3 Weed Monitoring

9.2.3.1 Monitoring objective

To assess weed populations in relation to completion criteria targets (Table 9-4) and the effectiveness of weed control measures.

Table 9-4 Weed completion criteria

Category	Domain	Completion criteria
C4.5 Weeds	All where revegetation is planned	Priority alert weed species are not present, or if present, cover is less than or equal to the surrounding areas (regional baseline). No new priority alert weed species introduced. **Land use: Relatively natural environments for pastoral grazing purposes** Total weed cover: • Drainage lines, floodplains <20%. • Upland hills, slopes and flats <10%. Buffel grass cover: • Drainage lines, floodplains <10%. • Upland hills, slopes and flats <5%. **Land use: Natural environment for managed resource protection** Total weed cover: • Drainage lines, floodplains <15%. • Upland hills, slopes and flats <5%. Buffel grass cover: • Drainage lines, floodplains <10%. • Upland hills, slopes and flats <5%.

9.2.3.2 Monitoring method and frequency

BHP's weed management procedures (WAIO, 2020a) describe the weed monitoring to be conducted and the measures used to prevent the introduction and spread of weeds, including weed control requirements. Site inspections are conducted annually and weed monitoring via quadrats and relevé transects is conducted during rehabilitation monitoring described in Section 9.2.2.

9.2.3.3 Corrective action

Where weed cover is not meeting objectives, weed control measures would be implemented in accordance with the Weed Management Procedure (WAIO, 2020a). Post-mining weed control measures and monitoring programs would be refined in consultation with the relevant authorities. Approved changes to the monitoring programs and control measures would be documented in the AER and revisions of the Weed Management Procedure (WAIO, 2020a).

9.2.4 Fauna monitoring of rehabilitation areas

9.2.4.1 Monitoring objectives

BHP recognise that fauna have an intrinsic value to key stakeholders and natural processes within rehabilitation, however, the transient nature of fauna makes it difficult to consistently capture data that can be compared to a quantitative target. The objectives of fauna monitoring are, therefore, to:

- Provide information to key stakeholders on observed use of rehabilitation areas by fauna; and
- Inform management of the impacts of feral animals and pests on rehabilitation.

9.2.4.2 Monitoring method and frequency

Damage to rehabilitation from feral animals/pests is currently recorded during on-ground rehabilitation monitoring and inspections. BHP is in the process of reviewing its rehabilitation monitoring procedures to determine how fauna use of rehabilitated areas can be integrated into the monitoring program.

9.2.4.3 Corrective action

Implement feral animal and pest controls, if required.

9.2.5 Regional water monitoring network

From a closure perspective, it is necessary to have an understanding of:

- Pre-mining conditions and acceptable levels of change so that appropriate completion criteria can be developed;
- The changes that occur during mining so that conceptual and numerical models can be refined to facilitate:
  - Prediction of impacts at closure; and
  - The development of a post-closure monitoring regime that would enable model predictions to be validated over time.

- The changes that occur post-closure to enable models to be calibrated and provide an acceptable level of certainty in model predictions.

A regional monitoring network has been installed at an operational (other existing BHP operations) and catchment scale, and a monitoring program is in place to collect information for compliance reporting and to improve the capacity to estimate receptor response to changing hydrological conditions and natural climatic variations and stresses (Figure 9-2). It is used to develop an understanding of the baseline conditions (prior to BHP operations) with future operational conditions (with BHP operations), to:

- Define the natural variance in hydrological conditions;
- Underpin adaptive management and modelling processes; and
- Be consistent with the threshold variables being used to assess significance of impacts to receiving receptors.

The regional monitoring network would be extended to the Ministers North operation and used to support and inform closure assessments, enabling progressive improvement in understanding and confidence in the achievement of the stated closure objectives related to the hydrological regime.

The regional hydrological monitoring network enables time-variant data collection from various hydrological systems, including:

- Groundwater aquifer water levels and quality;
- Surface water drainage feature and creek flow volumes;
- Spring discharges, seepages, waterholes and marsh zones; and
- Weather and climatic conditions.

The data from the regional ecological monitoring network would be supplemented by data collected on:

- Vegetation assemblages;
- Significant biodiversity, flora and fauna values;
- Tree health monitoring, including lead indicators such as leaf moisture, sap flow and trunk/stem growth gauges or satellite/ aerial photography-based vegetation condition; and
- Hydrological dependence of receiving receptors on surface water, groundwater or soil moisture.

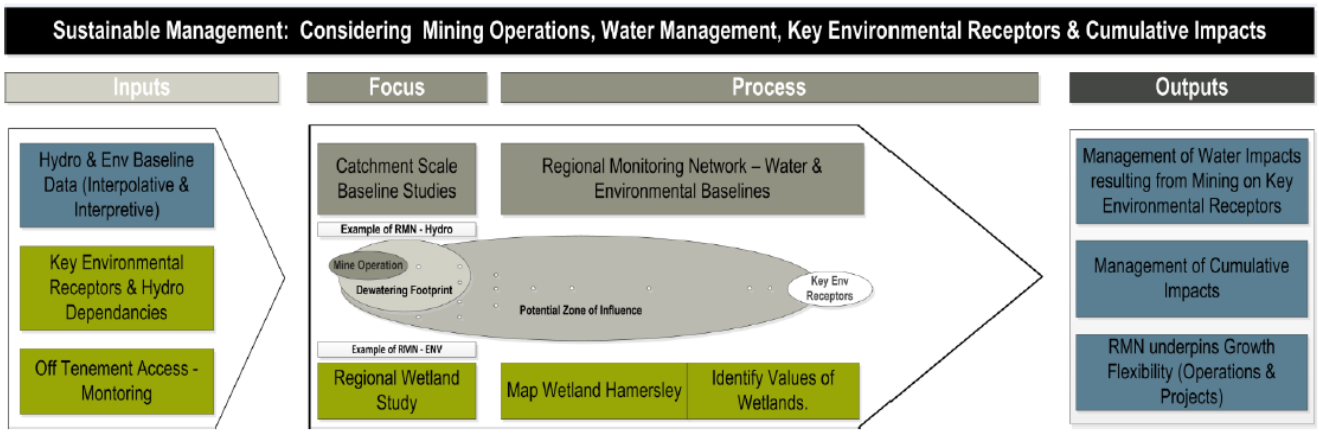


Figure 9-2 BHP's Pilbara regional monitoring network approach

9.2.6 Surface water and groundwater monitoring

9.2.6.1 Monitoring objectives

The objectives of surface water monitoring are to:

- Assess the quality of water in drainage lines to inform completion criteria and enable achievement of completion criteria to be demonstrated (Table 9-5).
- Measure flow rates to assist in the validation of surface water modelling.

Given that above water table operations are not expected to have a significant impact on groundwater levels or quality, the objectives of groundwater monitoring at this stage of the mine life would be to collect sufficient data to define the conceptual groundwater model for the site to an appropriate level of confidence.

Table 9-5 Surface and groundwater completion criteria

Category	Domain	Completion criteria
C5.1 Surface water	All where relevant	Downstream environmental receptors are not significantly affected by changes to quantity and quality of streamflow.
C5.2 Groundwater		There are no unacceptable, physical impacts at key receptors as a result of BHP's Pilbara operations. Groundwater levels and quality have been maintained to acceptable levels at key receptors as a result of BHP's Pilbara operations.

9.2.6.2 Monitoring method and frequency

Operational surface water monitoring requirements would be determined as part of the project approvals process. Data collected during operations would be used to refine and calibrate surface water models which would in-turn inform the locations and frequencies of a post-closure surface and water monitoring program designed to:

- Validate model predictions of:
  - The potential effects of peak floods on post-closure infrastructure and subsequent impacts on downstream receptors; and
  - The potential impacts of post-closure infrastructure on downstream flows.
- Provide the data necessary to assess achievement of completion criteria.

9.2.6.3 Corrective action

If monitoring indicates that completion criteria would not be achieved, an investigation into the cause of the exceedance would be conducted, and remedial measures defined in consultation with appropriate regulatory authorities

9.2.7 Landform and erosion monitoring

9.2.7.1 Monitoring objective

The monitoring objectives are to:

- Assess landform geotechnical and surface stability against the completion criteria outlined in Table 9-6.
- Identify any obvious sources of off-site impact.

Table 9-6 Landform and erosion completion criteria

Category	Domain	Completion criteria
C3.2 Geotechnical stability	All	Ex-pit landforms show no significant slumping or failure of accessible constructed slopes or berms.
C3.3 Geochemical stability	OSA, mine voids	No evidence of mineral scalds within rehabilitation areas. No exposed waste materials with adverse geochemical properties on the OSA.
C3.4 Surface stability	OSAs	Slope surfaces are stable, with no dispersive material on the surface; rock armouring is present as required; and no areas are exposed to the risk of significant erosion which may be defined as having): • Channelised flow resulting in extensive active gullies; • Failure of banks, berms or bunds; and • Evidence of ongoing significant sheet erosion (including large accumulation of silt at base of slope, exposed subsoil, poor seedling establishment). The average rate of erosion of slopes, flats and crests of the OSA measured at completion is <6t/ha/yr. The erosion rate at any point on a slope does not exceed the target threshold average rate by more than 100%.

9.2.7.2 Monitoring method and frequency

Table 9-7 outlines the monitoring methods to be implemented to demonstrate achievement of completion criteria for landforms and erosion.

Table 9-7 Landform and erosion monitoring program

Domain	Monitoring method	Frequency
OSA	Visual inspections and/or photographic review to identify: • Absence/presence of rilling or sheet erosion. • Whether erosion is active or inactive (i.e. will the erosion likely get worse or self-heal). • Failed frontal/interbunds. • Evidence of slumping.	During on-ground rehabilitation monitoring events (Section 9.2.2).
Backfilled pits	Settlement monitoring using Light Detection and Ranging (LiDAR).	Annual for the period of post closure monitoring (nominally 15-20 years).
OSA Flood bunds, Backfilled pits	LiDAR, Interferometric Synthetic Aperture Radar (INSAR) data, photogrammetry surveys and/or comparative assessment of erosion / scour / deposition at established survey points. Post-execution LiDAR/INSAR or photogrammetry survey data may also be used to identify areas of differential settlement that may pose a risk to the hydraulic functionality of landform designs.	Annually (initial 10 years) then decreased frequency (i.e. 1 event every 2 years) if a trend towards surface stability had been demonstrated by year 10. Monitoring will be conducted until a review of results indicates that landforms meet completion criteria.

9.2.7.3 Corrective action

Where unacceptable erosion or threats to geotechnical stability have occurred, maintenance works would be undertaken to improve performance.

9.2.8 Public safety monitoring

9.2.8.1 Monitoring objective

To confirm the integrity of public safety measures.

9.2.8.2 Monitoring method and frequency

Monitoring would be conducted during the post-closure monitoring and maintenance period and include:

- Periodic visual inspection of safety bunds and other safety measures including fencing and signage. Records would be kept of these inspections.
- Inspection and audit by District Mines Inspector to confirm the site is acceptable with respect to safety at completion.

9.2.8.3 Corrective action

Maintenance would be conducted where:

- The integrity of the bunds or other safety measure has been compromised to the extent that inadvertent public access could occur.
- Methods of egress during an emergency may become obstructed.

9.3 Reporting

The following information would be reported in the AER which covers all of BHP's operations:

- Progress and performance of rehabilitation including a summary of the rehabilitation monitoring results for the reporting period, maintenance/remedial actions completed or planned;
- New rehabilitation activities conducted including the area and nature of the rehabilitation;
- Research and development activities; and
- Rehabilitation activities planned for the future reporting period which would continue to be reported as environmental initiatives on an annual basis.

Reporting results would be made available to the relevant authorities on request.

9.4 Maintenance

The monitoring program would provide feedback on the performance of the site rehabilitation to identify any issues and inform maintenance activities. Examples of remedial maintenance activities that may occur during the post closure phase include:

- Minor earthworks:
  - Repair erosion or stability issues identified during landform monitoring.
- Maintenance and repair:
  - Fences, signage etc.
  - Monitoring networks.
  - Any retained infrastructure assets.
- Infill planting or reseeding:
  - Based on failing to maintain development trajectory, additional tube stock may be planted or reseeding undertaken to improve density or species diversity.
- Weed control:
  - Weed control may be required to manage weed species that may compete with planted rehabilitation species, increase fire risk or as required under regulation.
- Fire management:
  - Fire is part of traditional land management practices but is a risk to initial development of rehabilitation, and therefore would be controlled.
  - Fire would be excluded from rehabilitation areas for a nominal period until framework species have achieved the required parameters (to be determined from research). Following this establishment phase, season cool burns would be promoted to build resilience in the rehabilitation landscape.
- Application of fertiliser:
  - Some growth media used in rehabilitation may require fertiliser to create optimal growing conditions, however due to losses from volatilisation (from heat) and leaching (from rainfall) much of the fertiliser is unavailable to plants. Based on monitoring results for plant health and nutrient cycling, reapplication of fertilisers may be required.
- Pest control:
  - Insect damage and grazing by native and feral vertebrate fauna can impact rehabilitation success. Monitoring results would be used to determine impact vectors and appropriate management actions.
- Water management:
  - Irrigation established to support rehabilitation growth, if required, would be removed when no longer required.
  - If passive water/sediment structures are established for closure, these structures would be removed when no longer required.

Triggers for maintenance activities would be developed via the adaptive management process and would be based on measured deviation away from the completion criteria.

9.5 Completion and relinquishment

The DMPE (DMIRS, 2021) guideline for mine closure completion provides for progressive completion, but there may be a considerable time between completion of some areas, and completion and relinquishment of the whole site. During this time between completion and relinquishment, completed areas may still be managed by BHP, but differently to areas that are still subject to the post-closure monitoring and maintenance phase. This section outlines key steps in completion reporting, post-completion management and relinquishment.

9.5.1 Completion reporting

As areas of Ministers North approach completion, BHP will prepare completion reports in accordance with the Mine Closure Completion Guideline (DMIRS, 2021). With reference to the guideline requirements, BHP will consult with DMPE and DEED regarding the eligibility of the area for evaluation prior to submission of a completion report.

Completion reports will collate evidence that the completion criteria, outlined in Section 7.2, have been achieved using the data collected from the monitoring programs outlined in Section 9. The reports will also include:

- Details of how the closure risks identified in the MCP have been managed and an assessment of any residual post-closure risks requiring management by the post-mining land manager.
- A post-completion land management plan where there are residual post-closure risks that require management.
- Relevant information on consultation with stakeholders including:

- Documented acknowledgement of landowners/managers that rehabilitation objectives and completion criteria have been met.
- Documented infrastructure transfer agreements where infrastructure has been transferred.
- Documented agreements with post-mining land managers on implementation of any post-closure management activities (including the post-relinquishment land management plan).

9.5.2 Post-completion management

Following completion and prior to relinquishment, BHP will maintain tenure over the Ministers North site. During this period, the land will be managed in accordance with the post-completion management plan, either by BHP, or by arrangement with the landowner/manager. As detailed in the completion criteria in Section 7.2, land management requirements will be typical for the agreed post-completion land use unless otherwise specified in the post-completion management plan agreed with the landowner/manager.

9.5.3 Relinquishment

At relinquishment, land management responsibilities will be transferred to the landowner/manager, with adequate provisions for management requirements beyond those normally associated with the agreed post-completion land use. A process for residual risk assessment and identification of ongoing liability will be developed and implemented to support transfer of responsibilities at relinquishment.

10 Closure cost estimation

BHP considers the specifics of the closure cost estimate (provision) to be commercially sensitive information. This section outlines the general process used to develop the closure cost estimate.

10.1 BHP principles for closure cost estimation

The financial provision preparation is undertaken in accordance with the Closure and Legacy Management Global Standard (BHP, 2024a), and the associated BHP accounting and cost estimation standards. Closure cost estimates are updated annually.

BHP ensures costs included in the provision encompass all closure and rehabilitation activities (for areas disturbed as at balance sheet reporting date) expected to occur progressively over the life of the operation, at the time of closure and during the post-closure period (e.g., monitoring). This includes all expected indirect costs, such as project management costs, statutory reporting fees and technical support costs.

In some cases, substantial judgements and estimates are involved in forming expectations of future activities and the amount and timing of the associated cash flows. These expectations are formed based on existing environmental and regulatory requirements and / or company standards or policies as outlined in this MCP.

Adjustments to the estimated amount and timing of future closure and rehabilitation cash flows are a normal occurrence in light of the substantial judgements and estimates involved. Factors influencing those changes include:

- Revisions to the estimated mine life;
- Developments in technology;
- Regulatory requirements and environmental management strategies;
- Changes in the estimated extent and costs of anticipated activities; and
- Movement in economic input assumptions (interest rates, inflation).

BHP maintains sufficient closure input assumption documentation to support the closure model financial provision outcomes. The provision process and outcomes are subject to internal and external audit on an annual basis.

10.2 Closure cost estimation methods

The closure cost estimation process is conducted in accordance with BHP's accounting and cost estimation standards. The level of accuracy increases as the site approaches closure. The closure cost estimate is:

- An expected cost, based on best available information at a point in time;
- Reflective of the class of estimates appropriate for the proximity in time to the commencement of closure activities; and
- Inclusive of uncertainty and reflective of the maturity of the estimate using methods such as sensitivity analysis, weighted scenarios, range analysis, risk events and/or contingency.

Closure cost estimates are developed within the BHP business and include input from specialists in closure planning, rehabilitation, contamination, risk, finance, engineering (mining, civil, mechanical), water planning, and, where necessary, external consultants. The closure cost estimate is developed from the activities required to close each domain and uses internal BHP costs and / or external third-party rates, as appropriate for the activity. Selected costs are benchmarked against third party rates to provide confidence in the quantum of the estimate. The cost estimate for each activity is developed using the method that is considered by BHP to provide the most reasonable estimate. Methods include cost estimates built up by BHP from first principles, factorisation based on BHP's experience at its Pilbara sites, or cost estimates provided by specialist third-party consultants for specific studies such as engineering studies, demolition studies and/or detailed execution planning. BHP maintains sufficient closure input assumption documentation to support the closure model financial provision outcomes. The closure cost estimate is updated annually to take account of incremental changes to disturbance during the year and to capture changes to the cost basis for execution activities. The provision process and outcomes are subject to internal and external audit on an annual basis.

For commercial reasons BHP does not document the actual estimate in this Closure Plan.

11 Management of information and data

BHP would collect, store and manage closure data in line with its existing data management procedures, including the Rehabilitation Data Capture Work Instruction (WAIO, 2019b).

The MCP and related information would be managed by BHP. All data would be stored in a central and readily accessible location in accordance with existing BHP standards and procedures. After lease relinquishment BHP would transfer the MCP and all associated completion relevant information to the DMPE for its files.

BHP will progressively update this MCP over time to capture and summarise current closure planning information associated with:

- Closure planning prior to cessation of operations;
- Implementation of the closure program of works; and
- The post closure monitoring and reporting period.

BHP would communicate closure planning progress to the regulators via existing AER channels and would update the MCP as knowledge gaps are filled and closure plans are refined.

12 Reviewed mine closure plans

12.1 Changes to this revision of the MCP

This is the inaugural MCP for Ministers North and consequently there are no changes to record.

12.2 Summary table of improvement actions identified

The 2025 Guideline for Preparation of Mine Closure Plans (DEMIRS, 2025) states that revised MCPs must contain a table that includes noted comments for improvement from the regulator's review of the previous version of the MCP. The table should also include responses on how the comments have been addressed in the current revision of the MCP.

This is the inaugural MCP for Ministers North and so no comments have been received. This table will be included in future versions of the MCP.

12.3 Forward work program and progress to address knowledge gaps

Table 12-1 summarises the activities (as identified in previous sections) that are required to fill gaps in the existing knowledge base and further define the closure methodology. The table is structured as follows:

- Column 1 identifies the technical area to which a knowledge gap and improvement pertains.
- Column 2 outlines the knowledge gap that needs to be filled.
- Columns 3 to 5 outline the forward work program identified for this MCP.

Table 12-1 Ministers North forward work program

Item	Aspect	Knowledge gap	Planned Action	Action Owner[10]	Timing for completion	Progress
CONSULTATION						
1	Government and stakeholder consultation	Stakeholder views (Section 4).	Consultation would continue to be undertaken with identified stakeholders in line with the broader Stakeholder Consultation Program. Information sought would include, over time: • Opportunities for collaboration between BHP and Banjima People for ethnobotanical surveys • Post mining land use performance objectives and requirements for safe access • Visual amenity and the consideration of visual impacts in a closure context and aspects of importance to the Banjima People Ongoing consultation as outlined in Section 4 aligns with DMPE guidelines (DEMIRS, 2025) that advocate early and continuous engagement with stakeholders. The socio-economic and environmental issues that are required to be addressed in closure and the views of stakeholders, change over time. Failure to consult means that stakeholder expectations for post-mining land use and associated completion criteria may not be recognised. Given the established stakeholder engagement strategy (Section 4), this knowledge gap is considered to be a low risk.	Manager Mine Closure and Rehabilitation	Ongoing	-
SUSTAINABILITY						
2	Progressive Rehabilitation	Topsoil availability relative to volume required (Section 3.4.5).	Update the topsoil balance once detailed landform designs are complete and again following clearing (reconciliation against design). BHP has a process for regular reconciliation of topsoil stockpiles at its Pilbara operations. Information will be updated with each iteration of the MCP.	Manager Mine Closure and Rehabilitation	Ongoing	-

[10] Action owner titles are indicative.

Item	Aspect	Knowledge gap	Planned Action	Action Owner[10]	Timing for completion	Progress
3		Progressive rehabilitation	As part of BHP's embedded planning process, locations which may be available for rehabilitation/landform trials in the forthcoming five years will be incorporated into the five year mine plan. The timing of this program is necessarily driven by the availability of sites for progressive rehabilitation. BHP has significant rehabilitation experience to draw on from its Pilbara mining operations (Appendix F). The risk associated with this data gap is, therefore, considered to be low.	Manager Mine Closure and Rehabilitation	Ongoing	-
4			Undertake progressive backfill into pit voids. The timing of this work program is driven by the mine plan which considers access to areas for backfill and materials availability.	Manager Mine Planning	Ongoing	-
5		Culturally significant flora (Section 3.2.1.10)	A preliminary understanding of plants that have significance to the Banjima People was obtained through an on country ethnobotanical survey conducted in 2024 (Walsh, 2024). Undertake a study, in collaboration with the Banjima People, to: • Identify cultural keystone species that are significant to the Banjima People • ensure culturally significant species are incorporated into rehabilitation seed mixes. This work will be undertaken as part of ongoing collaboration between BHP and the Banjima People.	Indigenous Engagement Manager / Manager Mine Closure and Rehabilitation	Ongoing	-
LANDFORMS						
6	Waste characterisation	Waste characterisation (physical and chemical) modelling and analysis (Section 3.4).	As mining progresses, landform designs would be informed by more detailed characterisation of materials representative of those found at Ministers North. This may include data from nearby mines which intersect the same stratigraphies. The potential for erosion from the ex-pit OSA has been identified as having a high inherent risk. Knowledge of the characteristics of waste materials is a key factor in controlling this risk. BHP's mine planning processes characterise waste at a high level as part of the ongoing resource drilling and mine planning processes. The outcomes of this process are integrated into the Master Area Design. Given that wastes are broadly characterised as part of embedded processes, the timing for detailed characterisation is considered appropriate.	Manager Mine Closure and Rehabilitation	Prior to final executable design	-

Item	Aspect	Knowledge gap	Planned Action	Action Owner[10]	Timing for completion	Progress
7	Landform design	Final landform designs (Section 8.5.2).	Portions of the South Pit ISA will be constructed to a geomorphic design. The geomorphic design will be developed with regard to site specific information as it becomes available, such as: • Local climate and rainfall patterns, including climate change scenarios • Material characterisation of the overburden and soil conditions for construction, stability and suitability • The topography of upstream and downstream catchments, relief points and essential flow paths. Geomorphic landform designs will be shared with the Banjima People for review and comment prior to adoption. The outcomes of this process are integrated into the Master Area Design based on guidance provided in the Mines Closure Design Guidance Procedure (Sections 3.4.2 and 8.5.2). Given that OSA final landform considerations are incorporated into design guidance in the mine planning stages, the timing for final landform designs is considered appropriate.	Mine Planning / Manager Mine Closure and Rehabilitation	Prior to final executable design	-
8		Final landform designs (Section 8.5.2).	Final landform designs for non-geomorphic landforms will be confirmed through erosion modelling or comparable assessments of historical performance of other OSAs, and through validation of design assumptions during the operational life of the mine.	Mine Planning		-
9		Mine void stability and safety bund placement (Section 8.5.1)	Collaborate with BNTAC and DMPE regarding the placement of abandonment bunds so that meet the objectives of BNTAC and DMPE.	Manager Mine Closure	Ongoing as DMPE guidelines update	Preliminary discussions commenced (Section 4.2).
			Slope stability analysis to inform final safety bund locations for mine voids remaining at closure. While the inherent risk associated with pit stability is high, the timing for this study is appropriate given that final pit designs would not be known until closer to closure.	Mine Planning	Five years prior to mine completion	
10	Landform design	Climate change resilience (Section 3.1.1.2)	BHP is currently in the process of updating climate change prediction data. Use this information to undertake a climate change resilience assessment on landform closure designs. Landform design is an iterative process that evolves from conceptual through to detailed design. Climate change scenarios will be incorporated into models during all stages of design. A final climate change resilience assessment will be undertaken at the detailed design stage.	Manager Mine Closure and Rehabilitation	During detailed design of landforms	-
HYDROLOGY						
11	Surface Water Hydrology	Baseline surface water quality data	Collect additional surface water quality data to inform completion criteria. Collection of surface water quality data for Yandicoogina Creek (from pools) has commenced. This work would continue to inform the establishment of closure criteria and post-closure monitoring requirements.	Environment Manager	Ongoing	-

Item	Aspect	Knowledge gap	Planned Action	Action Owner[10]	Timing for completion	Progress
12		Surface water management structures for closure (Appendix I-2)	Refine surface water models and hydrological studies to inform the design of surface water management infrastructure necessary for closure. The small scale of possible, temporary diversions and/or pit inflow management required makes the risk associated with this knowledge gap low. Operating data and observations would inform post-closure modelling and design. The timing for this work is therefore appropriate.	Environment Manager	Five years prior to mine completion	-
HERITAGE						
13	Heritage	Stakeholder requirements to be addressed during closure planning	Undertake Closure workshops with BNTAC to collaborate on development of the MCP for Ministers North having regard to capturing the intent of the Banjima Closure Principles and Outcomes (Appendix H). The workshops will also be used to discuss other closure-specific issues in further detail with the aim of informing the closure approach for Ministers North.	Indigenous Engagement Manager	Ongoing	-
14			The Derived Proposal commits to pursing opportunities for collaboration between BHP and the Banjima People for ethnobotanical surveys. Consider the implications of the results of any surveys conducted to rehabilitation planning. The timing of this activity is dependent on the completion of any surveys and is reliant on the ongoing operational stakeholder engagement process.	Indigenous Engagement Manager	Following completion of surveys	-
Completion Criteria						
15	Completion Criteria	Refinement of draft completion criteria	**Ecological criteria:** Continue to refine completion criteria taking into consideration improved knowledge base. **Other criteria:** Review and refine completion criteria taking into consideration improved knowledge base and DMPE objectives (DEMIRS, 2025).	Manager Mine Closure and Rehabilitation	Ongoing	A comprehensive and multidisciplinary review is currently being undertaken to support future versions of MCP across WAIO sites.
16	Completion Criteria	Develop final completion criteria in collaboration with Banjima.	Undertake a collaborative process with the Banjima People to further develop completion criteria that address the Banjima Closure Principles and Outcomes.	Manager Mine Closure and Rehabilitation	Ongoing	-

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Appendix A. Closure Obligations

A-1. MS 1105 Obligations

This Appendix addresses the requirements of MS 1105 Conditions 15-3 - 15.5.

The success of closure can only be determined once the operational impact has ceased, and all closure and rehabilitation activities have been completed. The monitoring program outlined in the tables below to meet Conditions 15-3 to 15-5 refers to monitoring that would be conducted post-closure and as part of the completion assessment to determine whether management targets are being met. Operational monitoring and reporting are captured in other operational management plans. At this pre-approval stage of the mine's life, it is not possible to provide definitive locations and frequencies for monitoring as these would be informed by data collected from studies conducted during the life of the operation. The baseline data which are available to support the assumptions regarding closure planning are detailed in Section 5 of this MCP and would be updated in future iterations. Section 7 considers the effects of breakdown of those assumptions. These are captured in the causes of risk and the inherent risk ratings in Table 6-1. Section 12.3 of each iteration of the MCP will outline studies that would assist in addressing knowledge gaps and informing future management and monitoring programs as the MCP matures.

In the tables presented in this appendix, we have used the following terms:

- Post-closure – refers to the time after mining operations have ceased and closure and rehabilitation activities have been executed.
- Completion – refers to the time when completion criteria have been met.
- Completion assessment – refers to the time at which a report is prepared to demonstrate achievement of completion criteria.

Key environmental value/s	Flora and vegetation, terrestrial fauna habitat, surface water bodies, Aboriginal places of cultural significance.
Objective	Condition 15-1 (1) ensure that the proposal is decommissioned, and the site of the proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.
Key impacts and risks	Ability to achieve acceptable closure and rehabilitation (including revegetation) outcomes.

MS1105 condition clauses - Management-based provisions (Rehabilitation and decommissioning)			
Management actions	Management targets	Monitoring	Reporting
Condition 15-3 (2) specify the management actions that will be implemented to demonstrate compliance with the environmental objectives specified in condition 15- 1. Failure to implement one or more of these management actions represents non-compliance with these conditions (3) the provisions required by conditions 6-2(11) to 6-2(13) (4) demonstrate the validity of assumptions used in the Mine Closure Plan and consideration of the effects of	**Condition 15-3** (3) the provisions required by conditions 6-2(11) to 6-2(13) **Condition 6-2** (11) specify measurable management target(s) to determine the effectiveness of the risk-based management actions	**Condition 15-3** (3) the provisions required by conditions 6-2(11) to 6-2(13) Condition 6-2 (12) specify monitoring to measure the effectiveness of management actions against management targets, including but not limited to, parameters to be measured, baseline data, monitoring locations, and frequency and timing of monitoring	**Condition 15-4** If monitoring, tests, surveys or investigations indicate non-achievement of management target(s) specified in in the Mine Closure Plan, the proponent shall: (1) report the non-achievement in writing to the CEO within twenty-one (21) days of the non-achievement being identified (2) investigate to determine the cause of the management target (s) not being achieved (3) provide a report to the CEO within ninety (90) days of the non-achievement being reported as required by condition 15-41). The report shall include: (a) the cause of management targets not being achieved (b) the findings of the investigation required by condition 15-4(2) (c) details of revised and/or additional management actions to be implemented to prevent non-achievement of the management target(s) (d) relevant changes to proposal activities. **Condition 15-5** In the event that monitoring, tests, surveys or investigations indicate that one or more management actions specified in the Mine Closure Plan have not been implemented, the proponent shall:

MS1105 condition clauses - Management-based provisions (Rehabilitation and decommissioning)			
Management actions	Management targets	Monitoring	Reporting
breakdown of those assumptions. **Condition 6-2** (13) specify a process for revision of management actions and changes to proposal activities, in the event that the management targets are not achieved. The process shall include an investigation to determine the cause of the management target(s) not being achieved			(1) report the failure to implement the management action(s) in writing to the CEO within seven (7) days of identification (2) investigate to determine the cause of the management action(s) not being implemented (3) investigate to provide information for the CEO to determine potential environmental harm or alteration of the environment that occurred due to the failure to implement management actions (4) provide a report to the CEO within twenty-one (21) days of the reporting required by condition 15-5(1). The report shall include: (a) the cause of the failure to implement the management actions (b) the findings of the investigations required by conditions 15-5(2) and 15-5(3) (c) relevant changes to proposal activities (d) measures to prevent, control or abate the environmental harm which may have occurred.

