

BMA



BHP Mitsubishi Alliance

Appendix J

Management Plans



SRM-PLN-0014

BHP Mitsubishi Alliance

SRM PLAN

Erosion and Sediment Control (North)

Status: Approved

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Environment Operations

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1 Introduction

1.1 Purpose

- 1 This Erosion and Sediment Control Plan (ESCP) outlines the processes and activities at Saraji Mine (SRM) to minimise erosion and the release of sediment to receiving waters as a result of mining and ancillary activities in accordance with Environmental Authority EPML00862313 (the **SRM EA**).
- 2 This ESCP also meets BHP Mitsubishi Alliance (BMA) obligations as prescribed by the **BHP Environment Global Standard**.
- 3 This ESCP is developed in accordance with BMA STD Erosion & Sediment Control and Mine Affected Water Standard (Hereafter referred to as BMA-STD-0030).

1.2 Scope

- 4 This ESCP describes planning, operational and reporting requirements at SRM for minimising environmental impacts within the defined area of influence as required under **Condition F33** of the **SRM EA**.
- 5 This ESCP outlines the required management of erosion and sedimentation resulting from operational activities authorised under the **SRM EA**. The ESCP forms part of the SRM Environmental Management System (EMS) and shall be implemented in conjunction with the **SRM PLN Water Management Plan**.
- 6 The objectives of this ESCP include but are not limited to:
 - a Minimising and mitigating erosion and sedimentation, as well as erosion impacts associated with clearing of vegetation along banks of drainage lines;
 - b Preventing the degradation of water quality resulting from erosion and sedimentation through continued monitoring and improvement measures;
 - c Separation of runoff from disturbed and undisturbed areas where practicable;
 - d Diversion of water from disturbed catchments into appropriate control structures;
 - e Diversion of clean water away from areas of existing or planned disturbance;
 - f Rehabilitation of disturbed areas;
 - g Improving the integrity of areas prone to erosion and sedimentation through temporary and permanent erosion, drainage, and sediment control techniques; and
 - h The provision of information necessary to implement effective erosion, drainage, and sediment control measures.
- 7 This ESCP covers the roles and responsibilities and is applicable to all personnel involved in planning, exploration, operational and closure activities at SRM.

2 Environmental Authority and Commitments

2.1 Environmental Authority

- 1 SRM has an obligation to comply with all conditions prescribed in the **SRM EA**. The applicable conditions of the **SRM EA** relevant to the development this ESCP are outlined below in **Table 1**.
- 2 In addition to the ESCP development specific conditions outlined in **Table 1**, other relevant conditions to the management of erosion, drainage and sedimentation are outlined in **Table 2**.

Condition	Requirement
F33	Stormwater and water sediment controls An Erosion and Sediment Control Plan must be developed by an appropriately qualified person for all stages of the mining activities on the site, and must include an Implementation Plan.
F34	The Erosion and Sediment Control Plan, including the Implementation Plan, required by condition F33 must be implemented to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.
F35	The Erosion and Sediment Control Plan required by condition F33 must be reviewed each calendar year by an appropriately qualified person.
F36	By 30 November 2026 , the environmental authority holder must complete a study/ies into long-term mitigation measures for erosion and sediment management at the site. The study must be completed by an appropriately qualified person and must: <ul style="list-style-type: none"> a) investigate the feasibility of erosion and sediment control measures for each catchment, and must: <ul style="list-style-type: none"> i prioritise rehabilitation as a long-term measure; ii consider long-term mine planning; iii present a feasible solution to be implemented for each area; b) be designed and implemented in accordance with the design standards and criteria contained in the Water Management Plan required by condition F29 and the Erosion and Sediment Control Plan required by condition F33; and c) consider the ongoing monitoring and maintenance of the measures; d) consider State and Federal regulatory approvals that may be required for each of the measures; and e) consider measures that may need to be implemented through the Progressive Rehabilitation and Closure Plan.
F37	By 31 January 2027 , the environmental authority holder must submit to the administering authority a report that has been prepared by an appropriately qualified person, which includes: <ul style="list-style-type: none"> a) a summary of the findings of the study required by condition F36; b) details of the actions to be implemented; and c) a schedule for completion of the actions.
F38	By 31 March 2027 , the environmental authority holder must update the Erosion and Sediment Control Plan, including the Implementation Plan, required by condition F33 to include the outcomes of conditions F37(b) and F37(c) .
F39	On 31 July 2021 , and by 31 July each year thereafter, the environmental authority holder must provide a report to the administering authority that includes: <ul style="list-style-type: none"> a) a summary of the actions completed in accordance with the Implementation Plan required by condition F33 during the previous 12 month period, between 1 July and 30 June, including before and after photographs and designs, where appropriate; b) a summary of any amendments made to the Implementation Plan by the environmental authority holder in the previous 12 months; and c) a list of those catchments which have been removed from the Implementation Plan due to all actions for those catchments having been completed.
F40	A report must be submitted to the administering authority on the completion of the Implementation Plan required by condition F33 , which includes: <ul style="list-style-type: none"> a) evidence of completion of each action; b) a map which shows: <ul style="list-style-type: none"> i the location (including GPS coordinates) of the erosion and sediment control measures and infrastructure established within each catchment; ii the direction of runoff within the catchment; and iii creeks and tributaries within the catchment, identifying their direction of flow; and c) details of ongoing monitoring and maintenance requirements of any works required as an outcome of each action.

Table 1: SRM EA conditions relevant to the development and implementation of an ESCP.

Condition	Requirement
A2	<p>Prevent and/or minimise likelihood of environmental harm</p> <p>In carrying out the environmentally relevant activities, the environmental authority holder must take all reasonable and practicable measures to prevent and/or minimise the likelihood of environmental harm being caused. Any environmentally relevant activity, that, if carried out incompetently, or negligently, may cause environmental harm, in a manner that could have been prevented, shall be carried out in a proper manner in accordance with the conditions of this environmental authority.</p>
A3	<p>Maintenance of measures, plant and equipment</p> <p>The environmental authority holder must ensure:</p> <ul style="list-style-type: none"> a) that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; b) that such measures, plant and equipment are maintained in a proper condition; c) that such measures, plant and equipment are operated in a proper manner; and d) that all instruments and devices used for the measurement or monitoring of any parameters under any condition of this environmental authority are properly calibrated.
F1	<p>Contaminant Release</p> <p>Contaminants that will or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the mining activities, except as permitted under the conditions of this environmental authority.</p>
F12	<p>Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.</p>
F26	<p>Water General</p> <p>All determinations of water quality and biological monitoring must be:</p> <ul style="list-style-type: none"> a) performed by a person or body possessing appropriate experience and qualifications to perform the required measurements; b) made in accordance with methods prescribed in the latest edition of the administering authority's <i>Monitoring and Sampling Manual</i>; c) collected from the monitoring locations identified within this environmental authority, within ten hours of each other where possible; d) carried out on representative samples; and e) analysed at a laboratory accredited (e.g. NATA) for the method of analysis being used. <p><i>Note: Condition F26 required the Monitoring and Sampling Manual to be followed and where it is not followed because of exceptional circumstances this should be explained and reported with the results.</i></p>
F27	<p>The release of any contaminants as permitted by this environmental authority, directly or indirectly to waters, other than internal water management infrastructure that is installed and operated in accordance with a Water Management Plan that complies with conditions F29 and F30 inclusive:</p> <ul style="list-style-type: none"> a) must not produce any visible discolouration of receiving water; and b) must not produce any slick or other visible or odorous evidence of oil, grease or petrochemicals nor contain visible floating oil, grease, scum, litter or other objectionable matter.
F41	<p>Stormwater, other than mine affected water, is permitted to be released to waters from:</p> <ul style="list-style-type: none"> a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition F33; and b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with conditions F29 to F30 inclusive, for the purpose of ensuring water does not become mine affected water; and c) catchments the subject of the current version of the Implementation Plan required by condition F33.

Table 2: Additional SRM EA conditions relevant to controlling erosion and sedimentation

2.2 Environmental Commitments

- 3 This ESCP is furthermore designed to satisfy internal BHP policies and commitments set out in the following documents:
 - a *BHP Environmental Management Global Specification*
 - b *BHP Water Management Global Standard*
 - c *BHP HSEC Reporting, Event Management, and Investigation Global Standard*
 - d *BHP Risk Management Global Standard*

3 Overview of Operations

- 1 The SRM complex is located 20 km north of Dysart in the Bowen Basin coalfields. The mine encompasses Mining Leases (ML) 1775, ML1782, ML1784, ML2360, ML2410, ML70142, ML70294, ML70298, ML70328 and ML700021 totaling approximately 10,500 hectares. These leases are held by the BMA joint venture partners (the SRM EA holders).
- 2 The open cut operation consists of ten pits over a strike length of approximately 30 kilometres. The open cut operation also consists of concurrent dragline and truck/shovel operations and one coal handling and processing plant (CHPP) where mined coal is sorted, washed, and blended to meet supply demand specifications.
- 3 An overview of the site layout and catchment delineation is shown below in Figure 1.

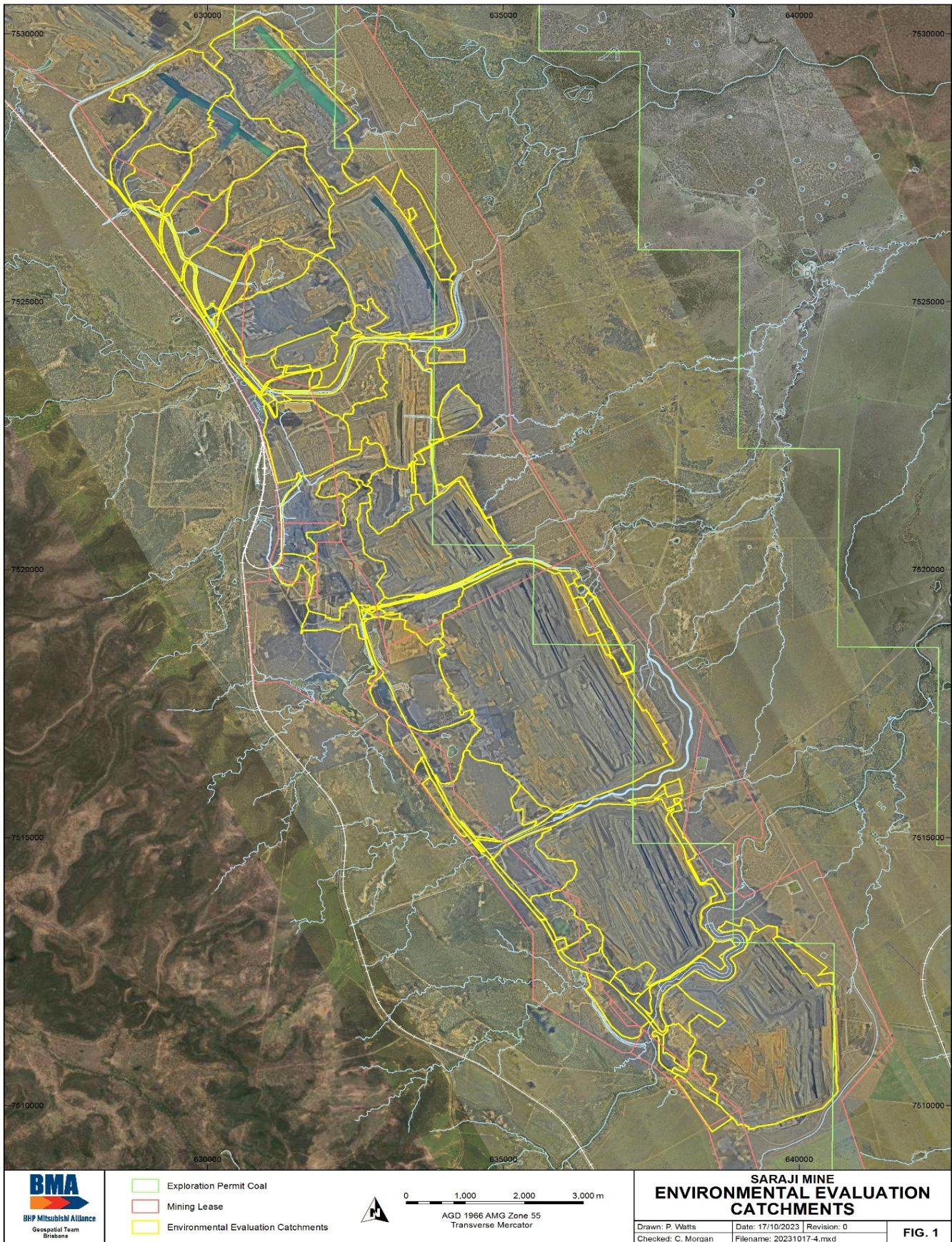


Figure 1: SRM site layout and high level catchment delineation

4 Baseline Environment

4.1 Pre-mining Land Use

- 1 The historic land use of SRM varied between dryland forage cropping for cereal crops on fertile cracking clay scrub soils in southern areas of the leases, moderate density grazing on coarser textured Brigalow clay soils and, lower density grazing on texture contrast eucalypt plains and tertiary lateritic rises.

4.2 Climate

- 2 A summary of long-term regional climatic data is presented below in **Table 3: Regional Climatic Data (Moranbah Water Treatment Plant data 1972-2012)**
- 3 . This data has been obtained from the Bureau of Meteorology (BoM) Station, Moranbah (Station Number 034038).

Climatic Characteristic	Value
Annual Average Rainfall	614.2mm
Annual Average Evaporation	2336mm
Mean Maximum Temperature	29.7°C
Mean Minimum Temperature	16.7°C
Mean Max Temperature Range	23.7 - 34.0°C
Mean Min Temperature Range	9.9 - 21.9°C
Prevailing Wind Direction	E-SE at 2 to 5 m/sec

Table 3: Regional Climatic Data (Moranbah Water Treatment Plant data 1972-2012)

- 4 The climatic conditions of SRM are classified as sub-tropical. Saraji rainfall data shows that 80% of annual rainfall is received in the 'Wet Season' as described in the SRM EA (November to March), with 47% of the annual total received in the three-month period December to February. The average number of rain days per year is 51, with 31 of these occurring during the Wet Season period. Rainfall of medium to high intensity can occur during this Wet Season period due to cyclonic rain depressions or summer thunderstorms.
- 5 A typical rainfall pattern for SRM may include:
 - a Thunderstorms during late spring/early summer (i.e. October – December) with erratic frequency and rainfall
 - b Wet season rainfall (typically through January – March) with heavy soaking falls for periods of up to several days.
 - c Dry season winter/early spring (i.e. April – September) with infrequent falls from passing cold fronts.
- 6 Open water surface evaporation exceeds median rainfall by a significant margin, and it is only during periods of storm or cyclone related activity that rainfall exceeds evaporation.
- 7 High intensity rainfall events are common and surface runoff can be substantial. Water stress is expected to be a significant factor in the performance of future rehabilitation of disturbed land, particularly on slopes or where topsoil thickness is limited, and the underlying spoil may be compacted.
- 8 Long term climate data used to assist with the statistical description of prevailing climatic conditions has been sourced from the BoM climate data at the Moranbah Water Treatment Plant. The Intensity-Frequency-Duration (IFD) chart for SRM is provided in **Figure 2**.

Requested coordinate Latitude: -22.4201 Longitude: 148.2903
Nearest grid cell Latitude: 22.4125 (S) Longitude: 148.2875 (E)

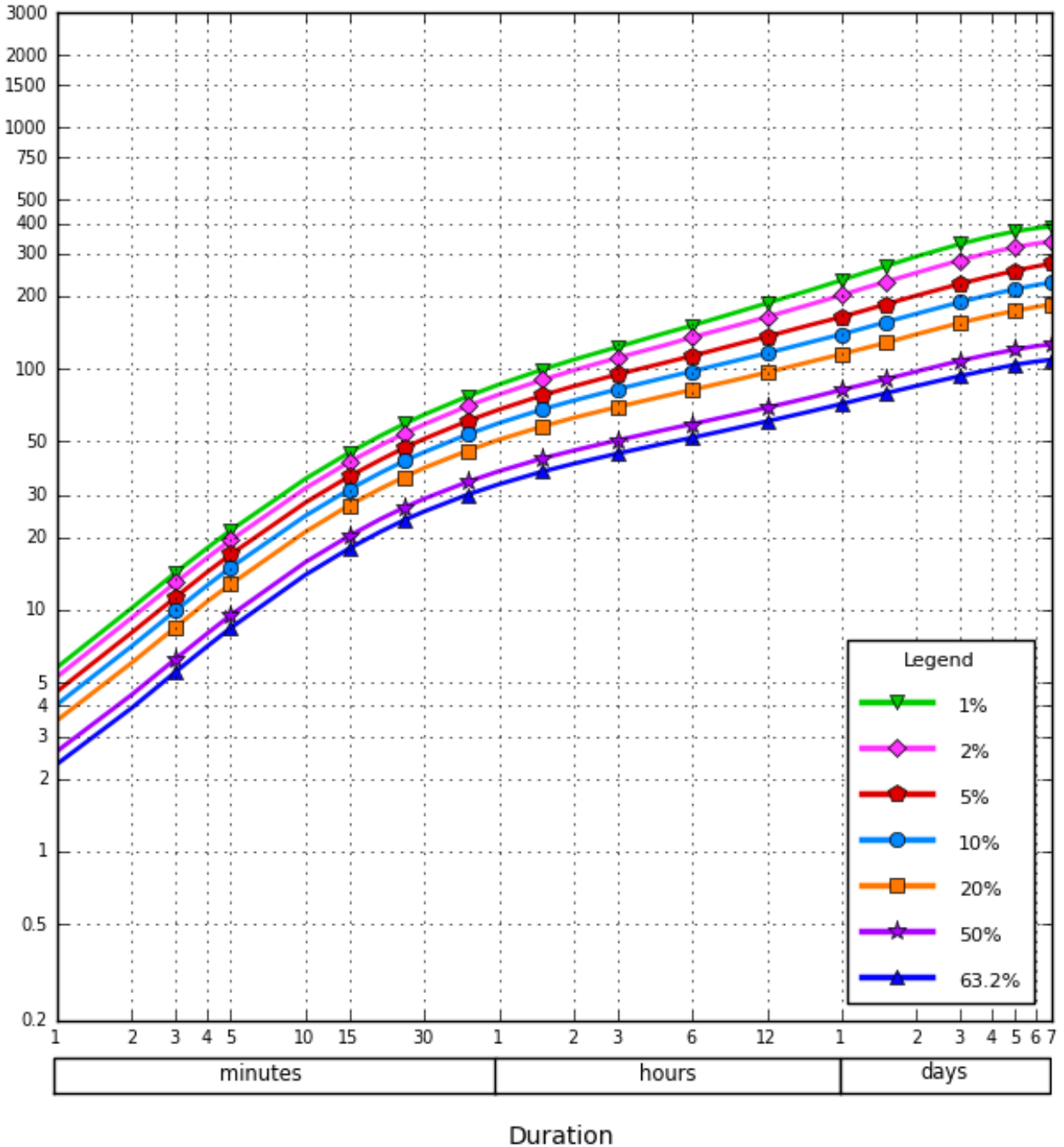
IFD Design Rainfall Depth (mm)

Issued: 19 July 2024

Rainfall depth in millimetres for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

Depth
(mm)

*AEP - Annual Exceedance Probability
 **EY - Exceedance per Year



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Figure 2: SRM IFD Chart up to 1 in 100 sized rainfall events

4.3 Hydrology and Topography

- 9 SRM is located in the Western upland tributaries of the Isaac River sub-catchment. The topography of SRM is dominated by the Cherwell Range running along the western boundary of the mine, by flat to gently sloping landforms, and by low rolling hills draining into ephemeral tributaries which flow to the Isaac River.
- 10 The local drainage regime comprises of eight ephemeral creeks and minor tributaries which flow eastwards across the mining operation. These creeks have been diverted as the mine has been progressively developed. The eight (8) diversions, from North to South, are described in **Table 4**.
- 11 The catchments associated with the 8 diversions at SRM are shown in **Error! Reference source not found..**

Creek	Description
Boomerang Creek	Diverted within Peak Downs Mine, however the downstream reaches flow through the North-Eastern lease areas of SRM (Jacaranda Pit Highwall)
Plumtree Creek	Diverted South into Hughes Creek.
Hughes Creek	Diverted and passes between Coolibah and Bauhinia Pits.
Barretts Creek	Diverted North into Hughes Creek Diversion.
One Mile Creek	Diverted and passes between Dogwood and Ebony Pits.
Spring Creek	Diverted and passes between Ebony and Grevillea Pits.
Southern Creek	Diverted South into Phillips Creek.
Phillips Creek	Diverted and passes between Grevillea and Hakea Pits.

Table 4: Creek diversions at SRM

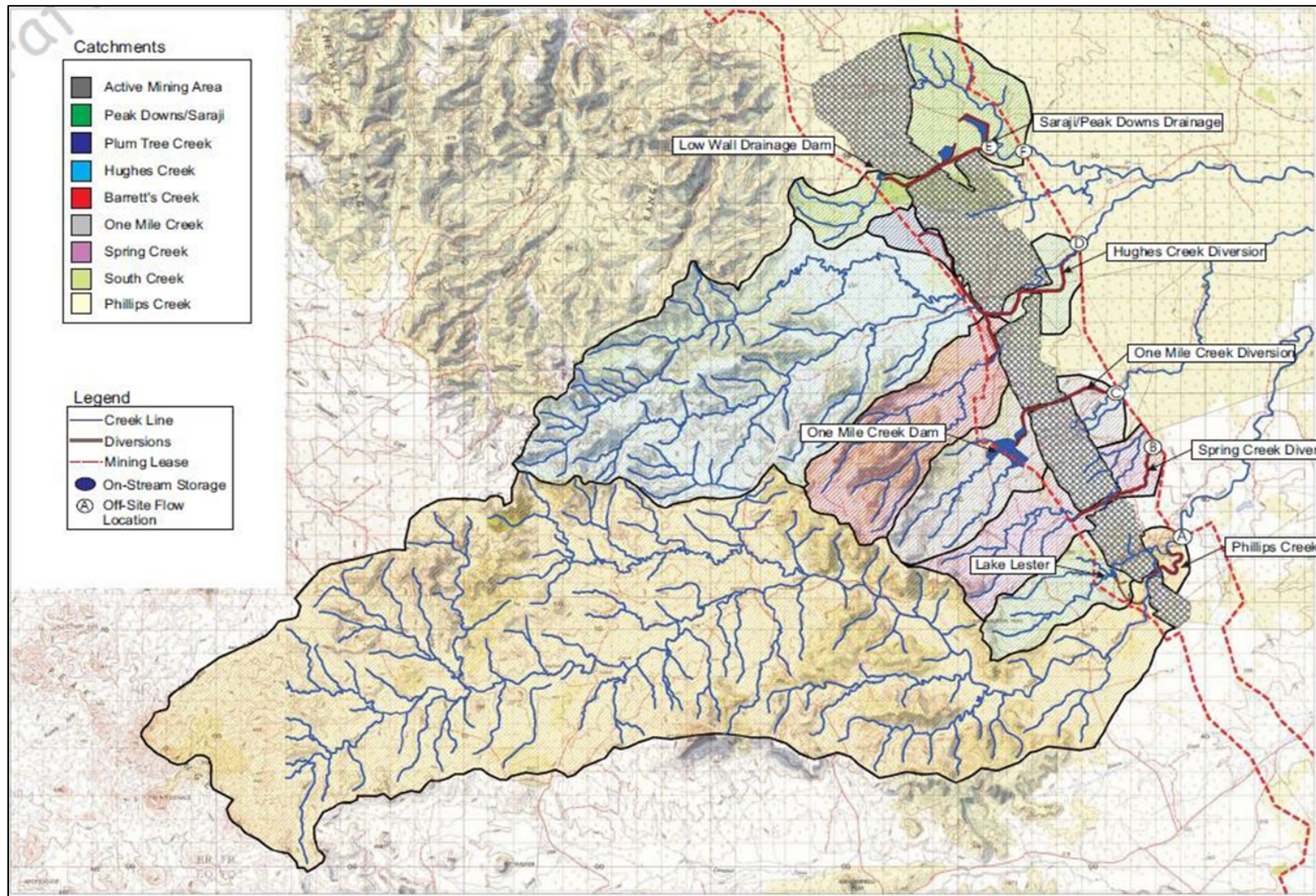


Figure 3: Catchments for the 8 Creek diversions at SRM

4.4 Soil and Spoil Characteristics

- 12 The two dominant surface geological groups at SRM are the erosional surfaces of highly weathered Permian sediments and depositional surfaces within the Tertiary zone.
- 13 Soils of the area have formed from weathered parent materials under the influence of time, land relief, moisture, temperature changes, and organisms. Predominant soil types are generally related to their position on the slopes of the catchment and can be broadly divided into the following types:
 - a Mountains and Ridges Assemblage: Shallow, coarse textured and rocky siliceous sand (uniform soils);
 - b Stony Hills Assemblage: Hard pedal duplex soils with colour range from red through brown to yellow or mottled yellow, neutral to alkaline;
 - c Foot slopes and Lowlands Assemblage: Hard pedal duplex soils with colour range of red, brown, and mottled yellow, alkaline reaction;
 - d Weathered Clay Plains Assemblage: Hard pedal duplex soils with colour range of red, brown, yellow, and black, alkaline reaction;
 - e Brigalow Plains Assemblage: Self-mulching, cracking clay. Uniform soil, colour range of red and brown to black; and
 - f Alluvial Plains and Terraces Assemblage: Hard pedal duplex soils with colour range or red, brown, and yellow.
- 14 Based on a review of SRM's long term rehabilitation monitoring sites and various spoil investigations across Central Queensland, five spoil types have been identified as likely to result from mining processes at SRM. These spoil types and their characteristics are listed below:
 - a Reactive basaltic influenced Tertiary – Quaternary clays and / or recent clayey Quaternary alluvium associated with current streams.
 - b Predominantly fresh, relatively stable, grey Permian siltstones and interbedded fine to medium grained, lithic, semi-competent sandstones, including box cut type materials with poorer characteristics and behavior that are dominated by weathered, fine grained, lithic sandstone / siltstones.
 - c Unconsolidated, relict alluvial / colluvial Cainozoic sediments sourced from the dissection of Tertiary and Permian sedimentary landscapes. Deposits are typically fine sandy, either loamy or clayey materials that are typically neutral to alkaline, dispersive, and usually saline.
 - d Pallid or mottled (white, red, purple) in-situ Tertiary clays that are typically acidic, often highly saline, and dispersive.
 - e Dark, carbonaceous Permian siltstones and shales or fresh and / or oxidized coal, rejects and tailings. Carbonaceous materials have the potential to be acid generating and can develop extremely low pH and high salinity. Water holding capacity is very low.
- 15 A description of geological units and soil erodibility is provided in **Table 5**.

Characteristic Lithology	Description	Erosion Potential
Quaternary Alluvium		
Fine sandy or silty materials	Recent sandy or silty Quaternary alluvium associated with current streams.	Moderate sediment contribution expected when freshly disturbed.
Unconsolidated Tertiary – Quaternary Calcareous Sediments and Clayed Alluviums		
Reactive clays	Reactive basaltic influenced tertiary-quaternary clays and/or recent clayey Quaternary alluvium associated with current streams. Materials include reactive basaltic influenced clays developed from transported sediments of mixed origin (basaltic as well as erosion products or Tertiary and Permian landscapes); as well as heavy alluvial clay deposits on major floodplains. This group also includes box cut type materials with similar characteristics and behaviour that are dominated by unconsolidated calcareous sediments and/or basaltic reactive clays.	High sediment contribution expected.
Unconsolidated calcareous sediments	Unconsolidated, basaltic derived, relict alluvial/colluvial calcareous Tertiary-Quaternary sediments. Deposits are typically whitish or fawn coloured, powdery calcareous (basaltic derived) materials characterized by rounded basaltic/sandstone gravel inclusions.	High sediment contribution expected.
Unconsolidated Cainozoic Sediments		
Fine sandy clays	Unconsolidated, relict alluvial/colluvial Cainozoic sediments sourced from the dissection of Tertiary and Permian sedimentary landscape. Deposits are typically fine sandy, either loamy or clayey materials that are typically neutral to alkaline, dispersive, and saline.	High sediment contribution expected. Soils can be difficult to revegetate effectively.
Tertiary Basalt		
Fresh or weathered basalt	Restricted unit. Occurs either as relatively pure in situ fresh/weathered Tertiary basalt rock, or more commonly as box cut type materials dominated by fresh or weathered Tertiary basalt but with a mix of weathered Permian and/or unconsolidated Cainozoic sediments. Basaltic derived box cut type materials exhibit better characteristics and behaviour than other box cut type materials.	Sediment generation from disturbed areas would be considered low.
Permian Sedimentary Rocks (Predominantly Fresh)		
Labile mudstones, siltstones and shales	Predominantly fresh, labile, fine grained Permian sedimentary rocks (mudstones, siltstones and/or shales) that weather readily to produce clayey materials.	High sediment contribution expected. Soils can be difficult to revegetate effectively.
Semi competent siltstones and fine to medium grained sandstones	Predominantly fresh, relatively stable, grey Permian siltstones and interbedded fine to medium grained, lithic, semi-competent sandstones, or less commonly interbedded, relatively labile feldspathic sandstones and/or fine grained, calcareous sedimentary rocks (sandstones/shales). Weathers readily to produce relatively clayey spoil materials.	Moderate sediment contribution expected when freshly disturbed, but this would decline with time and rock armouring.
	This group also includes box cut type materials with poorer characteristics and behaviour that are dominated by weathered, fine grained, lithic sandstones/siltstones.	Disturbed areas have high levels of dispersion and moderate runoff and erosion. Some rock armouring occurs with time.
Acid-forming sedimentary rocks	Fresh Permian sedimentary rocks characterized by a mineralogical suite with significant pyrite content. Acid generation is normally higher than neutralising capacity of the materials and net spoil acidity is expressed.	Moderate sediment contribution expected when freshly disturbed, but this would decline with time and rock armouring.
Coal Enriched Materials		
Carbonaceous materials	Dark, carbonaceous Permian siltstones and shales or coal enriched spoil/waste products.	The clay and silt fraction are easily mobilised, however only moderate sediment contribution is expected, mainly due to dissociation of the clay with the strong acidity present.

Table 5: Predominant geology units and soil erodibility

5 Planning

- 1 ESC should be incorporated into and considered during the planning stages of any activity or project that includes ground disturbance, or a material change in land use.
- 2 Activities which may cause erosion and sedimentation impacts include, but are not limited to:
 - a Vegetation or land clearing;
 - b Stockpiling of topsoil, coal, imported aggregate or other material;
 - c Earthworks and machinery movement;
 - d Mine development resulting in newly exposed surfaces;
 - e Grading of roads and associated traffic;
 - f Runoff from recently established rehabilitation areas progressing towards a stable cover;
 - g Runoff from impervious surfaces (buildings and roads); and
 - h Water release activities
- 3 The Permit to Disturb (PTD) process is used to control and minimise disturbance activities. The PTD process includes consideration of erosion and sedimentation impacts and the provision of appropriate controls. For further information refer to the ***BMA PRO Permit to Disturb Procedure***.

5.1 Water Types

- 4 Water managed at SRM is categorised into the following 4 groups:
 - a **Raw** water supplied to site by pipeline, truck, or other infrastructure.
 - b **Diverted** water, which refers to stormwater runoff that has not come into contact with mining processes or land disturbed by mining and associated activities, for example:
 - i Stormwater runoff from undisturbed areas within or around the active disturbance site (whether diverted around site or not);
 - ii Stormwater runoff from stable rehabilitated areas not prone to erosion
 - c **Sediment affected** stormwater, which may include runoff from areas that are disturbed by mining operations and potentially contains sediment loads but are not likely to have properties that would cause environmental harm.
 - d **MAW** as defined in the ***SRM EA***, including but not limited to the following:
 - i Pit water;
 - ii Runoff from areas that are potentially contaminated, such as coal stockpiled, industrial areas, processing areas, and areas of waste rock;
 - iii Groundwater ingress into the pits; and
 - iv Sewage Effluent;
- 5 This ESCP outlines strategies for the management of sediment affected stormwater and diverted water at SRM operations, strategies to manage MAW are detailed in the ***SRM PLN Water Management Plan***.
- 6 The following steps should be undertaken in ESC management to facilitate the correct design process:
 - a Collect relevant data on the area of the activity or project, including material characterisation, location, size/extent, duration of the activities and the associated catchment.
 - b Consult with the SRM Environment Operations Department to determine if the associated water can be managed as stormwater. This step may require the collection and review of water quality data.
 - c If the water can be managed as stormwater, consult with the relevant stakeholders to determine the appropriate controls and design requirements.

- d If the water is determined to be MAW, refer to the **SRM PLN Water Management Plan** for further guidance on management of the water. Where practicable, erosion controls shall still be implemented to reduce the deposition of sediment into the MAW structures.

5.2 Principles of Erosion and Sediment Control

- 7 In line with the requirements of the **SRM EA**, this ESCP adopts the three foundations of ESC as outlined below:
 - a Erosion control – prevention or minimisation of erosion caused by runoff on disturbed surfaces.
 - b Drainage control – a secondary erosion control, prevention or minimisation of soil erosion caused by concentrated flows. Appropriate management and separation of different water types through or around the area of concern.
 - c Sediment control – trapping or retention of sediment generated from either overland flow or concentrated flow.
- 8 Best practice sediment control measures cannot exclusively provide adequate environmental protection; therefore, erosion and drainage controls shall be implemented as supporting controls. Rehabilitation shall be prioritised as the preferred method of erosion control.
- 9 For ESC measures to be effective the following fundamentals are required:
 - a Integrate ESC measures into the planning phases of mine operations;
 - b Separate catchments by water types and control water movement through the site;
 - c Minimise the duration and extent of disturbed surfaces exposure where possible;
 - d Promptly stabilise disturbed areas where possible;
 - e Maintain all ESC measures in proper working order; and
 - f Monitor the site and adjust ESC practices as required
- 10 The *Best Practice Erosion and Sediment Control Guidelines 2008 (International Erosion Control Association (IECA))* outlines the key guiding principles (**Table 6**) that should be considered during the planning stage of an activity or project and re-enforced by the PTD process.

ESC Principles (IECA 2008)	Example Applications for Mining ESC
Plan for and design suitable ESC for each site/project prior to disturbance	Development and implementation of SRM ESCP
Minimise the extent and duration of soil disturbance and exposure to erosion	Minimising disturbance footprint Scheduling/timing of works Progressive rehabilitation
Control water movement through the site	Clean water diverted around disturbed areas Permanent and temporary drainage features Minimal velocity driven designs to minimise soil erosion/bulk sediment transfer
Minimise soil erosion and conservation of topsoil	Design of erosion control features to minimise soil loss (e.g. slope grades and length, soil surfaces, scour protection) Conservation of topsoil resources to use for rehabilitation post disturbance.
Maximise sediment retention on the site	Design of sediment dams, basins, traps, fences for sediment entrapment
Promptly stabilise and rehabilitate disturbed areas	Scheduling of rehabilitation or revegetation Rehabilitation plant species selection
Monitoring and maintenance of ESC to maintain required performance standards	Scheduling and budgeting of maintenance strategies (e.g. desilting) Routine and Event Based monitoring of ESC performance

Table 6: ESC guiding principles derived from (IECA 2008)

6 Design

6.1 Commencement of Design Standards

- 1 The design standards set out in this ESCP are aligned with ***BMA-STD-0030***.
- 2 For water control infrastructure designed or constructed before April 2020, BMA has developed an Erosion and Sediment Control Implementation Plan (ESCIP) to bring existing infrastructure into compliance with contemporary design standards (Refer to Appendix B).
- 3 Works conducted under the ESCIP prior to August 2022 have been implemented to the interim standard outlined in ***BMA-STD-0030***.
- 4 Works conducted under the ESCIP post August 2022 will be implemented to meet the design standards set out in this ESCP.
- 5 The design standards adopted for ESC measures are based on the catchment risk rating determined by utilising **Table 7**.