Management-based provisions			
Management actions	Management targets	Monitoring	Reporting
Hazards that could endanger the safety of any person will be identified and designs will be developed to eliminate them where practical. High inherent risk.	There are no unsafe areas where members of the general public could gain inadvertent access following closure. Residual safety and health hazards have been identified and controlled in accordance with regulatory requirements and consideration of industry guidance. Closed sites are assessed as acceptable with regards to safety by the District Mines Inspector following closure execution.	Inspection of access management structures against designs Site inspection with District Mines Inspector post completion	Progress reporting on actions taken to manage post-closure hazards (e.g. installation of safety bunds) will be reported in updates to the MCP. Note these actions are dependent on mine plans and dates for completion of certain areas will change over time as mine plans change. Completion inspection report. If the Completion inspection report identifies any failure to implement management actions or non-compliance with targets, this will be reported as required by Conditions 15-4 and 15-5. Any non-compliance will be addressed with a remedial action plan agreed with the District Mines Inspector and evidence of execution provided to the CEO.
Landforms are designed to minimise erosion and sediment run-off. High inherent risk.	OSA slope surfaces are stable, with no dispersive material on the surface; rock armouring is present as required; and no areas are exposed to the risk of significant erosion which may be defined as having: • Channelised flow resulting in extensive active gullies; • Failure of banks, berms or bunds; and • Evidence of ongoing significant sheet erosion (including large accumulation of silt at base of slope, exposed subsoil, poor seedling establishment).	Baseline and operational monitoring (reported elsewhere) will identify whether there have been any impacts that require management at closure. A detailed post-closure and completion assessment monitoring program for surface stability will be developed 5 years prior to closure Rehabilitation inspections post completion in accordance with Rehabilitation Monitoring Technical Process Instruction (WAIO, 2024) and subsequent updates.	Post closure and completion assessment monitoring program will be reported in the MCP 5 years prior to closure. Progress monitoring will be reported in AERs and in accordance with Ministerial Statements. At completion a rehabilitation inspection report will be produced. If the Completion reports identify any failure to implement management actions or non-compliance with targets, this will be reported as required by Conditions 15-4 and 15-5. Any non-compliance will be addressed with an agreed remedial action plan followed by evidence of execution provided to the CEO.

Management-based provisions			
Management actions	Management targets	Monitoring	Reporting
Rehabilitation plans and target seed mixes are designed to return vegetation communities appropriate to post-closure land use. Moderate inherent risk.	Vegetation targets for each post-closure land use are detailed in Section 7.2.2 (Completion Criteria)	Monitoring of vegetation post completion against targets in accordance with Rehabilitation Monitoring Technical Process Instruction (WAIO, 2024) and subsequent updates.	Progress monitoring will be reported in AERs and in accordance with Ministerial Statements A completion assessment monitoring report will be produced. If the Completion inspection report identifies any failure to implement management actions or non-compliance with targets, this will be reported as required by Conditions 15-4 and 15-5. Any non-compliance will be addressed with an agreed remedial action plan followed by evidence of execution provided to the CEO.
Closure plans will ensure significant Aboriginal heritage sites are managed and that traditional landowners have the opportunity to be involved in the protection and management of heritage places. Moderate inherent risk	Closure implementation meets the requirements of applicable Cultural Heritage Management Plans and the Aboriginal Cultural Heritage Act 2021 (WA).	Project, Environmental, Aboriginal and Heritage Review (PEAHR) audits to ensure compliance with the heritage management conditions associated with individual PEAHR's. Audit and inspection to ensure that mine closure execution is substantially in accordance with design and that cultural artefacts have been repatriated in accordance with stakeholder requirements, if appropriate.	A completion assessment report will be prepared and will include the results of PEAHR audits.

Appendix B. Overburden classification at BHP

B-1. Overburden classification system

BHP classifies overburden to inform the management of different overburden types according to their physical and geochemical properties using two interconnected classifications: Acid and Metalliferous Drainage (AMD) class and physical property (WMAT) class (Table 13-1). These classifications have been devised to support informed management of beneficial and problematic overburden during mine planning. The preliminary classifications are included into mining and geological models, with classifications confirmed though analysis and inspection of blast cone chips prior to mining. Furthermore, targeted test work is also conducted, as required, to validate the AMD classification assumptions and physical materials properties (Sections 3.4.1 and 3.4.2).

Table 13-1 Geochemical and physical waste classification categories

Classification	Geochemical / Physical Stability Stratigraphy	Description
AMD 0	**Geochemically inert:** NAPP <3 kg H_2SO_4/t:	AMD 0 overburden is segregated based on its physical properties into WMAT 1, WMAT 2 and WMAT 3 material types (see below).
AMD1	**Geochemically problematic**: All stratigraphies below water table, NAPP ≥3 kgH_2SO_4/tonne	**Adverse AMD overburden** for containment within OSAs following specific dumping guidance due to the adverse geochemical properties leading to AMD. **Management recommended** AMD1: Paddock dumped and encapsulated. AMD2 / AMD3: Encapsulated by at least 10 m of geochemically stable waste.
AMD2	**Geochemically problematic**: All stratigraphies above water table, NAPP ≥3 kgH_2SO_4/tonne	
AMD3	**Geochemically problematic**: All non-bedrock stratigraphies, i.e. Detritals. NAPP ≥3 kgH_2SO_4/tonne; includes alluvial, Scree, Tertiary Detritals (TD1, TD2, and TD3)	
WMAT1	**Geochemically inert:** AMD0, NAPP <3 **AND** **Physically inert:** Weeli Wolli BIF, Dales Gorge and Joffre (J4)	**Beneficial competent and inert waste rock** for placement on outer OSA surfaces due to inherent hardness, mean rock size (rockiness) and physical properties that promote a stable landform surface. **Management recommended** To be used on final surface with a minimum thickness of 1 m.
WMAT2 / WMAT3	**Geochemically inert:** AMD0, NAPP < 3 **AND** **Physically problematic**: Surface scree and Tertiary Detritals, Yandicoogina shale, Joffre, Whaleback Shale and Colonial Chert, Mt McCrae Shale, Mt Sylvia formation Weeli Wolli Dolerite	**Potential (WMAT2) and Certain (WMAT3) geochemically inert but physically problematic waste rock** for placement within OSAs, beneath outer surface material due to the unfavourable physical properties (dispersive, fine grained) that promote a highly erosive and unstable landform surface. **Management recommended** Avoid placement on final surface. To be placed below WMAT1.

Notes: NAPP – Net Acid Production Potential (see below for explanation)

Further detail on the geochemical and physical classification systems summarised in Table 13-1 is provided in the relevant sub-sections below.

Geochemical classification

Introduction to AMD

AMD is used to describe low-quality seepage or drainage that has been affected by the oxidation of sulphide minerals (primarily pyrite), and/or by the dissolution of acid generating sulphate minerals (such as jarosite, alunite, melanterite etc.).

AMD may be produced when sulphide minerals are exposed to oxygen and water, or when acid sulphate salts are leached. Oxidation of sulphide minerals and / or leaching of acid sulphate salts may result in the production of sulphate (SO_4^{2-}), acid (H^+), release of metals (Mg, Ca, Fe, Al, Mn, Zn, Cu, Ni, As, etc.) and salinity (SO_4^{2-}, Ca, Mg, HCO_3^-, Cl^-) depending on mineralogy. For AMD to occur, a sample must contain sulphides or acid generating sulphates. If a sample does not contain reactive sulphur, then AMD reactions cannot occur.

AMD can be acidic, pH circum-neutral, alkaline or saline (INAP, 2014; DISER, 2016b). Whether contact water is acidic and metalliferous (Acid and Metalliferous Drainage [AMD]), neutral/alkaline and metalliferous (Neutral Metalliferous Drainage [NMD]) or just saline (high sulphate Saline Drainage [SD]) largely depends on the relative proportion of sulphide minerals (acid generating) and carbonate minerals (acid neutralising) in the source materials.

Acidic drainage is generated when the acid generating capacity of a material exceeds its acid buffering capacity (Acid Neutralising Capacity [ANC]). In this case, the drainage is acid, contains elevated metal concentration and is saline (mostly sulphate salinity).

Neutral metalliferous drainage is formed when the acid generating capacity of a material is less than its ANC. In this case, the drainage is near neutral/alkaline (around pH 6-8) and can contain low levels of metals that are soluble at higher pH if they are present (manganese, cobalt, zinc, arsenic). Salinity is dominated by sulphate, calcium, magnesium and bicarbonate.

Saline drainage (oxidative) occurs when the acid buffering capacity of a system far exceeds its acid generating capacity; in this case, drainage pH is alkaline (>pH 8) and saline (mostly sulphate, calcium, magnesium, carbonate salinity) and has limited (potentially manganese) or no metals in solution.

The hazard for metalliferous and saline drainage associated with AMD reactions is linked to total sulphur (and specifically sulphide sulphur) concentrations. The higher the sulphur and ANC concentrations in Non-Acid Forming (NAF) materials, the higher the potential to generate neutral metalliferous and saline drainage. It is generally accepted that neutral metalliferous and saline drainage are generally of concern for materials characterised by total sulphur concentration above 1 wt.%.

Distinct from AMD reactions, other potential processes that may release salinity and metals are associated with the dissolution of readily soluble mineral groups such as salts, some sulphates (gypsum, epsomite), and carbonates (non-oxidative metalliferous and saline drainage). Some of these mineral groups may contain impurities and / or metals absorbed on their surface that may impact the quality of contact water upon mineral dissolution. However, based on the mineralogy of the stratigraphic units mined across BHP deposits, these minerals are not expected to be present in large quantities. Thus, it is not expected that non-oxidative metalliferous and saline drainage will be a key process impacting on contact water quality. Leach test data can assist with understanding the impacts on contact water quality associated with oxidative and non-oxidative processes.

Use of competent rock (WMAT 1, which is rocky and hard) on the final landform surface will minimise the potential for mobilisation of salts / metals associated with non-oxidative weathering in run-off and contact water.

BHP's geochemical classification system

BHP has historically identified PAF in geological and mine planning block models based on total Sulphur (S) content, degree of weathering and lithology, and the focus was on material known to have a high acid generating potential (i.e. unweathered black shales). However, since 2015, improvements have been made to procedures for identifying and coding PAF that may contribute to AMD in geological and mine planning block models. These improvements are possible based on the collection of extensive geochemical characterisation data across BHP's operations, and learnings from preliminary AMD risk assessments and research studies.

BHP now classifies PAF according to the Net Acid Production Potential (NAPP) classification and weathering condition. The NAPP classification evaluates the balance between the acid generating and acid neutralising potential of a sample or waste block. The pre-mining water table is used as a geochemical boundary, above which, material is assumed to be completely weathered (oxidised sulphur) and below which, the material is assumed to be partially or completely unweathered (reduced sulphur). Where unweathered (un-oxidised) material is assessed as having a NAPP $\geq$ 3 kg H_2SO_4/t, it is classified AMD1. Weathered and detrital material having a NAPP $\geq$ 3 kg H_2SO_4/t is classed as AMD2 or AMD3, respectively (Table 13-1). AMD1, AMD2 and AMD3 overburden are PAF and are managed according to their geochemical hazard. Thus, the current AMD classification manages geochemical risk associated with sulphide oxidation (pyrite) and acid sulphate salts leaching (acid generating sulphates).

The classification uses primary assay data to estimate the acid generating and acid neutralisation capacity of a sample. Regardless of the acid generating mineral (i.e. sulphides or sulphates), the classification embedded in the geological and mining models assumes that all sulphur is associated with pyrite, which is usually not the case, therefore, this classification system is especially conservative for AMD2 and AMD3 waste types. All mined materials are classed into inert (AMD0) or reactive (AMD1, AMD2 and AMD3) groups based a NAPP cut-off value of 3 kg H_2SO_4/t, as follows:

- **NAPP <3 kg H_2SO_4/t:**
  - **AMD0**: inert overburden which is then segregated based on its physical properties into WMAT1, WMAT2 and WMAT3 waste type (see below).
- **NAPP ≥ 3 kg H_2SO_4/t:**
  - **AMD1**: geochemically reactive overburden associated with fresh material (i.e. waste located below the water table and assumed to contain pyrite).
  - **AMD2**: potentially geochemically reactive overburden located above the water table.
  - **AMD3**: associated with detrital lithologies and containing potentially geochemically reactive overburden.

AMD1 overburden is likely to contain fresh sulphides (i.e. pyrite) and thus, poses the highest risk to water quality. AMD2 materials are unlikely to contain sulphide minerals, but they may contain acid sulphate minerals such as, alunite, jarosite, Na-alum. AMD3 materials may contain fresh sulphides (pyrite) particularly in the lignite horizons associated with Tertiary Detritals 2 (TD2), while other stratigraphies within the Detritals may contain acid sulphate minerals. AMD1, AMD2 and AMD3 overburden can generate water of poor quality and thus require management. However, acid sulphate salts minerals are sparingly soluble and pose a much lower risk to water quality compared to AMD1 type overburden, as recently determined from on-going AMD studies conducted by BHP.

B-2. Physical classification system

The WMAT classification was designed to manage physical property risks associated with how AMD0 material responds to weathering. BHP has conducted physical material characterisation, erosion simulations and field studies on overburden types from stratigraphic units of the Mara Mamba and Brockman Formations across BHP operations (Landloch, 2016). The physical property (WMAT) classes in Table 13-1 have been derived from the results of this material characterisation program.

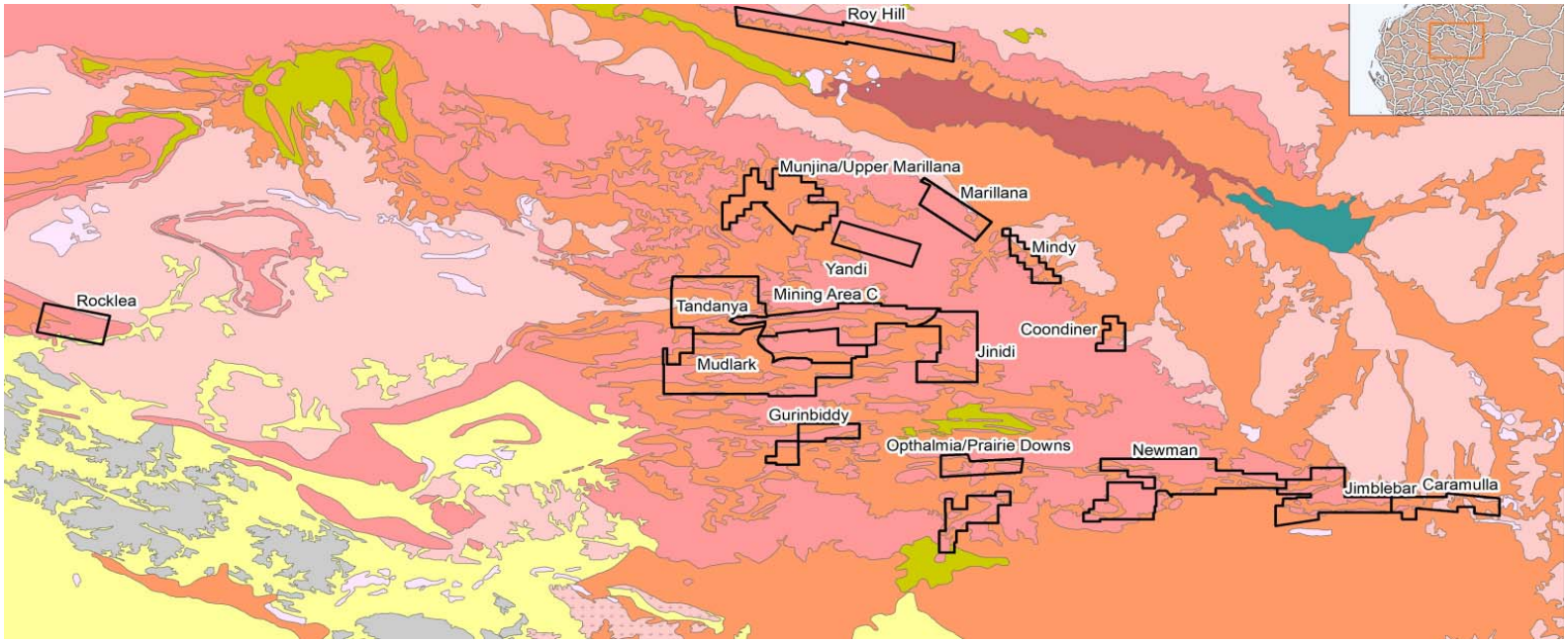
AMD0 overburden is segregated into three classes based on the propensity of each of the mined stratigraphic units to withstand erosion:

- **WMAT1**: comprises stratigraphies that are blocky, competent and resistant to erosion. This material is recommended for emplacement on the final surface with a minimum thickness of 1 m and used for armouring of final landforms. WMAT1 is considered an asset, and should be differentially handled, stockpiled and / or placed on landforms in strategic locations.
- **WMAT2**: Potential problematic overburden, with properties to be confirmed during mining. WMAT2 overburden requires management and is to be placed at least 1 m below the final surface of OSAs.
- **WMAT3**: known non-competent stratigraphies, to be placed at least 1 m below the final surface of OSAs.

Potentially fibrous material

Overburden and low-grade ore is also classified according to whether it is potentially fibrous material. Any potentially fibrous materials that are encountered during mining are placed in OSAs or used for mine void backfill and are placed at least 1 m below non-fibrous overburden.

Appendix C. Review of vegetation completion criteria



BHP WAIO REHABILITATION COMPLETION CRITERIA

March 2019

SYRINX ENVIRONMENTAL

BROAD APPROACH

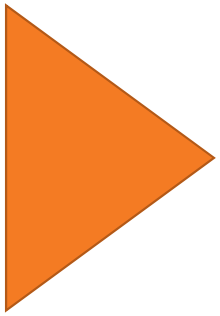
1. Determine end uses
2. Use baseline and reference data to assess what scale is right for assessment of rehabilitation success
    - Region (central, eastern, northern)
    - Site (hub)
    - Crests, slopes, flats
    - Major vegetation types
    - Strata
3. Review literature and use baseline and reference data to assess to assess what type of metrics make sense in the Pilbara (cover, density, richness etc)
4. Assess rehabilitation plots and fire plots in reference sites to determine what time scale is appropriate for measuring success (completion).
5. Derive targets median ranges for critical attributes using quantitative reference and baseline data and compare with published data for typical Pilbara

SYRINX ENVIRONMENTAL

COMPLETION - KEY CONCEPTS

1. **Rehabilitation - a process which improves a degraded environment toward some agreed goal.**

   Design and construction criteria, compliance monitoring



BHP

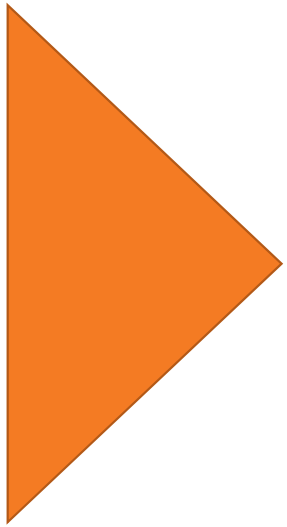
2. **End-use - the outcome environment one seeks to establish after disturbance.**

   Attributes which presuppose a range of services, based on the intended uses of this end point state.

3. **Completion – the metrics (criteria) that best define the achievement of the desired end use.**

   Surrogate for measuring rehabilitation success .

   Criteria are either pass or fail.



REGULATORS

SYRINX ENVIRONMENTAL

POSSIBLE END USES

PRIMARY CLASS	DEFINITION	SECONDARY CLASSES	RELEVANT TO BHP WAIO OPERATIONS
1 - Conservation and Natural Environments	Conservation purposes based on maintaining the essentially natural ecosystems present.	Nature conservation; **Managed resource protection**; **Other minimal use**	**Yes**
2 - Production from Relatively Natural Environments	Primary production with limited change to the native vegetation.	**Grazing native vegetation;** Production native forests	**Yes**
3 - Production from Dryland Agriculture and Plantations	Primary production based on dryland farming systems.	Plantation forests; Grazing modified pastures; Cropping; **Perennial horticulture**; Seasonal horticulture; Land in transition	Possible, linked to open water pits
4 - Production from Irrigated Agriculture and Plantations	Primary production based on irrigated farming.	Irrigated plantation forests; **Grazing irrigated modified pastures**; Irrigated cropping; Irrigated perennial horticulture; Irrigated seasonal horticulture; Irrigated land in transition	Possible, linked to open water pits
5 - Intensive Uses	Land subject to extensive modification, generally in association with closer residential settlement, commercial or industrial uses.	**Intensive horticulture**; Intensive animal production; Manufacturing and industrial; Residential and farm infrastructure; Services; Utilities; Transport and communication; Mining; **Waste treatment and disposal**	Possible for localised sites near Newman.
6 - Water	Water features.	Lake; Reservoir; River; Channel/aqueduct; Marsh/wetland; Estuary/coastal waters	Possible for artificial (e.g. pits) or modified water bodies or wetlands

Follows WABSI which aligns with Australian Land Use and Management (ALUM) classification (ABARES 2016)

SYRINX ENVIRONMENTAL

POSSIBLE END USES

1. **Natural Environments for Managed Resource Protection (Primary Class 1)**

   Areas managed primarily for the sustainable use of natural resources. This includes areas with largely unmodified natural systems that are managed primarily to ensure the long-term protection and maintenance of biological diversity, water supply, aquifers or landscapes, while providing a sustainable flow of natural products and services.

2. **Relatively Natural Environments for Pastoral Grazing Purposes (Primary Class 2)**

   Land that is subject to relatively low levels of intervention. The structure of the native vegetation generally remains intact despite deliberate use. Land uses based on grazing by domestic stock on native vegetation where there has been limited or no deliberate attempt at pasture modification. Some change in species composition may have occurred, however there must be greater than 50% dominant native species.

These end-uses already contain attributes and some metrics that need to be considered

SYRINX ENVIRONMENTAL

POSSIBLE END USES BY SITE

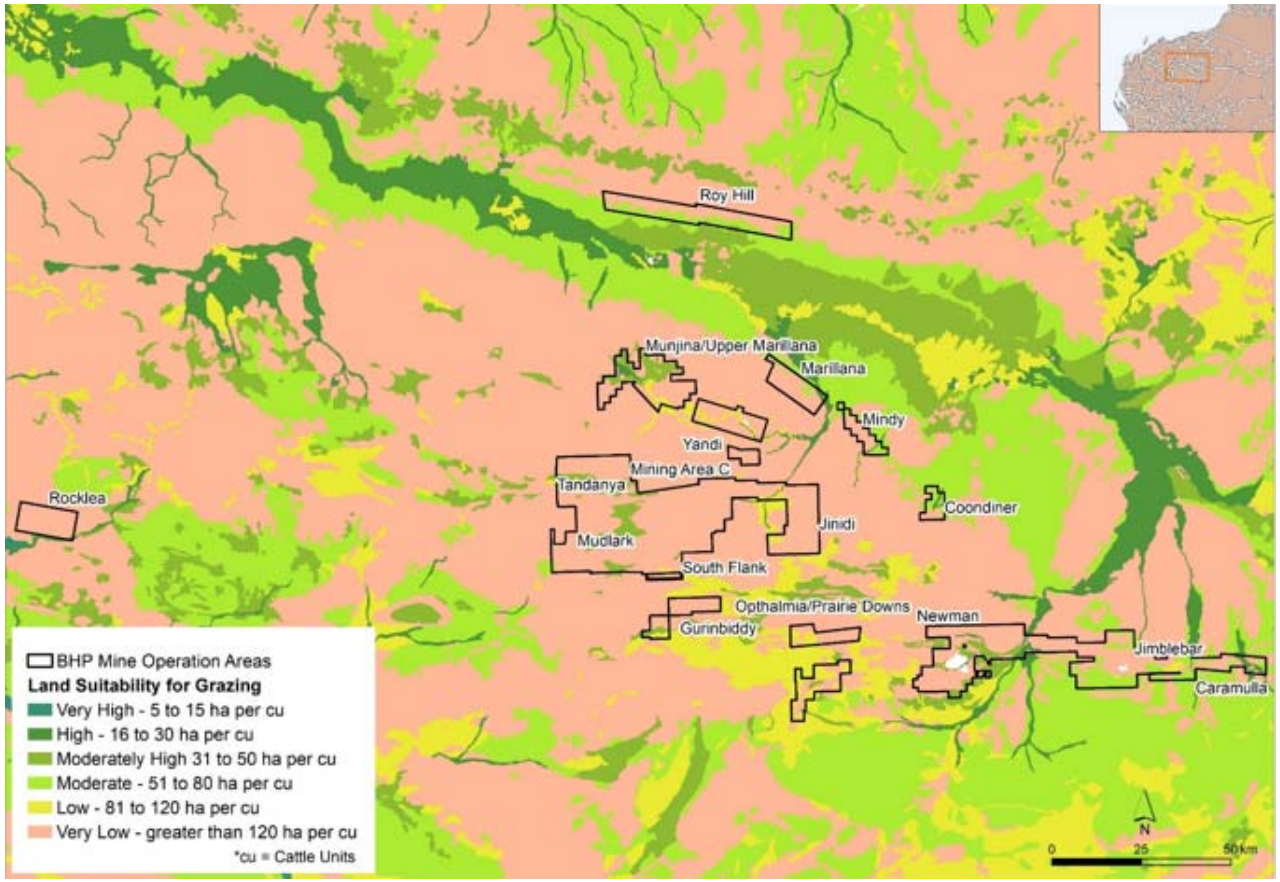
HUB	IBRA SUBREGION/S	GEOGRAPHIC REGION	TENURE (Etimated cover)	LAND SUITABILITY FOR PASTORAL GRAZING
Primary Operations				
Jimblebar	Hamersley, Fortescue, Augustus	Eastern Pilbara, Northern Gascoyne	~50% Pastoral 50% Unallocated Crown Land	40% MODERATE 10% LOW ~10% HIGH
Newman	Hamersley	Eastern Pilbara	~15% Pastoral ~20% Other and Rest Unallocated Crown Land	20% MODERATELY HIGH 5% HIGH 15% LOW 60% VERY LOW
Yandi	Hamersley, Fortescue	Central Pilbara	95% Pastoral (including pastoral lands under DBCA management) 5% Unallocated Crown Land and Other Lease	Yandi - <5% LOW and <2% HIGH Munjina and Upper Marillana ~60% MODERATE TO HIGH , however ~ 50% of this suitable area is now set for conservation with DBCA. Mindi - 15% MODERATE
Mining Area C	Hamersley	Central Pilbara	25% Pastoral 10% Other Lease 75% Unallocated Crown Land	South Flank - 100% VERY LOW Tandanya - 30% MODERATELY HIGH Mining Area C - <2% MODERATELY HIGH Mudlark - 15% MODERATELY HIGH but 90% of this is within DBCA controlled area Jindi - 2% LOW and <1% VERY HIGH
Chichester Rail	Chichester	Central and Northern Pilbara	100% Pastoral	10% MODERATELY HIGH 90% VERY LOW
Yarrie	Chichester	Northern Pilbara	95% Pastoral 5% Lease - Other	10% MODERATELY HIGH 15% MODERATE 5% LOW
Goldsworthy	Chichester	Northern Pilbara	75% Pastoral 21% Other Reserves 1.5% Unallocated Crown Land	20% HIGH 10% MODERATELY HIGH 25% MODERATE

Not all sites will support a pastoral grazing end use

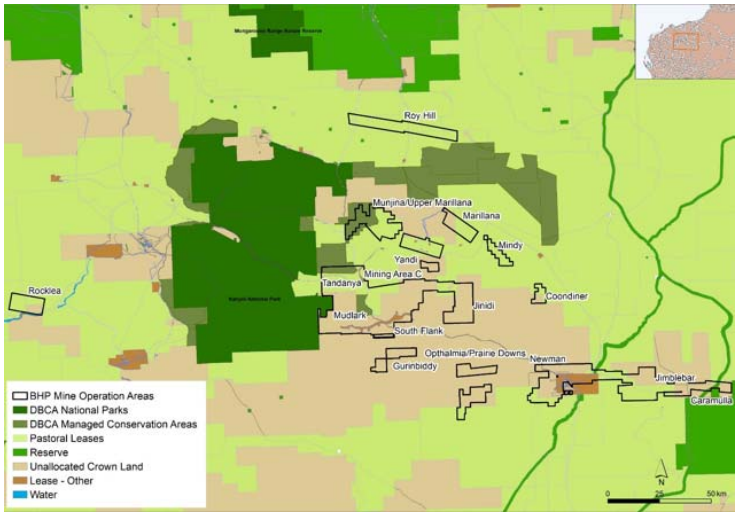
The minimum % of tenement area useful for grazing as well as the surrounding land-use will be relevant to end-use decisions for each site.

SYRINX ENVIRONMENTAL

POSSIBLE END USES BY SITE



Suitability of land for pastoral grazing

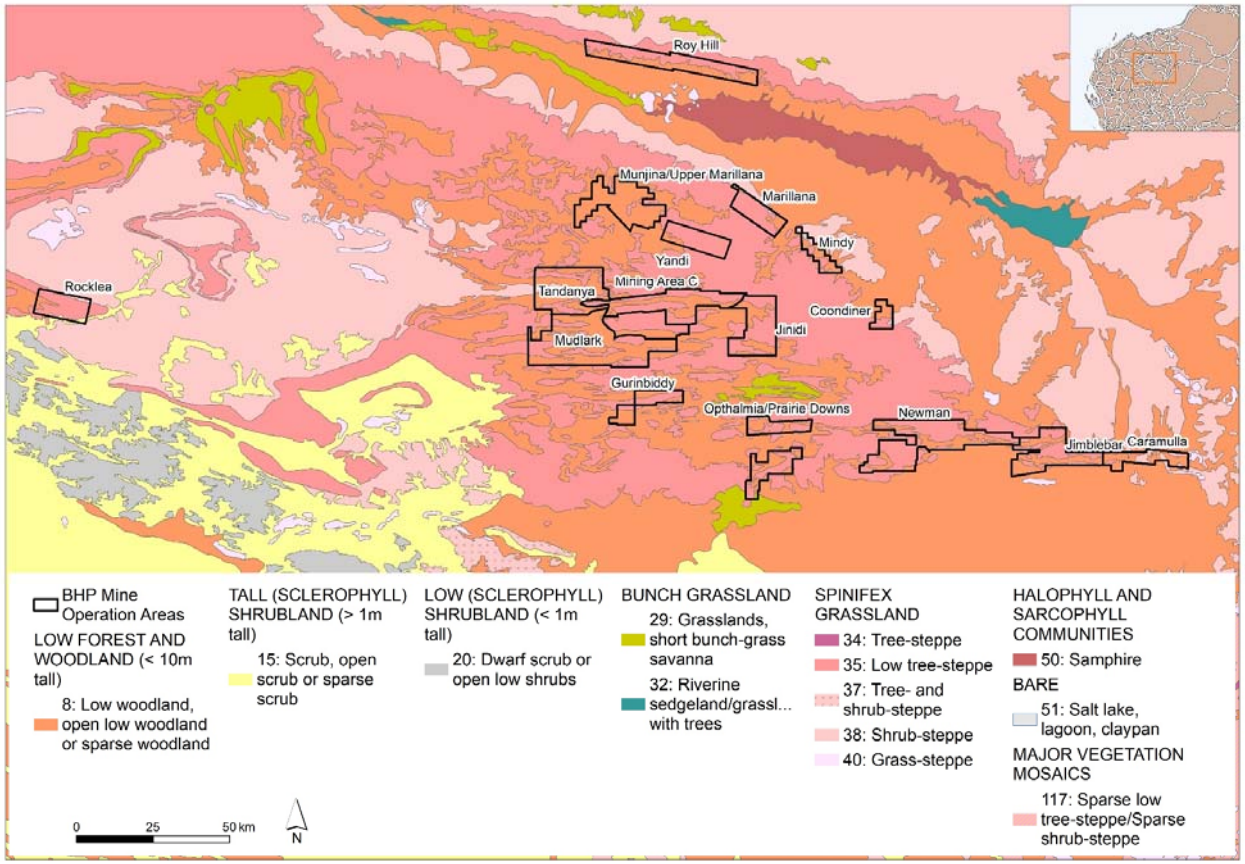


Current land tenure in the Pilbara

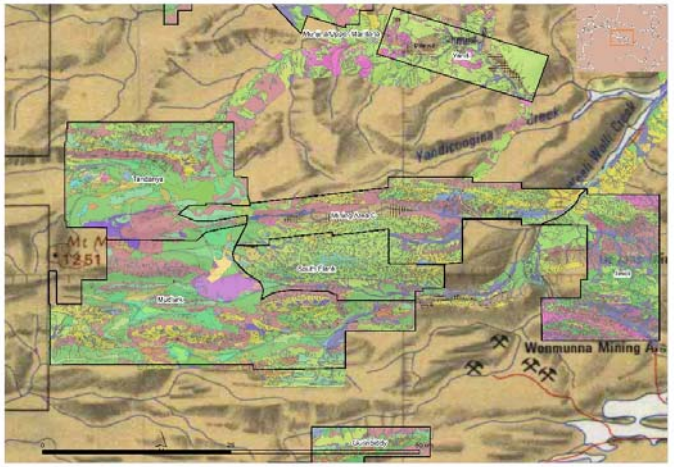
SYRINX ENVIRONMENTAL

SCALE OF ASSESSMENT

What is the Target Vegetation Groups?