6.2 Relevant Guidelines

- 6 ESC control measures shall be designed with consideration of the guiding principles outlined in the two (2) publications below:
 - a ***BMA-STD-0030***; and
 - b Best Practice Erosion and Sediment Control Guidelines (IECA 2008)

6.3 Key Considerations

- 7 The design of ESC is influenced by several site and project specific characteristics. These include but are not limited to:
 - a The scale and type of the disturbance;
 - b The soil types and/or slopes;
 - c The locality of the disturbance;
 - d Proximity to water courses or drainage features;
 - e Any site-specific legislative, hydraulic, and structural design requirements;
 - f Other constraints such as available space, agreed maintenance frequencies, and any sensitive receptors.
- 8 The design of erosion and sediment control structures is to be implemented as outlined in **Figure 4**.

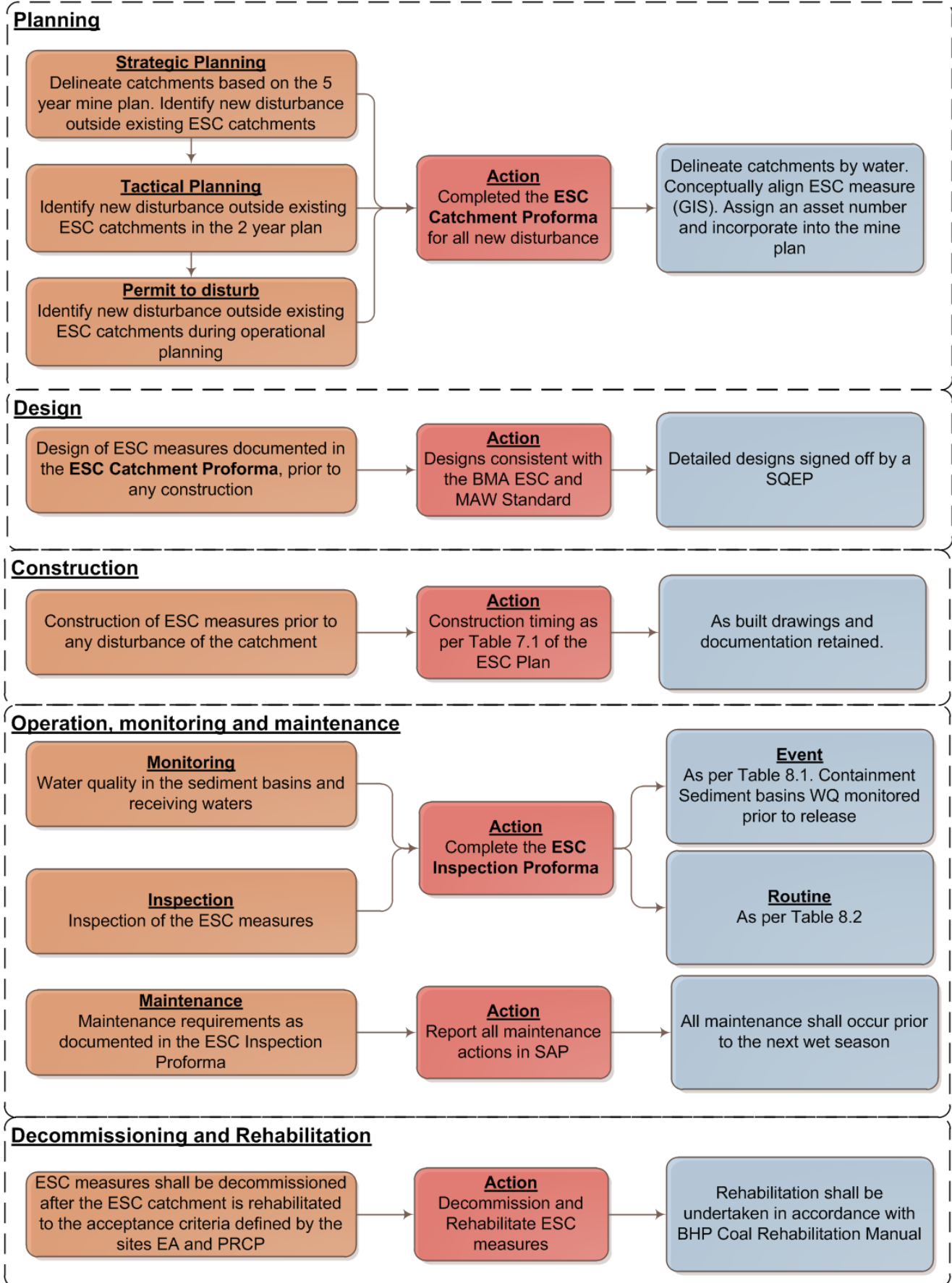


Figure 4: Implementation pathway for the design of ESC structures at SRM

6.4 Catchment Delineation

- 9 ESC planning shall occur for each catchment where new disturbance areas are identified (e.g. Highwall advancement identified in tactical or strategic mine plan). A single activity or project may extend across several delineated catchments.
- 10 Catchments shall be classified by their expected water type, land use, or recorded runoff water quality. Where more than one runoff water type occurs in a catchment, the water type with the poorest water quality is to be adopted for the catchment. Alternatively, drainage works are to be used to refine the catchment delineation to have a uniform water type.

6.4.1 Mine Affected Water Catchments

- 11 MAW catchments are defined in accordance with the SRM EA definition of MAW.
- 12 MAW catchments shall be minimised where practicable using drainage controls.

6.4.2 Stormwater Catchments

- 13 Stormwater catchments include disturbed areas that do not meet the definition of MAW and may include, but are not limited to the following:
 - a Unrehabilitated and partially rehabilitated spoil emplacements;
 - b Disturbed pre-strip areas;
 - c Civil earthworks;
 - d Topsoil stockpiles;
 - e Haul roads without rejects used as road base;
 - f Hardstand areas (excluding industrial and workshop areas); and
 - g Access tracks.
- 14 Stormwater runoff shall be discharged through release points associated with ESC structures that have been installed in accordance with this ESCP.

6.4.3 Diverted Water Catchments

- 15 Diverted Water includes runoff from areas where water quality is unaffected by mining operations including but not limited to the following:
 - a Undisturbed areas unaffected by mining; and
 - b Rehabilitated areas that have achieved the rehabilitation acceptance criteria defined by the **SRM EA**; and
 - c Exploration areas where ground disturbance for seismic works is negligible for creating potential erosion (e.g., slasher skimming the ground surface). If works are not negligible for creating potential erosion, the area shall be deemed a sediment affected stormwater catchment, with appropriate controls applied.
- 16 Diverted water catchments shall be directed around disturbed areas to reduce the size and cost of ESC and MAW measures.
- 17 Diverted water shall be returned to the environment where practicable to reduce associated freshwater harvesting and minimise impacts to the sediment transport and flow regime of receiving waters.

6.5 Catchment Risk Assessment

- 18 The catchment risk assessment is completed after the catchments have been delineated and classified by water type. The catchment risk assessment process determines the risk rating for each catchment and is based on the following criteria:

- a MAW catchment;
 - b Topsoil/spoil classification;
 - c Catchment slope;
 - d Disturbed catchment area (for risk rating) and total catchment area (for dam sizing); and
 - e Duration of disturbance.
- 19 This assessment allows mine planners and operational personnel to assess the risk rating of a catchment in accordance with **BMA-STD-0030** to assist with identifying appropriate management strategies prior to the commencement of disturbance works.
- 20 Catchment risk assessments shall be completed utilising **Table 7** (Below), with the risk rating determined based on the highest risk rating out of the four categories. The risk ratings are based on recommendations from *Australian Soils and Landscapes Handbook (CSIRO, 2005)* and the *Best Practice Erosion and Sediment Control (IECA 2008)*.

Risk Rating	Soil/spoil category	Disturbed Catchment area (ha)	Duration of disturbance	Average catchment slope
Very Low	Competent material	Less than 0.5 ha	Less than 3 months	Less than 1%
Low		0.5 to 1 ha	3 to 6 months	1% to 3%
Medium	Non-dispersive topsoil	1 to 4 ha	6 months to 2 years	3% to 10%
High	Dispersive topsoil	Greater than 4 ha	Greater than 2 years	Greater than 10%
	Non-dispersive spoil			
Very High	Dispersive spoil	Any	Any	Any
MAW	Per MAW definition in Section 1.3	Any	Any	Any

Table 7: Catchment risk assessment

6.6 Erosion Control

- 21 The most cost-effective method to achieve the ESC objectives is to prevent (or minimise) erosion at the source by protecting any disturbed surfaces with some form of cover. Surface cover reduces the impact of rainfall and wind erosion. It also reduces the speed of water flowing over land.
- 22 Disturbed areas, excluding active mining areas, are to have a suitable ground cover established as soon as practicable.
- 23 Areas available for permanent rehabilitation are to be revegetated in accordance with the rehabilitation criteria in the **SRM EA**, the **BMA MAN Rehabilitation Manual**, and with the approved rehabilitation plans for the site.
- 24 Haul roads and hardstand areas will have a suitable road base to minimise erosion at the time of construction. If haul roads and hardstands use coal rejects the catchment shall be classified as MAW.
- 25 Externally draining embankment batters and haul road safety bunds are to be reshaped and appropriate erosion controls applied at the time of construction.
- 26 Topsoil stockpiles are to have appropriate erosion controls applied (vegetation preferred) as soon as practicable. If topsoil stockpiles do not have erosion controls applied, the catchment risk rating may increase due to the disturbance duration. Appropriate seed mixes can be decided in consultation with the SRM Environmental Operations Department with reference to the seed mixes prescribed in the **BMA MAN Rehabilitation Manual**.
- 27 Disturbed footprints, such as those associated with linear infrastructure, dam embankments, clean water drains and culverts, which are not available for permanent rehabilitation, but which pose an erosion risk should be stabilised. Stabilisation material and practices are contained both in the *Best Practice Erosion and Sediment Control (IECA 2008)* and in the **BMA MAN Rehabilitation Manual**.

6.7 Drainage Control

- 28 Runoff can be controlled in several ways to reduce the risk of erosion. **Table 8** outlines the options, criteria and principles that should be considered in the design of drainage controls. Designs should consider velocity and the material type and sizing required to manage those velocities.

Contributing catchment	Receiving catchment type	Catchment risk rating	Separation Design Standard (AEP)
		(see Figure 3)	
MAW	sediment affected water /Diverted	All	5%
Diverted	MAW	-	5%*
Diverted	sediment affected water	All	5%
sediment affected water	MAW	All	5%
sediment affected water	Diverted / Clean	High/Very High	5%
sediment affected water	Diverted / Clean	Low/Medium	50%

*Diverted water drains that overflow to a MAW catchment that would overwhelm the water management system is likely to be a regulated structure (significant consequence category) and will require a design standard of 0.1% AEP in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures.

Table 8: Drainage design standard for the separation of water types

6.7.1 Overview

- 29 This section outlines the drainage control measures adopted at SRM. Drainage is used to convey and separate diverted water, stormwater, or MAW. Control measures for different drainage functions are discussed as follows:
- a **Permanent drainage** – will be in place at the end of mine life;
 - b **Operational drainage** – constructed on a temporary basis to convey diverted water, stormwater, or MAW. Operational drains are also required to separate catchments of different water types.
- 30 The design standard of all drains is determined from the anticipated design life of the structure or its purpose within the water management system.

6.7.2 Operational Drainage Controls

- 31 Specific design standards applied to operational drains that convey runoff to a sediment basin include:
- a Drains constructed in soil or spoil with a high or very high-risk rating, and with a disturbance duration of medium or higher shall be topsoiled and seeded to minimise channel erosion;
 - b Drains constructed in a catchment with a high-risk rating and a slope with a medium or high-risk rating shall be lined with appropriate armouring; and
 - c Drains constructed with a slope with a high-risk rating will be lined with appropriate armouring.

6.7.3 Catchment Separation Standard

- 32 Drains or bunds are used to separate catchments of different water types. The design standard, or capacity, of all drains is determined from either the disturbance duration of the structure, or its purpose within the Water Management System.
- 33 The minimum design standard for drains or bunds that separate catchments of different water types is shown below in **Table 9**.

6.7.4 Temporary Watercourse and Drainage Line Crossings

- 34 Temporary crossings of a watercourse or drainage feature as defined by the Queensland Government watercourse identification map shall adopt the design standards shown in **Table 9**. Note that this only relates to ESC requirements.

Disturbance Duration Risk rating (see Table 7.1)	Design standard
Very Low/Low/Medium	Low level crossing
High	Culverts capacity of 39% AEP (0.5 exceedances per year)
	Structurally sound up to the 10% AEP for overtopping

Note: Table 10 only relates to ESC requirements for temporary crossings of watercourse or drainage features.

Table 9: Temporary crossing design standard

6.7.5 Drainage Controls on Access Tracks

- 35 Access tracks draining to receiving waters shall have suitable erosion and drainage control measures, such as:
- a Whoa-boys and level spreaders;
 - b Suitable road base material;
 - c Erosion control of peripheral areas disturbed as part of the road construction.

6.8 Sediment Control

6.8.1 Overview

- 36 This section outlines the sediment control measures adopted at SRM. The catchment risk assessment is used to define the required sediment control measures.
- 37 Low-risk ESC catchments shall be treated with one of the following sediment control structures:
- a Excavated sediment traps;
 - b Rock check dams; and
 - c Sediment fencing or bunds

6.8.2 Sediment Basins

- 38 Sediment basins can be designed for a different operational function depending upon the risk rating as described in **Table 10**:
- a **'Flow-through'** – Designed to passively drain the sediment basin within 5 days using either a riser pipe or floating decant;
 - b **'Containment'** – Designed to contain the water for monitoring or treatment prior to dewatering, or to pump to the mine water management system.
- 39 All sediment basins shall have a consequence assessment in accordance with **Condition G1** of the **SRM EA**.

Risk Rating	Sediment control design standard
Very Low	No controls
Low	Supplementary sediment controls
Medium	FT ^a 80%ile 5 day
High	FT ^a 90%ile 5 day
Very High	Containment basin (95%ile 5 day)
MAW	MAW Dam

^a FT = 'Flow-through' sediment basin

Table 10: Sediment control design standard

7 Construction

7.1 Overview

- ESC measures shall be put in place prior to disturbance to reduce sediment laden stormwater discharging to the receiving environment. The scheduling and timing of works is an important element of any construction activity.

7.2 Construction Timing

- The timing of the construction of new ESC measures considers the risk of erosion during the construction phase. Where possible, construction of ESC measures shall occur during dry periods.

Table 11: Actions based on average monthly rainfall during construction period.

- The risk rating and the required action for the construction timing based on the average monthly rainfall is shown below in **Table 11**.

Risk Rating	Average monthly rainfall (mm)	Months	Action
Low	Less than 45	April, May, June, July, August, September, October	Catchments with low erosion risk don't need sediment controls if disturbance is less than 3 months
Medium	45 to 100	March, November	Normal ESC Planning
High	100 to 225	January, February, December	Reschedule work where possible
			No work within a watercourse
			Sediment basins required if disturbance is greater than 1 ha

Table 11: Actions based on average monthly rainfall during construction period.

7.3 Construction Records and Management of Change

- Management of Change (MoC) process is to be followed for construction of ESC infrastructure.
- Each sediment basin and drain shall be registered in SAP with a Functional Location as part of the MoC process.
- Construction designs, records, testing, operational rules, as-built survey, basis of design and other Engineering documentation are to be saved against the Functional Location in SAP and/or Documentum as a minimum.
- Inspection regimes are to be setup in SAP as part of project close out and prior to handover to operations.

8 Operation

8.1 Sampling and Inspections

- 1 Sampling and inspection regimes have been put in place to monitor the performance of ESC and MAW control structures at SRM.
- 2 Inspections shall be conducted routinely, and as required on an event basis (**Table 12**). The **minimum** details that shall be recorded during each inspection includes:
 - a Sediment storage volume;
 - b Details of any drainage, erosion, and sediment control measures with signs of erosion/scour that require maintenance;
 - c Occurrences of excessive sediment deposition; and
 - d Embankment toe, crest, spillway for cracking, settlement, slumping, erosion, scour, overtopping and seepage.

Control type	Minimum frequency
Erosion control infrastructure	Post-wet season inspections (prior to May)
Drainage, sediment basins and MAW dams	Pre (prior to November) and post wet season inspections

Table 12: Inspection requirements

- 3 Persons undertaking inspections shall meet the requirements for ‘Suitably Qualified’ under the **SRM EA**.
- 4 To assist monitoring and maintenance the sediment storage volume shall be clearly marked on each dam.
- 5 Water quality sampling shall occur within a week of the rain event that triggers the sampling, subject to being safe to do so and access permitting. Water quality sampling minimum requirements are outlined below in **Table 13**.

Catchment risk rating	Minimum Sampling (Dam Water) Requirements
All ESC Dams	<p>Initial:</p> <ul style="list-style-type: none"> • Post-construction, sample following a minimum of (3) rain events to verify performance and establish baseline water quality. • At least one sample must use the full Receiving Environment Monitoring Program (REMP) analysis suite, followed by at least (2) measurements of physical parameters using a hand-held water quality probe. <p>Event-based:</p> <ul style="list-style-type: none"> • Sample sediment dams that have the potential to discharge to the receiving environment following at least one rainfall event per year, using the full REMP analysis suite. Where multiple dams receive inflows from the same catchment disturbance type, sampling may be a representative subset (at the discretion of the site HSE team). <p>Ongoing:</p> <ul style="list-style-type: none"> • As per REMP EA requirements
All MAW Dams that have Released	<ul style="list-style-type: none"> • Sample as per the Environmental Authority.

Table 13: Minimum water quality sampling requirements

- 6 An annual sampling schedule has been developed to cover the ESC and MAW Standard requirements and is available from the site Environmental Operations Department. The schedule will be reviewed annually based on the findings from the previous year.
- 7 Any failure of effectiveness of an ESC structure must be entered as an event in the SRM Event Management System (EMS).
- 8 Each ESC structure with an embankment shall undergo an annual structural inspection by the SRM Responsible Dam Engineer (RDE).

9 Inspection, Monitoring and Maintenance

- 1 Inspections of ESC controls is important to ensure ongoing performance effectiveness.
- 2 The inspections should assess the condition of the ESC or MAW control structure. Where practicable, turbidity water quality data shall be obtained to monitor the effectiveness of the control.
- 3 All inspections and required maintenance following inspections must be documented in a register.

9.1 Inspections

- 4 **Error! Reference source not found.** Routine inspection requirements for ESC and MAW controls to be completed at SRM are listed above in section 8.2, **Table 12**.
- 5 Event based inspection requirements for ESC and MAW controls to be completed at SRM are listed below in **Table 14**.

<i>Table 14: Event based inspection requirements</i>	Trigger for Event based Inspection
Structure Containment Capacity	
<50% AEP	1 in 1.58-year event (e.g. Annually or 71mm in 24 hours)
50% AEP	1 in 2-year event (e.g. 81mm in 24 hours)
20% AEP	1 in 5-year event (e.g. 115mm in 24 hours)
10% AEP	1 in 10-year event (e.g. 130mm in 24 hours)
5% AEP	1 in 20-year event (e.g. 164mm in 24 hours)
1% AEP	1 in 100-year event (e.g. 233mm in 24 hours)

Table 14: Event based inspection requirements

- 6 Sediment dams shall be managed such that the discharged water is not significantly different to upstream conditions. To assist with sediment dam management, consideration shall be given towards dewatering structures prior to a rain event that is likely to produce runoff using a pump, siphon or floating decant.
- 7 Erosion and Sediment Control structure inspections are undertaken in accordance with the **SRM CHL ESC Structure Quarterly Inspection Checklist**.

9.2 Maintenance

- 8 Maintenance that is identified by an inspection shall be carried out in a timely manner. Examples of deficiencies that will trigger maintenance activities include, but are not limited to:
 - a Damage/scouring to ESC measures;
 - b Sediment deposition in excess of the sediment storage zone;
 - c Deterioration of access tracks;
 - d Contaminants or waste materials deposited in ESC or MAW control structures; and
 - e Deterioration of outlet controls (e.g. spillways and discharge points).
- 9 All maintenance requirements shall be actioned in SAP. Maintenance shall be actioned prior to the next wet season (November).
- 7 Erosion and Sediment Control structure maintenance is verified in accordance with the **SRM CHL ESC Structure Maintenance Completion Checklist**.

10 Decommissioning

- 1 All drainage controls shall be decommissioned prior to the decommissioning of dams.
- 2 Dams shall be de-watered and de-silted prior to decommissioning. Dams shall be decommissioned so they can no longer contain water.

11 Performance Indicators

- 1 To assess and determine the effectiveness of ESC management on site, the performance indicators defined in **Table 15** below shall be adopted.

Parameter	Performance Indicator
Compliance is maintained with EA conditions	ESCP developed and implemented in accordance with the SRM EA . Records of monitoring and inspections are maintained.
Community complaints	No Complaints received regarding ESC impacts. Any complaints received related to erosion and sediment impacts will be recorded and investigated in accordance with the SRM EA and BHP HSEC Reporting, Event Management, and Investigation Global Standard .
Visual Inspections	Sediment basins must not contain water that has visual or odour evidence of slick, hydrocarbons and/or coal.

Table 15: Performance indicators for ESC management at SRM

12 Data Management and Reporting

- 1 Any deficiencies observed that require remedial action will be actioned as soon as practicable to ensure the ESC or MAW control structure operates in accordance with the intent of design.
- 2 Sampling records shall be maintained through the Environmental Data Management System (EDMS).
- 3 Event and performance reporting will be included in the site Quarterly Environmental Management Review.

12.1 Event Investigations and Reporting

- 4 In the event of emergencies, exceptions or incidents, all reasonable actions must be taken by operations to minimise potential or actual environmental harm and notification must be given to the administering authority in accordance with the requirements of the **SRM EA**.
- 5 Any events relating to erosion and sediment impacts shall be managed in accordance with the **SRM EA**, and the following internal documents:
 - c **BHP HSEC Reporting, Event Management, and Investigation Global Standard**; and
 - d **SRM PRO Event and Investigation Management Procedure**

12.2 Complaints

- 6 A community complaint is defined as a verbal or written complaint made directly to a BHP representative by a member of the community relating to an adverse impact on the community from the Company's activities or employee in part or in whole.
- 7 Any complaints received related to erosion and sediment impacts will be recorded and investigated in accordance with the **SRM EA**, internal BHP documents listed above and the **BMA PRO Community Complaints and Grievance Procedure**.

13 Roles and Responsibilities

- 1 General requirements and responsibilities of roles are found in various elements of BMA systems including but not limited to
 - a Position Descriptions;
 - b Organisational Design Protocols; and
 - c BMA management system elements such as Standards, Procedures and Work Instructions.
- 2 Roles and Responsibilities specific to this ESCP are outlined below in **Table 16**.

Role	Responsibilities
General Manager	<ul style="list-style-type: none"> Overall responsibility for the implementation of the ESCP at SRM.
Mine Planning	<ul style="list-style-type: none"> Integrating water management and ESC in the mine planning process. Provide ESC plans which align with the requirements of this ESCP when requesting disturbance permission under the PTD process.
Engineering	<ul style="list-style-type: none"> Provide guidance on the design and associated requirements of ESC structures. Ensure all ESC plans provided by third parties align with the requirements of this ESCP Ensure all projects with proposed disturbance align with requirements of this ESCP
Governance & Technical Stewardship – Dams	<ul style="list-style-type: none"> Provide guidance on the design and associated requirements of ESC structures with respect to the administering authorities Manual for Assessing Consequence Categories and Hydraulic Performance of Structures. Inspect unregulated ESC structures pre- and post-wet season
Environmental Operations	<ul style="list-style-type: none"> Provide advice to operations and contractors on ESC. Actively define areas where ESC measures are needed, including through the PTD process. Conduct site inspections of areas requiring ESC measures pre- and post-wet season and after significant rainfall events where required. Coordinate with the other departments where compliance issues are identified, and corrective actions are needed.
Mine Services	<ul style="list-style-type: none"> Conduct the inspections defined in this ESCP, including documenting the inspection outcomes and any maintenance activities required in SAP. Complete maintenance activities in a timely manner.
RPEQ	<ul style="list-style-type: none"> May be consulted in the design and construction of sediment dam/basins.
Contractors, Site Supervisors, or Project Teams	<ul style="list-style-type: none"> Ensure stipulated and planned erosion and sediment controls are implemented. Inspect/monitor the effectiveness and condition of erosion and sediment controls during and/or after works. If required, implementing additional controls or maintenance works. Report any erosion and sediment control issues or non-compliance to the Environment Operations Department.

Table 16: Roles and responsibilities specific to the SRM ESCP

14 Terms and Definitions

Term	Definition
AEP	Annual Exceedance Probability
BMA	BHP MitsubishiM Alliance Coal Operations Pty Ltd
BoM	Bureau of Meteorology
CHPP	Coal Handling and Preparation Plant
Containment	Designed to contain the water for monitoring or treatment prior to dewatering, or to pump to the mine water management system.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Diverted Water	Water which refers to stormwater runoff that has not come into contact with mining processes or land disturbed by mining and associated activities
EDMS	Environmental Data Management System
EMS	Environmental Management System OR Event Management System
ESC	Erosion and Sediment Control
ESCIIP	Erosion and Sediment Control Implementation Plan
ESCP	Erosion and Sediment Control Plan
Flow-Through	Designed to passively drain the sediment basin within 5 days using either a riser pipe or floating decant.
GPS	Global Positioning System
Ha	Hectares
IECA	International Erosion Control Association
IFD	Intensity Frequency Duration – Used to describe rainfall events
MAW	Mine Affected Water, as defined in the SRM EA
ML	Mining Lease
MoC	Management of Change
NATA	National Association of Testing Authorities
Permanent Drainage	Drainage which will be in place at the end of mine life
PTD	Permit To Disturb
Raw Water	Water supplied to site by pipeline, truck or other infrastructure
RDE	Responsible Dam Engineer
RPEQ	Registered Practicing Engineer in Queensland, either internal or external consultant.
SAP	Internal Work Management System
Sediment Affected Stormwater	Water which may include runoff from areas that are disturbed by mining operations and potentially contains sediment loads but are not likely to have properties that would cause environmental harm.
SRM EA	Environmental Authority EPML00862313
Temporary Drainage	Drainage constructed on a temporary basis to convey diverted water, stormwater or MAW. Operational drains are also required to separate catchments of different water types

Table 17: Terms and definitions reference in this ESCP

15 References

References	Title	Document Number
Legislative Requirements Documents		
EXT-RPT-0002	EXTERNAL – Environmental Protection – Environmental Authority (EA) EPML00862313 – Saraji Mine	012585797
Technical Reference Documents		
	Department of Environment and Heritage Protection (DEHP) (2014). Manual for assessing consequence categories and hydraulic performance of structures (Version 4, 10 April 2014) (EM635)	External Document
	McKenzie, N.J.; Isbell, R.F.; Jacquier, D.W.; Brown, K.L. Australian soils and landscapes: an illustrated compendium, CSIRO Publishing, 2005 (CSIRO 2005)	External Document
	Guideline—Activities in a watercourse, lake or spring associated with a resource activity or mining operations WAM/2008/3435	External Document
	International Erosion Control Association (2008), Best Practice Erosion and Sediment Control Guidelines (IECA 2008)	External Document
BHP/BMA Documents		
BMA-STD-0030	BMA STD Erosion & Sediment Control and Mine Affected Water Standard	012962628
BMA-MAN-0080	BMA MAN Rehabilitation Manual	000199330
BMA-PRO-0056	BMA PRO Permit to Disturb Procedure	000205251
BMA-PRO-0101	BMA PRO Community Complaints and Grievance Procedure	013921842
GENV-GSTD-00003	BHP Environment Global Standard	
GENV-GSTD-00001	BHP Environmental Management Global Specification	
RCOE-GSTD-00026	BHP Water Management Global Standard	
GRIA-GSTD-00003	BHP Risk Management Global Standard	
GSFT-GSTD-00041	BHP HSEC Reporting, Event Management and Investigation Global Standard	
Site Documents		
SRM-JSA-0002	SRM JSA Environmental Risk Register	013675670
SRM-PLN-0051	SRM PLN Water Management Plan	000204603
SRM-PRO-0102	SRM PRO Event and Investigation Management Procedure	011804611
	SRM CHL ESC Structure Maintenance Completion Checklist	015102956
	SRM CHL ESC Structure Quarterly Inspection Checklist	015102955

Table 18: Referenced documents within this ESCP

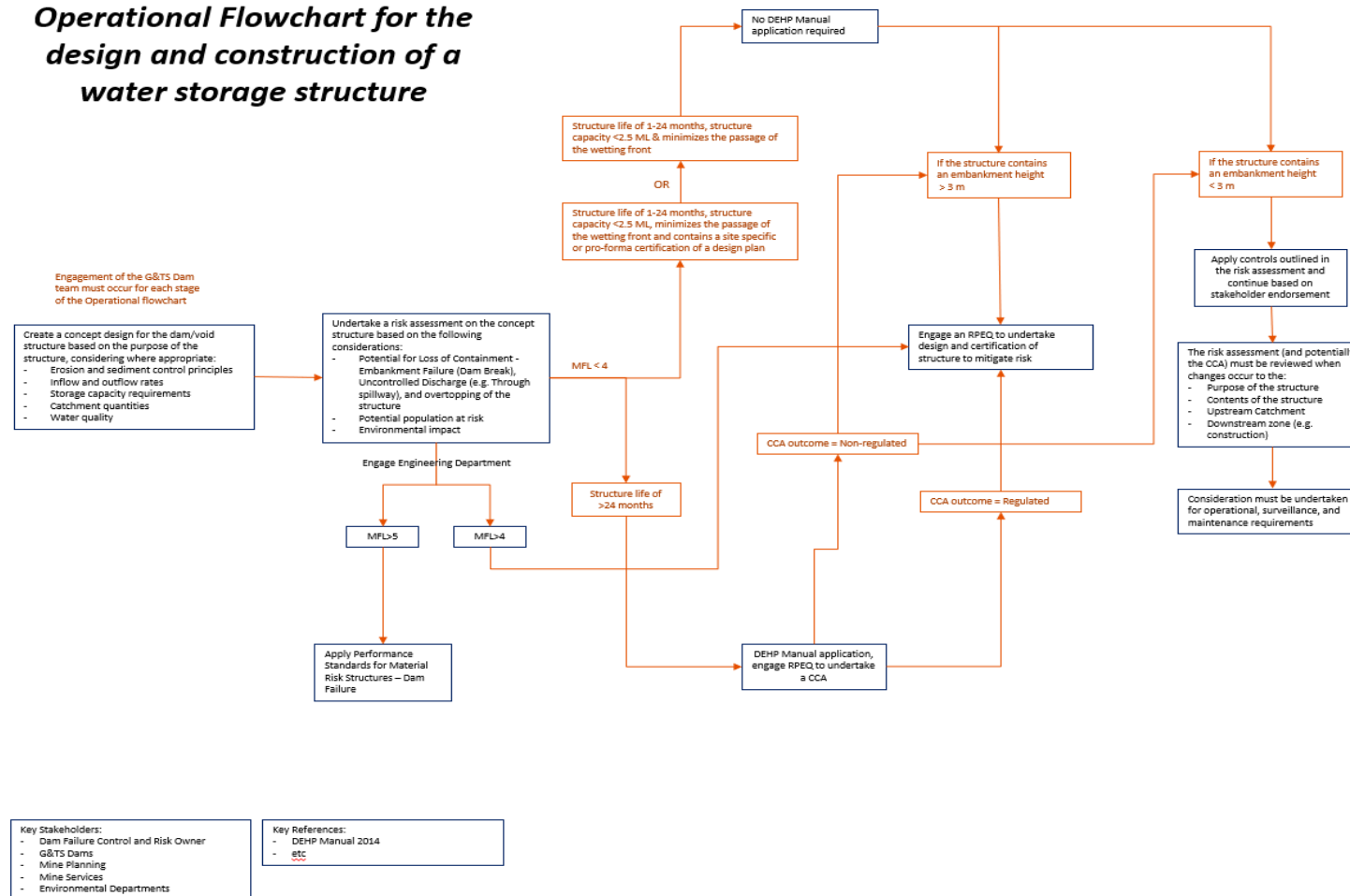
16 Version Management

Version	Details	Date
5.1	Minor terminology changes	08 July 2022
9.0	Major update as a result of Environmental Evaluation, principally to design standards and inspection requirements.	08 July 2022
10.0	Major update as a result of interim ESC design standards.	08 July 2022
11.0	Inclusion of Erosion and Sediment Control Implementation Plan	09 December 2020
12.0	Minor update incorporating ESC STD 30	02 November 2022
13.0	Annual update of ESCP and Implementation Plan	09 October 2024
14.0	Minor amendment to include ESC Maintenance and Inspection checklists	02 December 2024
15.0	Document has had wording updated for clarification	22 September 2025

Table 19: Version Management

17 Appendix A – Flowchart: Design of a Water Storage

Operational Flowchart for the design and construction of a water storage structure



18 Appendix B – Implementation Plan



BHP Mitsubishi Alliance

SRM PLAN

Erosion and Sediment Control Implementation Plan

18.1 Introduction

- 1 The purpose of this Erosion and Sediment Control Implementation Plan (ESCIP) is to outline the actions required to bring the existing infrastructure into compliance with the design standards set out in this ESCIP.
- 2 The actions described in this ESCIP are aligned with the Environmental Evaluation (EE) submitted to the administering authority in May 2019. Changes to individual actions and catchments committed to in the original EE submission may occur from time to time as required.

18.2 Data Management

- 3 All data is to be saved and stored in the Saraji EE SharePoint page. This SharePoint page will contain all of the evidence of works completed, which may include photographs, spatial files, designs, reports, studies, and correspondence. The information will be stored against the relevant catchment areas.
- 4 The SharePoint page is to be administered by HSE BP and maintained by the various stakeholders outlined in Table 20.

18.3 Reporting

- 5 An annual interim EE report will be provided to the administering authority on 31 July 2021 and by 31 July each year thereafter, in accordance with **condition F39** of the **SRM EA**. The annual report will include:
 - a A summary of the actions completed during the previous 12-month period, between 1 July and 30 June, including before and after photographs and designs, where appropriate;
 - b A summary of any amendments to this ESCIP in the previous 12 months. If amendments have been made, the ESCIP will be updated to reflect the changes, along with updated catchment maps as required, and a copy provided to the administering authority with the submission of the annual report; and
 - c A list of the catchments that have been removed from the ESCIP due to all actions for those catchments having been completed, or the catchment being absorbed into an adjacent catchment (e.g. pit progression)
- 6 Once all actions in this ESCIP have been completed, a final report will be provided to the administering authority in accordance with **condition F40** of the **SRM EA**. The final report will include:
 - a evidence of completion of each action;
 - b a map which shows:
 - i the location (including GPS coordinates) of the erosion and sediment control measures and infrastructure established within each catchment;
 - ii the direction of runoff within the catchment; and
 - iii creeks and tributaries within the catchment, identifying their direction of flow
 - c details of ongoing monitoring and maintenance requirements of any works required as an outcome of each action.
- 7 Due to the number of catchments, amount of mitigating works and studies being completed, the progress report will provide a summary of the information available for each action. This information will be made available to the administering authority on request.