Beard et al 2013 VEGETATION TYPES

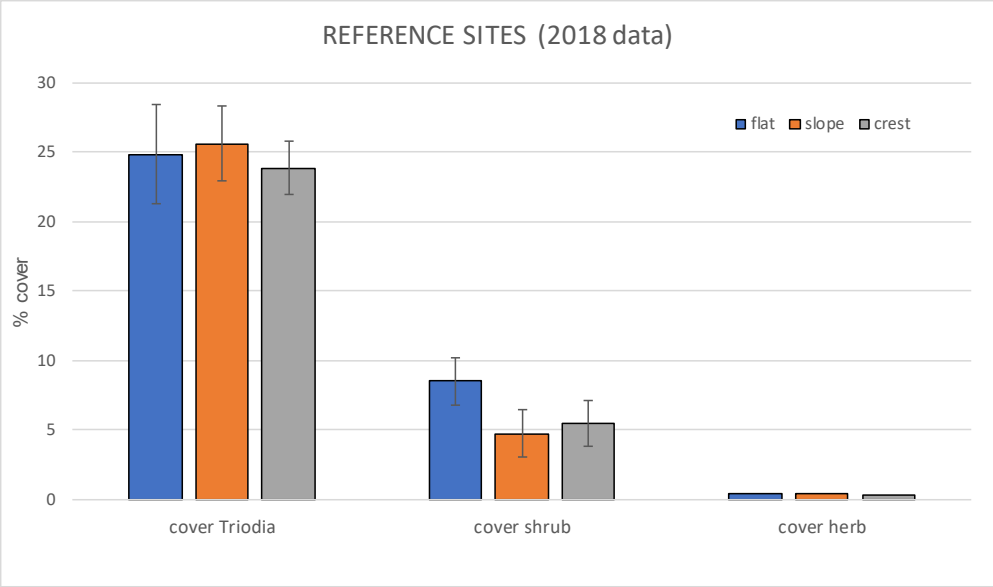


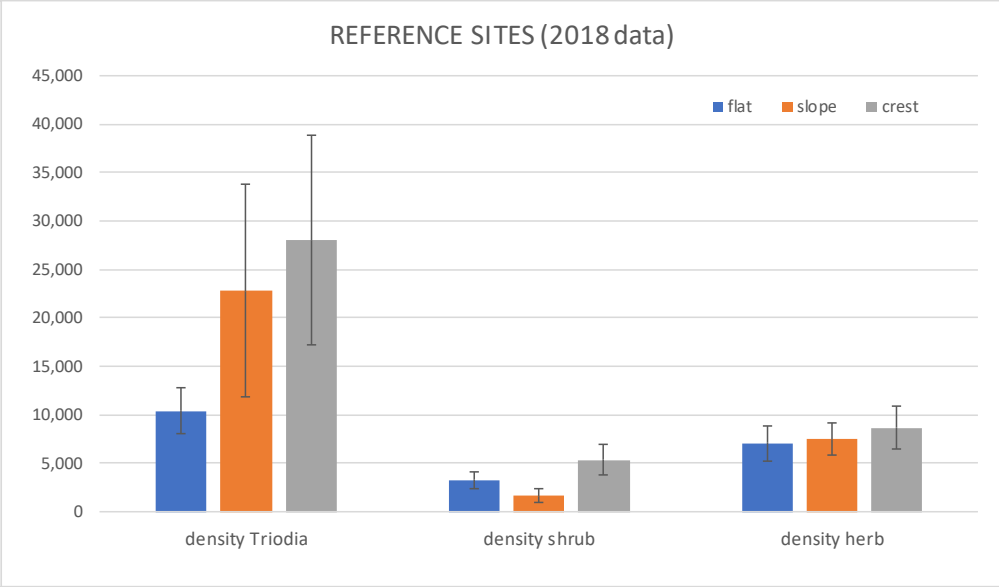
BHP mapping VEGETATION ASSOCIATIONS

SYRINX ENVIRONMENTAL

SCALE OF ASSESSMENT

Site Scale





Each site typically has only a few plots which do not capture the spatial variability well. Measurements of success are therefore strongly influenced by the sampling method and may not represent reality.

Data shows variability within landform type (hills, slopes, flats) is greater than variability within hubs.

Comparisons made separately for crests, slopes and flats, while potentially relevant for species composition, do not necessarily have relevance to the major attributes

SYRINX ENVIRONMENTAL

SAMPLING METHODS

COMPARISON OF REFERENCE SITES BETWEEN 2011/16 AND 2018 DATA SETS

Triodia Cover	2011 - 16 (no fire)	2018	% diff
CENTRAL	31.8	20.2	37%
EASTERN	35.9	15.8	56%
NORTHERN	34.6	30.5	12%
ALL REGIONS	33.6	21.1	37%

Shrub Cover	2011 - 16 (no fire)	2018	% diff
CENTRAL	3.9	8.2	-110%
EASTERN	3.6	7.6	-114%
NORTHERN	4.6	4.7	-1%
ALL REGIONS	4.0	7.0	-73%

Herb Cover	2011 - 16 (no fire)	2018	% diff
CENTRAL	0.5	0.2	59%
EASTERN	7.7	0.5	93%
NORTHERN	1.9	0.3	86%
ALL REGIONS	7.7	0.4	95%

Triodia Density	2011 - 16 (no fire)	2018	% diff
CENTRAL	34,222	27,108	21%
EASTERN	80,484	14,133	82%
NORTHERN	16,143	23,215	-44%
ALL REGIONS	40,706	20,234	50%

Shrub Density	2011 - 16 (no fire)	2018	% diff
CENTRAL	2,384	4,231	-77%
EASTERN	2,600	3,505	-35%
NORTHERN	1,829	4,385	-140%
ALL REGIONS	2,286	3,949	-73%

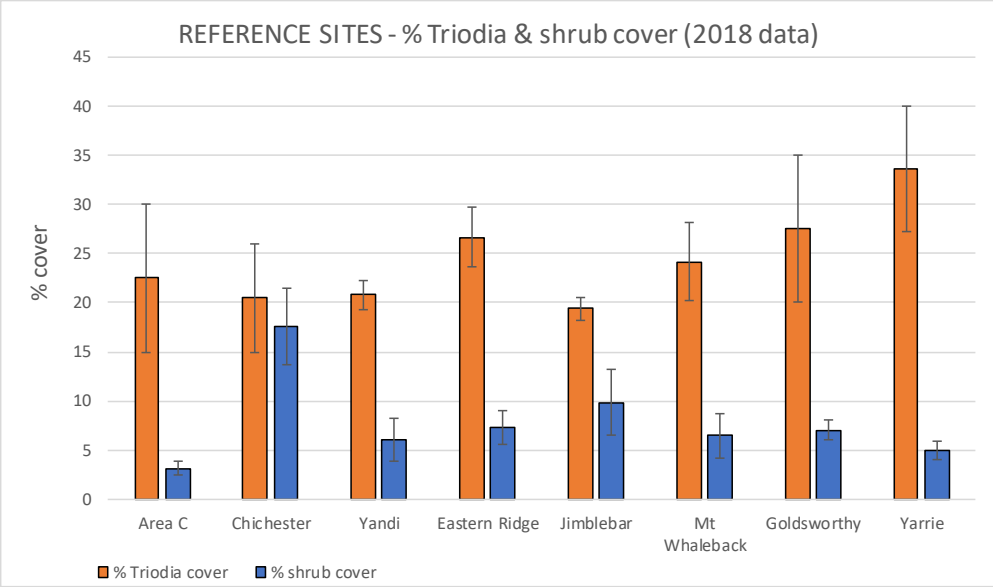
Herb Density	2011 - 16 (no fire)	2018	% diff
CENTRAL	2,130	7,785	-266%
EASTERN	12,884	7,400	43%
NORTHERN	3,867	9,862	-155%
ALL REGIONS	5257.1	8187.2	-56%

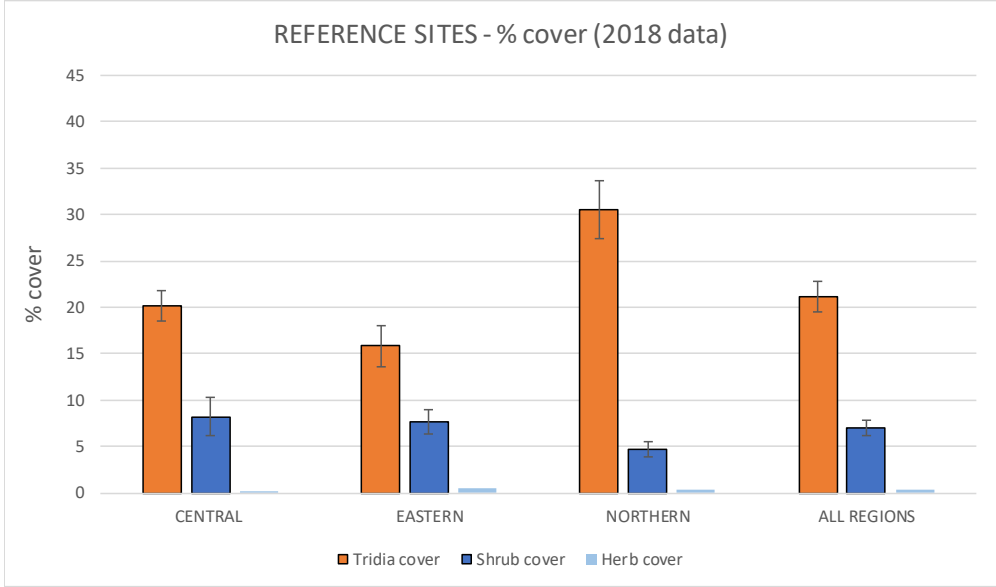
Sampling method has a significant influence on median ranges for cover, density, species richness (2018 data lowers the median ranges compared with analogue sites for shrubs, grasses, and increases for trees).

SYRINX ENVIRONMENTAL

SCALE OF ASSESSMENT

Hub vs Region vs Vegetation Type





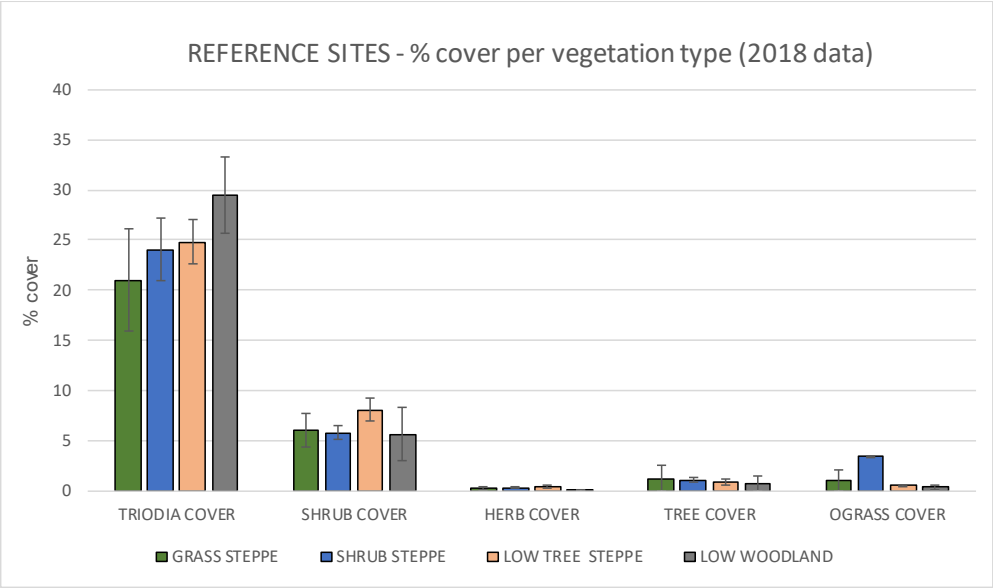
Regional variability is not as strong as the variability in major vegetation types which are more consistent in terms of floristic metrics.

Site data sets inadequate due to limited sample density.

SYRINX ENVIRONMENTAL

SCALE OF ASSESSMENT

Region vs Hub vs Vegetation Type



Data shows variability within landform type (hills, slopes, flats) is greater than variability within hubs.

Regional variability is not as strong as the variability in major vegetation types which are more consistent in terms of floristic metrics. Site data sets inadequate due to limited sample density.

Variability in hubs reflects the variability in vegetation types

SYRINX ENVIRONMENTAL

WHAT ATTRIBUTES?

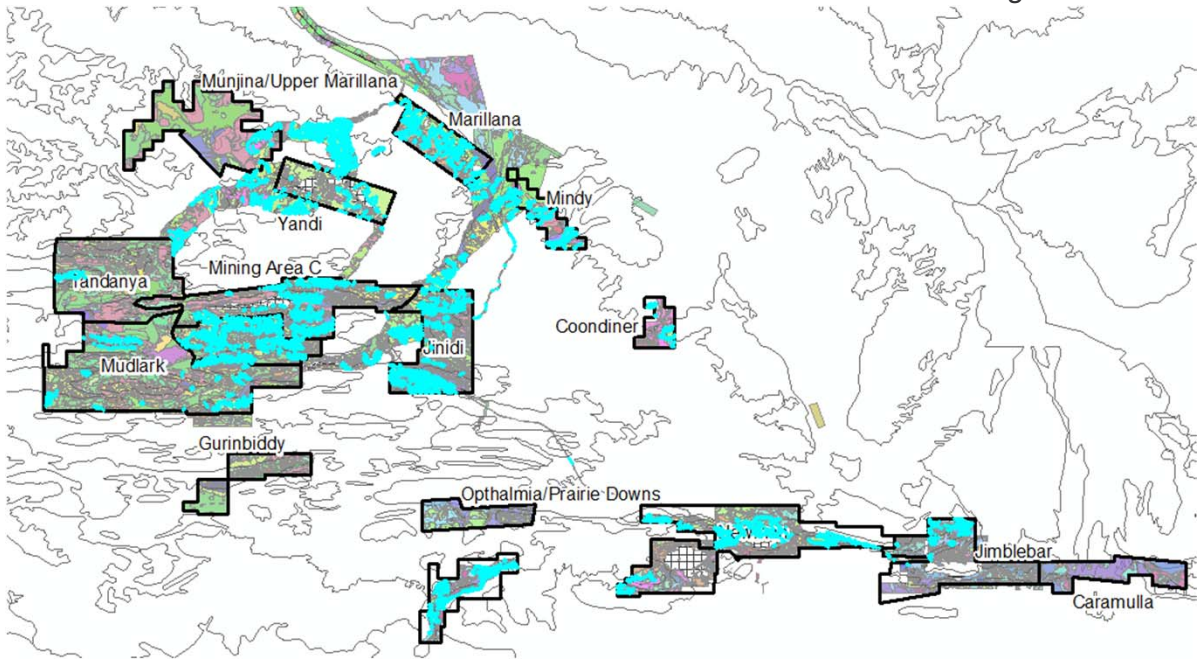
- Naturalness, resilience and habitat value are the key characteristics of importance
- The most significant variables in terms of resilience (soil stability, pattern, richness) are vegetation cover, species composition and buffel grass cover.
- The most significant variable in terms of naturalness and habitat is structure and pattern

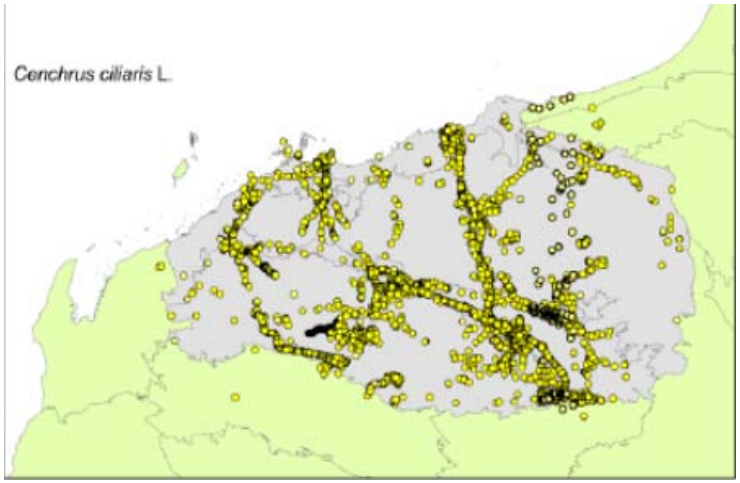
SYRINX ENVIRONMENTAL

WHAT ATTRIBUTES? - WEEDS

LANDFORM	% Area Containing Buffel Grass
DISTURBED	2%
FLOOD PLAINS	13%
GRANITE OUTCROPS AND ROCK PILES	3%
MAJOR DRAINAGE LINES	**21%**
MINOR DRAINAGE LINES	**16%**
SALINE FLATS AND MARSH	0.5%
SAND PLAINS	0.2%
STONY PLAINS	3%

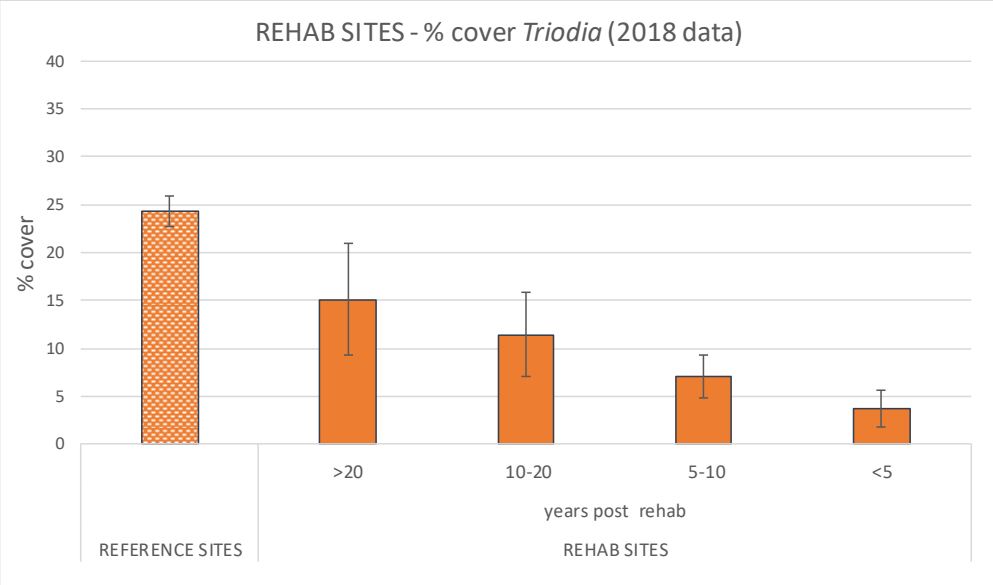
Distribution of minor drainage channels

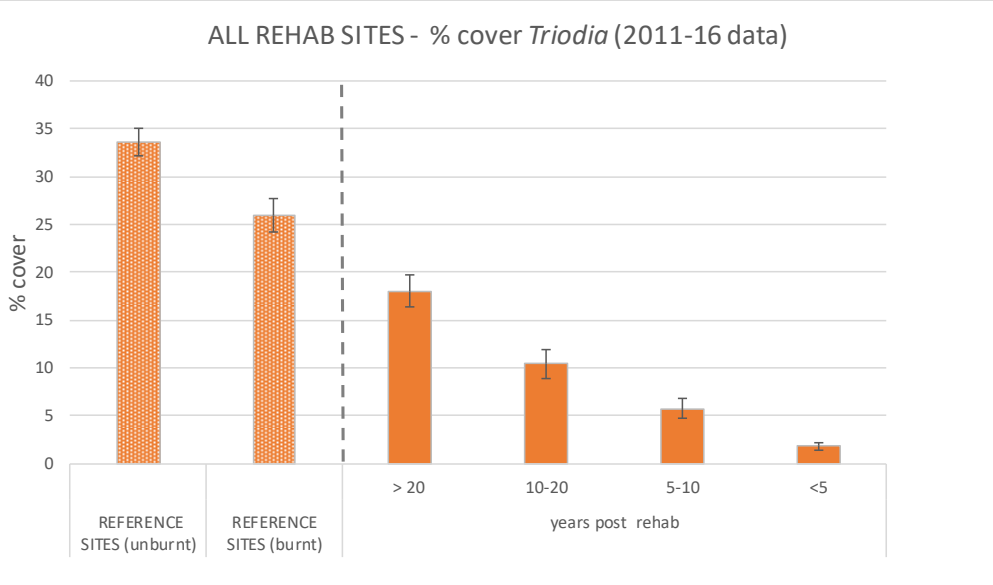




SYRINX ENVIRONMENTAL

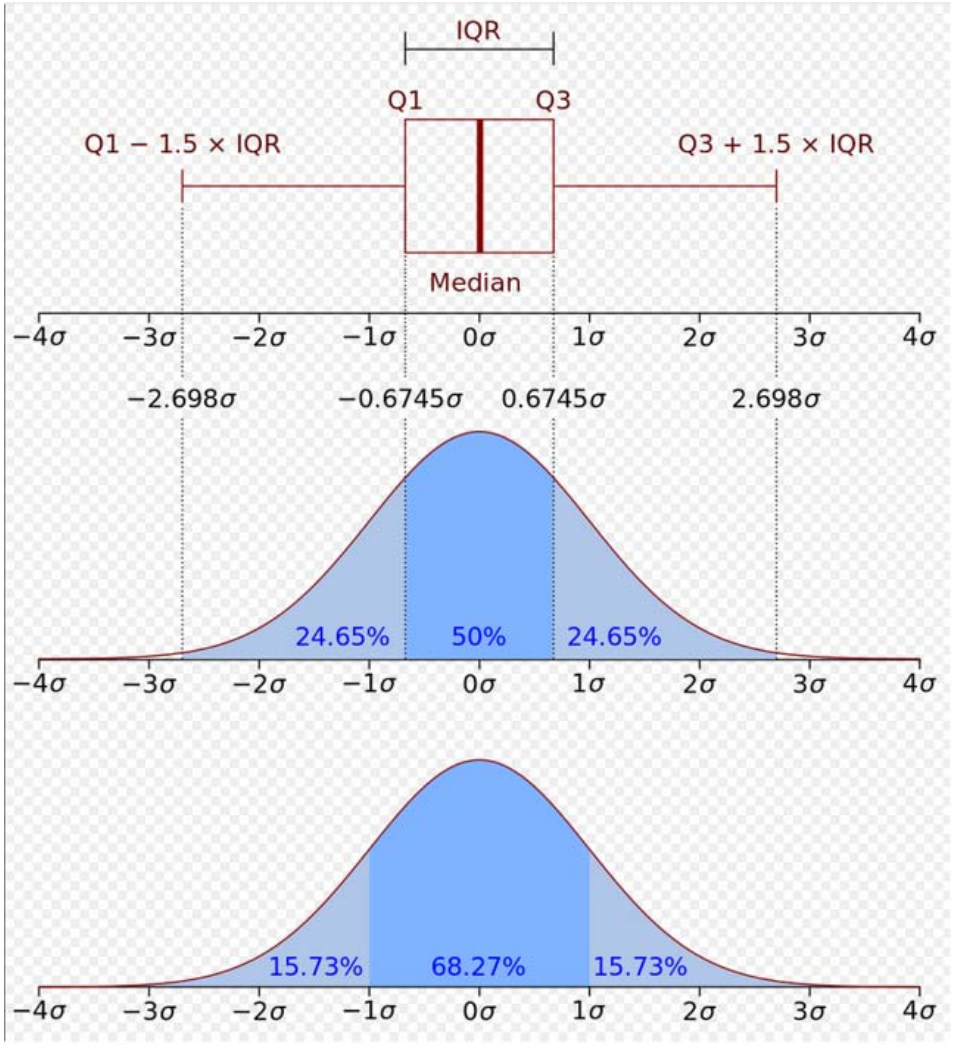
WHAT TIMESCALE? - WHEN IS COMPLETE COMPLETE?





SYRINX ENVIRONMENTAL

WHAT METRICS?



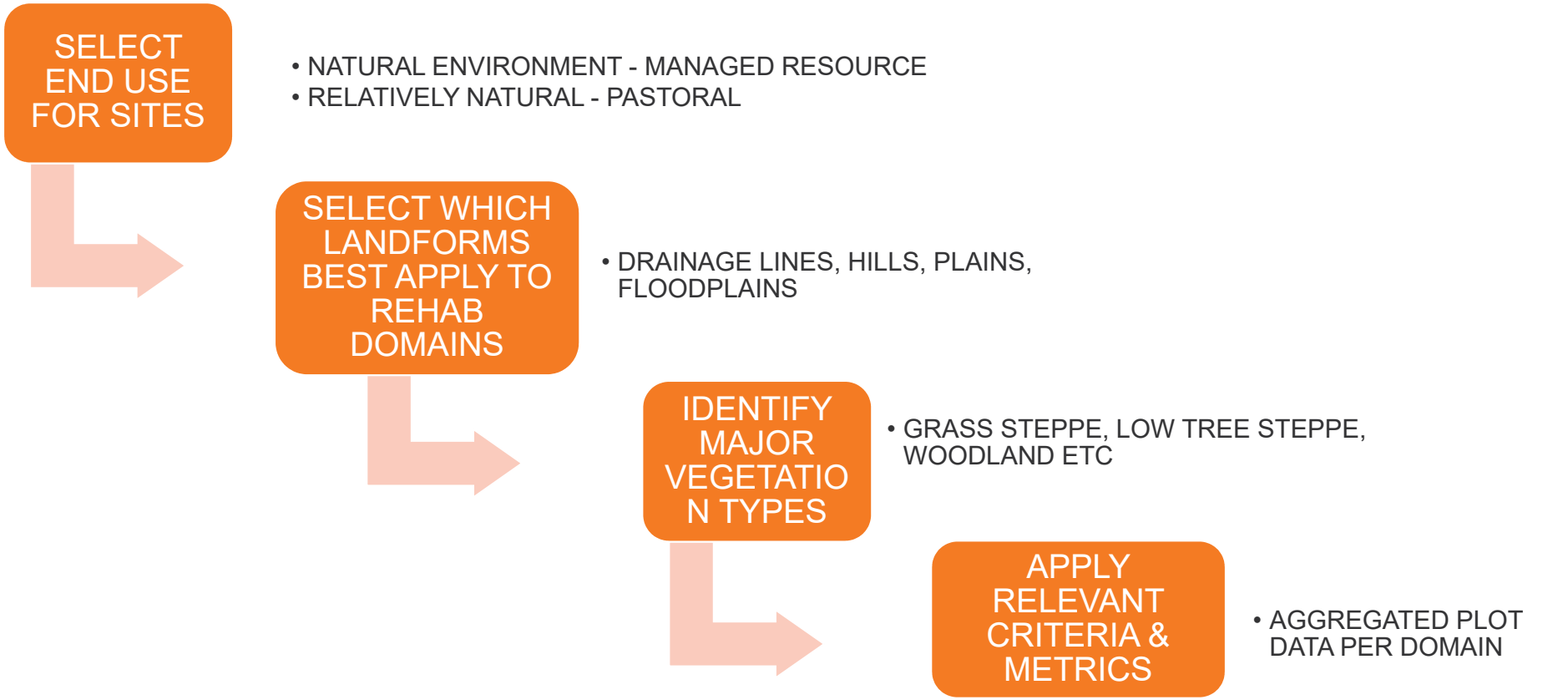
Interquartile range (IQR) statistical approach used - measure of variability, based on dividing a data set into quartiles

The interquartile Q1-Q3 range is defined as the difference between the largest and smallest values in the middle 50% of a set of data

The mid-range of data points best represents ‘typical’.

SYRINX ENVIRONMENTAL

DRAFT COMPLETION CRITERIA



SYRINX ENVIRONMENTAL

DRAFT COMPLETION CRITERIA

CLOSURE OBJECTIVES:	NATURALNESS (major vegetation types, characteristic (icon) species, structure, pattern), HABITAT and RESILIENCE (vegetation cover, richness, recruitment)			
ATTRIBUTE	**CRITERIA**	**METRIC**	**RATIONALE**	**Method of Assessment**
Bioregions and Landforms	Vegetation types to respond to biogeographic region and finished landforms			Refer to map
Bare Ground	Bare ground to be typical of the regional landforms and generally evenly dispersed between vegetation	% bare ground for individual landforms (e.g. hills, slopes,etc)	Critical for achieving key attributes such as patterns, diversity, soil stability.	Survey by plot and releve
Target Vegetation Types	All major Vegetation Types (Beard et al 2013) present at each site to be represented in post-mined landscapes	Presence of appropriate vegetation types	Provides variability of habitat types and critical for achieving naturalness objective.	Refer to map
Indicator Species	Presence of dominant and common species from each Target Vegetation Type represented in post-mined landscapes	Presence of dominant species to reflect end use. Presence of iconic species	Critical for achieving naturalness objective and ensuring required species and structure diversity.	Refer to list
Plant Cover	Vegetation cover for each strata to reflect major vegetation type present within the rehab	% cover for each strata (e.g. trees, shrubs, grasses, etc.). to be within the median range (Q1 - Q3) for each major vegetation type	Key attribute of closure objectives (naturalness, resilience and habitat connectivity)	Survey by plot and releve By plot not less than 15 years post rehab
Species Richness	Perennial and annual native species richness to reflect each major vegetation type present within the rehab	Number of perennial and annual species to be within the median range (Q1 - Q3) for each major vegetation type	Strong indicator of resilience in Pilbara; important for achieving diversity and vegetation cover.	Survey by plot and releve By plot not less than 15 years post rehab
Reproductive Capacity	Demonstrated capacity of the site to recover from fire, drought and other disturbances.	Demonstrated capacity of flora to reproduce as evidenced by seedling recruitment and vegetative production.	Critical for achieving resilience objective.	Survey data to include type, age and extent of seedling recruitment and vegetative production
Weed Invasiveness	DBCA priority list species to be eradicated from rehabilitation area and no new priority species to be introduced	Absence of priority weed species	Critical for achieving naturalness objective.	Surveys to show populations of priority weed species (DBCA list) eradicated
	Total weed cover to be typical for each site and landform, and reflect final end use.	% total weed cover and % buffel grass cover per end use and landform		Survey by plot and releve

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Targets for individual attributes – Land Use: Natural Environments for Managed Resource Protection.

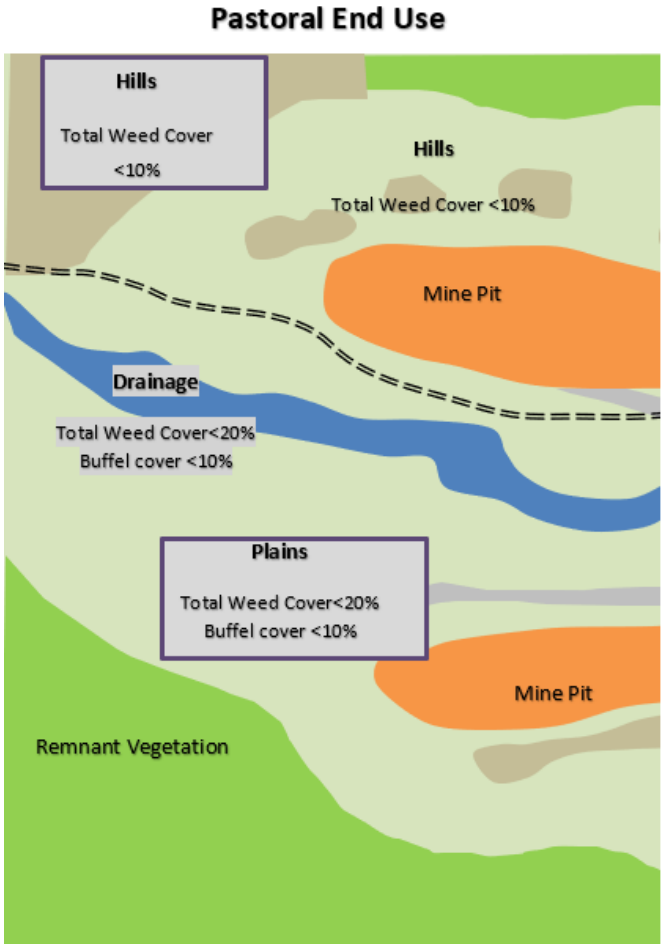
TARGETS **LAND USE:** **NATURAL ENVIRONMENTS FOR MANAGED RESOURCE PROTECTION**							
ATTRIBUTE	**METRIC**	**TARGETS**					
Bare Ground (non-vegetated)	% bare ground with rock or stony cover	Hills, slopes, dryplains Drainage lines (excluding channel bed) Floodplains	≤ 50 % ≤ 20 % ≤ 10 %				
Species Richness	Perennial and annual native species richness (number of species per 50 x 50 m plot)	Perennial native Annual native species	14% - 30% 4% - 11%				
Weed Invasiveness	Priority alert weed species presence and cover	Presence and cover Priority species	Not present or if present, cover ≤ the surrounding areas (regional baseline) No new priority species introduced				
	% all weed cover and % buffel grass cover	Total weed cover drainage lines, floodplains upland hills, slopes and flats	 < 15% < 5%				
		Buffel grass cover drainage lines, floodplains upland hills, slopes and flats	 < 10% < 5%				
Feral Animals	Presence of declared feral animals and pests	Presence	No new priority species introduced				
Target Vegetation Types	Presence of appropriate vegetation types		**Grass Steppe**	**Shrub Steppe**	**Low Tree Steppe**	**Low Woodland**	**Riverine sedgeland/grassland**
Indicator Species	Presence of dominant and common species from each Target Vegetation Type *Note, if more than one type is applicable, choose the most representative for each rehabilitated area*	At least one dominant species from each strata present >70% of common species present	 Dominant Grasses: *Triodia wiseana, T. basedowii*	 Dominant Shrubs *Acacia bivenosa, A. aneura group, A. pyrifolia, Grevillea pyramidalis* Dominant Grasses: *Triodia wiseana, T. basedowii, T. pungens.*	Dominant Trees *Eucalyptus leucophloia, E. gamophylla* Dominant Shrubs *Senna artemisioides, S. pleurocarpa var. pleurocarpa, Senna spp., Grevillea wickhamii, Hakea lorea* Dominant Grasses: *Triodia wiseana*	Dominant Trees *Acacia aneura group* Dominant Shrubs *Eremophila spp. Senna spp.* Dominant Grasses: *Triodia spp, Tussock grasses*	Dominant Trees *Eucalyptus camaldulensis, E. victrix* Dominant Shrubs Dominant Grasses/Sedges: Tussock grasses, sedges
Plant Cover	% cover for each strata and each Vegetation Type	Trees	0 - 1	1 - 10	1 -10	2 - 10	10 - 70
		Shrubs	0.2 - 7	3 - 7	2 - 10	2.6 - 6.8	2 -10
		Hummock Grasses	15 - 34	19 - 33	20 - 30	17 - 33	
		Other Grasses	0.01 - 0.4	0.02 - 0.16	0.04 - 0.62	0.2 - 1	2 -10
		Herbs	0.1 -0.2	0.1 - 1	0.05 - 0.4	0.06 - 0.27	

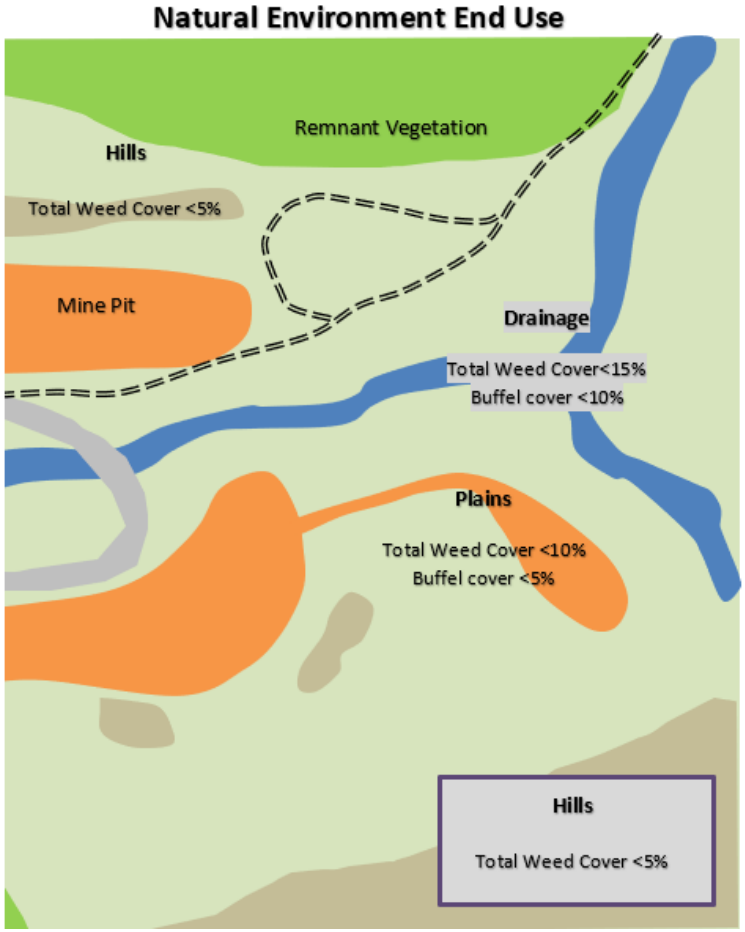
Targets for individual attributes – Land Use: Relatively Natural Environments for Pastoral Grazing Purposes.

TARGETS **LAND USE:** **RELATIVELY NATURAL ENVIRONMENTS FOR PASTORAL GRAZING PURPOSES**							
ATTRIBUTE	**METRIC**	**TARGETS**					
Bare Ground (non-vegetated)	% bare ground with rock or stony cover	Hills, slopes, dryplains Drainage lines (excluding channel bed) Floodplains	≤ 50 % ≤ 20 % ≤ 10 %				
Species Richness	Perennial and annual native species richness within >50% of rehabilitated sites (number of species per 50x50 m plot)	Perennial native Annual native species	14 - 30 4 - 11				
Weed Invasiveness	Priority alert weed species presence and cover	Presence and cover Priority species	Not present or if present, cover ≤ the surrounding areas (regional baseline) No new priority species introduced				
	% all weed cover & % buffel grass cover	Total weed cover drainage lines, floodplains upland hills, slopes and flats	 < 20% < 10%				
		Buffel grass cover drainage lines, floodplains upland hills, slopes and flats	 < 10% < 10%				
Feral Animals	Presence of declared feral animals and pests	Presence	No new priority species introduced				
Target Vegetation Types	Presence of appropriate vegetation types		**Grass Steppe**	**Shrub Steppe**	**Low Tree Steppe**	**Low Woodland**	**Riverine sedgeland/grassland**
Indicator Species	Presence of dominant and common species from each Target Vegetation Type *Note, if more than one type is applicable, choose the most representative for each rehabilitated area*	At least one dominant species from each strata present >50% of common species present		Dominant Shrubs *Acacia bivenosa, A. aneura group, A. pyrifolia, Grevillea pyramidalis*	Dominant Trees *Eucalyptus leucophloia, E. gamophylla* Dominant Shrubs *Senna artemisioides subsp. sturtii, S. pleurocarpa var. pleurocarp, Grevillea wickhamii, Hakea lorea*	Dominant Trees *Acacia aneura group* Dominant Shrubs *Eremophila spp. Senna spp.*	Dominant Trees *Eucalyptus camaldulensis, E. victrix* Dominant Shrubs Dominant Grasses/Sedges: Tussock grasses, sedges
			Dominant Grasses: *Triodia wiseana, T. basedowii*	Dominant Grasses: *Triodia wiseana, T. basedowii, T. pungens.*	Dominant Grasses: *Triodia wiseana*	Dominant Grasses: *Triodia spp, Tussock grasses*	
Plant Cover	% cover for each strata and each Vegetation Type to be > Q1 for relevant reference sites	Trees	>0	>1	>1	>2	>10
		Shrubs	>0.2	>3	>2	>2.6	>2
		Hummock Grasses	>15	>19	>20	>17	>2
		Other Grasses	>0.01	>0.02	>0.04	>0.2	
		Herbs	>0.1	>0.1	>0.05	>0.06	

DRAFT COMPLETION CRITERIA

Example of Pastoral vs Natural End Use Targets for Weeds





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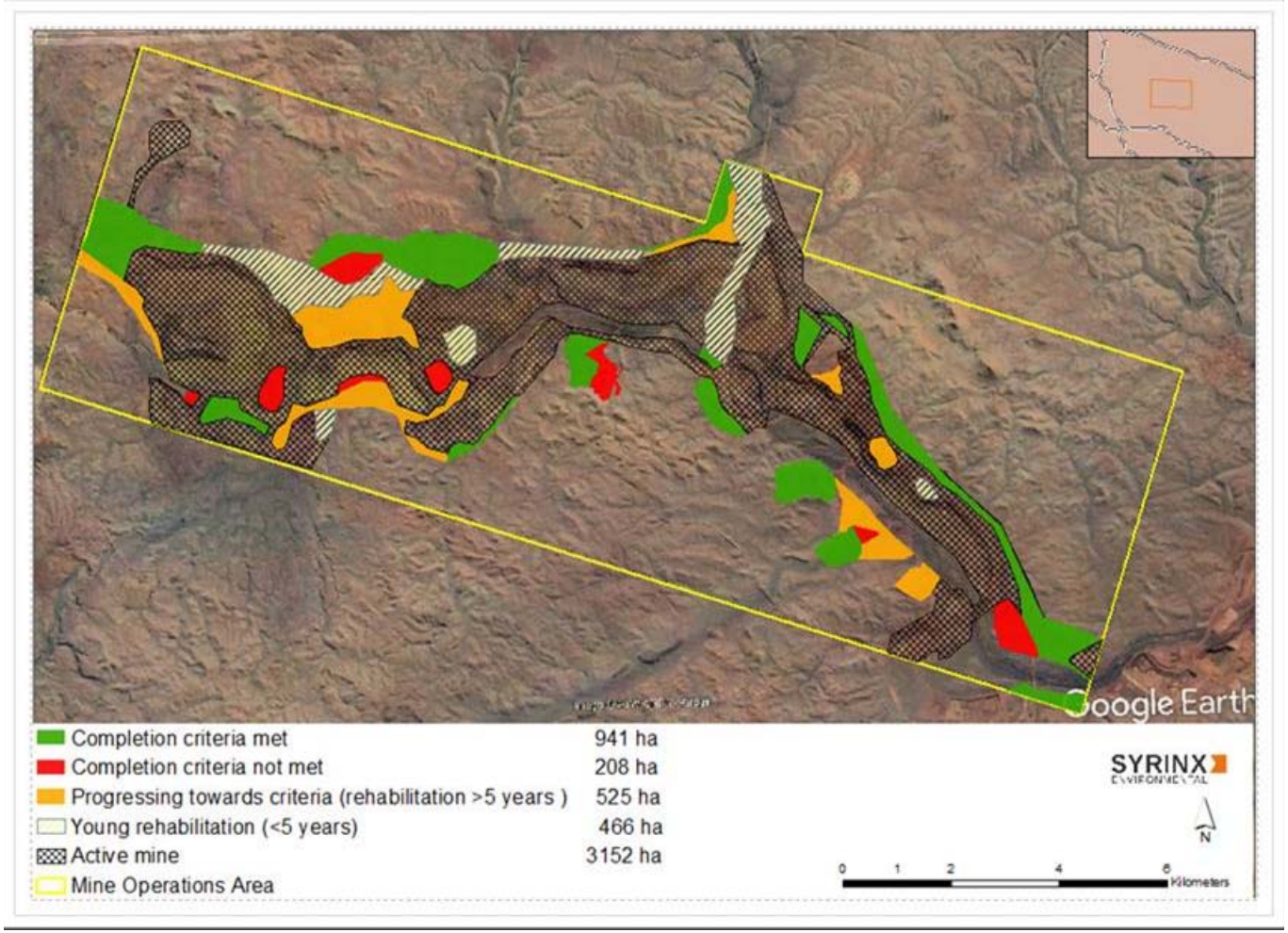
DRAFT COMPLETION CRITERIA

Visual assessment of rehabilitation success – hypothetical site



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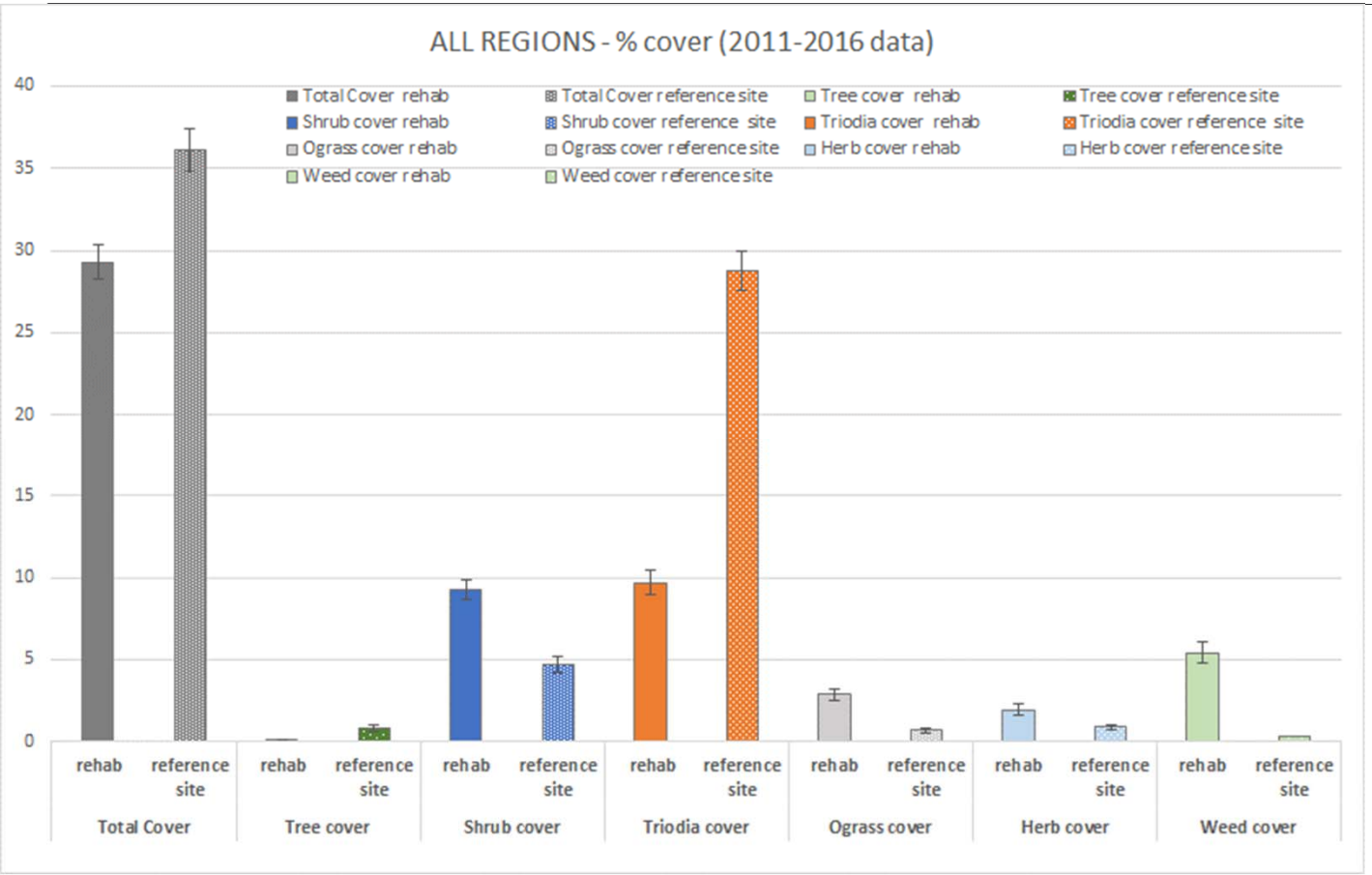
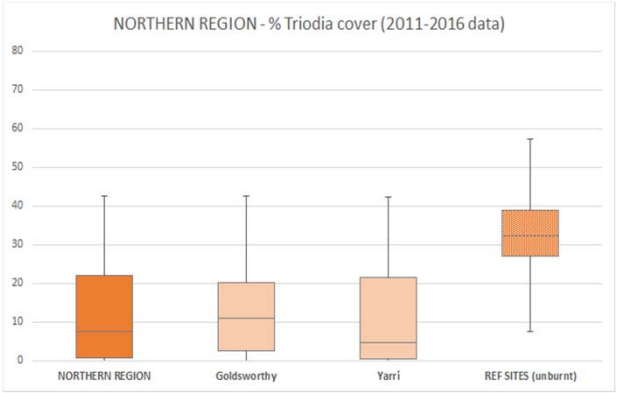
REHABILITATION SUCCESS – HISTORIC & CURRENT





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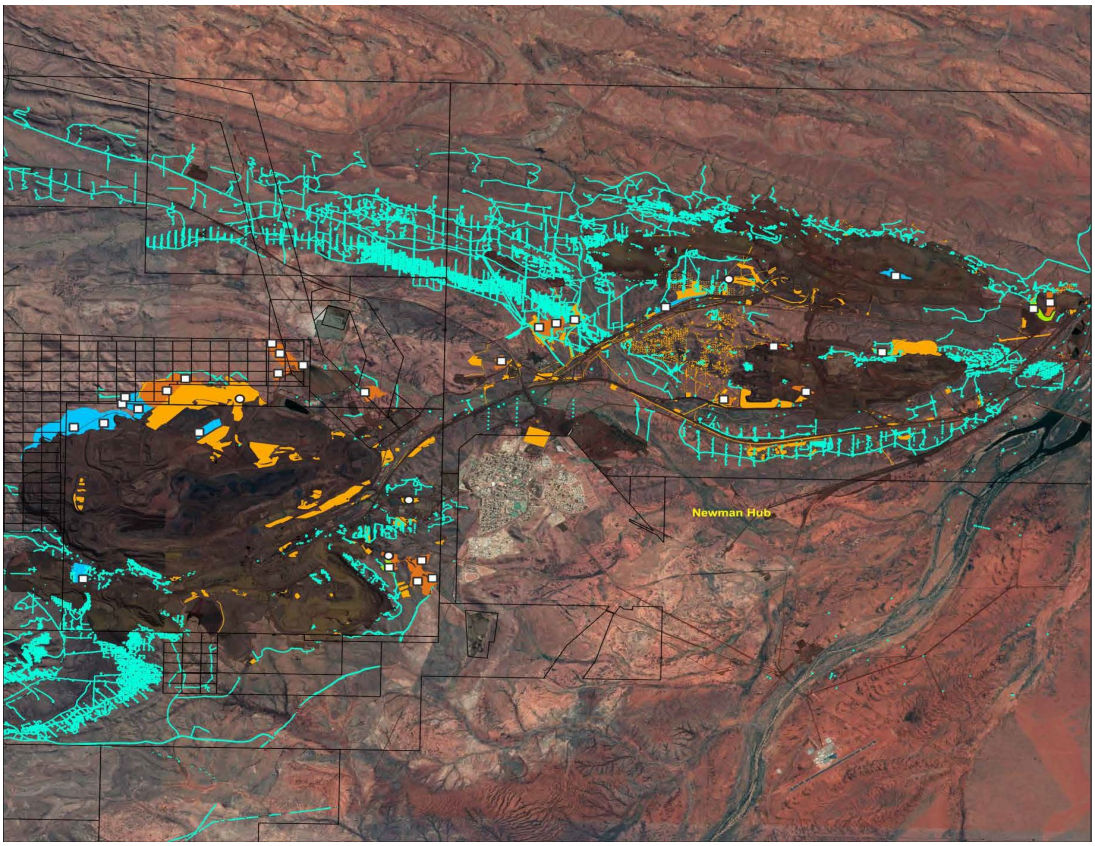

BHP Rehabilitation Improvement Projects

REVISED COMPLETION CRITERIA OPERATIONAL AND GNA SITES

March 2023

SYRINX

Document Control

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Version	**Date**	**Prepared by**	**Approved**	**Issue Details**
1	23.03.23	K. Meney L. Pantelic	KM	Draft for comment
2	4.04.22	K. Meney L. Pantelic	KM	Issued to broader team
3	23.03.2023	K. Meney L. Pantelic	KM	Final

Limitations of Report

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1.0 BACKGROUND TO DRAFT COMPLETION CRITERIA

1.1 WHAT DO THEY COVER?

A draft set of completion criteria was finalised for BHP WAIO sites in Feb 2020 (Syrinx 2020). These combine ecological criteria with landform and geochemical stability criteria and form the general set of measures applicable to all post-mining sites within mining hubs. From a regulatory perspective, the completion criteria are used to assess how well an individual Hub is performing across its major post-mining land use targets.

These criteria were developed for the most common post-mining land uses likely for these sites, and are applied based on the existing dominant tenure of each Hub, i.e. sites already within a pastoral grazing tenure are assumed to most likely return to this final land use after mining, and UCL is assumed to return to native vegetation.

The Australian Land Use and Management (ALUM Classification V8) classification system was used to determine appropriate final land uses and to maintain consistent terminology across Australia and with the Western Australian Biodiversity Science Institute (WABSI) Draft Rehabilitation Framework. For the purpose of this report and reflecting the current and future known proposals, the adopted final land uses are proposed to be:

CLASS 1 CONSERVATION AND NATURAL ENVIRONMENTS

Natural Environments for Managed Resource Protection

CLASS 2 PRODUCTION FROM RELATIVELY NATURAL ENVIRONMENTS

Pastoral Grazing

These two post-mining land uses cover the majority of the existing sites and future approved sites under the BHP Pilbara Strategic Approval (2017).

1.2 WHAT DON'T THEY COVER?

The Draft criteria did not address separate criteria for legacy sites, nor addressed 'non-standard' landforms within sites, where the current criteria may be considered unsuitable for a range of reasons including:

- Finished landforms may have been done prior to best practice rehabilitation methods were developed, are not natural to the Pilbara and unlikely to support particular vegetation types or representative strata or species. This mainly includes 'moonscaped' slopes which occur predominantly from Goldsworthy to Yarrie (GNA mines).
- Finished landforms may have acid generating or other contamination residual issues which are covered by primary remediation requirements and other completion criteria (covers etc) that may not be compatible with some ecological completion criteria. This predominantly impacts OSAs at Whaleback.

- Constructed ecosystems such as pit lakes (open or infilled), pit walls and tailings which require specific criteria.

Furthermore, the criteria didn't address sites that cannot support the umbrella hub-scale agreed PMLU, and which might comprise 20% of a site at completion.

1.3 WHAT ARE THEY APPLICABLE FOR?

The Completion Criteria and the assessment of sites against these are pertinent to:

1. Closure planning and related approvals for existing operations
2. Future approvals of new operations
3. Rehabilitation improvement for current operations

Existing and future mines are shown in Figure 1.

The ***current*** operations are:

- Newman Hub - located approximately 2 km west of Newman township and consists of Mount Whaleback, and Orebodies 29, 30 and 35.
- Mining Area C Hub – Northern and Southern Flanks - located approximately 100 km northwest of Newman Township.
- Jimblebar Mine Hub - Wheelarra Hill, Orebody 18 and Orebody 31 - located approximately 35 km east of Newman township.
- Eastern Ridge Hub - located approximately 5 km east of Newman township and consists of Orebodies 23, 24, 25 and 32.
- Yandi Mine Hub - located approximately 100 km north northwest of Newman township.

The Goldsworthy to Yarrie northern mines, are closed and are currently being rehabilitated.

Closure plans are required for all sites. Plans that have incorporated the Draft Completion Criteria to date include Jimblebar and Yandi mines, and most recently Whaleback.

The ***future mines*** will be approved as they arise under the Pilbara Expansion Strategic Proposal MS1105 - Guidelines for submitting a Derived Proposal 1(c). Specifically, the requirement is a Rehabilitation Report from BHP that details the following:

1. The types of ecosystems and total area of rehabilitation that BHP will be required to rehabilitate across their WAIO tenure, including the derived proposal.
2. An analysis of the history of rehabilitation that BHP has undertaken in the Pilbara and the demonstrated success of this rehabilitation.

3. The likely success of future rehabilitation activities in establishing self-sustaining areas of rehabilitation, taking into account contemporary scientific evidence; the types of areas to be rehabilitated; and the scale of the rehabilitation activities.

Because the final agreed set of Completion Criteria need to be able to support all stages of the life of mine, from new mine approvals, to active rehabilitation, to closure approvals, it is important that the final agreed criteria are consistent and appropriate.

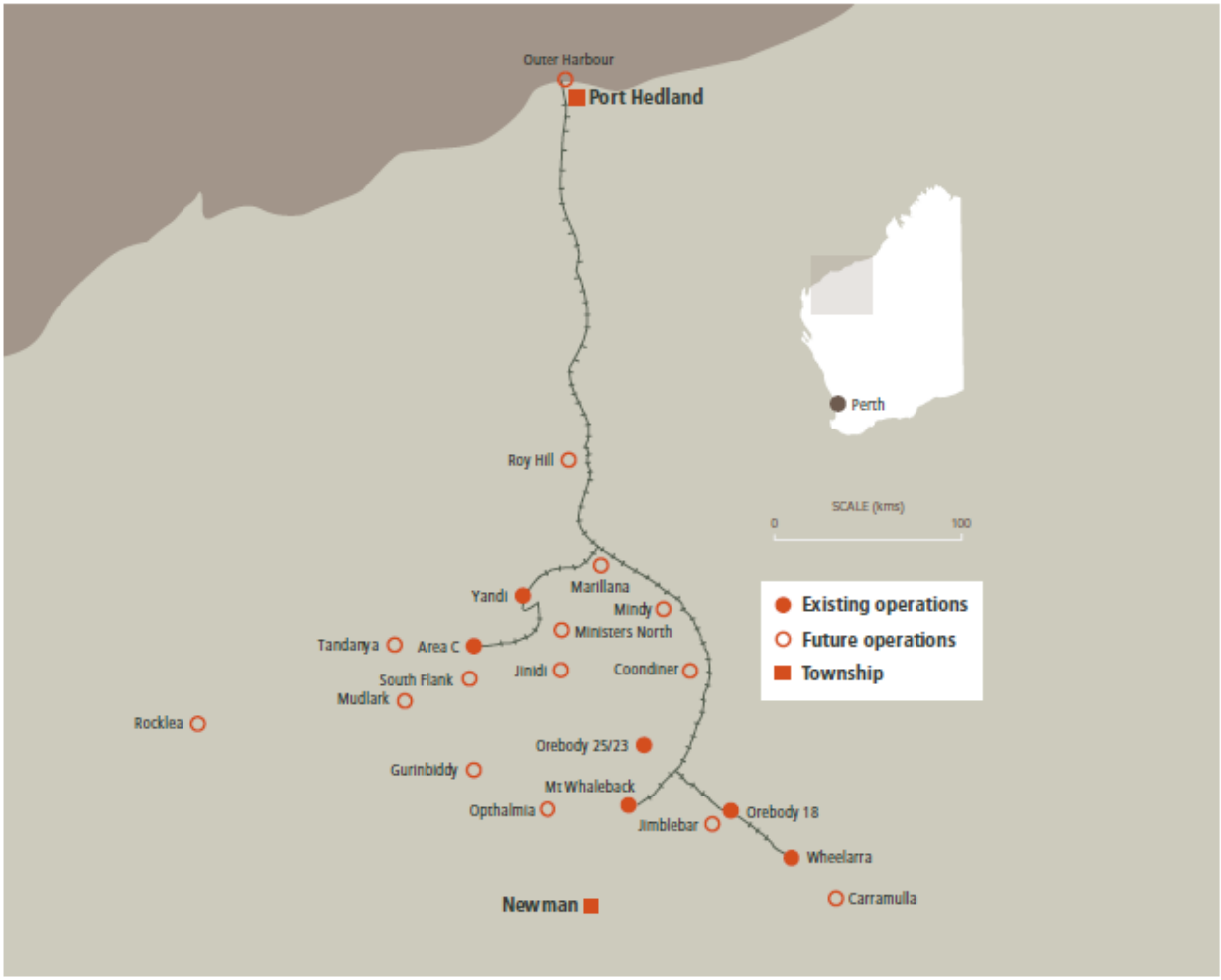


Figure 1. Location of current and future mines (from Strategic assessment). Note, South Flank became operational in 2021.

2.0 USE OF THE DRAFT CRITERIA AND LESSONS LEARNED

Since the Draft Completion Criteria were adopted within BHP, they have been adapted for use in various closure plans (Jimblebar, Yandi, Whaleback), have been applied to the assessment of rehabilitation success by the Rehabilitation Team, and have been used to support annual Rehabilitation reporting to the EPA required as part of the Strategic Approval process.

There have been some key learnings from this process to date which are useful to understand in order to finalise the criteria for regulatory approval:

1. The Closure Team have adapted the criteria to apply them at a mine scale and domain scale within the Closure Plans. Completion criteria are seen as the last stage of a process (Planning, Execution, Completion) and form part of the full Closure Criteria. They have also noted some criteria included in approval commitments for certain sites were missing from the main Completion Criteria table.

   This has resulted in modifications to some criteria and the way they are being applied.

2. The Rehabilitation Team have not yet transferred the criteria into a revised monitoring methodology and the following gaps/issues have been identified:

   - not all data is yet being collected to assess sites against the Draft criteria, partly due to COVID site restrictions over the past 2 years;
   - the criteria are being used to assess data collected via remote sensing, where these can be applied;
   - there is limited data to make progressive rehabilitation assessments, which are the targets better suited to the 'Execution' stage used in closure reporting;
   - there are current deficiencies with the databases used; and
   - specific criteria for legacy sites and landforms are a gap that needs to be addressed moving forward.

   These factors have resulted in the need for rework to generate annual traffic light reports, in a lag in understanding progressive success and remedial actions required, and in understanding acceptable completion standards for legacy sites.

3. The Strategic Referrals Team have continued to rely on internal BHP GIS resources to i). update and make corrections to operational, exploration, and rehabilitation areas to provide the required reports to support derived proposals, and ii). continue to require external support in order to undertake data cleansing and to produce the required outputs.

   This has resulted in the need for rework to generate annual traffic light reports, and a level of inaccuracy in Rehabilitation Reports for derived proposals that needs to be addressed moving forward.

The current experience has been useful in establishing the need for developing a final agreed set of completion criteria, a method for assessment of sites against these criteria, and consistency in how they are used and reported against.

3.0 REVISIONS TO THE CRITERIA AND MONITORING PROCESSES

Since August 2021, Syrinx and the BHP Rehabilitation Team have been progressing work to improve the existing completion criteria, develop new criteria more suited to legacy sites and altered landforms, address database issues, and develop new agreed monitoring procedures.

The Rehabilitation Team are now seeking to take the revised completion criteria to the regulators before end June 2022, and have set the following objectives:

The ***Completion Criteria*** must be:

- Focused on the 'end game' – only reporting on how a Hub performs when it has reached the age at which the assessment applies, which is 15 years or older, and not as part of a progressive rehabilitation process.
- Robust (defensible) – the data collection, processing, storage and analysis needs to be scientific, consistent, protected, meet the required quality assurance standards and be controlled by BHP internally.
- Consistent - Completion Criteria must be used within the final agreed formats and not adjusted for different sites or purposes (although may be periodically modified for all sites in line with the knowledge base and/or corporate and or regulatory shifts). This is needed to maintain consistency in regulatory expectations and reporting. Separate reference target tables should be applied to cover variances between post mine land uses and to capture any site-specific criteria.
- Appropriate – to legacy sites, current operational sites, future mines and to particular landforms and settings.
- Simple to understand - the ultimate reports are to be traffic light spatial maps that tell a simple and visual story of success and progress towards success.

Progressive criteria are to be used to assess whether or not a site is moving along the right trajectory and if remedial works are required to ensure it does achieve acceptable completion.

The current changes and new criteria that have been developed to address this is covered under the key subject headings below.

3.1 PROPOSED HIERARCHY FOR COMPLETION CRITERIA

The completion criteria are intended to apply to the Hub scale, and the post-mining landuse (PMLU) is intended to be the overarching landuse for the groups of mines within each hub, based on the dominant current tenure (pastoral, UCL). This aligns with the WABSI framework and has been generally discussed as the appropriate scale with regulators to date.