18.4 Roles and Responsibilities

8 Roles and Responsibilities specific to this ESCIP are outlined below in **Table 20**.

Role	Responsibilities
General Manager	<ul style="list-style-type: none"> Overall responsibility for the implementation of the ESCIP at SRM.
Mine Planning	<ul style="list-style-type: none"> Integrating water management and ESC in the mine planning process.
Engineering	<ul style="list-style-type: none"> Manage mid-term and long-term studies and then facilitate the execution of detailed designs. Maintain evidence of mid-term and long-term studies from ESCIP with EE SharePoint Page Provide guidance on the design and associated requirements of ESC structures.
Governance & Technical Stewardship – Dams	<ul style="list-style-type: none"> Provide guidance on the design and associated requirements of ESC structures in respect of the DES Manual for Assessing Consequence Categories and Hydraulic Performance of Structures. Inspect unregulated ESC structures pre- and post-wet season
Environmental Operations	<ul style="list-style-type: none"> Update the ESCP and ESCIP. Liaise with stakeholders and provide reports to the DESI on the progress of the ESCIP. Document and where required escalate any erosion and sediment control issues to the appropriate party.
Mine Services	<ul style="list-style-type: none"> Execute mitigating actions outlined in the EE and ESCIP. Maintain evidence of mitigating actions from the ESCIP with EE SharePoint Page. Coordinate and complete maintenance activities in a timely manner and record evidence of activities completed.
RPEQ	<ul style="list-style-type: none"> May be consulted in the design, construction and inspection of sediment dam/basins.
Contractors, Site Supervisors, or Project Teams	<ul style="list-style-type: none"> Ensure stipulated and planned erosion and sediment controls are implemented. Inspect/monitor the effectiveness and condition of erosion and sediment controls during and/or after works. If required, implementing additional controls or maintenance works. Report any erosion and sediment control issues or non-compliance to the HSE Team.

Table 20: ESCIP Roles and Responsibilities

18.5 Catchment Areas

- 9 For the purpose of this ESCIP, SRM has been broken down into hydrological catchment areas. As operations at the mine progress, these catchments are likely to change.
- 10 Updated catchment areas (and associated maps) are to be provided in the reports submitted for each reporting period, in accordance with **condition 39** of the **SRM EA**.
- 11 **Figure 5** to **Figure 8** shows these catchment areas.



Figure 5: Hughes Creek and One Mile Creek Sub-Catchments



Figure 6: One Mile Creek and Spring Creek Sub-Catchments



Figure 7: Spring Creek and Phillips Creek Sub-Catchments



Figure 8: Phillips Creek Sub-Catchments

18.6 Mitigating Actions

- 12 The mitigating works program includes the actions to mitigate potential environmental harm for each catchment that is classified as a “Mine Affected Water” catchment and which may flow to Hughes Creek, One Mile Creek, Spring Creek or Phillips Creek during rainfall events. These are undertaken whilst engineering studies and design are underway.
- 13 Many of these actions are temporary in nature, and will be replaced by more permanent solutions which will result from further studies.
- 14 **Table 21** provides the indicative list of mitigating actions. Ongoing updates on actual mitigation actions (completed and ongoing) will be provided in the reports submitted for each reporting period, in accordance with **condition F39** of the **SRM EA**.

Creek	Catchment	Action	Expected Completion Date
Hughes Creek	H02	Develop and implement operating controls for the Ramp 2 Fillpoint Dam	Completed
Hughes Creek	H05	Install drainage to ensure catchments drain to Ramp 4 LW Sump and H19 water storage and pump back into Tailings Dam (subject to engineer of record sign-off)	Completed
Hughes Creek	H05	Redirect water from haul road Ramp 4 into settling area	Completed
Hughes Creek	H08	Install several small sumps alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H08	Re-grade haul road away from Hughes Creek	Completed
Hughes Creek	H09a	Install several small sumps alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H09a	Re-grade haul road away from Hughes Creek	Completed
Hughes Creek	H09b	Install several small sumps alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H09b	Re-grade haul road away from Hughes Creek	Completed
Hughes Creek	H10	Drain water into H26 and install sediment structures No coal hauled along the H10 access road	Completed
Hughes Creek	H11	Install several small sumps alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H11	Re-grade haul road away from Hughes Creek	Completed
Hughes Creek	H12	Install sump alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H13	Install sump alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H14	Install drainage to ensure catchments drain to Ramp 4 LW Sump and H19 water storage and pump back into Tailings Dam (subject to engineer of record sign-off)	Completed
Hughes Creek	H15	Install sump alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H15	Develop and implement maintenance strategy to regularly clean existing drains of sediment and rejects	Completed
Hughes Creek	H16	Install sediment traps in the spillway	Completed
Hughes Creek	H17	Construct replacement effluent polishing ponds. <i>Alternative Solution as reported in FY21 Interim Report</i>	Completed
Hughes Creek	H19	Install drainage to ensure catchments drain to Ramp 4 LW Sump and H19 water storage and pump back into Tailings Dam (subject to engineer of record sign-off)	Completed
Hughes Creek	H21	Re-grade haul road away from Hughes Creek (to the west) and install sediment structure on western side of haul road. <i>Mitigated by Coolibah Pit Restart Project</i>	Completed
Hughes Creek	H23	Undertake rehabilitation works	Completed
Hughes Creek	H24	Install several small sumps alongside Hughes Creek as a temporary sediment control measure	Completed
Hughes Creek	H24	Re-grade haul road away from Hughes Creek	Completed
Hughes Creek	H25	Undertake rehabilitation works – This catchment has not yet become available for rehabilitation due to operational requirements, refer to latest interim report. Undertake rehabilitation works if the catchment becomes available	Completed

Creek	Catchment	Action	Expected Completion Date
Hughes Creek	H32	Install drainage to ensure catchments drain to Ramp 4 LW Sump and H19 water storage and pump back into Tailings Dam (subject to engineer of record sign-off)	Completed
Hughes Creek	H33	Install drainage to ensure catchments drain to Ramp 4 LW Sump and H19 water storage and pump back into Tailings Dam (subject to engineer of record sign-off)	Completed
Hughes Creek	H33	Redirect water from haul road Ramp 4 into settling area	Completed
Hughes Creek	H37	Install sediment control structures along bank of Hughes Creek	Completed
Hughes Creek	H38	Install sediment control structures along bank of Hughes Creek	Completed
Hughes Creek	H40	Install sediment trap	Completed
Hughes Creek	H41	Install sediment trap	Completed
Hughes Creek	H42	Install sediment sumps	Completed
Hughes Creek	H43	Install sediment sumps	Completed
Hughes Creek	H44	Install sediment sumps	Completed
Hughes Creek	H45	Install sediment sumps	Completed
One Mile Creek	O01	Install high-wall pump at Wilkies Dam	Completed
One Mile Creek	O01	Undertake works to raise and re-align intersection and haul road at One Mile Junction	Completed
One Mile Creek	O01	Install culvert under the haul road to direct flow of water into Wilkies Dam	Completed
One Mile Creek	O01	Re-grade haul road to direct flow of water into Wilkies Dam	Completed
One Mile Creek	O02	Install temporary mine water storage structure and pump back into mine water management system	Completed
One Mile Creek	O02	Undertake rehabilitation works Address rehabilitation requirement and scheduling in the long-term action plan as per condition F36 of EPML00862313.	30-Nov-26
One Mile Creek	O05	Install high-wall pump at Wilkies Dam	Completed
One Mile Creek	O05	Undertake works to raise and re-align intersection and haul road at One Mile Junction	Completed
One Mile Creek	O06	Install high-wall pump at Wilkies Dam	Completed
One Mile Creek	O06	Undertake works to raise and re-align intersection and haul road at One Mile Junction	Completed
One Mile Creek	O06	Install temporary rock checks and sediment sumps along the haul road	Completed
One Mile Creek	O07	Undertake works to contour the bench along bank of One Mile Creek	Completed
One Mile Creek	O07	Undertake rehabilitation works Complete mitigating drain. Address rehabilitation requirement and scheduling in the long-term action plan as per condition F36 of EPML00862313.	30-Nov-26
One Mile Creek	O08	Re-grade haul road longitudinally (north to south) and lift haul road	Completed
One Mile Creek	O08	Install temporary rock checks and sediment sumps along the haul road	Completed

Creek	Catchment	Action	Expected Completion Date
One Mile Creek	O12	Install drainage in catchment to direct run-off to O02 catchment	Completed
One Mile Creek	O12	Upgrade in-stream rock checks to manage residual run-off from catchment (including development and implementation of a maintenance strategy for these rock checks)	Completed
One Mile Creek	O13	Install high-wall pump at Wilkies Dam	Completed
One Mile Creek	O13	Undertake works to raise and re-align intersection and haul road at One Mile Junction	Completed
One Mile Creek	O15	Install several small sumps alongside One Mile Creek for catchments O15, O16, O19	Completed
One Mile Creek	O16	Install several small sumps alongside One Mile Creek for catchments O15, O16, O19	Completed
One Mile Creek	O17	Install a medium sized sump. Mining progressed in this catchment as reported in FY21 Interim Report	Completed
One Mile Creek	O18	Install a medium sized sump. Mining progressed in this catchment as reported in FY21 Interim Report	Completed
One Mile Creek	O19	Install several small sumps alongside One Mile Creek for catchments O15, O16, O19	Completed
One Mile Creek	O20	Install temporary sediment structure. Mining progressed in this catchment as reported in FY21 Interim Report	Completed
One Mile Creek	O21	Install a medium sized sump	Completed
One Mile Creek	O22	Install a medium sized sump	Completed
Phillips Creek	P02	Install drainage to drain run-off into the P01 catchment and into the Ramp 14 Fill Point Dam	Completed
Phillips Creek	P03	Consider relocation of stockpile in P03 catchment	Completed
Phillips Creek	P03	Install drainage to drain run-off into the P01 catchment and into the Ramp 14 Fill Point Dam	Completed
Phillips Creek	P04	Install sumps on both sides of haul road to catch haul road run-off	Completed
Phillips Creek	P05	Install sumps on both sides of haul road to catch haul road run-off	Completed
Phillips Creek	P06	Install sumps on both sides of haul road to catch haul road run-off	Completed
Phillips Creek	P07	Install sumps on both sides of haul road to catch haul road run-off	Completed
Phillips Creek	P07	Develop and implement maintenance strategy clean existing drains of sediment and rejects	Completed
Phillips Creek	P07	Install rock checks and sediment sumps along the haul road	Completed
Phillips Creek	P08	Install drainage to direct run-off to the P08 catchment sump and utilise P08 catchment sump as a temporary sediment structure	Completed
Phillips Creek	P09	Install drainage to direct run-off to the P08 catchment sump and utilise P08 catchment sump as a temporary sediment structure	Completed
Phillips Creek	P10	Commence work to cap and rehabilitate the dump area	Completed
Phillips Creek	P10	Install pumps to pump mine affected water into Mine Water Management System	Completed
Phillips Creek	P11	Install a sediment structure	Completed
Phillips Creek	P11	Rehabilitate the P11 catchment area Address rehabilitation requirement and scheduling in the long-term action plan as per condition F36 of EPML00862313.	30-Nov-26

Creek	Catchment	Action	Expected Completion Date
Phillips Creek	P12	Install drainage to direct run-off to the P08 catchment sump and utilise P08 catchment sump as a temporary sediment structure	Completed
Phillips Creek	P12	Develop and implement maintenance strategy clean existing drains of sediment and rejects	Completed
Phillips Creek	P12	Install rock checks and sediment sumps along the haul road	Completed
Phillips Creek	P13	Install drainage to direct run-off to the P08 catchment sump and utilise P08 catchment sump as a temporary sediment structure	Completed
Phillips Creek	P14	Install sumps on both sides of haul road to catch haul road run-off	Completed
Phillips Creek	P15	Install drainage to direct run-off to the P08 catchment sump and utilise P08 catchment sump as a temporary sediment structure	Completed
Phillips Creek	P16	Install a sediment structure	Completed
Phillips Creek	P17	Install a sediment structure	Completed
Phillips Creek	P19	Install a temporary sediment control structure	Completed
Phillips Creek	P21	Install a sediment structure	Completed
Phillips Creek	P23	Install a temporary sediment control structure	Completed
Phillips Creek	P24	Install a temporary sediment control structure	Completed
Phillips Creek	P25	Install small scale sediment structure	Completed
Phillips Creek	P26	Install a temporary sediment control structure	Completed
Phillips Creek	P27	Install sediment sumps. Mining progressed in this catchment as reported in FY21 Interim Report	Completed
Phillips Creek	P28	Install sediment sumps. Mining progressed in this catchment as reported in FY21 Interim Report	Completed
Spring Creek	S01	Install temporary water storage structure in S01 to catch drainage	Completed
Spring Creek	S01	Re-grade S02 catchment to ensure drainage into S01 catchment	Completed
Spring Creek	S02	Install temporary water storage structure in S01 to catch drainage	Completed
Spring Creek	S02	Re-grade S02 catchment to ensure drainage into S01 catchment	Completed
Spring Creek	S03	Install temporary in-stream sediment structures	Completed
Spring Creek	S03	Investigate and implement means to reduce erosion and sediment issues until a long-term solution can be implemented	Completed
Spring Creek	S04	Install temporary water storage structure and pump back into mine water management system	Completed
Spring Creek	S04	Potential rehabilitation works to S04 (depending on outcomes of Spring to Phillips creek diversion)- Complete mitigating rock checks and cover crop in exposed areas. Address rehabilitation requirement and scheduling in the long-term action plan as per condition F36 of EPML00862313.	30-Nov-26
Spring Creek	S05	Install drainage to direct run-off from S05 and S08 catchments into Ebony Pit	Completed

Creek	Catchment	Action	Expected Completion Date
Spring Creek	S08	Install drainage to direct run-off from S05 and S08 catchments into Ebony Pit	Completed
Spring Creek	S10	Install drainage to direct run-off from S10 catchment into S04 catchment	Completed
Spring Creek	S10	Develop and implement maintenance strategy to clean existing drains of sediment and rejects	Completed
Spring Creek	S10	Install rock checks and sediment sumps along the haul road	Completed
Spring Creek	S11	Install temporary in-stream sediment structures	Completed
Spring Creek	S11	Investigate and implement means to reduce erosion and sediment issues until a long-term solution can be implemented	Completed
Spring Creek	S11	Develop and implement maintenance strategy to clean existing drains of sediment and rejects	Completed
Spring Creek	S11	Install rock checks and sediment sumps along the haul road	Completed
Spring Creek	S12	Install drainage to re-direct run-off to water storage. Mining progressed in this catchment as reported in FY21 <i>Interim Report</i>	Completed
Spring Creek	S13	Install drainage to re-direct run-off to water storage. Mining progressed in this catchment as reported in FY21 <i>Interim Report</i>	Completed

Table 21: Mitigating Actions

18.7 Studies

- 15 By 30 November 2026, a study (or multiple studies) will be completed in respect of existing and new water storage and erosion control structures, to determine the most effective and sustainable long-term solutions. These studies will necessarily take longer to complete, and long-term solutions will evolve as studies progress.
- 16 The study/ies will be completed by an appropriately qualified person and include the following:
 - a investigate the feasibility of erosion and sediment control measures for each catchment, and must:
 - i prioritise rehabilitation as a long-term measure;
 - ii consider long-term mine planning;
 - iii consider medium and long-term, and permanent measures;
 - iv present a feasible solution to be implemented for each area;
 - b be designed and implemented in accordance with the design standards and criteria contained in the Water Management Plan required by **condition F29** and the Erosion and Sediment Control Plan required by **condition F33**; and
 - c consider the ongoing monitoring and maintenance of the measures;
 - d consider State and Federal regulatory approvals that may be required for each of the measures; and
 - e consider measures that may need to be implemented through the Progressive Rehabilitation and Closure Plan.
- 17 **Table 22** outlines the current study program. This program is indicative only as individual studies may be combined or changed.
- 18 By 31 January 2027, a report will be prepared by an appropriately qualified person and submitted to DES, which includes:
 - f a summary of the findings of the study;
 - g details of the actions to be implemented; and
 - h a schedule for completion of the actions.
- 19 By 31 March 2027, this ESCP, including the ESCIP, will be updated to include the actions and schedule for completion of actions from the study report.