However, there are clear challenges in applying criteria to every mine and domain within mines, given their different histories and status (location, extent of modification, scale etc). There are also challenges in the different requirements of reporting, where for instance closure reporting and rehabilitation monitoring are done at the mine scale, whereas completion reporting is aggregated for mines to the Hub level.

In order to develop a revised set of criteria that better address these challenges, a framework is proposed to guide the process (Figure 2):

TIER 1 (HUB)

- The two major PMLU's (pastoral and natural) apply to ALL Hubs (as is currently done).

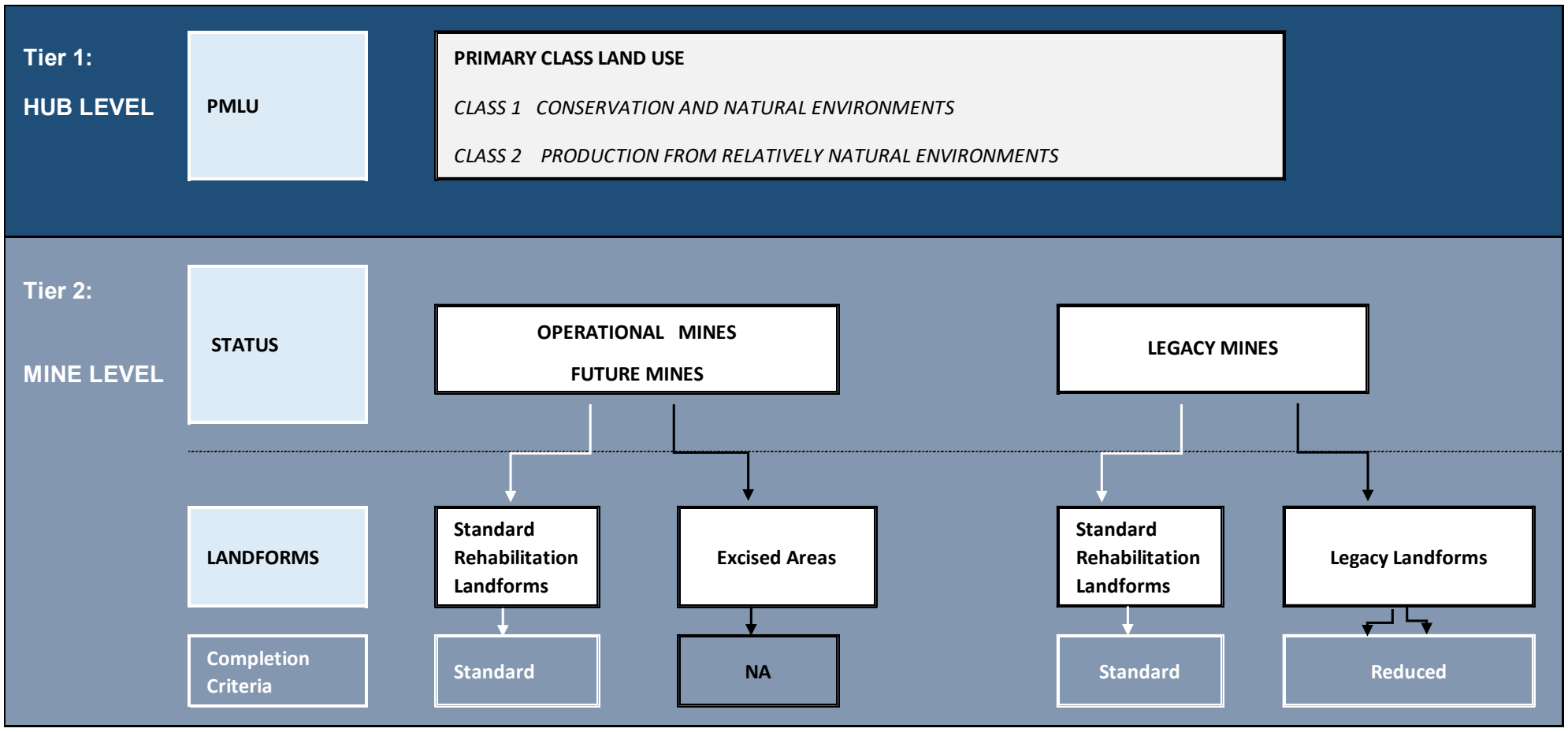
TIER 2 (MINE)

- Separate criteria apply to operational and future mines within hubs, compared with legacy mines, and
- Separate criteria are applied to 'standard rehabilitated landforms' and 'legacy landforms' (moonscapes) within legacy mines (GNA).

  Standard rehabilitation landforms are those classed as being formed and rehabilitated to a standard that can meet the objectives of naturalness, resilience and habitat connectivity and can be assessed against ecological outcomes.

  Legacy landforms are those that were done before best practice methods were implemented and which are unlikely to support all ecological outcomes set for the Hub level PMLU.

Note, these criteria are envisaged to be applicable to ~80% of the footprint of an individual mine, with the balance not assessable against these criteria (excised areas).



DEFINITIONS

Landforms	Definition
Standard Rehabilitation Areas	Areas formed and rehabilitated to a standard that can meet the objectives of naturalness, resilience and habitat connectivity and can be assessed against ecological outcomes. Standard landforms include: crests, slopes, flats, drainage lines and floodplains
Legacy Landforms	Areas formed in legacy mines using methods that precede current best practice and which are unlikely to support all ecological outcomes set for the Hub level PMLU. Legacy landforms currently only include moonscapes, but others may apply if natural ecosystems or pasture are the intended final PMLU.
Excised Areas	Areas including pit lakes, some AMD OSA's, retained infrastructure etc where these sites are covered under separate criteria and the PMLU is not to native ecosystems or pasture. The criteria in this framework do not apply to such excised areas.

Completion Criteria	Definition	Relevant reference tables	
Standard	i) standard rehabilitation landforms, both non-ecological and ecological criteria apply; ii) ecological criteria apply to Target Vegetation Types.	Table 1 Completion Criteria	Table 2. Ecological Targets- Operational & Future Sites
Reduced	i) legacy landforms; both non-ecological and ecological criteria apply; ii) ecological criteria apply to Non-specific Vegetation Type (Pilbara typical)	Table 1 Completion Criteria	Table 3. Ecological Targets - Legacy Mines

Figure 2. Suggested framework for application of completion criteria.

3.2 REVISED COMPLETION CRITERIA – OPERATIONAL AND FUTURE MINES

The revised Completion Criteria are shown in Appendices 1-3. These are intended to be the final Completion Criteria that BHP will seek regulatory approval for.

The following changes have been proposed to better consolidate the completion criteria applicable to operational and future mines, and to better delineate how legacy mines and landforms are assessed:

- Criteria for *Natural* and *Pastoral* Post-mining Landuses have been combined into one common table (APPENDIX 1).

  This table now aligns more closely with the WABSI Completion Criteria (Young *et al* 2019), and adopts some of the more recent criteria used in the Closure reports.

- Separate criteria have been created for *legacy landforms* within legacy mines (GNA), which constitute sufficient area to influence completion outcomes, and which are unlikely to meet or be expected to meet ecological criteria as they apply to standard rehabilitation sites. The criteria now allow for a lower stringency of assessment compared with 'standard rehabilitated landforms' (APPENDIX 1).

- New criteria have been added for visual amenity, and non-ecological criteria have been adjusted to reflect the most recent ones used by the Closure Team (APPENDIX 1).

- Separate Assessment (Target Reference) Tables have been created which contain the specific quantitative targets that apply to each post-mining land use and to each type of mine (operational, legacy). For operational and future mines with standard landforms, refer to APPENDIX 2). For GNA legacy sites, refer APPENDIX 3.

  These targets can be developed and adjusted over time in line with improved baseline data, and without the need for any regulatory approval changes (unless substantive). These tables will be used (as they are currently) within both the remote sensing monitoring, site plot-based survey monitoring, and within the model used to produce output tables and spatial maps (traffic light reports). The Target tables rely on consistency between the monitoring and data analysis phases, and between years.

A link to the revised COMPLETION CRITERIA AND ASSESSMENT TARGET tables (*BHP WAIO Rehabilitation Criteria Workbook – COMPLETION CRITERIA*) is attached to this document.

4.0 GOLDSWORTHY NORTHERN AREA (GNA) - PROPOSED CRITERIA

4.1 BACKGROUND

The Goldsworthy northern operations extend from Goldsworthy (~ 95 km east of Port Hedland) to Yarrie (~180km east of Port Hedland) on the northern boundary of the Pilbara Region, and adjacent to the western extremity of the Great Sandy Desert. The area includes the Goldsworthy and Yarrie minesites covering deposits at Mt Goldsworthy, Shay Gap, Sunrise Hill, Nimingarra, and Yarrie (which includes Cundaline, Yarrie and Cattle Gorge deposits). These mining operations are all closed and represent BHP's oldest 'legacy' iron ore mines in the Pilbara.

The Goldsworthy mine was commissioned in 1965/66 by Goldsworthy Mining Ltd and was the first iron ore operation in the Pilbara region. Mining ceased in 1982. BHP acquired Goldsworthy Mining Limited in 1990, commenced preliminary rehabilitation in 1993, and closed the township in 1994.

Shay Gap and Sunrise Hill mines were both closed in 1993, and Nimingarra in 2007. Yarrie commenced operations in 1993 and maintained a small output of iron ore until suspension of activities in 2014.

Mine overburden dumps, borrow pits, exploration tracks and drill pads at Shay Gap, Sunrise Hill and Nimingarra were first rehabilitated during 1993-1995. However, 'preliminary' rehabilitation activities were largely ad hoc and poorly documented. J. A secondary rehabilitation phase occurred across most of the GNA sites in 2012, with some through to 2016 (Cattle Gorge).

In all of the GNA sites, the post-mining landforms largely comprised of the open voids and waste dumps, which were mostly contoured as 'moonscapes' prior to 2004. 'Moonscaping' was a method used for scalloping the slopes to enhance rainfall infiltration and create microclimates. Seeding was done using a general Pilbara list, not specifically targeted to the northern region. Whilst not considered current best practice, it is worth noting that BHP won a golden gecko award in 1993 for the moonscaping, because it was done at a large scale when not required.

In summary, the GNA mines have a similar history in that:

- They are old mines (mid 1960's to early 90's).
- Post-mined landforms were intended to achieve 'safe, stable' criteria only and did not integrate with surrounds ('moonscaped' waste dumps).
- There was a significant gap between final landforming activities and preliminary rehabilitation (done in the early 1990's) and follow-up (remedial) rehabilitation' done predominantly between 2012 and 2016. Therefore, whilst the landforming can be considered part of 'legacy' rehabilitation activities, some mines are relatively young in terms of their revegetation and hence are considered still young or progressing in terms of completion criteria assessment.

In order to develop appropriate criteria suited to the GNA context, the following tasks were undertaken:

- Review of initial draft completion criteria for GNA sites and specifically legacy landforms (moonscapes).
- Review of performance of GNA sites against the standard rehabilitation criteria
- Amend and expand the criteria and workshop with BHP Rehabilitation Team.
- Prepare agreed final draft criteria to be used as the basis of regulatory approvals.

4.2 PERFORMANCE OF GNA SITES AGAINST CRITERIA FOR OPERATIONAL SITES

An assessment of how the GNA sites perform against the Draft (2019) Ecological Completion Criteria, applying the pastoral post-mining land use, was undertaken using 2021 data.

Table 1 shows the total area of the GNA mines under rehabilitation. This is all the data for all sites (Goldsworthy mines and Yarrie Hubs combined). This table shows clearly two main points:

1. Most of the rehabilitation (70%) is still in the progressive stage, and not yet assessable against completion criteria (noting this does not apply until revegetation is >15 years). As such, the probability that the GNA as a whole will meet these criteria will mainly depend on the trajectory of these younger sites.
2. The percentage success for either completed or progressive sites against the relevant criteria is very low.

What is not currently well understood is the proportion of progressive sites that are ‘moonscaped’ at GNA sites. Moonscaping applies only to the slope of a rehabilitated waste dump. These landforms are old and most were initially rehabilitated 20 years or more. Remedial rehabilitation works were undertaken in 2012, hence these sites are captured as Progressive Rehabilitation (< 15 years post rehabilitation). Over half (56%) of monitoring plots within the progressive monitoring set are from moonscaped areas. It is probable that the success or otherwise of the moonscaped areas will determine the success or otherwise of the entire GNA sites in terms of ecological criteria.

A detailed evaluation of the GNA sites (Yarrie, Goldsworthy) assessed against the standard rehabilitation criteria can be found in Syrinx (2021) memo report.

Table 1. GNA rehabilitation area breakdown

GNA CURRENT BREAKDOWN	Area (ha)	% Total Rehab
Total GNA Rehab (operations)	1,614	100%
Assessable against Completion Criteria (> 15 yrs post rehab)	376	23%
Completion Criteria Met	***64***	***4%***
Progressive Rehab	1,124	70%
Progressive Criteria Met	***94***	***6%***
Young Rehab (< 5 yrs post rehab)	114	7%

4.3 PROPOSED REVISED GNA CRITERIA

In discussions with BHP Rehabilitation Team, it was agreed that the same set of ecological criteria should be applied to *both* GNA Hubs (Goldsworthy and Yarrie).

Subsequent conversations held regarding moonscaped areas is now captured by having these assessable against specific landform criteria (i.e. legacy landforms).

The key proposed changes arising from the analysis of GNA site performance against the initial draft critical criteria were:

1. Remove species richness – these sites were seeded with around 20 common Pilbara species to stabilise sites only, mostly comprised of Acacias and grasses, with little or no *Triodia* included in seed mixes.

2. Remove the requirement for a particular reference vegetation community (which have a particular composition of species) and accept all Pilbara native species.

3. Remove dominant indicator species, which are linked to the reference vegetation community.

4. Remove the requirement for a minimum herb density.

These are all considered reasonable changes and ones that will not be at odds with BHP's rehabilitation goal for the Pilbara ("*To leave safe, stable, non-polluting and sustainable systems that conform with the regional landforms and vegetation types, and support the agreed final land use"*), nor be at odds with the objectives of naturalness, resilience and habitat connectivity.

The following **ecological completion criteria** have now been agreed in the revised GNA completion criteria (APPENDIX 3):

- Total native vegetation cover >15%
- Hummock grasses to be present in 50m x 50m plots. This reflects the published literature which indicates that hummock grasses are fundamental to soil moisture and soil carbon dynamics in the Pilbara (summarised in Syrinx 2020), and also reflects the minimum radius between *Triodia* patches that form the regularity of patterns at local scale.
- Native grasses combined cover >5%. This acknowledges that native grasses may be preferable to support the intended pastoral end-use.

The other ecological criteria retained are:

- Weed invasiveness - this criterion is considered necessary to retain because it is a measure of residual impacts to surrounds and resilience. It is also captured as a minimum requirement within the regulatory process. *The GNA sites are already compliant with this criterion.*
- Feral animals – retained as is. *The GNA sites are already compliant with this criterion.*

Note, the existing GNA sites have not yet been assessed against the revised criteria using the existing model and traffic light reporting method. However, a qualitative assessment has been made which indicates that the criteria will be readily met within the Yarrie Hub, and will likely be met with an improved coverage of monitoring plots for Goldsworthy (mostly covers moonscaped areas at this stage).

APPENDICES

APPENDIX 1. Revised Completion Criteria – Operational and Future Mines : NON ECOLOGICAL CRITERIA

TABLE 1. COMPLETION CRITERIA OBJECTIVES AND RATIONALE

COMPLETION CRITERIA

POST MINING LAND USES:
(ALUM CLASSIFICATION V8)

CLASS 1 CONSERVATION AND NATURAL ENVIRONMENTS
1.2 Managed Resource Protection
CLASS 2 PRODUCTION FROM RELATIVELY NATURAL ENVIRONMENTS
2.1 Grazing Native Vegetation

NON- ECOLOGICAL CRITERIA - Measures to assess how well a site achieves the following :

1. SAFETY – rehabilitated landscapes must be (physically) safe to humans and animals.
2. STABILITY – rehabilitated landscapes must be geotechnically stable
3. NON-POLLUTING - rehabilitated landscapes must be geochemicall) non-polluting/ non-contaminating

ATTRIBUTE	APPLICABLE HUBS	OBJECTIVE	METRIC/S	CRITERIA	DOMAIN	RATIONALE	METHOD OF ASSESSMENT
Landforms		Reconstructed landforms to be geotechnically stable and safe.	Factor of Safety	As-constructed landforms achieve a Static FoS of ≥1.5.	All constructed slopes, pit walls, except where specific higher FoS criteria applied.	A FoS approach is commonly used to ensure the final landform is not at risk of mass failure. Acceptable FoS should reflect any DMIRS regulatory guidelines and specific minesite requirements, where applicable.	Geotechnical FoS assessment after construction (audit against design) and at completion.
				Landforms show no significant slumping or failure of accessible constructed slopes or berms, which cause unacceptable or unintended impacts to rehabilitation or stability.	All finished landforms, except pit walls	Captures wider possibility of non compliant landforms that may have negative impacts on safety and stability.	Final inspection at closure, and progressive records.
				No unacceptable hazards to humans or wildlife have developed thorough erosion, subsidence, or other events.			
Visual Amenity		Visual amenity of constructed landforms is compatible with that of local Pilbara landforms.	Final constructed landform	Landforms have been substantially constructed in accordance with the designs informed by consultation with stakeholders, to minimise visual impact.	Site	Aligns with closure requirements under DMIRS.	Rehabilitation inspections confirm final landform has substantially met visual impact design criteria.
Soils and Surface covers	**ALL HUBS**	Soils and surface covers to be stable, non-polluting and not subject to accelerated erosion.	Rate of erosion	Average erosion rate of <6 t/ha/yr Peak erosion rate at any point does not exceed the target average rate by more than 100%.	All constructed slopes	Critical for achieving resilience of rehabilitated systems, protection of resources, protection of adjacent sites, animals and people. Rate of erosion based on acceptable erosion rates for mine waste landforms in the Pilbara (Landloch 2018). Area affected by erosion as per inventory of soil and condition survey of the Pilbara (Van Vreeswyk et al 2004, Table 3, p 66).	Measured assessment of actual erosion rate (or equivalent method) at completion is same or less than design target
			Type and extent of erosion	Erosion to be slight (<10% of site affected)	All constructed slopes		Visual qualitative assessment of erosion extent or equivalent method.
				Slope surfaces do not show significant erosion which may be defined as having: ▪ Channelized flow resulting in extensive active gullies; ▪ Failure of banks, berms or bunds; and ▪ Evidence of ongoing significant sheet erosion (including large accumulation of silt at base of slope, exposed subsoil, poor seedling establishment).	All constructed slopes		Visual qualitative assessment of erosion extent or equivalent method.
			soil pH, presence/ absence of exposed potentially contaminating materials	Soil pH within regional range of natural soils No evidence of mineral scalds or exposed waste materials	All constructed slopes and covers		Soil validation data for sites where potentially contaminated or reactive materials used.
Water		Surface run-off, groundwater, drainage waters and any stored water to be non-polluting/contaminating.	Surface water quality data for each site	Turbidity, pH, EC (and other relevant to specific sites) of surface run-off and drainage water is not significantly different to upstream values and suitable for final land use	Surface run-off and drainage water discharging from or interacting with rehabilitated areas	Habitat and resilience and protection	Comparison against upstream data to demonstrate no environmental harm arising from the site at closure.
			Groundwater quality data for each site	Groundwater geochemically stable, non-contaminating or toxic, and if abstracted then suitable and safe for the reuse purpose	Groundwater migrating off-site or used for beneficial reuse.		

Appendix 1 (CONT.) Revised Completion Criteria – Operational and Future Mines : ECOLOGICAL CRITERIA

COMPLETION CRITERIA

POST MINING LAND USES: (ALUM CLASSIFICATION V8)

CLASS 1 CONSERVATION AND NATURAL ENVIRONMENTS

1.2 Managed Resource Protection

CLASS 2 PRODUCTION FROM RELATIVELY NATURAL ENVIRONMENTS

2.1 Grazing Native Vegetation

ECOLOGICAL CRITERIA - Measures to assess how well a site achieves the following :

1. NATURALNESS – rehabilitated landscapes must have sufficient characteristics of the regional landforms and vegetation to be visually harmonious.
2. RESILIENCE – rehabilitated landscapes must be able to recover from impacts typical of the region & final land use (i.e. fire, drought climatic changes, grazing) & continue to support the ecosystem services relevant to the final land use.
3. HABITAT CONNECTIVITY - rehabilitated landscapes must provide suitable habitat (breeding, feeding, shelter, or migration) for regional and local fauna and must not sever ecological connections.

ATTRIBUTE	APPLICABLE HUBS	OBJECTIVE	METRIC/S	CRITERIA	DOMAIN	RATIONALE	METHOD OF ASSESSMENT
Bare Ground	**OPERATIONAL, FUTURE, LEGACY**	Bare ground to have stony/rocky cover and be typical of the regional landforms and generally evenly dispersed between vegetation.	% Bare ground	% bare ground relevant to position in landscape (Ecological Target Reference Table, Table 2 & Table 3).	Standard and legacy rehabilitation landforms	Critical for achieving key attributes such as patterns, diversity, soil stability.	Survey by plot, remote sensing or equivalent method.
Target Vegetation Types		Vegetation types to respond to biogeographic region and finished landforms. The major Vegetation Type (Beard et al 2013) present at each hub pre-mining, to be represented in post-mined landscapes.	Presence of major **vegetation type/s**	Dominant vegetation in rehabilitated areas to comprise one or more of the following broad vegetation types (Grass Steppe, Shrub Steppe, Low Tree Steppe, Riparian Woodland),	Standard rehabilitation landforms	Provides variability of habitat types and is critical for achieving naturalness objective.	Survey by plot, remote sensing or equivalent method. For standard rehabilitation areas comparison against Beard et al 2013 Pilbara vegetation types. For legacy landforms, comparison against native species of the Pilbara biogeographic region.
				Dominant vegetation in legacy landforms, to be <u>non-specific</u> and comprise a blend of native Pilbara species that integrates with the surrounds.	Legacy landforms		
Indicator Species		Presence of dominant and common species from each Target Vegetation Type represented in post-mined landscapes.	Presence of **dominant** species from each Target Vegetation Type	At least one dominant species from each strata present for the target major vegetation type. Hummock grasses, other native grasses	<u>Operational/future mines</u> - standard rehabilitation landforms <u>Legacy mines-</u> standard rehabilitation landforms	Critical for achieving naturalness objective and ensuring required species and structure diversity.	Survey by plot, remote sensing or equivalent method and comparison with Beard et al 2013 Pilbara vegetation types, or for legacy landforms, comparison against native species of the Pilbara biogeographic region.
			Proportion of **common** species from each Target Vegetation Type	Composition of species to include minimum percentage of those most common to each Target Vegetation Type as per Ecological Target Reference Table (Table 2 & Table 3)	Standard rehabilitation landforms		Survey by plot, remote sensing or equivalent method. Species should be compared against the combined seed list for each hub (which are derived from the various communities that sit under the major Vegetation Types.
Native Plant Cover		Vegetation cover for each strata to reflect dominant target vegetation type present within the region, or if legacy landforms, then to have a minimum stable cover.	% cover	Percentage cover targets for each strata to be appropriate to the post-mining land use and relevant Vegetation Type, as per Ecological Target Reference Table (Table 2 & Table 3)	Standard rehabilitation landforms	Key attributes of naturalness, resilience and habitat connectivity.	Survey by plot, remote sensing or equivalent method. For standard rehabilitated landforms, compare the median of aggregated plots per site to the Q1-Q3 range for natural end use, >Q1 for pastoral. For legacy landforms, not less than the minimum agreed native species cover. Assessed for sites not less than 15 years post rehab.
				Minimum total native species cover is achieved as per Ecological Target Reference Table (Table 2 & Table 3)	Legacy landforms		
Species Richness	**OPERATIONAL, FUTURE**	For standard rehabilitation landforms, perennial native species richness to reflect the target vegetation type and final land use.	Number of perennial species	Median species richness in plots for relevant Vegetation Type (see Ecological Target Reference Table) (Table 2)	Standard rehabilitation landforms	Strong indicator of resilience in Pilbara; important for achieving diversity and vegetation cover.	Survey by plot and releve. For standard rehabilitated landforms, median of aggregated 50 x 50m plots per site compared to Q1-Q3 range for natural end use, >Q1 for pastoral. For legacy landforms, this criterion does not apply.
Reproductive Capacity (Resilience)	**OPERATIONAL, FUTURE, LEGACY**	Demonstrated capacity of the site to recover from fire, drought and other disturbances.	Demonstrated capacity of flora to reproduce as evidenced by seedling recruitment and vegetative production	Evidence of seedlings/juveniles within plots for more than one species	Standard rehabilitation landforms	Critical for achieving resilience objective.	Native seedling density (plants per m^2) and area of clonal growth within a 'visual radius' of 50 metres. Survey data to include type, age and extent of seedling recruitment and vegetative production.
				Evidence of different aged plants			
				Evidence of vegetative reproduction in more than one species.			
Weed Invasiveness		DBCA priority list weed species to be managed so as not to cause unacceptable risk to surrounding environments.		Not present or if present, cover ≤ the surrounding areas (regional baseline)	Standard and legacy rehabilitation landforms	Critical for achieving naturalness and resilience objectives.	Surveys and comparison with regional baseline data and DBCA priority weed list (https://www.dbca.wa.gov.au/sites/default/files/2021-08/pilbara_region_-_impact_and_invasiveness_ratings.xlsx).
				No new priority species introduced			
		Weed cover in standard rehabilitation areas to be within typical ranges for each site and landform, and reflect final end use.	% total weed cover	Within acceptable thresholds as per Ecological Target Reference Table	Standard rehabilitation landforms		Survey by plot and releve or equivalent method
			% buffel grass cover				
		Weed cover in legacy landforms not to undermine resilience of standard rehabilitation areas.	No increase in weed cover of standard rehabilitation areas over time from legacy landscapes	Weed cover stable and no evidence of point source contamination of surrounding areas.	Legacy landforms		Survey by plot and releve or equivalent method
Feral Animals		Feral animals and pests to be managed to protect native fauna and surrounding native habitats.	New declared feral pests	No new declared feral pests to be introduced as a consequence of BHPs operations	Standard and legacy rehabilitation landforms	Critical for achieving naturalness and resilience objectives.	Surveys and comparison with regional baseline data.

APPENDIX 2. Reference Targets for assessing Completion Success for each Post-Mining Land Use and Type of Rehabilitation (standard rehabilitation).

TARGET REFERENCE TABLE - OPERATIONAL AND FUTURE SITES

			REHABILITATION LANDFORMS	STANDARD				
			TARGET VEGETATION TYPES	Grass Steppe	Shrub Steppe	Low Tree Steppe	Low Woodland	Riparian Woodland
POST MINING LAND USES	*METRIC*		*ECOLOGICAL TARGETS*					
NATURAL ENVIRONMENTS	**Bare Ground**	*% bare ground*	Crests, slopes, flats	≤ 50				
			Drainage lines, floodplains	≤ 20				
	Indicator Species	*Proportion (%) of common species*	% species present in rehabilitation areas common to the Target Vegetation Type	**>70%** of species present in rehabilitation areas are common to the Target Vegetation Type.				
		Presence of dominant species	Dominant Grasses Dominant Shrubs Dominant Trees	*At least one dominant species from each strata from the major Target Vegetation Type.* *Dominant species as per*				
	Native Plant Cover	*% cover for each strata and each Vegetation Type to be within Q1-Q3 range*	Trees	0 - 1	1 - 10	1 -10	2 - 10	10 - 70
			Shrubs	0.2 - 7	3 - 7	2 - 10	2.6 - 6.8	2 -10
			Hummock Grasses	15 - 34	19 - 33	20 - 30	17 - 33	2 -10
			Other Grasses	0.01 - 0.4	0.02 - 0.16	0.04 - 0.62	0.2 - 1	2 -10
			Herbs	0.1 -0.2	0.1 - 1	0.05 - 0.4	0.06 - 0.27	2 -10
	Species Richness	*Perennial native species richness to be within Q1-Q3 range.*	No. of perennial species recorded in aggregated 50 x 50 m plots	8 - 16.5	15 - 19	16 - 29	28 - 30	14 - 30
	Reproductive Capacity (Resilience)	*Presence of seedlings*	All native lifeforms	Flowering and seed production observed in more than one lifeform				
		Varied age structure	All native lifeforms	Different aged plants observed for more than one native species and for all lifeforms				
	Weed Invasiveness	*% total weed cover*	Drainage lines, floodplains	<15				
			Crests, slopes, flats	<5				
		% buffel grass cover within acceptable thresholds	Drainage lines, floodplains	<10				
			Crests, slopes, flats	<5				
PASTORAL ENVIRONMENTS	**Bare Ground**	*% bare ground*	Crests, slopes, flats	≤50				
			Drainage lines, floodplains	≤20				
	Indicator Species	*Proportion (%) of common species*	% species present in rehabilitation areas common to the Target Vegetation Type	**> 50%** of species present in rehabilitation areas are common to the Target Vegetation Type.				
		Presence of dominant species	Dominant Grasses Dominant Shrubs Dominant Trees	*At least one dominant species from each strata from the major Target Vegetation Type.* *Dominant species as per*				
	Native Plant Cover	*% cover for each strata and each Vegetation Type to be > Q1.*	Trees	>0	>1	>1	>2	>10
			Shrubs	>0.2	>3	>2	>2.6	>2
			Hummock Grasses	>15	>19	>20	>17	>2
			Other Grasses	>0.01	>0.02	>0.04	>0.2	>2
			Herbs	>0.1	>0.1	>0.05	>0.06	>2
	Species Richness	*Perennial native species richness to be > Q1.*	No. of perennial species recorded in aggregated 50 x 50 m plots.	>8	>15	>16	>28	>14
	Reproductive Capacity (Resilience)	*Presence of seedlings/juveniles*	All native lifeforms	Flowering and seed production observed in more than one lifeform				
		Varied age structure	All native lifeforms	Different aged plants observed for more than one native species and for all lifeforms				
	Weed Invasiveness	*% total weed cover*	Drainage lines, floodplains	<20				
			Crests, slopes, flats	<10				
		% buffel grass cover within acceptable thresholds	Drainage lines, floodplains	<10				
			Crests, slopes, flats	<10				

APPENDIX 3. Reference Targets for assessing Completion Success for Legacy GNA Hubs and standard and legacy landforms (Goldsworthy and Yarrie).

TARGET REFERENCE TABLE - LEGACY MINES

REHABILITATION LANDFORMS	STANDARD	LEGACY LANDFORMS
TARGET VEGETATION TYPES	Grass Steppe or Shrub Steppe	Non-Specific

POST MINING LAND USES	*METRIC*		*ECOLOGICAL TARGETS*		
PASTORAL ENVIRONMENTS	**Bare Ground**	*% bare ground*	Crests, slopes, flats	≤ 50	na
			Drainage lines, floodplains	≤ 20	na
			Moonscapes	na	≤ 20
	Indicator Species	*Proportion (%) of common species*	% species present in rehabilitation areas common to the Target Vegetation Type	All native species present in rehabilitation areas are common to the Pilbara	All native species present in rehabilitation areas are common to the Pilbara
		Presence of dominant species		Hummock grasses, other native grasses	na
	Native Plant Cover	*Presence of hummock grasses*		Hummock grasses to be present in each 50 x 50 m plot	na
		% cover for each strata	Total native species	>15	> 15
			Trees	> 0	na
			Shrubs	> 0.2	na
			All Grasses	> 5	na
	Reproductive Capacity (Resilience)	*Presence of seedlings*	All native lifeforms	Flowering and seed production observed in more than one lifeform	Flowering and seed production observed in more than one lifeform
		Varied age structure		Different aged plants observed for more than one native species and for all lifeforms	Different aged plants observed for more than one native species and for all lifeforms
	Weed Invasiveness	*% total weed cover*	Crests, slopes, flats	< 20	na
			Drainage lines, floodplains	< 10	na
			Moonscapes	na	< 10
		% buffel grass cover within acceptable thresholds	Crests, slopes, flats	< 10	na
			Drainage lines, floodplains	< 10	na
			Moonscapes	na	< 10

na= not applicable

REFERENCES

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Appendix D. Indicator species and plant cover criteria

The indicator species and plant cover targets for the Natural Environments for Managed Resource Protection and pastoral grazing purposes are described in the tables below.

Indicator species and cover targets for pastoral grazing land uses

Target Vegetation Types			Grass Steppe	Shrub Steppe	Low Tree Steppe	Low Woodland	Riparian Woodland
Indicator Species	Presence of dominant and common species from each Target Vegetation Type *Note, if more than one type is applicable, choose the most representative for each rehabilitated area*	All dominant species present >50% of common species present	Dominant Trees -	Dominant Trees -	Dominant Trees *Eucalyptus leucophloia,* *E. gamophylla*	Dominant Trees *Acacia aneura group*	Dominant Trees *Eucalyptus camaldulensis, E. victrix*
				Dominant Shrubs *Acacia bivenosa, A. aneura group, A. pyrifolia, Grevillea pyramidalis*	Dominant Shrubs *Senna artemisioides subsp. sturtii, S. pleurocarpa var. pleurocarp, Grevillea wick hamii, Hakea lorea*	Dominant Shrubs *Eremophila spp. Senna spp.*	Dominant Shrubs -
			Dominant Grasses: *Triodia wiseana, T. basedowii*	Dominant Grasses: *Triodia wiseana, T. basedowii, T. pungens.*	Dominant Grasses: *Triodia wiseana*	Dominant Grasses: *Triodia spp, Tussock grasses*	Dominant *Grasses/Sedges: Tussock grasses, sedges*
Plant Cover	% cover for each stratum and each Vegetation Type to be > Q1 for relevant reference sites	Trees	<2	<2 - 10	2 -10	2 -10	>10
		Shrubs	>5	>3	>3	>2	>2
		Hummock Grasses	>14	>19	>19	>25	>2
		Other Grasses	>0.01	>0.04	>0.1	>0.1	
		Herbs	>0.1	>0.1	>0.1	>0.1	

Indicator species and cover targets for managed resource protection land use

Target Vegetation Types			Grass Steppe	Shrub Steppe	Low Tree Steppe	Low Woodland	Riparian Woodland
Indicator Species	Presence of dominant and common species from each Target Vegetation Type *Note, if more than one type is applicable, choose the most representative for each rehabilitated area*	All dominant species present >70% of common species present	Dominant Trees -	Dominant Trees -	Dominant Trees *Eucalyptus leucophloia,* *E. gamophylla*	Dominant Trees *Acacia aneura group*	Dominant Trees *Eucalyptus camaldulensis, E. victrix*
				Dominant Shrubs *Acacia bivenosa, A. aneura group, A. pyrifolia, Grevillea pyramidalis*	Dominant Shrubs *Senna artemisioides S. pleurocarpa var. pleurocarp, Grevillea wick hamii, Hakea lorea*	Dominant Shrubs *Eremophila spp. Senna spp.*	Dominant Shrubs -
			Dominant Grasses: *Triodia wiseana, T. basedowii*	Dominant Grasses: *Triodia wiseana, T. basedowii, T. pungens.*	Dominant Grasses: *Triodia wiseana*	Dominant Grasses: *Triodia spp, Tussock grasses*	Dominant Grasses/Sedges: Tussock grasses, sedges
Plant Cover	% cover for each stratum and each Vegetation Type to be	Trees	0 - 1	1 - 10	1 -10	2 - 10	10 - 70
		Shrubs	0.2 - 7	3 - 7	2 - 10	2.6 - 6.8	2 -10
		Hummock Grasses	15 - 34	19 - 33	20 - 30	17 - 33	>2
		Other Grasses	0.01 - 0.4	0.02 - 0.16	0.04 - 0.62	0.2 - 1	
		Herbs	0.1 -0.2	0.1 - 1	0.05 - 0.4	0.06 - 0.27	

Appendix E. Water quality

E-1. Yandicoogina Creek surface water quality

Dry Season Sampling 2019

		ANZECC default GV		Yandicoogina Creek				Reference Sites			
	Units	99% GV	95%	YC1	YC2	YC3	YC4	WWS	BENS	MUNJS	SS
Temp	°C			23.6	24.5	26.4	23.3	27.5	20.6	25.6	26.41
pH	pH units		6-8	7.22	6.8	7.23	7.45	7.25	7.84	8.08	7.74
Redox	mV			-46.8	-43.7	-43	-41.1	-56.2	-62	-29.7	-90.5
EC	µS/cm		250	598	571	664	621	1030	890	922	729
DO	%		85-120	53.8	27.0	55.6	70.3	83.6	52.0	108.8	58.1
Turbidity	NTU		15	3.6	3.8	0.3	2.4	0.5	<0.1	2.0	2.2
TSS	mg/L			8	23	36	11	1	<1	5	5
Alkalinity	mg/L			266	251	295	267	256	395	426	328
Hardness	mg/L			228	202	238	209	284	382	443	259
Na	mg/L			35.2	31.6	42.9	39.5	84.8	42.5	28.2	53.6
Ca	mg/L			47.1	42.3	48	41.9	37.5	67.3	68.4	47.7
Mg	mg/L			26.8	23.4	28.8	25.4	46.3	52.1	66.2	33.9
K	mg/L			9.8	9.5	11	10	12.2	9.6	7.6	4.9
HCO3	mg/L			266	251	295	267	246	395	426	328
Cl	mg/L			38	38	44	45	201	71	54	51
S_SO4	mg/L			9.17	8.37	8.83	9.13	4.27	17.9	11.1	6.63
CO3	mg/L			<1	<1	<1	<1	11	<1	<1	<1
dAl	mg/L	0.027	0.055	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
dAs	mg/L	0.001	0.024	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0004	0.0006	0.0002
dB	mg/L	0.09	0.37	0.144	0.126	0.172	0.157	0.252	0.376	0.157	0.144
dBa	mg/L			0.0166	0.0165	0.028	0.0185	0.0618	0.0103	0.0698	0.472
dCd	mg/L	0.00006	0.0002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
dCo	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0004
dCr	mg/L	0.00001	0.001	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
dCu	mg/L	0.001	0.0014	<0.00005	0.00009	<0.00005	<0.00005	0.00011	0.00008	0.00048	0.00013
dFe	mg/L			0.054	0.02	0.032	0.038	0.025	<0.002	0.004	0.046
dMn	mg/L	1.2	1.9	0.0406	0.0022	0.0039	0.0014	0.0019	<0.0005	0.0741	0.553
dMo	mg/L			0.0002	0.0002	0.0002	0.0002	<0.0001	0.0003	0.0005	0.0005
dNi	mg/L	0.008	0.011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005
dPb	mg/L	0.001	0.0034	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
dS	mg/L			9.9	8.8	9.5	8.9	4.9	18.1	11.6	7.2
dSe	mg/L	0.005	0.011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
dU	mg/L			0.00011	0.0001	0.00019	0.00017	<0.00005	0.00065	0.00046	0.00048
dV	mg/L			<0.0001	0.0007	0.0011	0.0014	0.0002	0.0029	0.0012	0.0007
dZn	mg/L	0.0024	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N_NH_3	mg/L	0.32	0.90	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
N_NO_3	mg/L	1.00	2.40	0.02	0.04	<0.01	0.01	<0.01	<0.01	0.02	0.01
N_NOx	mg/L		0.01	0.02	0.04	<0.01	0.01	<0.01	<0.01	0.02	0.01
TN	mg/L		0.30	0.17	2.20	0.06	0.27	0.25	0.02	0.71	0.12
TP	mg/L		0.01	0.04	0.09	0.03	0.06	0.04	0.03	0.09	0.04

Source: Biologic (2020b)

Notes:

WWS - Weeli Wolli Spring; BENS - Ben's Oasis; MUNJS - Munjina Spring; SS - Skull Spring

Highlighted cells refer to values which are in excess of: ■ > ANZECC Guideline Value for 99% Protection of Ecosystems; ■ > ANZECC Guideline Value for 95% Protection of Ecosystems ■ >low reliability ANZECC Guideline Value.

Wet Season Sampling 2020

		ANZECC default GV		Yandicoogina Creek				Reference Sites			
	Units	99% GV	95%	YC1	YC2	YC3	YC4	WWS	WM	MUNJS	SS
Temp	°C			25.8	25.7	27.8	24.5	29.1	25.3	23.3	27.2
pH	pH units		6-8	7.36	7.39	7.45	7.68	7.94	8.22	7.96	8.09
Redox	mV			45.8	-63.7	105.9	53.7	138	92	92.6	37.9
EC	µS/cm		250	620	554	639	641	883	525	833	581
DO	%		85-120	38.2	25.5	39.5	23.3	53.2	92.4	73.1	76.5
Turbidity	NTU		15	7.6	10.9	2.0	1.5	0.4	3.2	1.1	0.4
TSS	mg/L			3	4	5	4	2	5	<1	<1
Alkalinity	mg/L			241	218	261	254	324	81	162	294
Hardness	mg/L			263	240	274	262	413	193	294	248
Na	mg/L			36.2	32.7	39.6	43.4	42.3	36.9	63.5	37.5
Ca	mg/L			54.4	49.7	55.3	52.7	72.8	41.6	44.2	49.1
Mg	mg/L			30.9	28.2	32.9	31.7	56.2	21.6	44.6	30.5
K	mg/L			11	10.8	12.2	12	10	6	13	5.5
HCO3	mg/L			241	218	261	254	324	81	162	292
Cl	mg/L			39	37	40	45	71	58	150	43
S_SO_4	mg/L			11.1	8.3	10.3	9.67	19.8	31.5	22.8	6.47
CO_3	mg/L			<1	<1	<1	<1	<1	<1	<1	2
dAl	mg/L	0.027	0.055	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
dAs	mg/L	0.001	0.024	0.0003	0.0002	<0.0002	<0.0002	0.0005	0.0004	0.0004	0.0002
dB	mg/L	0.09	0.37	0.18	0.15	0.18	0.17	0.34	0.06	0.25	0.13
dBa	mg/L			0.020	0.020	0.029	0.022	0.012	0.031	0.062	0.243
dCd	mg/L	0.00006	0.0002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
dCo	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
dCr	mg/L	0.00001	0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
dCu	mg/L	0.001	0.0014	<0.00005	0.00005	0.00008	<0.00005	0.00009	0.00164	0.00009	0.00010
dFe	mg/L			0.030	0.468	0.014	0.038	<0.002	0.009	0.080	0.021
dMn	mg/L	1.2	1.9	0.0393	0.0344	0.0083	0.0049	<0.0005	0.0016	0.0041	0.111
dMo	mg/L			0.0002	0.0002	0.0004	0.0001	0.0003	0.0001	0.0001	0.0003
dNi	mg/L	0.008	0.011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
dPb	mg/L	0.001	0.0034	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
dS	mg/L			9.6	7.3	9.9	7.6	17.0	28.9	20.6	5.6
dSe	mg/L	0.005	0.011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
dU	mg/L			0.00011	0.00006	0.00017	0.00015	0.00069	0.00006	<0.00005	0.00044
dV	mg/L			<0.0001	0.0002	0.0007	0.0006	0.0032	0.0019	0.0002	0.0016
dZn	mg/L	0.0024	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N_NH_3	mg/L	0.26	0.73	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N_NO_3	mg/L	1.00	2.40	0.01	<0.01	0.01	0.01	0.04	<0.01	0.02	0.08
N_NOx	mg/L		0.01	0.01	<0.01	0.01	0.01	0.04	<0.01	0.02	0.08
TN	mg/L		0.30	0.21	0.11	0.40	0.12	0.06	0.34	0.22	0.12
TP	mg/L		0.01	0.04	0.05	0.06	0.03	0.03	0.03	0.04	0.02

Source: Biologic (2020b)

Notes:

WWS - Weeli Wolli Spring; BENS - Ben's Oasis; MUNJS - Munjina Spring; SS - Skull Spring

Highlighted cells refer to values which are in excess of: > ANZECC Guideline Value for 99% Protection of Ecosystems; > ANZECC Guideline Value for 95% Protection of Ecosystems >low reliability ANZECC Guideline Value.

E-2. Marillana Creek surface water quality

Ambient water sampling at Flat Rocks and Yandi

Parameter	Flat Rocks Gauging Station[1]	YNSWPC001 (Upstream)[2]
	Range	Maximum
pH	6.10 - 8.70	7.9 - 8.4
EC (uncompensated) (µS/cm)	136 - 1805	240 - 1600
Total Dissolved Solids (calc @180°C-by cond.) (mg/L)	100 - 722	58 - 920
Al (mg/L)	0.18 - 0.66	<0.005 - 0.1
$CaCO_3$ (mg/L)	54 - 420.34	Not measured
Ca (mg/L)	20 - 54	6.4 - 56
Cl (mg/L)	4.85 - 237	10 - 290
K (mg/L)	8 - 15	1.6 - 29
Mg (mg/L)	44 - 76	3 - 73
Na (mg/L)	75 - 136	4.8 - 160
SO_4 (mg/L)	44 - 84	4 - 100

Source:

1. DoW (2010) Water Information (WIN) database - discrete sample data. [8/12/2010]. Department of Water, Water Information Provision section, Perth Western Australia. Hydstra database - time-series data. [8/12/2010].
2. Yandi surface water monitoring site results from March 2012 to February 2020 WAIO (2020b)

E-3. Groundwater quality

Parameter	Units	MN2P	MN3P
pH (pH units)	pH units	7.3 – 8.14	7.44 – 7.98
Total Dissolved Solids (grav @ 180C)	mg/l	310 - 442	317 - 464
Total Suspended Solids	mg/l	<5	NM
Aluminium	mg/l	<0.005	NM
Antimony	mg/l	<0.001	NM
Arsenic	mg/l	<0.001	NM
Barium	mg/l	0.01	NM
Bicarbonate Alkalinity as CaCO3	mg/l	213 -290	202 -234
Boron	mg/l	0.1 – 0.15	NM
Cadmium	mg/l	<0.001	NM
Calcium	mg/l	47 - 250	38 -52
Carbonate Alkalinity as CaCO3	mg/l	<1	<1
Chloride	mg/l	37 - 54	39 -59
Copper	mg/l	<0.001	<0.001
EC - Lab Result	µS/cm	506 - 672	532 -638
Fluoride	mg/l	0.2 – 0.3	NM
Hardness (equivalent CaCO3)	mg/l	230	NM
Hydroxide Alkalinity as CaCO3	mg/l	<1	<1
Iron	mg/l	<0.01 – 0.46	<0.05 -0.43
Lead	mg/l	<.001	<0.001
Magnesium	mg/l	24 - 110	23 -28
Manganese	mg/l	<0.01 – 0.91	<0.001 -0.446
Mercury	mg/l	<0.0005	NM
Molybdenum	mg/l	<0.001	NM
Nickel	mg/l	<0.001	NM
Nitrate as N	mg/l	<0.005	0.36
Nitrite-Nitrogen	mg/l	<0.005	NM
Potassium	mg/l	9.3 - 52	7.9 - 47
Selenium	mg/l	<0.001	NM
Silica	mg/l	9.1 -18	NM
Sodium	mg/l	30 -180	32 - 42
Sulphate	mg/l	25 - 57	30 - 38
Sulphate as SO4 2	mg/l	26 - 28	31 - 33
Total Alkalinity as CaCO3	mg/l	213 - 252	202 - 234
Zinc	mg/l	0.006 -0.13	<0.005 – 0.066

Source: BHP (2019)

Appendix F. BHP Pilbara operations closure and rehabilitation research and trials

Summary of rehabilitation research

Subject	Research Summary
Seed Management	Pilbara Seed Atlas: a five-year research project involved with the development of practical recommendations for the collection, processing, storage, germination, and efficient use of seeds in mine-site restoration in collaboration with researchers from the Botanic Gardens and Parks Authority. Restoration Seed Bank: initiative is a five-year partnership between BHP Billiton Iron Ore, the University of Western Australia, and the Botanic Gardens and Parks Authority to improve the existing 'restoration supply chain' from seed collection, cleaning, drying, storage, treatment, distribution, germination, establishment and monitoring, verification and reporting.
Seed Treatments	Trials commenced at Whaleback to: • Evaluate pelleted seed using local topsoil as a filler rather than inert clay. • Assess flame treated *triodia* seed compared to non-flamed seed. • Monitor the effect of various ripping depths and scarification to improve surface erosion control. • Observe the position of seed placement using optimised seeding equipment. • Assess the influence of soil amendments on germination • Observe the influence of first summer rain on germination.
Growth Media	Yarrie/Nimingarra: Topsoil deficit has been identified as an issue for future rehabilitation works. As a result, BHP is conducting a trial to use shallow lateritic material as future growth media on rehabilitated landforms. Yarrie/Nimingarra: Growth media trails utilising in-situ waste materials are being incorporated into progressive rehabilitation works Growth Media Atlas: to enable successful establishment of vegetation in rehabilitated areas by assessing existing topsoil stockpiles for the chemical, physical and plant growth properties; and identify suitable alternative growth media materials that could be made available for rehabilitation.
Fire Ecology	Jimblebar, Wheelarra Hill, OB18, Marillana Creek (Yandi): BHP is investigating fire ecology (i.e. response of ecosystems following fire) by monitoring areas which have been burnt. Findings from this investigation will be used to determine the possibility of using fire as a rehabilitation tool and to better manage fire affected areas.
Surface Treatments	Yarrie/Nimingarra: Trial to assess the stability and revegetation success using alternative surface treatments to 'moonscaping', such as contour ripping, and the creation of contour banks. Yarrie/Nimingarra: Surface treatment trials are being undertaken to assess stability and revegetation success using no rip and minimal rip treatments. The trials are incorporated into progressive rehabilitation works.
Erosion Guidelines	Collaboration with Pilbara Rehabilitation Group Members, Western Australian Biodiversity Institute and Pilbara Mining Industry Funding Partners to develop Acceptable Rates of Erosion Guidelines.

Subject	Research Summary
Erosion Trials	Six erosion trial plots at OB18 were installed FY2019, to collect erosion and runoff data from six different surface configurations. Findings from this investigation will be used to determine suitability of each configuration for future rehabilitation applications across OB18. The six different surface treatments comprise: • 500mm rock armour, no growth media; • 250mm of rock armour, no growth media; • 150mm of rock armour, no growth media; • 250mm rock armour, 150mm of growth media; • 500mm rock armour, 150mm growth media; and • 1000mm, rock armour, 150mm growth media. Nine ongoing long-term rock armour trials established in 2012 at Mining Area C to assess the effects of varying surface and armour treatments on surface erosion. The treatments assessed comprised: • Detrital material no rip, ripped, scarified; • 1:1 detrital/rock mix no rip, ripped, scarified; and • 1:2 detrital/rock mix no rip, ripped, scarified; Findings: • Detrital material on its own had the highest mean annual erosion rates outside of acceptable design criteria. • Erosion rates for the other rock mixes recorded rates that were within acceptable design criteria ranges. • There was no functional difference between the 1:1 and 1:2 detrital/rock mixes. The no rip treatment produced slightly more sediment movement in these material types, but well within acceptable design criteria ranges. Erosion plots established at Mt Whaleback in 2015 continued to be monitored and maintained. The plots at Mt Whaleback represent both analogue and rehabilitated slope conditions. The plots here represent the oldest erosion plots installed on concave surfaces anywhere within BHP's Pilbara project areas.
Remote sensing	Since 2016, BHP have used remote sensing data capture and cross referenced this information with key plant species data. This investigation provides the opportunity to quantitatively assess rehabilitation development across large areas. The project aims to improve vegetation discrimination, (including weed identification), investigate additional data types for vegetation detection; and to develop an integrated remote sensing methodology for rehabilitation monitoring.
Ecosystem re-establishment	With the use of ants as a biological indicator (bioindicators) of ecological succession in rehabilitation areas, BHP is investigating options to establish a simple invertebrate monitoring procedure that can be used to help assess ecosystem re-establishment. In May 2018, BHP undertook the first phase of survey work to begin establishing a baseline trajectory for ant succession in rehabilitated areas at Goldsworthy Northern Areas. The program sampled 20 sites consisting of 14 rehabilitation areas and six analogue areas. BHP has now completed its third round of monitoring throughout the GNA provenance. Initial results show a favourable correlation between species richness and the age of rehabilitated areas.
Completion criteria	Detailed analysis of rehabilitation monitoring program data has occurred and has been used in the development of draft rehabilitation completion criteria metrics for two post-mining land uses, Pastoral Grazing and Native Habitat. The ongoing review of rehabilitation monitoring data will continue to inform completion criteria development. It is proposed to use the same approach for the assessment of the success of historical rehabilitation. BHP will update predictions of future rehabilitation success as it undertakes progressive rehabilitation and updates its assessment of the success of historical rehabilitation as a hub approaches closure. BHP may also refine criteria/targets over time as new information becomes available.
Vegetative cover	Previous works conducted at Mt Whaleback have identified that vegetation can substantially reduce net percolation, and thus potential acid mobilisation, through plant transpiration. Therefore, the aim of future work will be undertaken to investigate and quantify the role of evapotranspiration on store-and-release cover systems designed to minimise net percolation.

Summary of findings – waste rock management at BHP's Pilbara operations

Subject	Research Summary
Neutralising Mineral Reactions for Control of Acid Completed 2004	Investigation of ARD control including mineral reaction control and hydrogeologic control through cover design, assessment and prediction of short and long-term mineral reactivity in waste deposits, measurement of the reactivity of minerals with long-term neutralising capacity. Included a case study of Mt Whaleback. Research partners: AMIRA International, University of South Australia, Env. Geochemistry International, Levay & Co. Env. Services Findings: Identified ARD passivation mechanisms and methods for assessing the reactivity of minerals.
Evaluation of ARD Passivation Treatments Completed 2013	Confirmation and definition of ARD passivation mechanisms leading to a methodology for implementation at mining sites using readily available materials. Included a case study of Mt Whaleback. Research partners: AMIRA International, University of South Australia, Env. Geochemistry International, Levay & Co. Env. Services Findings: Improved understanding of pyrite oxidation control and test methods. Identified alternative treatment options for long term ARD control. Extension of the project is planned for long-term acid rock and tailings drainage mitigation through source control.
Acid generating characterisation of stored waste rocks and current impact upon the surface environment, Mt Goldsworthy Iron Ore Mine Completed 2009	Masters research project investigated OSA waste rock material and AMD release at Mt Goldsworthy. Research Partner: Environmental Inorganic Geochemistry Group (EIGG) at Curtin University Findings: Identified the occurrence and characteristics of acid generating waste rock on the surface of OSAs and their effects on vegetation. The work is being extended in a PhD research project.
Environmental impact of the storage of lignite waste rocks from the Jimblebar iron ore mine, Newman, Western Australia 2013	Study of Tertiary lignites (young, immature, low grade coal deposits) that may pose risks of combustion and AMD formation if they contain pyrite or other metal sulphide minerals. Research partner: EIGG at Curtin University Findings: Identified the geochemical and mineralogical nature of the rock types, their sulphide contents, and capacity to release acidic, metal laden drainage. Informs proper management and storage of the waste rock material
Investigation into the Rapid Oxidation Potential for Pyrite Containing Mt McRae Shales from Mt Whaleback Completed 2013	Investigation and recommendation of options for treatment of PAF wastes to remove long term liabilities. Research Partners: Umwelt Australia, University of Western Australia, ChemCentre Findings: A desktop study has been completed that reviewed chemical, biological and physical treatment options. Identified possible laboratory and pilot scale trials that could be conducted.
Pit Lake Disposal of Pyritic Shale Completed 2013	Conducted a desktop study of potential subaqueous disposal of shale. Included review of several case studies and examples that have been described in the literature where pit lakes have been used for the pit lake storage of sulphidic waste material, including waste rock and mine tailings. Considered implications for pit lake waste rock disposal at Mt Whaleback. Research Partners: Umwelt Australia, ChemCentre Findings: A key finding from the literature review is that pit lakes are considered to be an effective location for the long-term storage of acid generating materials. This information will inform long-term management of Mt Whaleback pyritic waste and other potentially problematic mine waste deposits.

Summary of active waste rock research

Subject	Research Summary
Acid Rock Drainage Cover Research Program at Mt. Whaleback and Yarrie mine sites	Cover system field trials have been monitored at the Mt Whaleback site and Yarrie site since 1997. The trials evaluate performance of cover systems of varying thickness that primarily utilise the moisture store-and-release concept. Research partners: O'Kane Consultants.

Subject	Research Summary
Mechanisms of acid release from waste rock piles containing pyritic carbonaceous shale, Mt Goldsworthy Mine	PhD research project. Detailed study with the overall goal of elucidating not only the full extent of acid-generating potential but also comprehending the kinetics of the geochemical alteration and AMD production. Comparisons will be drawn with other iron ore mine sites across the Pilbara region where shale is encountered to assess implications for waste rock management and closure. Research partner: (EIGG) at Curtin University
Analysis for selenium content of iron mining waste rock in the Pilbara	Investigation of the difficulties in producing accurate and reliable analysis for Se in geological materials and application of the optimised procedures to environmental samples encountered in BHP's Pilbara operations. Research partner: EIGG at Curtin University
Investigation into PAF Waste and Shale Reactivity Iron Ore Mines in the Pilbara	Isothermal reactor and ARD testing of reactive pyritic shale samples to investigate spontaneous combustion reactivity and ARD potential. Evaluation of the associated management strategies. Research Partner: University of Western Australia

Appendix G. Plant lists

G-1. Rehabilitation Seed List

Domain	OSA			Infrastructure	Road/rail/corridors
Landform	Lower Slope /Plains	Mid Slope	Crest/Mesa	Lower Slope /Plains	Lower Slope /Plains
Community	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland
Species					
Acacia adoxa var. adoxa	P	P	P	P	P
Acacia ampliceps					
Acacia ancistrocarpa	P	P	P	P	P
Acacia aneura	P	P		P	P
Acacia arida	P	P		P	P
Acacia atkinsiana	P	P		P	P
Acacia bivenosa	P	P	P	P	P
Acacia citrinoviridis					
Acacia coriacea subsp. pendens					
Acacia dictyophleba	P	P		P	P
Acacia hilliana	P	P	P	P	P
Acacia inaequilatera	P	P		P	P
Acacia kempeana					
Acacia maitlandii	P	P	P	P	P
Acacia monticola					
Acacia orthocarpa					
Acacia pachyacra					
Acacia pruinocarpa	P	P	P	P	P
Acacia pyrifolia					
Acacia sericophylla					
Acacia spondylophylla		P	P		
Acacia synchronicia					
Acacia tenuissima			P		
Acacia tumida var. pilbarensis					
Alternanthera nana					
Aristida contorta	P	P		P	P
Aristida holathera var. holathera	P	P		P	P
Atalaya hemiglauca					
Boerhavia coccinea	P	P		P	P
Chrysopogon fallax					
Cleome viscosa	P	P		P	P
Corchorus crozophorifolius					
Corchorus lasiocarpus subsp. lasiocarpus	P	P	P	P	P
Corchorus sidoides					
Corymbia aspera					
Corymbia deserticola subsp. deserticola		P	P		
Corymbia hamersleyana	P	P		P	P
Crotalaria novae-hollandiae subsp. novae-hollandiae					
Cymbopogon ambiguus					
Cymbopogon obtectus	P	P		P	P
Cymbopogon procerus					
Cyperus iria					
Cyperus squarrosus					
Cyperus vaginatus					
Duperreya commixta					
Dysphania rhadinostachya subsp. rhadinostachya					
Enchylaena tomentosa var. tomentosa		P	P		
Enneapogon caerulescens	P	P	P	P	P
Enneapogon polyphyllus	P	P		P	P
Eragrostis dielsii					
Eragrostis tenellula					
Eremophila fraseri subsp. fraseri					
Eremophila longifolia					
Eriachne aristidea	P	P		P	P
Eriachne helmsii					
Eriachne lanata	P	P		P	P
Eriachne mucronata	P	P		P	P
Eriachne pulchella	P	P	P	P	P
Eriachne tenuiculmis					
Eucalyptus camaldulensis var. obtusa					
Eucalyptus gamophylla	P	P	P	P	P
Eucalyptus leucophloia subsp. leucophloia	P	P	P	P	P
Eucalyptus victrix					
Eucalyptus xerothermica					
Eulalia aurea					

Approx %Cover	
<1	P
1-20	P
21-40	P
41- 60	P
61-80	P
>80	P

Significant to Banjima People

Domain	OSA			Infrastructure	Road/rail/corridors
Landform	Lower Slope /Plains	Mid Slope	Crest/Mesa	Lower Slope /Plains	Lower Slope /Plains
Community	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland	Triodia Hummock Grassland
Species					
Euphorbia australis	P	P		P	P
Evolvulus alsinoides var. decumbens	P	P		P	P
Evolvulus alsinoides var. villosicalyx	P	P		P	P
Ficus brachypoda					
Fimbristylis dichotoma	P	P		P	P
Gompholobium sp. Pilbara (N.F. Norris 908)	P	P		P	P
Gomphrena cunninghamii		P	P		
Goodenia stobbsiana	P	P	P	P	P
Gossypium australe					
Gossypium robinsonii		P	P		
Grevillea wickhamii	P	P	P	P	P
Hakea chordophylla	P	P	P	P	P
Hakea lorea subsp. lorea					
Heliotropium tenuifolium	P	P		P	P
Hibiscus sturtii					
Indigofera monophylla	P	P	P	P	P
Indigofera rugosa	P	P		P	P
Melaleuca argentea					
Melaleuca glomerata					
Melhania oblongifolia					
Oldenlandia crouchiana	P	P	P	P	P
Olearia fluvialis					
Panicum effusum		P	P		
Paraneurachne muelleri		P	P		
Petalostylis labicheoides			P		
Phyllanthus maderaspatensis					
Polycarpaea corymbosa					
Polycarpaea holtzei	P	P	P	P	P
Polycarpaea longiflora					
Polymeria ambigua					
Ptilotus aervoides					
Ptilotus astrolasius var. astrolasius	P	P	P	P	P
Ptilotus auriculifolius		P	P		
Ptilotus calostachyus	P	P	P	P	P
Ptilotus exaltatus var. exaltatus	P	P	P	P	P
Ptilotus helipteroides					
Ptilotus obovatus var. obovatus		P	P		
Rhynchosia minima					
Rulingia luteiflora					
Senna artemisioides subsp. oligophylla	P	P	P	P	P
Senna ferraria	P	P		P	P
Senna glutinosa subsp. glutinosa	P	P	P	P	P
Senna glutinosa subsp. pruinosa	P	P		P	P
Senna notabilis	P	P		P	P
Sida echinocarpa	P	P	P	P	P
Sida fibulifera	P	P		P	P
Solanum lasiophyllum	P	P	P	P	P
Stemodia grossa					
Tephrosia rosea var. glabrior Pedley ms					
Themeda sp. Mt Barricade (M.E. Trudgen 2471)					
Themeda triandra	P	P	P	P	P
Trianthema glossostigma	P	P		P	P
Tribulus hirsutus	P	P		P	P
Trichodesma zeylanicum var. zeylanicum					
Triodia brizoides	P	P	P	P	P
Triodia longiceps					
Triodia pungens	P	P	P	P	P
Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)	P	P		P	P
Triodia wiseana	P	P	P	P	P
Typha domingensis					

Approx %Cover	
<1	P
1-20	P
21-40	P
41- 60	P
61-80	P
>80	P

Significant to Banjima People

G-2. Banjima Cultural Plant Inventory

Banjima name	Common name	Latin name	Source
Bajirla	Coastal Caper	*Capparis spinosa subsp. Nummularia*	BHP's ethnobotanical database
Barlgarringu	Bloodwood	*Corymbia hamersleyana*	BHP's ethnobotanical database
Birrungu	-	-	Banjima Yurlubajagu Strategic Plan
Blackart, Gurrabi-unn or Malygan	Snappy Gum	*Eucalyptus leucophloia*	BHP's ethnobotanical database
Burdardu	Northern Sandalwood	*Santalum lanceolatum*	BHP's ethnobotanical database
Burdardu	Sandalwood	*Santalum spicatum*	BHP's ethnobotanical database
Bunga	Type of berry	-	Banjima Yurlubajagu Strategic Plan
Cuggla-leara	Silky Pear	*Marsdenia australis*	BHP's ethnobotanical database
Dam-bar-lee Murruru	Two Nerved Wattle	*Acacia bivenosa*	BHP's ethnobotanical database
Djidda; Djitha; Marla	Native Carrot	*Rhynchosia minima*	BHP's ethnobotanical database
Gawiwarnda	Fish Poison	*Tribulus suberosus*	BHP's ethnobotanical database
Gajawari	Wild orange	-	Banjima Yurlubajagu Strategic Plan
Ganyji	White gum	*Acacia pyrifolia*	BHP's ethnobotanical database
Garlumbu	Wild tomato	-	Banjima Yurlubajagu Strategic Plan
Garlburla	Wild banana	-	Banjima Yurlubajagu Strategic Plan
Garrany	Camel Bush	*Acacia inaequilatera*	BHP's ethnobotanical database
Garrayin	Corkwood Tree	*Hakea lorea subsp. lorea*	BHP's ethnobotanical database
Gudja-wari; Jirrwirliny	Native Orange	*Capparis lasiantha*	BHP's ethnobotanical database
Gurlibirn	Desert honey-myrtle	*Melaleuca glomerata*	BHP's ethnobotanical database
Jami; Jummy Bush	Vicks Bush	*Stemodia grossa*	BHP's ethnobotanical database
Jandaru	Wild honey	-	Banjima Yurlubajagu Strategic Plan
Jarrawayi	River Jam	*Acacia citrinoviridis*	BHP's ethnobotanical database
Jibburra	Rock Melon	*Cucumis melo*	BHP's ethnobotanical database
Jitha; Jidda; Gulyu	Bush Potato	*Ipomoea muelleri*	BHP's ethnobotanical database
Jilgurra or Gurarra	Snakewood	*Acacia tetragonophylla*	BHP's ethnobotanical database
Jilybugarri	Wild passionfruit	-	Banjima Yurlubajagu Strategic Plan
Jummy	Tupentine Bush	*Eremophila fraseri subsp. fraseri*	BHP's ethnobotanical database
Malha	Honeycomb	-	Banjima Yurlubajagu Strategic Plan
Marduwari	Bulrush	*Typha domingensis*	BHP's ethnobotanical database
Marruwa; Bugardi	Snakewood	*Acacia xiphophylla*	BHP's ethnobotanical database
Mathangura	Scent grass	*Cymbopogon ambiguus*	BHP's ethnobotanical database
Mina	Soft Spinifex	*Triodia pungens*	BHP's ethnobotanical database
Mirli	Black tea-tree	*Melaleuca bracteata*	BHP's ethnobotanical database
Mugarli, Jun-Gin/Junjin	Pilbara Pindan Wattle	*Acacia tumida var. pilbarensis*	BHP's ethnobotanical database
Mulumulu	Mulla mulla flowers	-	Banjima Yurlubajagu Strategic Plan
Ngarlgu	Wild onion	*Cyperus bulbosus*	BHP's ethnobotanical database
Nyinarri	Ruby Saltbush	*Enchylaena tomentosa var. tomentosa*	BHP's ethnobotanical database
Thalgu; Tharlgu	Paperbark	*Melaleuca argentea*	BHP's ethnobotanical database
Thambarli	Gundabluey Wattle	*Acacia victoriae subsp. victoriae*	BHP's ethnobotanical database
Weenyarr	White Fig	*Ficus virens*	BHP's ethnobotanical database

Wiranggura	River Red Gum	*Eucalyptus camaldulensis*	BHP's ethnobotanical database
Wiranggura	River Red Gum	*Eucalyptus camaldulensis var. obtusa*	BHP's ethnobotanical database
Wirndamarra	Broad-Leaf Mulga	*Acacia aneura*	BHP's ethnobotanical database
Winyarrangu; Wingga	Desert Fig	*Ficus brachypoda*	BHP's ethnobotanical database
Yaliri	Stiffleaf Sedge	*Cyperus vaginatus*	BHP's ethnobotanical database

Source: BNTAC (2019)

Appendix H. Banjima People Closure Principles

Appendix not publicly available and supplied separately

Appendix I. WAIO Standard Closure Methods

This section outlines the standard closure and rehabilitation methods that are generally applied at WAIO sites. These methods will be adopted at Ministers North as appropriate.