Creek	Catchment	Action
Hughes Creek	All	Study in respect of the preferred long term sustainable solution to prevent mine affected water (including sediment) runoff into Hughes Creek
Hughes Creek	H05, H14, H19, H32, H33, H37	Study in respect of the preferred long term sustainable solution
Hughes Creek	H08, H09a, H09b, H11, H24	Study in respect of a permanent sediment structure in-stream
Hughes Creek	H10	Study in respect of a permanent sediment trap
Hughes Creek	H12, H13, H15	Study in respect of a permanent sediment structure in-stream
Hughes Creek	H16	Study in respect of a mine water storage structure (or upgrade of Dudley Dam) and integrated drainage / contouring
Hughes Creek	H17	Study in respect of a mine water storage structure
Hughes Creek	H21	Study in respect of drainage to direct run-off to mine water storage structure
Hughes Creek	H23, H25	Study in respect of a sediment dam
Hughes Creek	H42, H43, H44, H45	Study in respect of a permanent sediment structure outside of mining area to catch sediment from the high-wall and integrated drainage
One Mile Creek	All	Study in respect of the preferred long term sustainable solution to prevent mine affected water (including sediment) runoff into One Mile Creek
One Mile Creek	O01, O05, O06, O13	Study in respect of potential water storage structure/s
One Mile Creek	O03, O04	Study in respect of a mine water storage structure (or upgrade of Bulge Dam) with integrated drainage/contouring
One Mile Creek	O12	Study in respect of potential water storage structure/s, with integrated drainage / contouring
One Mile Creek	O15, O16, O19	Study in respect of a permanent sediment structure in-stream
One Mile Creek	O17, O18, O21, O22	Study in respect of a permanent sediment structure outside of mining area to catch sediment from the high-wall and integrated drainage

Creek	Catchment	Action
Phillips Creek	All	Study in respect of the preferred long term sustainable solution to prevent mine affected water (including sediment) runoff into Phillips Creek
Phillips Creek	P02, P03	Study in respect of a mine water storage structure (or upgrade of Ramp 14 Fill Point Dam)
Phillips Creek	P04, P05, P06, P07, P14	Study in respect of a mine water storage structure (or upgrade of Lester Dam)
Phillips Creek	P08, P09, P12, P13, P15	Study in respect of multiple water storage structures
Phillips Creek	P19	Study in respect of a turkey's nest dam
Phillips Creek	P23	Study in respect of a small sediment structure
Phillips Creek	P24, P26	Study in respect of a water storage structure
Phillips Creek	P27, P28	Study in respect of a permanent sediment structure outside of mining area to catch sediment from the high-wall, and integrated drainage
Spring Creek	All	Study in respect of an alternative long term sustainable solutions to prevent mine affected water (including sediment) runoff into Spring Creek
Spring Creek	All	Study in respect of the diversion of Spring Creek to Phillips Creek
Spring Creek	S01, S02, S04	Study in respect of water storage structures
Spring Creek	S12, S13	Study in respect of a permanent sediment structure outside of mining area to catch sediment from the high-wall, and integrated drainage

Table 22: Study Program



SRM-PLN-0033

BHP Mitsubishi Alliance

SRM PLAN

Waste Management

Status: Approved

Version: 11.0 (10 April 2025)

Business Owner: BMA SRM HSS Manager

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1 Introduction

1.1 Purpose

- 1 The primary purpose of this Waste Management Plan (Waste MP) is to identify the potential environmental risks from generating waste and the controls to minimise impacts. The Waste MP aims to minimise the release of contaminants to the receiving environment and to ensure waste generated from Saraji Mine (SRM) and Saraji South Mine (SSM) (formerly Norwich Park Mine) does not adversely impact the local and regional environment.
- 2 The contents of this plan are intended to meet obligations of the following:
 - a **SRM Environmental Authority (EA) EPML00862313** (the **SRM EA**);
 - b **Norwich Park Mine (now Saraji South Mine) Environmental Authority (EA) EPML00865013** (the **SSM EA**) and;
 - c **BHP Our Requirements: Environment and Climate Change**.

1.2 Scope

- 3 This Waste MP describes SRM's and SSM's planning, operational and reporting requirements for minimising impacts in regards to waste management.
- 4 This Waste MP covers anyone involved in planning or executing exploration, operational or closure activities at SRM and SSM.
- 5 This Waste MP forms part of the SRM and SSM Environmental Management System (EMS).

1.3 Risk Management

- 6 Risks associated with SRM and SSM have been assessed in accordance with
 - a The **SRM EA**;
 - b The **SSM EA**;
 - c **BHP Our Requirements: Risk Management**; and
 - d **SRM PLN Material Risk Management Plan**

2 Overview of Operations

2.1 SRM Location

- 1 Saraji Mine (SRM) is located 20 km north of Dysart in the Bowen Basin coalfields. The mine encompasses Mining Leases ML1775, ML1782, ML1784, ML2360, ML2410, ML70142, ML70294, ML70298, ML70328 and ML700021 totalling some 10,500 hectares. These leases are held by the joint venture partners and mining activity is authorized under the **SRM EA**.
- 2 The current layout of SRM is provided *Figure 1*, with the layout represented by the FY22 ERC (Estimated Rehabilitation Cost) Forecast Disturbance Map.

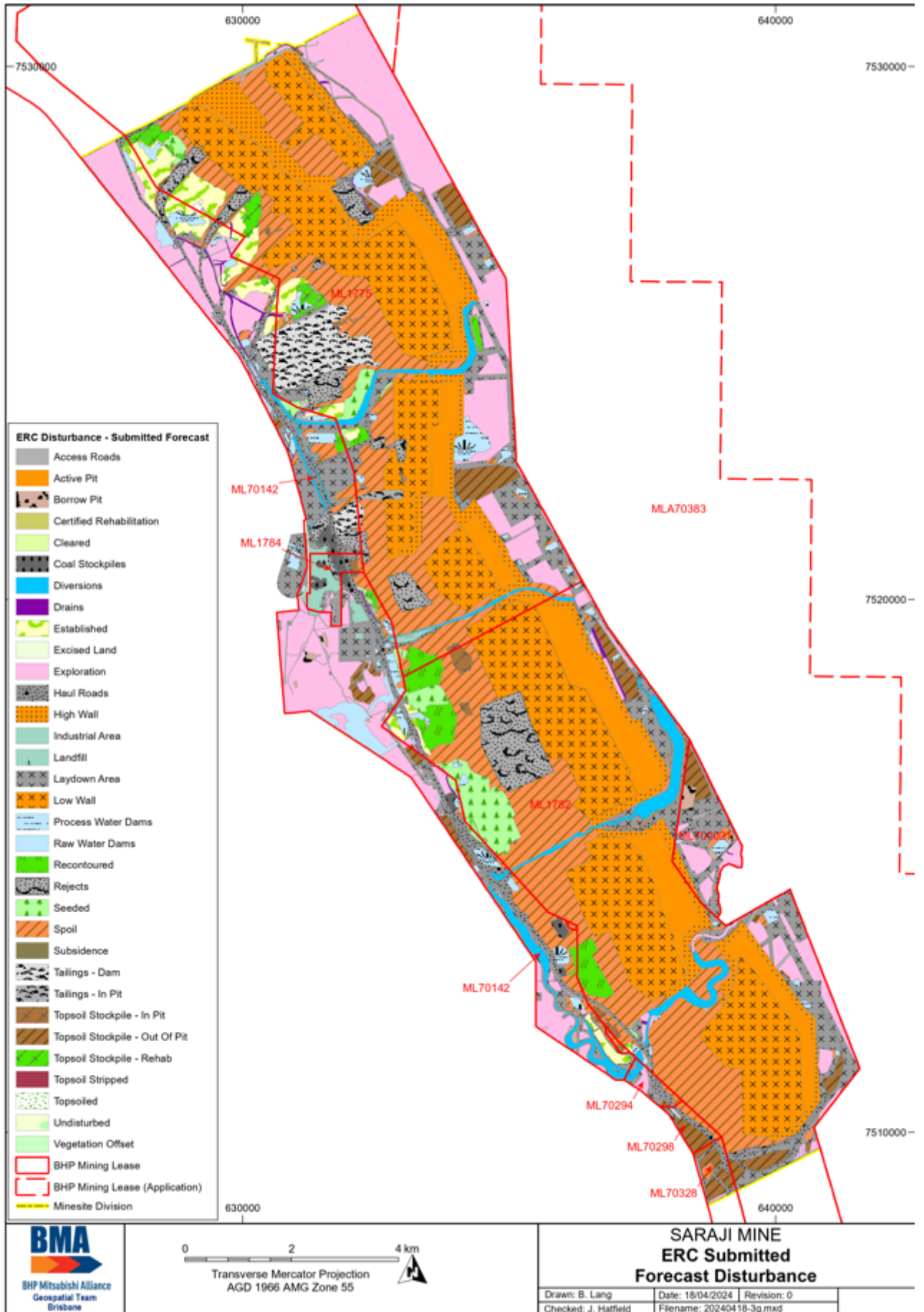


Figure 1: Saraji Mine FY24 ERC Submitted Forecast Disturbance

2.2 SSM Location

- 3 Saraji South Mine (SSM) is located 24 km south-east of Dysart and 100 km south-east of Moranbah in the Central Queensland region of the Bowen Basin. BMA operated SSM between 1979 and 2012 before placing the site under care and maintenance from May 2012; SSM remained under care and maintenance until November 2022, operations have now recommenced in a small section of the Northern Pits.
- 4 The current layout of SSM is provided *Figure 2*, with the layout represented by the FY22 ERC (Estimated Rehabilitation Cost) Forecast Disturbance Map.

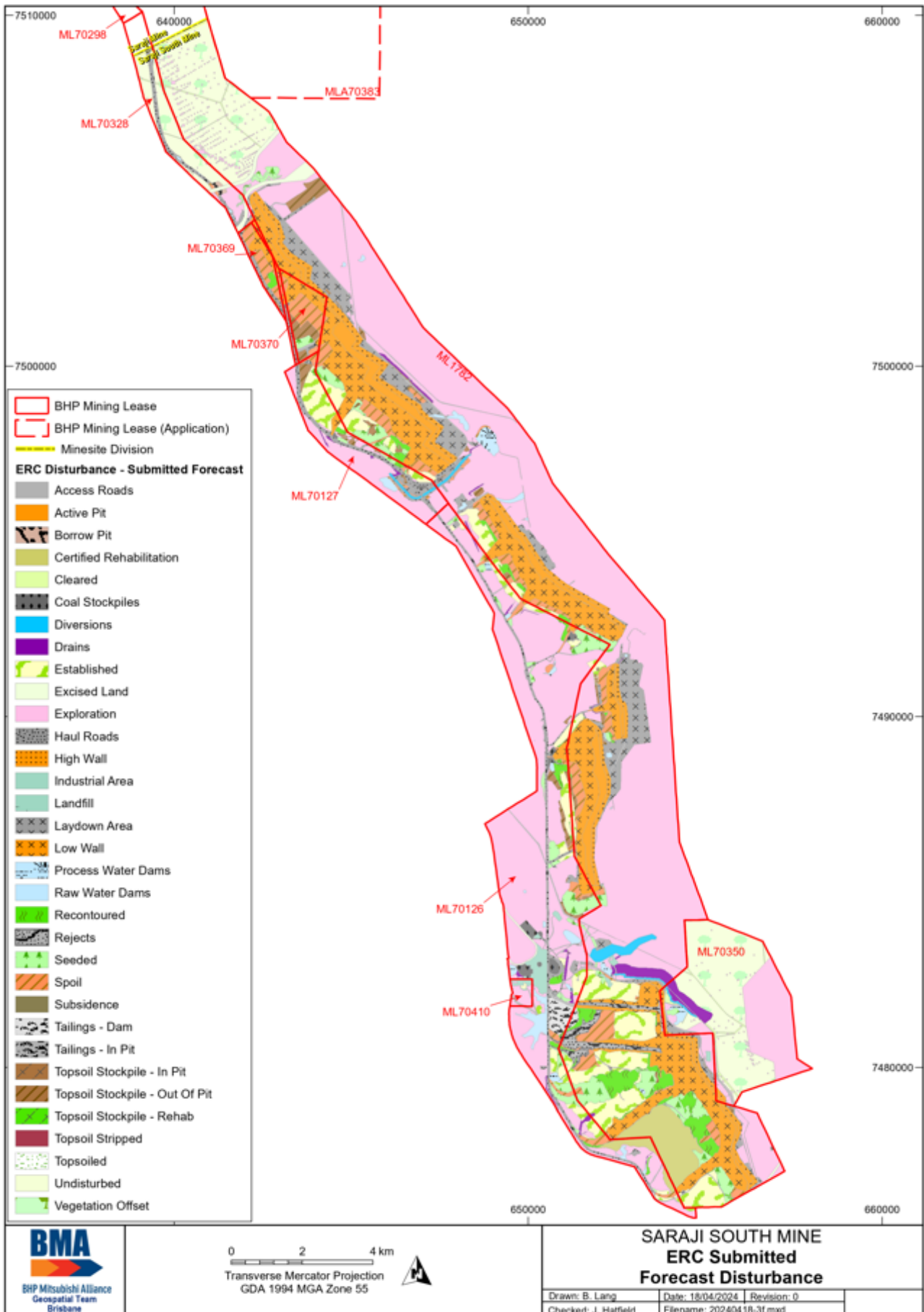


Figure 2: Saraji South Mine FY22 ERC Submitted Forecast Disturbance

2.3 Scope

- 5 The SRM open cut operation consists of ten pits over a strike length of approximately 30 kilometres and uses multiple draglines and a truck/shovel overburden removal operation. The open cut operation also consists of one coal handling and processing plant (CHPP) where mined coal is sorted, washed and blended to meet supply demand specifications.
- 6 At SRM Approximately 8.5 million tonnes of export coking coal is produced per annum.
- 7 The SSM open cut operation consists of six pits over a strike length of approximately 30 kilometres and when operational, using a single dragline and a truck/shovel overburden removal operation.
- 8 SSM produced ~0.35 million tonnes of export coking coal for FY23 and is forecast to produce ~0.34 million tonnes for FY24.

2.4 Life of Mine

- 9 SRM currently has long term operations scheduled to the year 2056. Exploration in the area surrounding SRM is ongoing, and further reserves may become available. Over the life of the mine, due to economical restraints, modifications to current methods of mining may need to be implemented.
- 10 SSM currently has long term operations scheduled to the year 2098. Exploration in the area surrounding SSM is ongoing, and further reserves may become available. Over the life of the mine, due to economical restraints, modifications to current methods of mining may need to be implemented.
- 11 The life of the mine for SRM and SSM could be extended significantly by extraction of the reserves being explored to the east of the current leases.
- 12 Waste management and disposal strategies have been developed to be consistent with the SRM and SSM life of mine plans.

3 Legal and Other Requirements

3.1 Legislation

- 1 Details of SRM and SSM legal obligations in regards to waste management are specified on the online *Environment Essentials*.
- 2 Relevant legislation includes the:
 - a *Environmental Protection Act 1994 (QLD) (EP Act)*;
 - b *Environmental Protection Regulation 2019 (QLD)*; and
 - c *Waste Reduction and Recycling Act 2011 and Regulation 2011 (QLD)*.
- 3 Legal and other requirements include:
 - a ***SSM Environmental Authority (Mining Activities) – Permit Number EPML00862313***;
 - b ***SRM Environment Authority (Mining Activities) – Permit Number EPML00865013***
 - c ***BHP Our Requirements: Environment and Climate Change***;
 - d ***BHP Our Requirements: Health, Safety, Environment and Community Reporting***; and
 - e ***BHP Our Requirements: Closure***.

3.2 SRM Environmental Authority

- 4 The main regulatory tool used by the Administering Authority (the Department of Environment, Science and Innovation) to implement the *Environmental Protection Act 1994 (EP Act)* is the **SRM EA**. SRM must adhere to the waste management conditions as stated in the **SRM EA Conditions D1-D7 (Table 1)**

Condition	Requirement
D1	<p>Waste management</p> <p>A Waste Management Plan must be developed by an appropriately qualified person and implemented. The Waste Management Plan must include, but is not limited to:</p> <ul style="list-style-type: none"> a a description of the mining activities that may generate waste; b a description of all waste activities being carried out; c the location/s (including GPS coordinates) of where all waste activities are, or have been, carried out, including: <ul style="list-style-type: none"> i the type of waste disposed of, treated, or reprocessed; and ii the volume of waste disposed of, treated, or reprocessed; d identification of the potential risk to the environment from all waste activities carried out; e control measures to be implemented to minimise the potential for environmental harm associated with carrying out of the waste activities, including but not limited to: <ul style="list-style-type: none"> i segregation of the waste; ii storage of the wastes; iii transport of the wastes; and iv monitoring and reporting matters concerning the wastes; f how the waste will be managed in accordance with the waste management hierarchy (that is, avoid, reuse, recycling, energy recovery, disposal); g the hazardous characteristics of the wastes generated including disposal procedures for hazardous wastes; h procedures for reprocessing waste in accordance with condition D4; i procedures for managing accidents, spills and other incidents; j the indicators or other criteria on which the performance of the waste management plan will be assessed; and k staff training.
D2	<p>The environmental authority holder must submit the Waste Management Plan required by condition D1 to the administering authority prior to commencing a new process, or varying an existing process, for reprocessing or composting any waste.</p>
D3	<p>Waste receipt</p> <p>The only waste permitted to be received is:</p> <ul style="list-style-type: none"> a the types of waste specified in conditions D5 to D7 (inclusive); and b sewage and sludge for treatment in accordance with Schedule H: Sewage Treatment; and c from a BHP Biliton Mitsui Coal (BMC) or BHP Mitsubishi Alliance (BMA) site in Queensland.

<p>D4</p>	<p>Waste reprocessing</p> <p>The only waste permitted to be reprocessed is:</p> <ul style="list-style-type: none"> a spoil or overburden; b vegetation; c water or sediment containing hydrocarbons; d fuels, oils, lubricants and coolants; e bulk rubber; f inert waste; g poly-pipe and other plastic; h fibreglass; i treated and untreated timber; and j asphalt.
<p>D5</p>	<p>Waste disposal</p> <p>Unless otherwise specified in conditions D6 and D7, waste, other than spoil or overburden or vegetation removed as part of the mining activity, must not be disposed of within the mining leases listed on this environmental authority and must be taken to a facility that is lawfully allowed to accept such waste under the provisions of the <i>Environmental Protection Act 1994</i>.</p>
<p>D6</p>	<p>The following types of waste are permitted to be disposed of within the specified features for the waste type:</p> <ul style="list-style-type: none"> a rejects and sediment containing hydrocarbons: <ul style="list-style-type: none"> i in spoil emplacements; and ii in regulated structures in accordance with Schedule G: Structures of this environmental authority; and iii in pits or voids; and iv in dedicated rejects emplacements; and b tailings and water or sediment containing hydrocarbons: <ul style="list-style-type: none"> i in regulated structures in accordance with Schedule G: Structures of this environmental authority; and ii in pits or voids that are not regulated structures, provided a consequence category assessment in accordance with condition G1 has been completed.
<p>D7</p>	<p>The following types of waste may be disposed of within the mining leases listed on this environmental authority:</p> <ul style="list-style-type: none"> a bulk rubber; b inert waste; c poly-pipe and other plastic; d fibreglass; e treated and untreated timber; f asphalt; and g asbestos.