I-1. Acid, metalliferous and/or saline drainage management

AMD is a consideration for mine closure if concentrated levels of acidic, metalliferous or saline drainage enter waterways. Drainage that contains elevated concentrations of sulphuric acid, salts or toxic metals can present a risk to aquatic life, riparian vegetation, ground and surface water or users of these e.g., stock and humans. If the AMD risk is not managed during the life of the mine, it may arise post closure. In BHP's operations, potential sources of AMD include the OSA, exposed pit walls and other disturbances.

As described in Section 3.4.1, the risk of AMD is low at Ministers North. However, the standard BHP approach to management of AMD is presented here in the event that problematic materials are encountered as more information about the orebody becomes available.

BHP is committed to managing and mitigating geochemical risk using a structured approach, consistent with global leading practice guidelines including INAP (2014) and DISER (2016b). Procedures for managing geochemical risk are outlined in several procedures including:

- BHP's Global Mined Management Standard (BHP, 2024f) which sets company-wide standards for geochemical risk management.
- WAIO's suite of procedures that outline how geochemical risk is identified, assessed and managed across BHP's Pilbara operations. These procedures include:
  - Acid and Metalliferous Drainage Management Technical Process Instruction (BHP, 2022a).
  - Reactive Ground and AMD Potential: Mining Design and Dumping Procedure (WAIO, 2021a).
  - Reactive Ground and Associated Gases Procedure 0129611 (WAIO, 2020c).
  - Mines Closure Design Guidance Procedure (WAIO, 2022e).
  - Preliminary AMD Risk Assessment Procedure 0132980 (WAIO, 2017b).

The Acid and Metalliferous Drainage Management Technical Process Instruction (BHP, 2022a) outlines the overall strategy for management of geochemical risk (Figure 13-1) and considers the full mine life cycle.

The approach shown in Figure 13-1 is a risk-based approach which is refined with increasing knowledge of the geochemical characteristics of overburden material. Specifically, the characterisation stage (Stage 1) informs Stages 2 through 5 which result in OSA designs and mine void management practices aimed at minimising the potential risks associated with acid, metalliferous and/or saline drainage.

Characterisation of mined material commences at the exploration stage and is progressively refined through subsequent resource definition, short term geological drilling and grade control drilling, as applicable (Figure 13-1 and Figure 13-2). Based on geochemical characterisation test work across BHP's mining operation, BHP has developed an algorithm that is used to classify materials within the resource model as either NAF (AMD 0) or PAF (AMD 1, AMD 2 and AMD 3) (refer to Appendix B-1). This enables mine planners to identify materials that require management, and to determine their placement according to their geochemical risk. The geochemical risk of materials generated at each site is confirmed through site-specific targeted geochemical testing and risk assessment (Section 3.4.1). This work informs the management requirements for geochemically problematic materials and, depending on risk, can include predictive hydrogeochemical modelling. As shown in Section 3.4.1, over 99% of overburden at Ministers North is currently classified as AMD 0.

Further to the geochemical characterisation work, geochemical classifications in the resource model are confirmed though analysis and inspection of blast cone chips prior to mining and the results of this analysis are integrated into the short term mine plan and communicated to the production team (Figure 13-2).

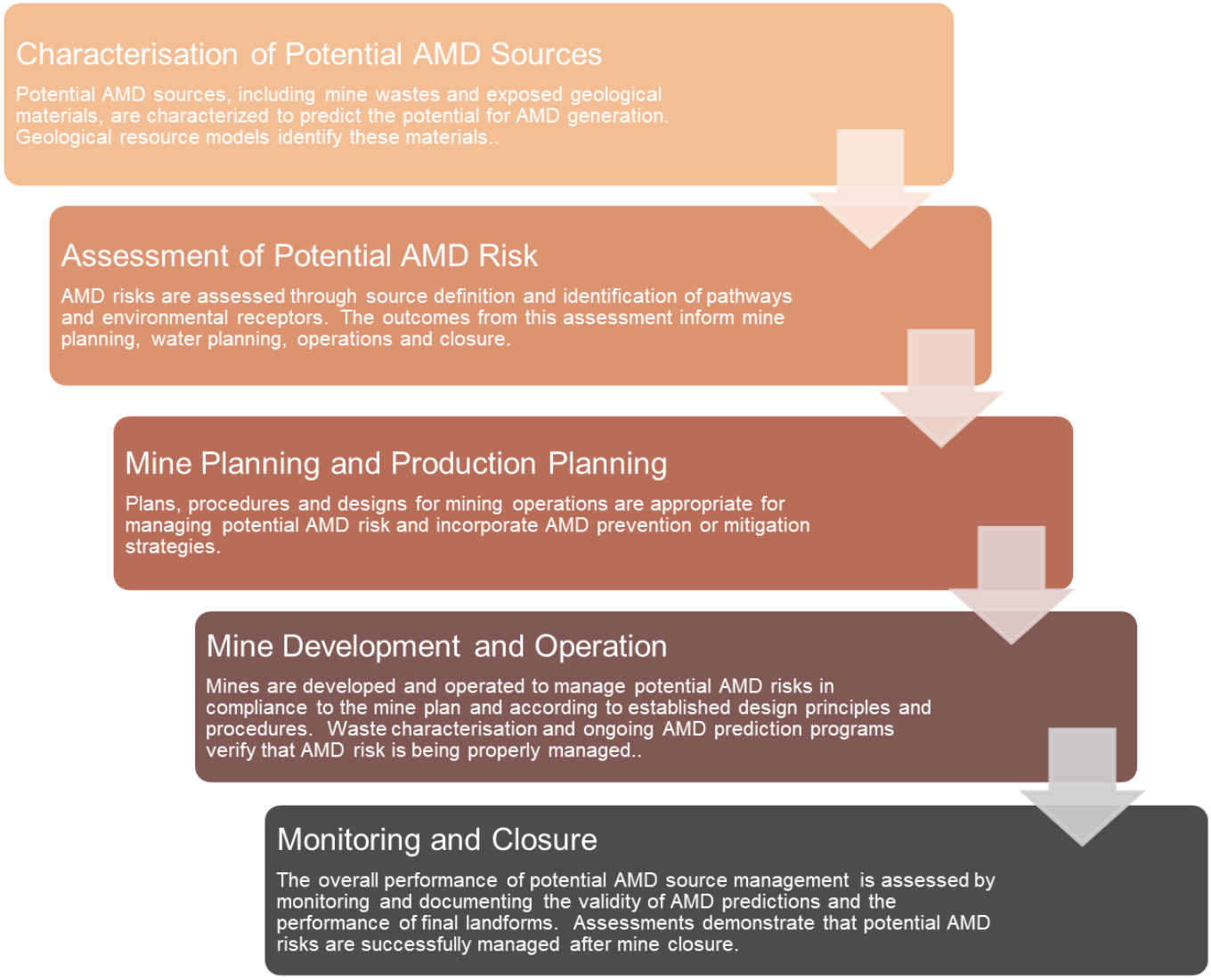


Figure 13-1 BHP's AMD management process

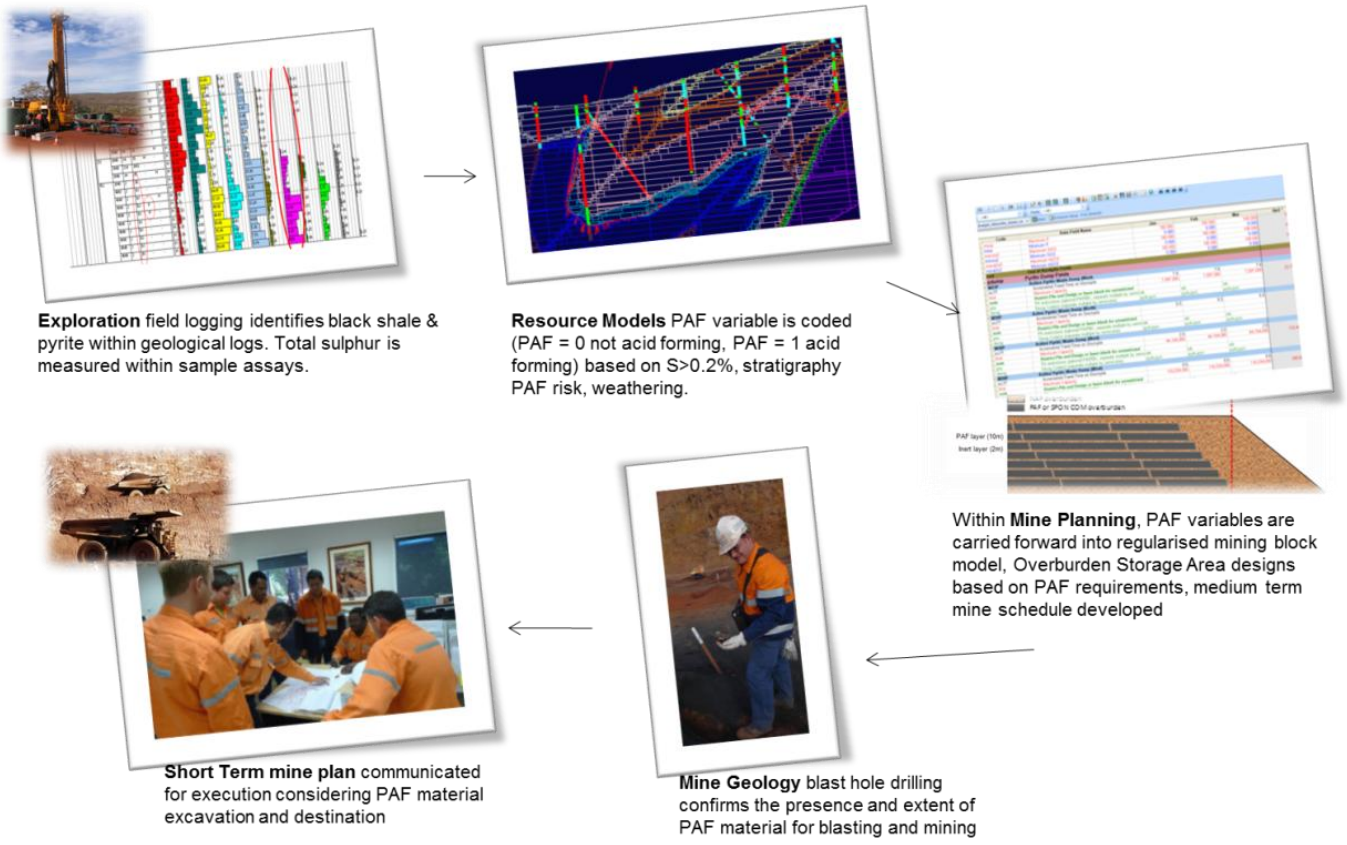


Figure 13-2 PAF management process flow (BHP's ELearning tool)

Although not relevant to Ministers North, based on current geochemical characterisation (Section 3.4.1), overburden management and mitigation options are available for higher risk stratigraphies that have AMD generation potential (Figure 13-3). Material can be encapsulated, co-disposed with inert or acid neutralising material, disposed sub-aqueously or a combination of options can be applied. These options are evaluated on a site-specific basis following the completion of appropriate material characterisation, risk assessment and modelling.

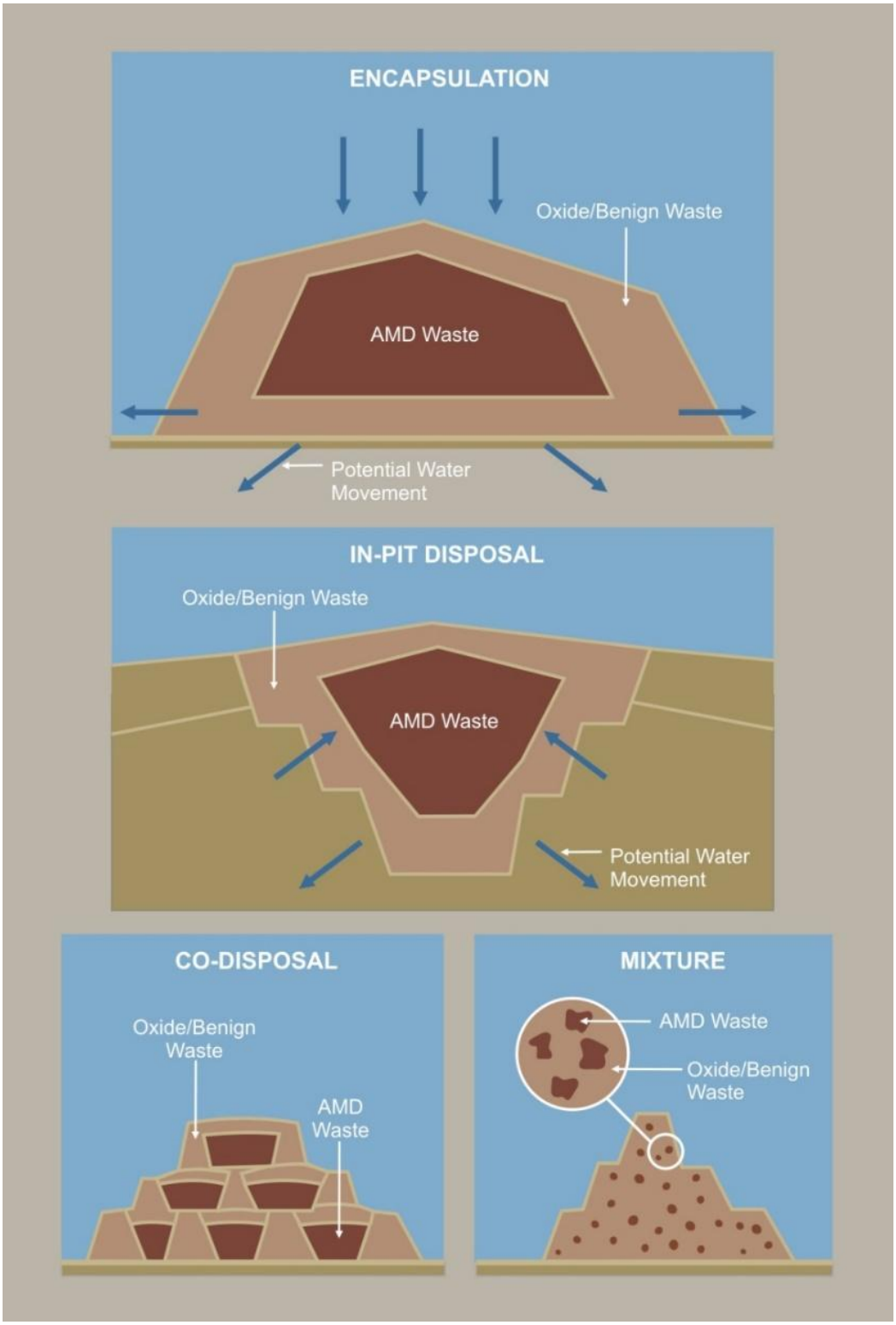


Figure 13-3 BHP's PAF overburden management strategies, following DISER (2016b)

As the risk of AMD, NMD and SD from overburden and pit wall exposures at Ministers North is low (Section 3.4.1), no specific management measures for overburden or pit wall exposures are required.

The current mine plan for Ministers North allows for backfilling of the North and South pits to a minimum of 5 m above the water table with non-acid forming material. However, this plan is subject to change as pit optimisation and other aspects of mine planning progress. Future changes in the mine plan will be incorporated into future updates of this MCP.

In the unlikely event that overburden or wall rock exposure presents an AMD risk in the future, it would be managed in accordance with the Acid and Metalliferous Drainage Management Technical Process Instruction (BHP, 2022a) and mine closure design procedure (WAIO, 2022e).

I-2. Surface water

This section outlines the procedures that BHP uses to progressively refine surface water management measures for closure throughout the life of a mine.

BHP uses flood modelling to identify the need for surface water management measures at closure. This modelling is periodically updated over the life of a mine as the mine develops and modifies drainage characteristics. The modelling is used to inform the designs of surface water management measures such as flood bunds or diversions. Depending on the significance of a structure, closure is generally considered at a conceptual level during the operational design phase to enable interactions with other infrastructure to be planned for (e.g., pit set back distances, locations of OSA). However, unless design studies indicate otherwise, a detailed design is generally not progressed until closer to the time of closure when the full mine footprint has been developed. This is because mine plans change throughout the life of a mine, according to many factors including economics, and as the mine footprint changes, so do the surface water drainage characteristics that must be managed at closure.

Executed operational designs are revisited at least five years prior to the closure of a site (or individual pit if this will not be impacted by changes to other areas of the mine) and a detailed closure design is developed. The development of the closure design near to the end of a mine's (or pit's) life will permit the closure design to benefit from the data captured through the operational period as well as the increased certainty around final landforms.

Surface water designs for closure focus on achieving long term stability of the OSA, creek diversions, flood bunds and pit walls adjacent to natural creek sections. Closure designs consider:

- The interaction of flood waters with ex-pit landforms such as the OSA and the need for diversions, flood bunds or armouring to protect the OSA from erosion post-closure. Appendix I-4 discusses how landform designs address flood risks.
- The potential impacts of surface water drainage designs on ecosystems sensitive to changes in surface water flows such as riparian vegetation and sheet-flow dependent Mulga. The surface water system at closure will be designed to meet the closure principle of no significant impact on surface water quality and flow regimes in nearby waterways beyond the levels accepted by project approvals.
- The stability of pit walls adjacent to diversions, flood bunds or natural creek sections to prevent 'creek capture' post-closure. Consistent with DMPE Ground Control Guidelines (DMIRS, 2019), target FoS for pit walls are defined based on risk. A static FoS ≥1.5 is typically used, and where this is not achieved, pit walls may be designed to achieve a lower slope angle or may be buttressed to improve stability. Creek diversions and flood bunds are located outside pit setback distances which define the safe distance between the infrastructure and mine voids.
- The potential impact of climate change on flood events, and the potential for major events to damage surface water controls (including those on constructed landforms) that may in turn impact future groundwater / surface water interactions, and hence, long term water balances.

The flood protection works required for closure are designed and constructed to achieve stable, maintenance-free, freely draining landforms. Hydraulic modelling of the flow characteristics of the modified drainage layout informs the designs and provides information on requirements for additional rock armouring or changes to the elevation and slope of flood protection bunds, and stream management, to locally reduce velocities at critical locations.

Although not relevant to Ministers North, significant creek diversions are designed to mimic natural conditions and may be informed by a combination of geomorphic assessment and hydraulic and sediment transport modelling.

Closure designs for surface water management are based on an assessment of risk which considers (Table 13-2):

- Catchment size.
- The sensitivity of the receiving environment and likely impact from a change in flows.
- The risks of permanent creek capture or compromising the stability of post-closure landforms such as the OSA.

The design event for each surface water management feature constructed for closure is considered on a case-by-case basis using the guidance provided in Table 13-2. The element in Table 13-2 that has the highest risk drives the flood event to be used as the basis for the design of surface water management infrastructure. For high-risk surface water management structures, modelled 1 in 10,000-year ARI events are typically used to inform designs. Probable Maximum Floods (PMF) have been calculated for comparison, however, are not used by BHP as a basis of design. This is due to the very large extrapolation and uncertainties involved in their estimates. Furthermore, the PMF method produces flood estimates significantly larger when adjusted for catchment area than any contained in the palaeo record of any Australian River. The 10,000-year event estimates generally result in a flow rate several times larger than the 1% (100-year) AEP event and are considered an appropriately conservative basis for a closure design for a high-risk structure.

Table 13-2 Guidance for selection of design events for surface water management infrastructure

Catchment Size	Design ARI Applicable (Years)					
	Risk of Creek Capture or to Stability of Post-closure Landform			Sensitivity of Receiving Environment & Potential Impact		
	Low	Moderate	High	Low	Moderate	High
Small (<10 km^2)	100	1,000	1,000	100	1,000	10,000
Medium (10 - 100 km^2)	1,000	1,000	10,000	1,000	1,000	10,000
Large (100 - 1,000 km^2)	1,000	10,000	10,000	1,000	10,000	10,000
Very Large (>1,000 km^2)	10,000	10,000	10,000	10,000	10,000	10,000

Discharges to surface water during operations are typically managed via Part V licence conditions, or management plans approved under relevant ministerial statements.

I-3. Groundwater

This section outlines the procedures that BHP uses to define groundwater impacts and management measures for closure. The proposed development at Ministers North does not include mining below the water table, therefore no dewatering will be required to access the ore.

Conceptual and numerical modelling is used to define potential impacts to ecohydrological receptors from drawdown and discharges to groundwater (where relevant). Impacts during operations are managed via environmental licences and management plans approved by DWER. Contaminated sites are managed as discussed in Appendix I-11.

Impacts requiring management at closure are integrated into MCPs and, depending on site circumstances, may be informed by one, or a combination of:

- Conceptual models.
- Modelling of groundwater.
- Water balance modelling.
- Hydrogeochemical modelling.
- Contaminant transport modelling.

An operational management matter will only be incorporated into the MCP if it requires a closure management response.

I-4. Landforms

Landforms are managed in accordance with WAIO's Mines Closure Guidance Design procedure (WAIO, 2022e). Surface water management infrastructure designs are managed as discussed in Appendix I-2.

The development of the post mining landform design is an iterative process, integrating all the closure domains. Important to the transformation of the operational domains, to a successful and sustainable post-closure landform design is a fundamental understanding of the chemical and physical properties of overburden material used to construct final landforms and the site's hydrological setting (Section 3.2.4). In particular, the surface materials must be appropriate to withstand erosive forces and sustain vegetation growth in the long term.

BHP follows the adaptive management framework, with the mine plan and closure landform designs evolving over the life of mine as knowledge of constraints and opportunities become available over time. As operations/landforms in certain areas approach completion, closure designs are progressively developed and implemented. Final landform designs, therefore, continue to evolve over the life of a mine. Designs are based upon multi-disciplinary inputs including for example:

- Exploration data;
- Overburden characterisation;
- Hydrology, hydrogeology, and hydro-geochemistry information;
- Post-mining land use and tenure considerations;
- Physical footprint;
- Cumulative impacts;
- Visual impact considerations;
- Mine planning, scheduling, and overburden volumes;
- Flora, fauna and heritage issues;
- Stakeholder inputs; and
- Safety and access considerations (discussed further in Appendix I-8).

Final landform designs require integration of all the domains listed in Table 8-1 (Section 8.1) including:

- Mine voids (discussed in Section 8.5.1);
- OSA, ROM pad and stockpiles (discussed in Appendix I-4 and Section 8.5.2);
- Infrastructure including:
  - Surface water management and flood protection works (discussed in Appendix I-2); and
  - Roads and post-closure access (discussed in Section 8.5.4).

BHP undertakes a suite of work to inform and guide the landform design process including:

- **Resource Sterilisation Assessment:** which is an assessment of resource or potential mineralisation beneath an area typically selected for proposed OSA construction. This assessment also applies to mine voids where backfill is proposed as part of the operations and/or closure strategy. It adds to the spatial dataset to assist with OSA positioning at the conceptual stage.
- **The Resource Block Model:** which contains geological resource information for planned and operational mines. The model contains, amongst other things, the relevant stratigraphies, physical and geochemical properties of the rock mass allowing for the identification of ore and appropriate classification of overburden material.
- **Overburden Characterisation:** identifies material suitable for use on final slopes and problematic material (e.g. PAF, sodic) which should be buried within an OSA or mine void as appropriate.
- **Mine Plan Optimiser:** Mine planning software is used to assist in generating an optimal pit design based on financial and geotechnical parameters, assuming an appropriate risk level. The mine planning software is also used to schedule multiple deposits based on optimal maximised net present value (in consideration of operational and environmental constraints). Schedules provide the necessary information to develop optimal overburden strategies and are an iterative process. This influences OSA designs and backfill strategies.
- **Physical Erosion Potential Modelling:** An examination of overburden that forms the outer surfaces of OSA landforms is undertaken to determine the key erosion characteristics of the overburden material. This is conducted under laboratory conditions using predicted rainfall events based on local rainfall data. It provides validated data for the numerical modelling on how well a specific overburden type behaves in surface flow conditions and informs detailed OSA design such as stable slope angles and material use. In addition, field trials are utilised where appropriate, to validate laboratory findings.
- **Numerical Erosion Potential Modelling**: Surface erosion modelling (e.g., WEPP, SIBERIA) can be undertaken as part of the detailed OSA design stage to evaluate the predicted rates and locations of erosion on a final landform. This process is supported by numerical inputs obtained from the material characterisation programs. This activity supports planning considerations around final landform design and overburden scheduling objectives.

Design of OSAs and ISAs

Potential requirements for OSA designs are integrated into the Master Area Design for a mine and are refined throughout the mine planning process (Figure 13-4). During the early stages of mine planning (see ‘Range Analysis’ and ‘Development Strategy’ on Figure 13-4), conceptual OSA landform designs are used to delineate OSA locations and disturbance extents for approval purposes. In these strategic planning stages, the overall landform extent and conservative assessment of slope angle is used to estimate a final disturbance area. As more localised information becomes available and knowledge improves, a final landform design will be developed (see ‘Engineering’ stage on Figure 13-4) which will transition into an executable design. During construction, assessments are undertaken of compliance to plans based on survey data.

Erodible overburden may be backfilled into pits (sometimes as constructed ISA landforms) or placed in ex-pit OSAs which have appropriate geometries and are sheeted with competent material defined through materials characterisation studies. OSAs are generally located outside the Zone of Instability (ZOI) of pits, but where this is not possible, pit walls will be buttressed or pits backfilled to increase stability, or the ex-pit overburden material will be transferred to an alternative location. OSAs will also typically be located outside the 1 in 10,000-year flood plain. However, where the 1:10,000 floodplain intersects OSAs, consideration will be given to additional rock armouring or toe protection bunds or diversions to minimise the potential for erosion in a post-closure flood event.

The final shape of the OSA and ISAs will be designed to maintain surface stability, with regard also given to visual amenity where this has been identified as an issue. At Ministers North, geomorphic design principles will be considered along the interface between Khargoonha, South Pit pushbacks and the southwestern aspect of Central OSA.

Erosion of OSAs is minimised by managing surface water run-off and designing slopes that will result in minimal rilling as this minimises the opportunity for accelerated erosional forces to develop within channel flows. Such slopes will have minor potential to become heavily gullied, and any interrill erosion that occurs will be insignificant relative to potential rates of erosion by rilling that could develop on long, steep, slopes. If rilling and gullying is avoided, the slope should be stable.

Where berms are deemed necessary in design due to overall landform geometry, berm cross-sectional water holding storage is based on 200-year 72 hr event with 300 mm freeboard from top of crest embankment. Berm design includes engineered features to contain or direct slope run-off above 200-year events up to a 10,000-year event.

Opportunities to minimise the size of the OSAs by increasing the amount of overburden material used to infill final voids are explored as part of ongoing operational planning.

Final OSA landform designs are informed by:

- Final contours of an ‘as tipped’ OSA;
- Surface water assessments including an assessment of the catchments that impact on the OSA and potential for run-off from the OSA;
- Materials characterisation (Section 3.4.2); and
- Modelling of erosion (Section 3.4.2).

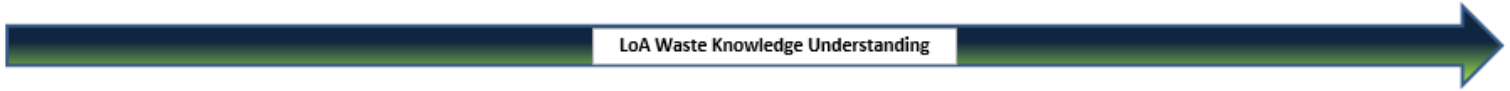
There are a number of standard design elements that are typically integrated into most landform designs. These comprise:

- Frontal crest bunds to control surface water run-off down slopes (Figure 13-5). A typical cross section is shown in Figure 13-6.
- Interbunds to control surface water movement across landform surfaces (Figure 13-7). Cells generally run perpendicular to the frontal crest bunds. A typical cross section is shown in Figure 13-8. Finished cell surfaces are deep ripped. The top RL of inter-bunds is required to be a minimum of 300 mm below the frontal crest bunds.

Waste Resource Planning Knowledge Map

Purpose: To layout the waste planning activities and study levels during the various stages of project development, from early Range Analysis to execution by Operations. By detailing the study/management level, risks can be identified and separate management plans to manage the risks can be developed.

Scope: This document covers the management of waste material at WAIO sites. Waste generated at WAIO sites includes:
1. Non-mineralised waste rock (mining overburden).
2. Mineralised waste rock (Low/Blend Grade).
3. Quarried rock used for construction.