	<p>h These types of waste may be disposed of:</p> <p>i in pits or voids;</p> <p>j in spoil emplacements; and</p> <p>k left insitu below ground level.</p>
--	---

Table 1: SRM EA Conditions D1-D7

3.3 SSM Environmental Authority

- 5 The main regulatory tool used by the Administering Authority (the Department of Environment, Science and Innovation) to implement the *Environmental Protection Act 1994 (EP Act)* is the **SSM EA**. SRM must adhere to the waste management conditions as stated in the **SSM EA Conditions D1-D7** (Table 2)

Condition	Requirement
D1	<p>Waste management</p> <p>A Waste Management Plan must be developed by an appropriately qualified person and implemented. The Waste Management Plan must include, but is not limited to:</p> <ul style="list-style-type: none"> a a description of the mining activities that may generate waste; b a description of all waste activities being carried out; c the location/s (including GPS coordinates) of where all waste activities are, or have been, carried out, including: <ul style="list-style-type: none"> i the type of waste disposed of, treated, or reprocessed; and ii the volume of waste disposed of, treated, or reprocessed; d identification of the potential risk to the environment from all waste activities carried out; e control measures to be implemented to minimise the potential for environmental harm associated with carrying out of the waste activities, including but not limited to: <ul style="list-style-type: none"> i segregation of the waste; ii storage of the wastes; iii transport of the wastes; and iv monitoring and reporting matters concerning the wastes; f how the waste will be managed in accordance with the waste management hierarchy (that is, avoid, reuse, recycling, energy recovery, disposal); g the hazardous characteristics of the wastes generated including disposal procedures for hazardous wastes; h procedures for reprocessing waste in accordance with condition D4; i procedures for managing accidents, spills and other incidents; j the indicators or other criteria on which the performance of the waste management plan will be assessed; and k staff training.

D2	The environmental authority holder must submit the Waste Management Plan required by condition D1 to the administering authority prior to commencing a new process, or varying an existing process, for reprocessing any waste.
D3	<p>Waste receipt</p> <p>The only waste permitted to be received is:</p> <ul style="list-style-type: none"> a the types of waste specified in conditions D5 to D7 (inclusive); and b sewage and sludge for treatment in accordance with Schedule H: Sewage Treatment; and c from a BHP Biliton Mitsui Coal (BMC) or BHP Mitsubishi Alliance (BMA) site in Queensland.
D4	<p>Waste reprocessing</p> <p>The only waste permitted to be reprocessed is:</p> <ul style="list-style-type: none"> a spoil or overburden; b vegetation; c water or sediment containing hydrocarbons; d fuels, oils, lubricants and coolants; e bulk rubber; f inert waste; g poly-pipe and other plastic; h fibreglass; i treated and untreated timber; and j asphalt.
D5	<p>Waste disposal</p> <p>Unless otherwise specified in conditions D6 and D7, waste, other than spoil or overburden or vegetation removed as part of the mining activity, must not be disposed of within the mining leases listed on this environmental authority and must be taken to a facility that is lawfully allowed to accept such waste under the provisions of the <i>Environmental Protection Act 1994</i>.</p>
D6	<p>The following types of waste are permitted to be disposed of within the specified features for the waste type:</p> <ul style="list-style-type: none"> a rejects and sediment containing hydrocarbons: <ul style="list-style-type: none"> i in spoil emplacements; and ii in regulated structures in accordance with Schedule G: Structures of this environmental authority; and iii in pits or voids; and iv in dedicated rejects emplacements; and b tailings and water or sediment containing hydrocarbons:

	<ul style="list-style-type: none"> i in regulated structures in accordance with Schedule G: Structures of this environmental authority; and ii ii. in pits or voids that are not regulated structures, provided a consequence category assessment in accordance with condition G1 has been completed.
D7	<p>The following types of waste may be disposed of within the mining leases listed on this environmental authority:</p> <ul style="list-style-type: none"> a bulk rubber; b inert waste; c poly-pipe and other plastic; d fibreglass; e treated and untreated timber; f asphalt; and g asbestos. h These types of waste may be disposed of: <ul style="list-style-type: none"> i in pits or voids; j in spoil emplacements; and k left insitu below ground level.

Table 2: SSM EA Conditions D1-D7

4 Risks & Environmental Impacts

4.1 Environmental Risk Register

- 1 The **SRM JSA Environmental Risk Register** has been completed in accordance with **BHP Our Requirements: Risk Management** to assess the potential risks of waste generation, transport, treatment and disposal.
- 2 SRM's and SSM's main activities with actual or reasonably foreseeable environmental impacts resulting from waste management include:
 - a improper storage and handling of hazardous substances, chemicals and/or hydrocarbons leading to discharge to receiving environment,
 - b incorrect waste categorisation and disposal leading to waste contamination,
 - c incorrect use / production of waste (eg. biosolids),
 - d land or water impacted by salinity of spoil, and
 - e non compliant treatment at of sewage (Including sewerage treatment plant)

4.2 Potential Beneficial Impacts

- 3 The beneficial impact of waste management is financial remuneration and improved external relations as a result of recycling programs, including the recycling of tyres, batteries, oil and scrap metal.
- 4 Prevention of environmental contamination by appropriately managing storage and disposal of waste streams.

4.3 Potential Adverse Impacts

- 5 Potential adverse impacts associated with generating and disposal of waste include:
- a wastage of raw materials (e.g. wastage of construction materials, such as steel and concrete);
 - b wastage of embedded energy and greenhouse gas emissions;
 - c consumption of landfill space (e.g. where waste is sent to local landfills);
 - d generation of landfill leachate and landfill gas (e.g. from waste sent to local landfills);
 - e risks to human health or safety (e.g. through poor management of hazardous materials);
 - f poor public perception/relations and risk to company reputation;
 - g pollution of soil, groundwater, or surface water (e.g. through accidental spills or releases); and
 - h lost opportunity for resource re-use/recycling if product is disposed.

4.4 Waste Assessment and Instructions

- 6 *Table 3* provides guidance on the types of waste at SRM, where they are sourced, their potential impacts and details on the disposal requirements.
- 7 *Table 4* provides guidance on the types of waste at SSM, where they are sourced, their potential impacts and details on the disposal requirements.

Types of Waste	Waste Material	Potential Impacts	Disposal Instructions	Disposal Location/Destination
Hydrocarbons	Grease (Blackjack)	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	All waste grease must be collected and stored in drums located either within a bunded area or ontop of a temporary bund. When full, the drums must be transported to the designated area in the Waste Management Compound (or similar) and exchanged for empty drums.	Offsite as a Regulated Waste. Waste compound in the Mine Industrial Area (MIA) is the transfer location.
	Waste Oil / Coolant	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Must be pumped into a bulk waste oil / coolant container or tank located at the designated Waste management Compound (or similar) and transported offsite by the sites designated waste contractor.	Offsite as a Regulated Waste. Waste compound in the MIA is transfer area. Alternatively transfer into the MIA's bulk waste oil tank for use on site in blasting operations.
	Contaminated solids (e.g. Oily rags, hoses, gloves)	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Wastage of Raw Materials Consumption of Landfill Space 	All contaminated solids must be placed in the designated regulated waste bins and then transported offsite by the designated waste contractor.	Offsite as a Regulated Waste (Brown Bin) store within bunded area.
	Contaminated soil	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Increased volume of waste going to landfill instead of being recycled Wastage of Raw Materials Consumption of Landfill space Risks to human health or safety 	Contaminated soil must be collected immediately and stored in drums or other containers (ensure these are labelled). These containers / drums must be transported to the designated Waste management Compound (or similar) which are then taken offsite by the designated waste contractor. Alternatively, contaminated soil must be disposed of onsite at the discretion of the Environment Department. The Environment department must be notified of all spills to soil or water and the event must be recorded in the EMS.	Offsite as a Regulated Waste (Brown Bin) store within bunded area, Or Onsite in either spoil eplacements, regulated structures in accordance with Schedule G: Structures of the SRM EA , in pit or in dedicated rejects eplacements. Current location is the Ramp 6 TSF (Tailings Storage Facility) – also known as the Ramp 6 Header Dam.
	Contaminated & oily water	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Contaminated water captured via drains, sumps and bunds shall be pumped out buy the designated waste contractor when it reaches a capacity of 75%. Contaminated water that runs off infrastructure that has a high exposure to contaminants (e.g. fuel bays, industrial areas, workshops) must be captured and treated via an oily	Onsite discharge into regulated structures in accordance with Schedule G: Structures of the SRM EA , or into pits/voids which are not regulated structures provided a CCA (Consequence Category Assessment)

			water interceptor or collected in sumps. At a minimum, these interceptors must be inspected, with the silt / sediment removed on a monthly basis by the designated waster contractor.	has been completed in accordance with Condition G1 of the SRM EA Current location is the Ramp 6 TSF (Tailings Storage Facility) – also known as the Ramp 6 Header Dam.
	Solvents, paints	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Must be placed in the designated regulated waste bins or under the cover of a bunded waste shed to be later removed by the designated waste contractor.	Offsite as a Regulated Waste (Brown Bin), stored within bunded area.
	Hydraulic hoses	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. 	Must be disposed of in the designated regulated waste bins and taken offsite by the designated waste contractor.	Offsite as a Regulated Waste (Brown Bin), stored within bunded area.
	Oil filters	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Wastage of Raw Materials Consumption of Landfill space Risks to human health or safety 	Following draining of excess fluid (as per disposal requirements for 'waste oil' above) used oil filters must be placed in the designated blue bins located at Workshops and Service Bays.	Offsite as a Regulated Waste (Blue Bin), stored within bunded area.
Scrap Rubber	Scrap Tyres	<ul style="list-style-type: none"> Groundwater aquifer impediment Potential non-compliance to legal HSEC obligations 	Must be taken to the designated tyre disposal area. Refer to BHP PRO Tyre Storage and Disposal Procedure.	Onsite in approved locations consistent with the SRM EA . a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location is Ramp 10, just East of the Blast Compound. Ramp 4 is a legacy tyre dump within the spoil emplacement. Note, some tyres are used as road deliniators and will not reach the above location.
Recyclable Waste	Paper, glass, bottles, aluminium, PET plastic bottles	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations 	Must be disposed of in the designated bins which are taken offsite by the designated waste contractor.	Offsite as Recyclable Purple Bins.

		<ul style="list-style-type: none"> Impact on aquatic ecosystems. Wastage of Raw Materials 		
	Scrap Dragline Ropes	<ul style="list-style-type: none"> Wastage of Raw Materials Consumption of Landfill space 	Must be dragged to designated laydown areas. These ropes are not to be left outside these areas without first seeking permission from the Environment Department. The designated waste contractor will collect and remove the ropes.	<p>Offsite as a Recyclable via Scrap Metal Merchant. May be left on laydown yard for sufficient quantities to allow collection.</p> <p>Main storage area on old Airstrip or CHPP laydown yard.</p>
	Scrap steel and other metal	<ul style="list-style-type: none"> Wastage of Raw Materials Consumption of Landfill space 	<p>Must be placed in the designated scrap steel skip bins outside workshop facilities.</p> <p>For Major Projects / Bulk Steel – Must be placed in a designated area. The Project Manager is to contact the Environment Department to arrange for storage in laydown yard until such time it can be removed by the designated waste contractor.</p>	<p>Offsite as a Recyclable via Scrap Metal Merchant. May be left on laydown yard for sufficient quantities to allow collection.</p> <p>Where possible large scrap metal skip are provided.</p> <p>Main storage area on old Airstrip or CHPP laydown yard.</p>
	Poly Pipe	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables Wastage of Raw Materials Consumption of Landfill space 	Must be stockpiled on the laydown area on Ramp 5 adjacent to TMM.	Onsite reuse or sent offsite for recycling.
	Vehicle batteries Office batteries	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety Wastage of Raw Materials Consumption of Landfill space 	Must be placed in the designated areas within the Waste Management Compound (or similar). These will be collected by the designated waste contractor Office batteries are to be placed in battery boxes.	Offsite as a Recyclable, stored in white battery pallet box.
	Electrical waste	<ul style="list-style-type: none"> Contamination of soil / water Increase volumes to landfill Wastage of Raw Materials 	Contact the Environment department and discuss disposing of electrical waste in the provided electrical waste bin.	Bins are located at the Environment Department. To use these bins please contact the Environment department as you will need a key to open the lids and advice on what is intended to be thrown out meets IT disposal standards. Not all E-waste can go in these bins so please familiarise yourself with the images/instructions on the bins. If bins are full or you need

				further assistance, please contact the Environment department. These bins are taken off site by Infrabuild / onesteel (13Metal / Chris Black 0427 926 134) The site info brief with these instructions are in D2 - https://minaudctm.bhp.com/D2/?docbase=MINERALS_AUSTRALIA&locateld=0902d9c6851c2213
General Waste	Food scraps, plastics etc	<ul style="list-style-type: none"> Increased volume of waste going to landfill Generation of landfill leachate and landfill gas 	Compactable general wastes must be disposed of in the designated bins that are located primarily in or near buildings across operations. The contents of the bins are transferred to the industrial bins which are then emptied by the designated waste contractor.	<p>Offsite in Green Bins by licenced contractor.</p> <p>Disposal location is Peak Downs Mine licenced facility.</p>
	Timber pallets and wooden building material	<ul style="list-style-type: none"> Potential non-compliance Potential non-compliance to legal HSEC obligations 	Must be collected in the designated skip bins and taken to the waste timber dump.	<p>Onsite in approved locations consistnt with the SRM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current dump location Ramp 1 for timber pallets</p>
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be disposed of in General Waste Bin.	<p>Offsite disposal via by licenced contractor (Green Bins).</p> <p>Disposal location is Peak Downs Mine licenced facility.</p>
	Inert waste	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydowan area established at Ramp 4 coarse rejects dump where it will await burial by Mine Services.	<p>Onsite in approved locations consistnt with the SRM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location for disposal is Ramp ramp 4 (just south of Ramp 2/3 TSF)</p>
	Asphalt	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydowan area established at Ramp 4 coarse rejects dump where it will await burial by Mine Services.	<p>Onsite in approved locations consistnt with the SRM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location for disposal is Ramp 4 (just south of Ramp 2/3 TSF)</p>
	Fibreglass	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydowan area established at Ramp 4 coarse rejects dump where it will await burial by Mine Services.	<p>Onsite in approved locations consistnt with the SRM EA.</p> <p>a) in pits or voids;</p>

				b) in spoil emplacements; and c) left insitu below ground level. Current location for disposal is Ramp 4 with inert waste (just south of Ramp 2/3 TSF)
Contaminated liquid waste	Sewage / sludge	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Risks to human health or safety 	<p>Sewage and sludge shall be treated at the onsite sewerage treatment plant or via septic systems in-field.</p> <p>Sludge that accumulates at the plant shall be discharged to the designated evaporation sump.</p> <p>Sludge or septic waste that is generated in-field shall be pumped out by the designated waste contractor.</p>	Transported by licenced contractor to a licenced facility.
Special Waste	Asbestos	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	<p>Asbestos is managed by an authorised contractor. The waste contractor will provide skips for the purpose of removing the material from site.</p> <p>The material must be double wrapped in plastic and clearly labelled.</p>	Offsite disposal by a licenced contractor. Any storage or details are to be recorded on the SRM REG Asbestos Register .
	Polychlorinated Biphenols (PCBs)	<ul style="list-style-type: none"> Contamination of soil / water Impact on aquatic ecosystems. Potential non-compliance to legal HSEC obligations Risks to human health or safety 	<p>PCBs are typically associated with old electrical transformer oils. It is believed all sources of PCBs have been removed from QLD Coal sites however, if it is suspected that PCBs may be present in any materials the EnvironmentSuperintendent shall be notified. They will investigate and manage each reported location of PCBs on a case-by-case basis.</p> <p>If waste containing PCBs is verified, disposal will be arranged by a licenced contractor.</p>	<p>Offsite disposal by a licenced contractor.</p> <p>Any suspected areas of PCB contamination are to be updated in the geospatial's environmental liabilities layer on Mine to Map.</p>
	Ozone Depleting Substances (ODS)	<ul style="list-style-type: none"> Contamination of air Potential non-compliance to legal HSEC obligations Risks to human health or safety 	<p>Applicable examples of ODS are chemical refrigerants and fire extinguishers (e.g. Halons, CFCs and HCFCs). In accordance with the Environmental Protection Regulations (2019), all ODS are to be captured by a qualified person and disposed of at a licenced facility.</p> <p>Equipment containing ODS shall be labelled with a sticker identifying the specific substance.</p>	Offsite disposal by a licenced contractor.
	Clinical waste	<ul style="list-style-type: none"> Potential non-compliance to legal HSEC obligations Risks to human health or safety 	Used medical supplies are to be stored in lockable bins which are then taken offsite by the designated waste contractor.	Offsite disposal by a licenced contractor.
	Chemicals	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations 	Must be labelled and disposed of as per the Safety Data Sheet disposal requirements. A 'disposal by a licenced facility' form is required, chemicals must be stored in the	Offsite as a Regulated Waste in accordance with the SDS.