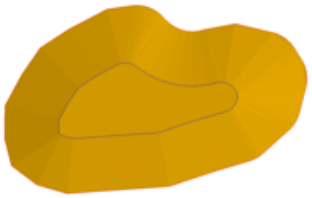
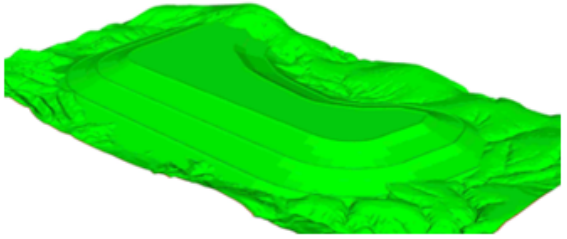
	Range Analysis	Development Strategy	Engineering	Implementation
OVERVIEW	The waste and landform considerations will generally be at a high level due to a limited waste understanding caused by the model maturity.	A conceptual 9 degree OSA final design with no ramps developed for extents that considers preliminary geochemistry and landform requirements. Assumes all waste/LG/BG dumped ex-pit.	Executable rehabilitated designs are developed to inform the as-tipped designs. The design is to consider the material properties of the waste and physical environmental conditions of the area.	Mine Operations execute the OSA and landform structure in accordance with the approved as-tipped design. Waste schedule optimises waste placement objectives to minimise haulage and rehabilitation costs.
OSA LANDFORM REQUIREMENT				
KNOWLEDGE LIMITATIONS	*Initial drilling program that has broadly defined a known mineral deposit. Footprint of conceptual OSA should consider drainage alignments and future pit and infrastructure footprints.*	*Infill drilling has allowed for the development of resource models that consider the waste risks of the deposit.*	*Infill drilling completed, resource and mining models available with a good understanding of lithologies and PAF potential. Site specific material characterisation work may not yet have been completed but reviews of adjacent studies has been undertaken.*	*Monthly review of compliance to plan undertaken to ensure compliance with design during execution of landforms. As material competency investigations are completed, mine plans are amended to optimise waste placement objectives if possible.*

Figure 13-4 OSA landform development stages during mine planning

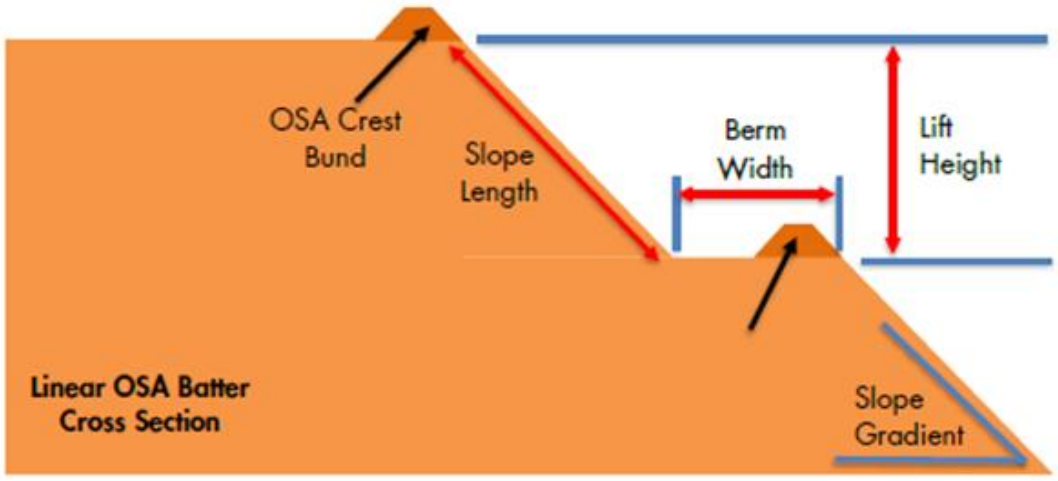


Figure 13-5 Linear OSA batter cross section showing location of crest bunds

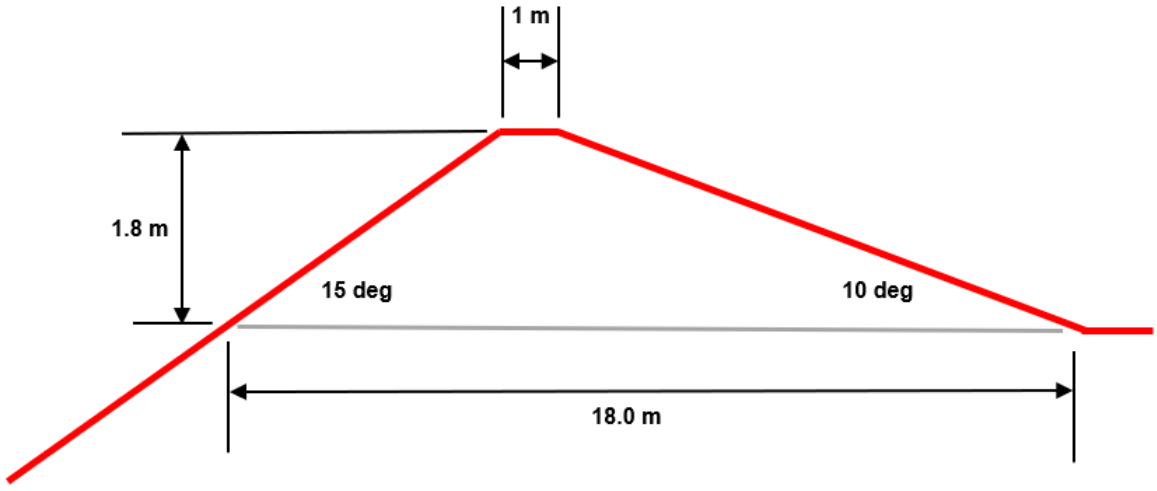


Figure 13-6 Typical frontal crest bund cross section

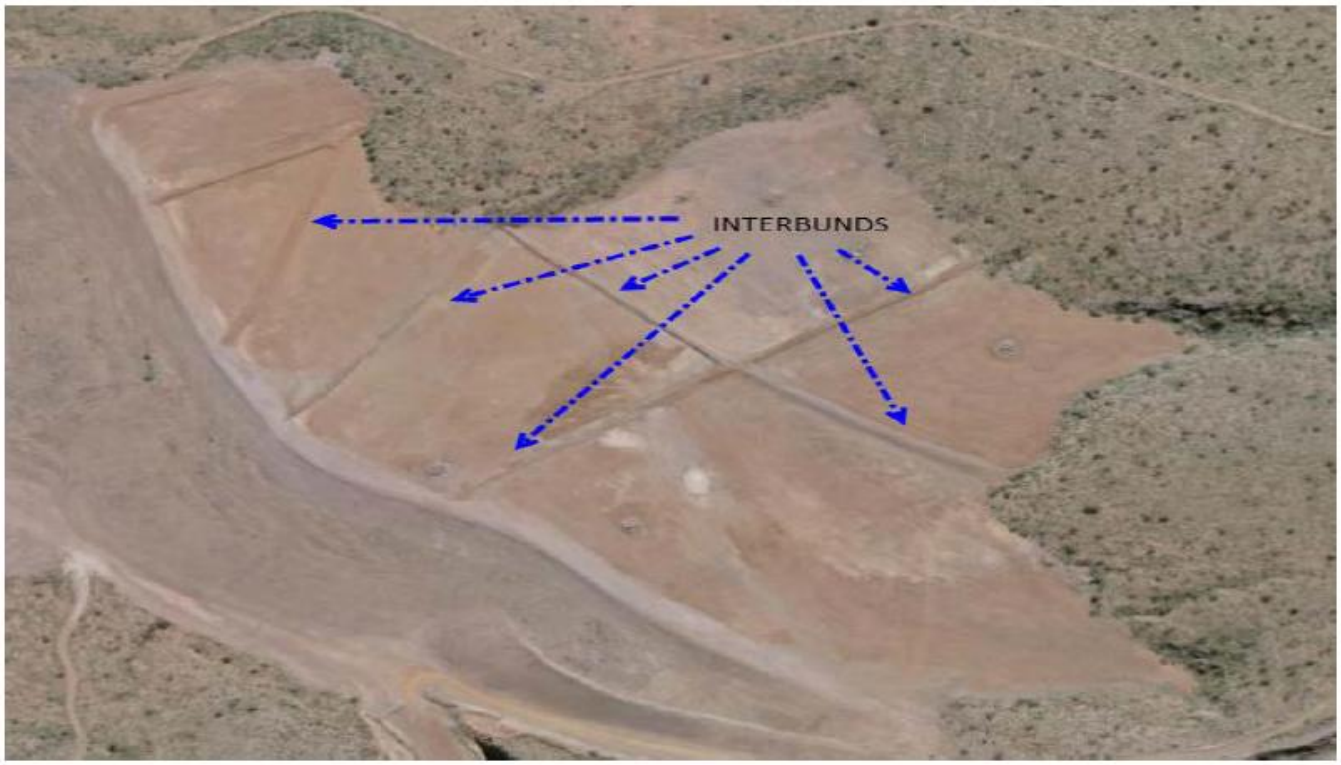


Figure 13-7 Example inter-bund configuration

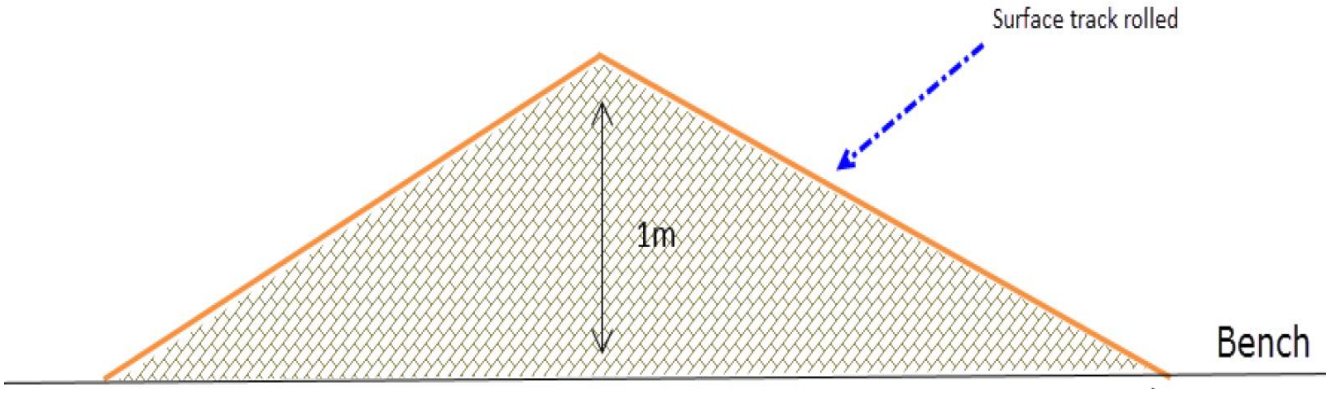


Figure 13-8 Typical cell bund cross section

Mine voids

Mine void closure strategies consider the post-closure influence of mining areas on groundwater and associated receptors, as well as opportunities for reducing the ex-pit footprint of OSAs and management of physically or geochemically problematic materials. Following the confirmation of the preferred mine void closure strategy (e.g., whether they will be backfilled) and final pit shells, pit wall stability is assessed and the potential for the ZOI of the pits to impact on infrastructure (such as safety bunds and surface water management infrastructure) is determined. Where post-closure infrastructure falls within the ZOI of pits (determined in accordance with DMPE (2019) on the basis of risk, but typically using a FoS of ≥1.5), pit walls may be designed to achieve a lower slope angle or buttressed or backfilled to improve stability.

Geological and geotechnical models are produced for each pit which are used as the basis for geotechnical assessments. Geotechnical, hydrological and hydrogeological assessments are used to inform pit designs and pit wall stabilities and BHP's Master Area Design Review process checks that geotechnical guidance has been incorporated into designs. Following construction, surveys are undertaken as part of BHP's compliance to plan processes to check final pit walls against designs.

At closure, safety bunds will be located outside the ZOI of the pits in line with DMPE guidelines (DoIR, 1997), and designs (Section 8.5.1) will take into account the outcomes of recent consultation with DMPE (Section 4). Consideration will also need to be given to how the safety bunds interact with surface water management infrastructure remaining post-closure (e.g., flood bunds and diversions).

I-5. Standard closure and rehabilitation strategies

BHP will implement its Rehabilitation Standard (WAIO, 2023b) which covers all procedures relevant to rehabilitation works including rehabilitation planning, growth media, earthworks, audit and inspection, seed management, rehabilitation data management and rehabilitation monitoring. The rehabilitation standard is used across BHP's Pilbara mine sites and other areas where appropriate. A description of each area of the standard is provided in the subsections below.

The internal procedures and standards referenced may be amended or replaced from time to time in accordance with BHP's adaptive management approach (Section 9.2).

The rehabilitation standard and associated procedures are used across BHP's Pilbara mine sites and other areas where appropriate. A description of each area of the standard is provided in the subsections below.

Rehabilitation planning

Rehabilitation planning is conducted generally in accordance with BHP's Rehabilitation Planning and Execution Technical Process Instruction (WAIO, 2023a). This requires that a 5-year rehabilitation plan be developed in consultation with the mine planning and production scheduling teams. The plan is updated as part of the financial closure provision process and is used as the basis of a five year seed supply plan which guides seed purchases (species and volumes).

For each area of rehabilitation, a work pack (and / or scope of work if rehabilitation is to be executed by an external contractor) is developed. Work packs typically outline the key tasks for the project with appropriate stages, which require sign-off by all relevant parties, validating that the work conforms to BHP's rehabilitation and closure standards and objectives.

Earthworks

The Earthworks for Rehabilitation Procedure (WAIO, 2022b) has been prepared to provide a consistent methodology for rehabilitation earthworks across BHP's Pilbara operations. It covers earthworks planning procedures and guidance for earthworks execution. The procedure requires that a work pack be developed for each project to provide a clear scope of work. Work packs typically outline the key tasks for the project with appropriate stages, which require sign-off by all relevant parties, validating that the work conforms to BHP's rehabilitation and closure standards and objectives.

Rehabilitation earthworks may involve:

- Relocating materials (e.g. backfilling pits).
- Re-profiling the land surface to create landforms that are consistent with the surrounding landscape, within the constraints imposed by the physical nature of the materials.
- Reshaping slopes to a profile suited to the nature of the material used (determined by overburden characterisation studies and modelling of erosion potential).
- Constructing surface water controls.
- Application of rock armour.
- Implementing the surface treatments outlined in Appendix I-5.
- Constructing fauna habitats as outlined in Appendix I-5.

At the end of each earthworks phase, a rehabilitation inspection is conducted generally in accordance with WAIO's Rehabilitation Inspection and Sign-off procedure (WAIO, 2022c) to confirm conformance to the work pack/scope of work for that area.

Surface treatment

Several surface treatments may be used, depending on the size and nature of the rehabilitated area. The proposed surface treatments for rehabilitation areas at Ministers North have been developed to satisfy the closure objectives and may consist of one or more of the following:

- Deep ripping of compacted surfaces, and cross ripping if clod size is greater than 150 mm.
- Selective application of topsoil material (or alternative growth media) to provide a medium to support plant growth.
- Application of inorganic or organic amendments informed by assessment of the growth media and research findings (refer to Appendix F).
- Surveyed contour ripping or scarifying of surfaces following the application of soils to maximise water infiltration and enhance revegetation success (Appendix I-5). When scarifying on the contour is not appropriate due to physical constraints (such as narrow areas or areas constrained by infrastructure or natural features), a herringbone technique may be used (Appendix I-5). Where there is high rock content and natural surface roughness of the final designed surface, contour ripping may not be required, and is the preferred approach where applicable based on the outcomes of research and trails across BHP operations.

- Selective placement of logs or smaller woody debris and/or boulders (if available) across the re-profiled surface (Appendix I-5) and/or constructing rocky cliff features (where potential exists) to provide additional habitat areas for fauna species recorded prior to mining.

The Management of Growth Media for Rehabilitation Procedure (WAIO, 2022d) provides general information on soils of the Pilbara region and methods for soil stripping, stockpiling and use in rehabilitation. The procedure has been informed by the results of the 5-year Restoration Seedbank Initiative research program completed in 2020 (Appendix F).

Topsoil stockpiles are regularly surveyed and, where topsoil deficits exist, alternate growth media are tested and trialled. Topsoil resources are typically prioritised for areas that will provide the best benefit to rehabilitation outcomes.

Direct placement of topsoil onto rehabilitation areas is preferable. If direct placement is not possible, contemporary guidance for topsoil stockpiles is that soil should be stockpiled in mounds no more than 3 m high with an overall convex shape that has a slight watershed slope across the entirety of the stockpile to prevent the degradation of topsoil and seedbank by pooling water. Stockpiles should be placed away from large populations of weeds and should not be located in areas where water is likely to collect against the stockpile. Compaction of the topsoil stockpiles is minimised through the use of track-based machinery and deep ripping

At the completion of works, a rehabilitation inspection is conducted generally in accordance with WAIO's Rehabilitation Inspection and Sign-off Procedure (WAIO, 2022c) to confirm conformance to the work pack/scope of work for that area.

Figure 13-9 Contour ripping

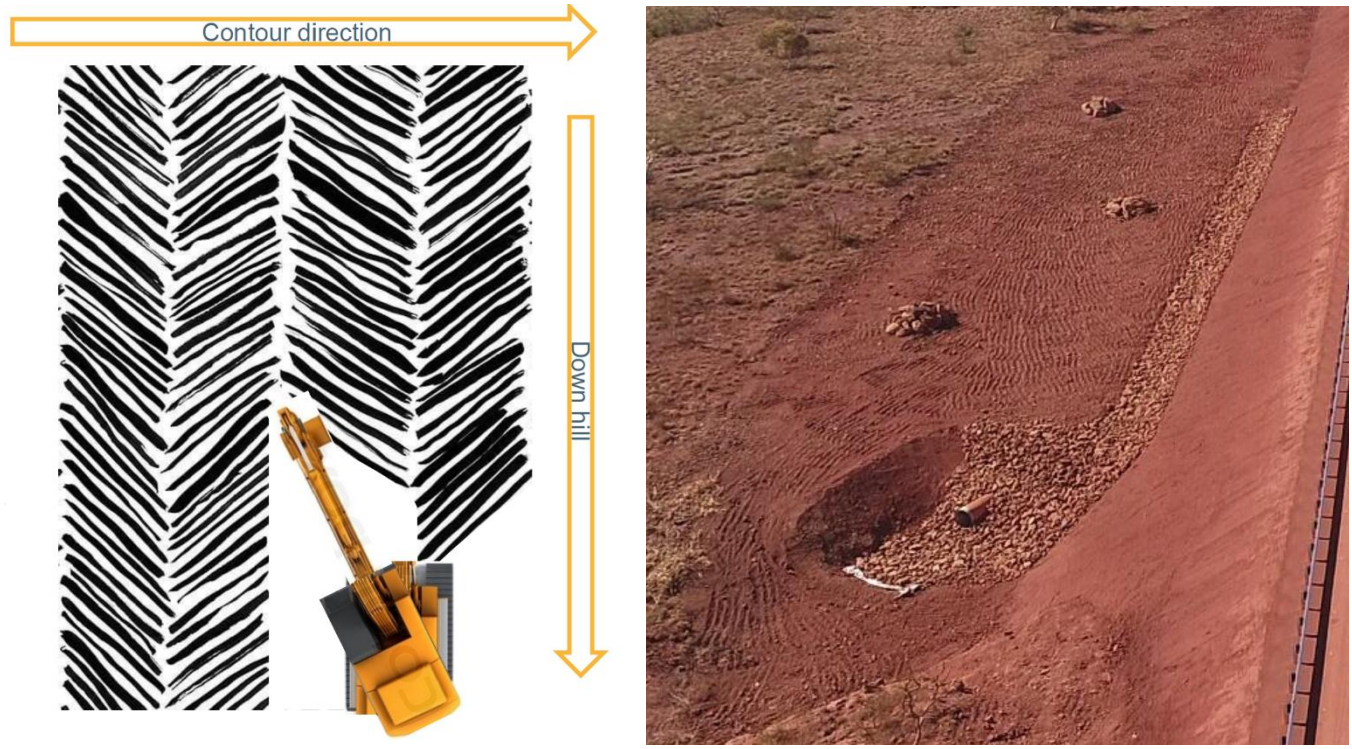


Figure 13-10 Herringbone scarification

Figure 13-11 Example of placement of logs and branches as fauna habitat

Revegetation

Revegetation programs are typically designed to establish native vegetation that blends with surrounding areas and provides habitat and foraging areas for native fauna, while taking into consideration the constructed landform design and overburden material characteristics within the potential root zone.

The Rehabilitation Standard (WAIO, 2023b) requires that revegetation be conducted to establish plant species that would support the approved post-mining land use(s). The plant species used in revegetation are selected from revegetation species lists generated for each site as part of planning works (see Appendix J). Plant species lists for different domains are generated, using baseline vegetation data, to include a range of typical vegetation assemblages suited to the post-mining landform. While selected plant species will typically be consistent with vegetation associations and native species recorded in the mine area prior to mining,

some domains (e.g. backfilled pits) or post-mining land uses, may require the return of novel ecosystems. Where a novel ecosystem is proposed, research/studies are conducted to define appropriate species for use in revegetation of these areas. Based on the provisional post-closure land use (Section 5.2), revegetation at Ministers North would use local provenance native seed sourced from the local area (but as a minimum from within the Hamersley biogeographic sub-region and 100 km of the site) consistent with vegetation associations and native species recorded in the mine area prior to mining. Following engagement with the Banjima in September 2024, BHP understands that it is important for seed to be collected from the Ministers North project area and that there is a preference for traditional “bush medicine” plants to be incorporated into the rehabilitation strategy.

Based on the available climate change predictions, BHP considers that the most appropriate revegetation approach is to select native species based on the current climatic conditions. If there were to be an effect on revegetation from climate change, those changes would reasonably be expected to be gradual and would be experienced across the entire region, including adjoining unmined areas. Major differences between regional and post-mined vegetation will be managed by planning for diversity of species within rehabilitated sites, so that the natural adjustments to a changing climate will be accommodated within the local species pool. However, BHP will maintain a watching brief on emerging research associated with the use of out of provenance seed sources to increase genetic diversity to provide resilience to climate change.

The Seed Management Procedure (WAIO, 2022a) describes the types of seed species mixes and seeding rates that BHP uses at its Pilbara mining operations. Through BHP’s adaptive management approach (refer Section 9.2), seed mixes and methods of seed handling, assessment of seed viability and seeding rates will continue to be improved and informed by ongoing monitoring results, and research. All seed collections are recorded in BHP’s seed collection database (developed as part of the Restoration Seedbank Initiative). This database records information for each seed batch such as provenance zone, seed test data, and landform position, and aspect, preferred by each species.

Where monitoring results indicate vegetation establishment may not meet required standards, (vegetation density, species diversity and plant age heterogeneity), additional seeding (in subsequent years) may be undertaken.

Two rainfall periods characterise the Pilbara region – one from January to March and the other from May to August. The most reliable rainfall period occurs from January to March. Accordingly, revegetation activities would be completed during November and December, where practicable. Work completed as part of the Restoration Seed Bank Initiative has highlighted the significance of sowing time (in relation to expected rainfall events) to the success of seed germination.

Fauna habitats

Rehabilitation plans address the return of fauna habitat through selection of target vegetation communities and / or specialised constructed habitat features. Establishment of specialised fauna habitats is considered during the development of landform designs and associated work packs for execution.

Where available, large rocks (with a minimum of 500 mm diameter) may be used to create fauna habitats. The rock habitats are formed with a wide base, often sunk into the ground, with multiple layers of rocks to 2.5 m high. Topsoil is pushed back in/around the lower section of the rock stack. These rock habitat structures provide gaps and voids to allow species such as quolls and pebble mound mice to gain entry.

Landform designs typically require a higher percentage of rock on slopes for stability, but the surfaces of OSAs may contain less rock and, therefore, are of greater suitability for species that require less rocky habitat.

BHP is in the process of planning a research program on fauna habitat, including consideration of key species of importance to Traditional Owners, and the return of fauna to rehabilitated areas. This will inform future rehabilitation practices.

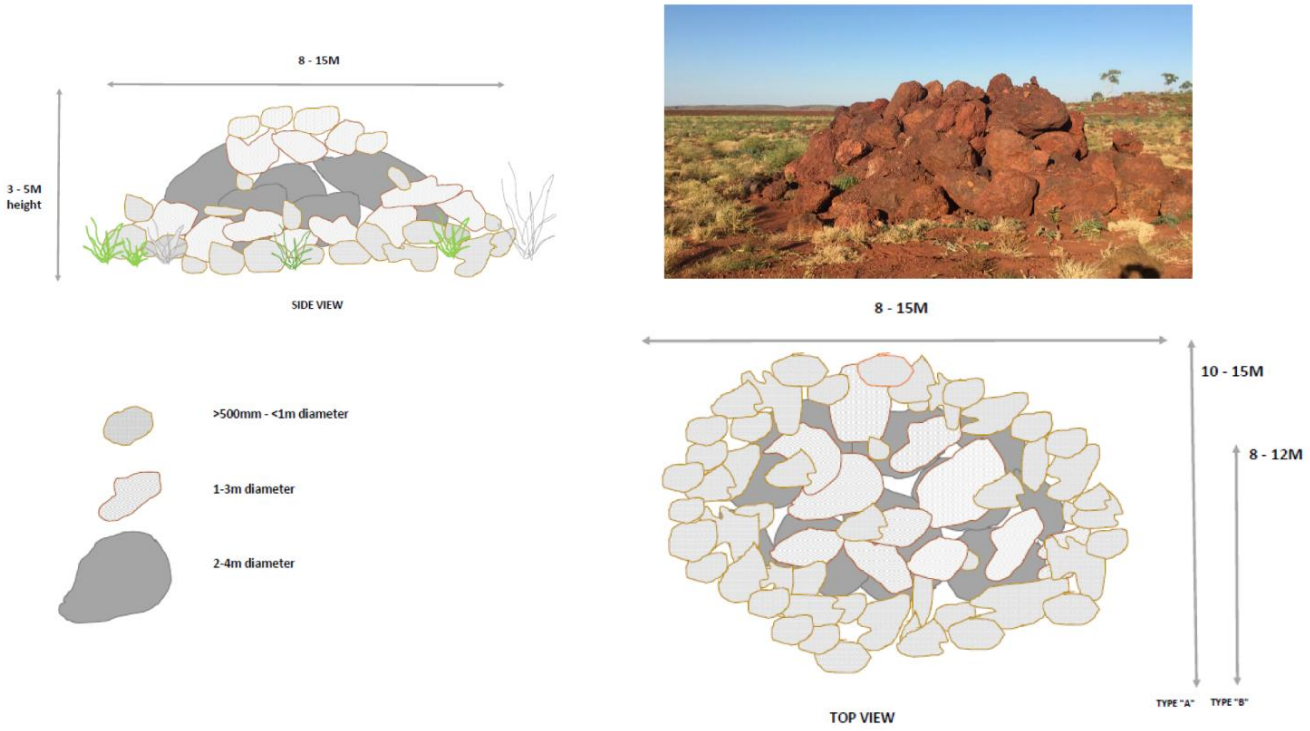


Figure 13-12 Fauna habitat

I-6. Borrow pits

Borrow pits will be closed in accordance with the BHP Borrow Pit Management and Rehabilitation Procedure (BHP, 2022c) which broadly requires:

- Borrow pit walls to be battered to blend with the surrounding environment.
- Straight edges to be avoided and edges to be blended with the surrounding environment.
- Borrow pits to be free draining.
- Compacted areas to be deep ripped prior to topsoil return.
- Light scarification of topsoil and seeding.

I-7. Weeds

Weeds are monitored and managed generally in accordance with BHP's weed management procedure (WAIO, 2020a). This procedure:

- Details the known environmental weed species that occur on BHP sites.
- Outlines requirements for mapping environmental weeds on a regular basis (generally annually).
- Developing a scope for weed treatment.

I-8. Site safety and security

Safety considerations for closure include:

- The post mining land use and associated requirements for safe access.
- Safe access to sites of significance for Traditional Owners.
- Measures to prevent inadvertent access to hazardous areas.
- Management of hazardous materials.
- Decommissioning and removal of above ground infrastructure that will not be transferred to a third party post-mining.

Safety hazards are identified during risk assessments conducted in appropriate design phases, and where practicable, are eliminated through a range of measures including, but not necessarily limited to:

- Placement 1 m below the surface of an OSA/ISA/backfill of fibrous overburden encountered during mining.
- Removal of infrastructure, filling of voids left after infrastructure removal and capping of bores.

Where hazards cannot be eliminated, designs are developed to prevent inadvertent access. In defining appropriate site safety and security measures to prevent inadvertent access, consideration is given to the accessibility of a site (such as proximity to public access routes). Consultation is also conducted with post-mining land managers and Traditional Owners to identify safe access requirements to accommodate the post-mining land use and access to sites of importance to Traditional Owners. Inadvertent access is typically controlled using safety bunds which are designed to be located outside the ZOI of the pits in accordance with DMPE guidelines (DoIR, 1997) and include consideration of matters raised during consultation with DMPE in 2019 (Section 4). However, for some sites near population centres, fencing, signage and locked gates may also be required. In these instances, provision would need to be made for ongoing inspection and maintenance post-closure.

At sites where flood bunds and creek diversions remain post-closure, the interaction of safety bunds with these features will need to be factored into designs.

I-9. Cultural values and heritage

Comprehensive archaeological and ethnographic surveys are undertaken to identify sites of cultural significance prior to ground disturbing activities. In general, closure activities are unlikely to impact these sites as these activities usually occur in areas that have already been disturbed. However, where new disturbance is required to execute closure designs, BHP reviews and authorises the disturbance via its Project Environmental Aboriginal Heritage Review (PEAHR) procedure (WAIO, 2021b) prior to work commencing. For each planned disturbance area, the following details are addressed in the PEAHR form:

- A summary of the proposed disturbance activities;
- A plan showing the location of the proposed works;
- The anticipated environmental, land access and Aboriginal heritage impacts; and
- Specific management measures where necessary.

The primary mechanism for protection of cultural heritage sites identified as being significant, is the development of closure plans and designs to avoid identified sites. Any post closure issues (including ongoing management) relevant to these sites will be discussed with the relevant Traditional Owners through the stakeholder engagement process (Section 4). Discussions will also include:

- The opportunity to repatriate artefacts that have been collected and stored during the mining process, if required.
- Options for closure designs to provide safe access to sites of importance post-closure.
- Cultural values and potential closure designs to incorporate / retain these values.

All work will be conducted in compliance with relevant legislation, and in accordance with BHP's comprehensive agreement with the Banjima People.

I-10. Post-closure land use

The provisional post-closure land uses proposed for Ministers North are outlined in Section 5.2. However, it is recognised that stakeholder views (including those of Traditional Owners) and the appropriateness/feasibility of different land uses change over time. BHP's ongoing stakeholder consultation program will enable future land use options to be identified and studied in further detail throughout a mine's life, and detailed land use-specific performance objectives and completion criteria to be developed.

As Ministers North approaches closure, discussions will be held with key stakeholders to determine whether they have a requirement for site infrastructure post-closure. If infrastructure is to be transferred to third parties, a condition assessment of the infrastructure will be conducted, and the infrastructure (including responsibilities for ongoing management and maintenance) will be formally transferred to its new owner.

Post-closure monitoring will be used to gain an understanding of any long-term land maintenance requirements. Where specific long-term management actions are required, which are above those expected for the post-closure land use, an agreement will be made to provide for these actions prior to relinquishment.

I-11. Site contamination

In areas where the potential for soil contamination is identified, assessment and remediation is generally managed in accordance with the CS Act and DWER requirements (including sampling/analysis and remediation/management) during a site's operational life and not left unresolved at the time of closure. As a site approaches closure, investigation and remediation of any remaining contamination is considered during BHP's closure study phases. This includes consideration of whether the contamination land use classification of sites previously investigated / remediated is commensurate with the agreed post mining land use.

Remaining surfaces would be reshaped to conform to surrounding landforms, with surface treatment and revegetation implemented as outlined in Appendix I-5.

I-12. Dust emissions

Dust has the potential to be emitted during decommissioning and bulk earthworks activities during closure. Dust control measures would be implemented during closure e.g. regular watering of unsealed roads, exposed surfaces and active earthwork areas. Upon closure, dust generation from the rehabilitated surfaces would be expected to be similar to other nearby natural landforms.

Appendix J. Technical Reports

Appendix not publicly available and supplied separately