		<ul style="list-style-type: none"> Impact on aquatic ecosystems Risks to human health or safety 	designated area within the Waste Management Compound (or similar).	
	Seal-zit	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. 	Waste Seal-zit must be recovered during change out and/or removal of large earthmoving tyres and stored in containers that are banded. These are to be taken to the assigned section of the Waste Management Compound (or similar) for collection by the designated waste contractor.	Offsite as a Regulated Waste in accordance with the SDS.
	Printer toner and ink cartridges	<ul style="list-style-type: none"> Contamination of soil/water Risks to human health or safety Increased volume of waste going to landfill instead of being recycled 	In designated recycling boxes provided by printer manufacturer.	Offsite recycling by a licensed contractor
	F3 Foam	<ul style="list-style-type: none"> Contamination of soil/water Potential non-compliance to legal HSEC obligations Risks to human health or safety Impact on aquatic ecosystems 	F3 Foam is captured in IBC trailer near Waste Transfer Yard	Offsite as regulated waste to an appropriately licensed disposal facility.
	PFAS & PFAS Contaminated Waste	<ul style="list-style-type: none"> Contamination of soil/water Risks to human health or safety Impact on aquatic ecosystems Potential non-compliance to legal HSEC obligations 	Must only be handled and disposed of by an appropriately licensed contractor. Any identified PFAS contaminated waste should be appropriately banded to minimise the risk of release into the environment.	Offsite as a regulated waste to an appropriately licensed disposal facility.
	Lithium Batteries	<ul style="list-style-type: none"> Contamination of soil/water Risks to human health or safety Impact on aquatic ecosystems Potential non-compliance to legal HSEC obligations 	Disposal boxes available at Infrastructure Maintenance. Contact relevant department Infrastructure Maintenance.	Offsite disposal by licensed contractor
Spoil	Coal Rejects	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Coal rejects are to managed in accordance with the BHP MAN Rehabilitation Manual and the BHP Coal Landform Design Guideline . The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform. Rejects are Mine Affected Water generating in line with BHP GDL Environmental Authority Definition of Mine Affected Water . The release of water that has been in contact with rejects is to be managed in accordance with SRM PRO Mine Affected Water Release and Notification	Onsite in approved locations consistent with the SRM EA . a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.

			Procedure and SRM PLN Water Management Plan (North).	
	Saline soil	<ul style="list-style-type: none"> • Contamination of soil / water • Potential non-compliance to legal HSEC obligations • Impact on aquatic ecosystems 	<p>Saline spoil characteristics are outlined in BHP MANI Rehabilitation Manual. The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform.</p> <p>The release of water that has been in contact with saline spoil is to be managed in accordance with SRM PRO Mine Affected Water Release and Notification Procedure and SRM PLN Water Management Plan (North). The preferred management method in the BHP MAN Rehabilitation Manual is the sufficient encapsulation within a waste landform.</p>	<p>Onsite in approved locations consistent with the SRM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p>
	Dispersive spoil	<ul style="list-style-type: none"> • Contamination of soil / water • Potential non-compliance to legal HSEC obligations • Impact on aquatic ecosystems • Impact to land - vegetaion 	<p>Dispersive spoil characteristics are outlined in BHP MAN Rehabilitation Manual. The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform.</p> <p>Areas subject to erosion and sedimentation are to be managed in accordance with the SRM PLN Erosion and Sediment Control (North) Plan.</p>	<p>Onsite in approved locations consistent with the SRM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p>

Table 3: SRM Waste Streams (Type, Source, Impacts and Disposal Requirements)

Types of Waste	Waste Material	Potential Impacts	Disposal Instructions	Disposal Location/Destination
Hydrocarbons	Grease (Blackjack)	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	All waste grease must be collected and stored in drums located either within a bunded area or on top of a temporary bund. When full, the drums must be transported to the designated area in the Waste Management Compound (or similar) and exchanged for empty drums.	Offsite as a Regulated Waste. Waste Management Shed, see Figure 5 and 7
	Waste Oil / Coolant	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Must be pumped into a bulk waste oil / coolant container or tank located at the designated Waste management Compound (or similar) and transported offsite by the sites designated waste contractor.	Offsite as a Regulated Waste. Stored at waste management Shed, see Figure 5.
	Contaminated solids (e.g. Oily rags, hoses, gloves)	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Wastage of Raw Materials Consumption of Landfill Space 	All contaminated solids must be placed in the designated regulated waste bins and then transported offsite by the designated waste contractor.	Offsite as a Regulated Waste (Brown Bin) store within bunded area, see Figure 5 and Figure 7 for transfer location.
	Contaminated soil	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Increased volume of waste going to landfill instead of being recycled Wastage of Raw Materials Consumption of Landfill space Risks to human health or safety 	Contaminated soil must be collected immediately and stored in drums or other containers (ensure these are labelled). These containers / drums must be transported to the designated Waste management Compound (or similar) which are then taken offsite by the designated waste contractor. Alternatively, contaminated soil must be disposed of onsite at the discretion of the Environment Department. The Environment department must be notified of all spills to soil or water and the event must be recorded in the EMS.	Offsite as a Regulated Waste (Brown Bin) store within bunded area, see Figure 2 and Figure 3 for transfer location. Or Onsite in either spoil replacements, regulated structures in accordance with Schedule G: Structures of the SSM EA , in pit or in dedicated rejects emplacements. Current location is Ramp 67 TSF (Tailings Storage Facility) – Also known as the Ramp 5 TSF.
	Contaminated & oily water	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems 	Contaminated water captured via drains, sumps and bunds shall be pumped out by the designated waste contractor when it reaches a capacity of 75%. Contaminated water that runs off infrastructure that has a high exposure to contaminants (e.g. fuel bays, industrial	Offsite as a Regulated Waste – stored in bunded area awaiting transport. Or

		<ul style="list-style-type: none"> Risks to human health or safety 	<p>areas, workshops) must be captured and treated via an oily water interceptor or collected in sumps. At a minimum, these interceptors must be inspected, with the silt / sediment removed on a monthly basis by the designated waster contractor.</p>	<p>Onsite discharge into regulated structures in accordance with Schedule G: Structures of the SSM EA, or into pits/voids which are not regulated structures provided a CCA (Consequence Category Assessment) has been completed in accordance with Condition G1 of the SSM EA.</p> <p>Current suitable locations include Old Tailings Dam and the Ramp 67 TSF (Tailings Storage Facility) – Also known as the Ramp 5 TSF.</p>
	Solvents, paints	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	<p>Must be placed in the designated regulated waste bins or under the cover of a bunded waste shed to be later removed by the designated waste contractor.</p>	<p>Offsite as a Regulated Waste (Brown Bin), stored within bunded area, see Figure 5 and Figure 7 for transfer location.</p>
	Hydraulic hoses	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. 	<p>Must be disposed of in the designated regulated waste bins and taken offsite by the designated waste contractor.</p>	<p>Offsite as a Regulated Waste (Brown Bin), stored within bunded area, see Figure 5 and Figure 7 for transfer location.</p>
	Oil filters	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Wastage of Raw Materials Consumption of Landfill space Risks to human health or safety 	<p>Following draining of excess fluid (as per disposal requirements for 'waste oil' above) used oil filters must be placed in the designated blue bins located at Workshops and Service Bays.</p>	<p>Offsite as a Regulated Waste (Blue Bin), stored within bunded area, see Figure 5 and Figure 7 for transfer location.</p>
Scrap Rubber	Scrap Tyres	<ul style="list-style-type: none"> Groundwater aquifer impediment Potential non-compliance to legal HSEC obligations 	<p>Must be taken to the designated tyre disposal area. Refer to <i>BHP PRO Tyre Storage and Disposal Procedure</i>.</p>	<p>Onsite in approved locations consistent with the SSM EA .</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p> <p>Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Note, some tyres are used as road</p>

				deliniators and will not reach the above location.
Recyclable Waste	Paper, glass, bottles, aluminium, PET plastic bottles	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Wastage of Raw Materials 	Must be disposed of in the designated bins which are taken offsite by the designated waste contractor.	Offsite as Recyclable Purple Bins, see Figure 5 and Figure 7 for transfer location.
	Scrap Dragline Ropes	<ul style="list-style-type: none"> Wastage of Raw Materials Consumption of Landfill space 	Must be dragged to designated laydown areas. These ropes are not to be left outside these areas without first seeking permission from the Environment Department. The designated waste contractor will collect and remove the ropes.	Offsite as a Recyclable via Scrap Metal Merchant. May be left on laydown yard for sufficient quantities to allow collection. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5.
	Scrap steel and other metal	<ul style="list-style-type: none"> Wastage of Raw Materials Consumption of Landfill space 	Must be placed in the designated scrap steel skip bins outside workshop facilities. For Major Projects / Bulk Steel – Must be placed in a designated area. The Project Manager is to contact the Environment Department to arrange for storage in laydown yard until such time it can be removed by the designated waste contractor.	Offsite as a Recyclable via Scrap Metal Merchant. May be left on laydown yard for sufficient quantities to allow collection. Where possible large scrap metal skip are provided. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South
	Poly Pipe	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables Wastage of Raw Materials Consumption of Landfill space 	Must be stockpiled in a designated location if there is no intention to reuse the pipe. If the poly pipe is to be reused/repurposed satellite laydown areas are permitted.	Onsite reuse or sent offsite for recycling. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South
	Vehicle batteries Office batteries	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems 	Must be placed in the designated areas within the Waste Management Compound (or similar). These will be collected by the designated waste contractor Office batteries are to be placed in battery boxes.	Offsite as a Recyclable, stored in black battery pallet box or if no boxes are available, stacked neatly on a pallet at

		<ul style="list-style-type: none"> Risks to human health or safety Wastage of Raw Materials Consumption of Landfill space 		the Waste Management Shed, see Figure 5 and 7.
General Waste	Food scraps, plastics etc	<ul style="list-style-type: none"> Potential non-compliance to legal HSEC obligations 	Compactable general wastes must be disposed of in the designated bins that are located primarily in or near buildings across operations. The contents of the bins are transferred to the industrial bins which are then emptied by the designated waste contractor.	Offsite in Green Bins by licenced contractor. Disposal location is Peak Downs Mine licenced facility, see Figure 5 and Figure 7 for transfer location.
	Timber pallets and building materials (i.e. steel)	<ul style="list-style-type: none"> Potential non-compliance to legal HSEC obligations 	Must be collected in the designated skip bins and taken to the waste timber dump.	Onsite in approved locations consistent with the SSM EA . a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be disposed of in General Waste Bin.	Offsite disposal via by licenced contractor Green Bins. Disposal location is Peak Downs Mine licenced facility, see Figure 5 and Figure 7 for transfer location.
	Inert waste	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydown area established where it will await burial.	Onsite in approved locations consistent with the SSM EA . a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South
	Asphalt	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydown area established where it will await burial.	Onsite in approved locations consistent with the SSM EA . a) in pits or voids; b) in spoil emplacements; and

				<p>c) left insitu below ground level. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South</p>
	Fibreglass	<ul style="list-style-type: none"> Contamination of regulated waste or recyclables 	Must be transported to the laydown area established where it will await burial by Mine Services.	<p>Onsite in approved locations consistent with the SSM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level. Current location is Ramp 4 laydown (Also known as Ramp 68), see Figure 5. Historically Stockpiled in the Ramp 5 landfill (Also known as Ramp 67) area at Saraji South</p>
Contaminated liquid waste	Sewage / sludge	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. Risks to human health or safety 	<p>Sewage and sludge shall be treated septic systems in-field or transported to Saraji. Sludge or septic waste that is generated in-field shall be pumped out by the designated waste contractor.</p>	Transported by licenced contractor to a licenced facility.
Special Waste	Asbestos	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	<p>Asbestos is managed by an authorised contractor. The waste contractor will provide skips for the purpose of removing the material from site. The material must be double wrapped in plastic and clearly labelled.</p>	Offsite disposal by a licenced contractor. Any storage or details are to be recorded on the SRM REG Asbestos Register .
	Polychlorinated Biphenols (PCBs)	<ul style="list-style-type: none"> Contamination of soil / water Impact on aquatic ecosystems. Potential non-compliance to legal HSEC obligations Risks to human health or safety 	<p>PCBs are typically associated with old electrical transformer oils. It is believed all sources of PCBs have been removed from QLD Coal sites however, if it is suspected that PCBs may be present in any materials the Environment Superintendent shall be notified. They will investigate and manage each reported location of PCBs on a case-by-case basis.</p> <p>If waste containing PCBs is verified, disposal will be arranged by a licenced contractor.</p>	<p>Offsite disposal by a licenced contractor.</p> <p>Any suspected areas of PCB contamination are to be updated in the geospatial's environmental liabilities layer on Mine to Map.</p>
	Ozone Depleting Substances (ODS)	<ul style="list-style-type: none"> Contamination of air 	Applicable examples of ODS are chemical refrigerants and fire extinguishers (e.g. Halons, CFCs and HCFCs). In	Offsite disposal by a licenced contractor.

		<ul style="list-style-type: none"> Potential non-compliance to legal HSEC obligations Risks to human health or safety 	<p>accordance with the <i>Environmental Protection Regulations (2019)</i>, all ODS are to be captured by a qualified person and disposed of at a licenced facility.</p> <p>Equipment containing ODS shall be labelled with a sticker identifying the specific substance.</p>	
	Clinical waste	<ul style="list-style-type: none"> Potential non-compliance to legal HSEC obligations Risks to human health or safety 	Used medical supplies are to be stored in lockable bins which are then taken offsite by the designated waste contractor.	Offsite disposal by a licenced contractor.
	Chemicals	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	Must be labelled and disposed of as per the Safety Data Sheet disposal requirements. A 'disposal by a licenced facility' form is required, chemicals must be stored in the designated area within the Waste Management Compound (or similar).	Offsite as a Regulated Waste in accordance with the SDS, stored at the Waste Management Shed, see Figure 5.
	Seal-zit	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems. 	Waste Seal-zit must be recovered during change out and/or removal of large earthmoving tyres and stored in containers that are banded. These are to be taken to the assigned section of the Waste Management Compound (or similar) for collection by the designated waste contractor.	Offsite as a Regulated Waste in accordance with the SDS, stored at the Waste Management Shed, see Figure 5 and 7.
	Printer toner and ink cartridges	<ul style="list-style-type: none"> Contamination of soil/water Risks to human health or safety Increased volume of waste going to landfill instead of being recycled 	In designated recycling boxes provided by printer manufacturer.	Offsite as a Regulated Waste in accordance with the SDS.
	PFAS & PFAS Contaminated Waste	<ul style="list-style-type: none"> Contamination of soil/water Risks to human health or safety Impact on aquatic ecosystems Potential non-compliance 	Must only be handled and disposed of by an appropriately licensed contractor. Any identified PFAS contaminated waste should be appropriately banded to minimise the risk of release into the environment.	Offsite as a Regulated Waste to an appropriately licensed disposal facility.
Spoil	Coal Rejects	<ul style="list-style-type: none"> Contamination of soil / water Potential non-compliance to legal HSEC obligations Impact on aquatic ecosystems Risks to human health or safety 	<p>Coal rejects are to managed in accordance with the <i>BHP MAN Rehabilitation Manual</i> and the <i>BHP Coal Landform Design Guideline</i>. The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform.</p> <p>Rejects are Mine Affected Water generating in line with <i>BHP GDL Environmental Authority Definition of Mine Affected Water</i>. The release of water that has been in contact with rejects is to be managed in accordance with <i>SRM PRO Mine Affected Water Release and Notification</i></p>	<p>Onsite in approved locations consistent with the <i>SSM EA</i>.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p> <p>Currently disposed onsite in regulated structures in accordance with Schedule G: Structures of the <i>SSM EA</i>.</p>

			<i>Procedure and SRM PLN Water Management Plan (South).</i>	Current locations are Ramp 3 Tailings Dam or Ramp 4 in Figure 5.
Saline soil	<ul style="list-style-type: none"> • Contamination of soil / water • Potential non-compliance to legal HSEC obligations • Impact on aquatic ecosystems 	<p>Saline spoil characteristics are outlined in <i>BHP MANI Rehabilitation Manual</i>. The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform.</p> <p>The release of water that has been in contact with saline spoil is to be managed in accordance with <i>SRM PRO Mine Affected Water Release and Notification Procedure</i> and <i>SRM PLN Water Management Plan (South)</i>. The preferred management method in the <i>BHP MAN Rehabilitation Manual</i> is the sufficient encapsulation within a waste landform.</p>	<p>Onsite in approved locations consistent with the SSM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p> <p>Determined by source location upon the mine and prevailing ability to bury.</p>	
Dispersive spoil	<ul style="list-style-type: none"> • Contamination of soil / water • Potential non-compliance to legal HSEC obligations • Impact on aquatic ecosystems • Impact to land - vegetation 	<p>Dispersive spoil characteristics are outlined in <i>BHP MAN Rehabilitation Manual</i>. The preferred management is the sufficient encapsulation within suitable inert spoil within a waste landform.</p> <p>Areas subject to erosion and sedimentation are to be managed in accordance with the <i>SRM PLN Erosion and Sediment Control (South) Plan</i>.</p>	<p>Onsite in approved locations consistent with the SSM EA.</p> <p>a) in pits or voids; b) in spoil emplacements; and c) left insitu below ground level.</p> <p>Determined by source location upon the mine and prevailing ability to bury.</p>	

Table 4: SSM Waste Streams (Type, Source, Impacts and Disposal Requirements)

4.5 Waste Reprocessing

- 8 SRM reprocesses the following wastes:
 - a Vegetation for use in mine site rehabilitation in accordance with *BHP MAN Rehabilitation Manual*.
 - b Hydrocarbons for use in blasting in accordance with *SRM PRO Blasting Operations*.
- 9 No waste is currently reprocessed at SSM.

4.6 Continuous Improvement

- 10 The Environment Department shall ensure that the Waste MP is subjected to routine review, which is done by periodic PM02 work orders. The findings from these reviews shall be used to develop methodologies aimed at continually improving waste re-use, recycling and minimisation.

5 Waste Disposal

5.1 SRM Disposal Locations

- 1 The locations of waste burial and/or onsite disposal at SRM is provided in *Figure 3*.
- 2 The locations of hydrocarbon contaminated water and soil disposal at SRM is provided in *Figure 4*.



Figure 3: SRM Waste Burial and/or onsite disposal Locations as of FY24

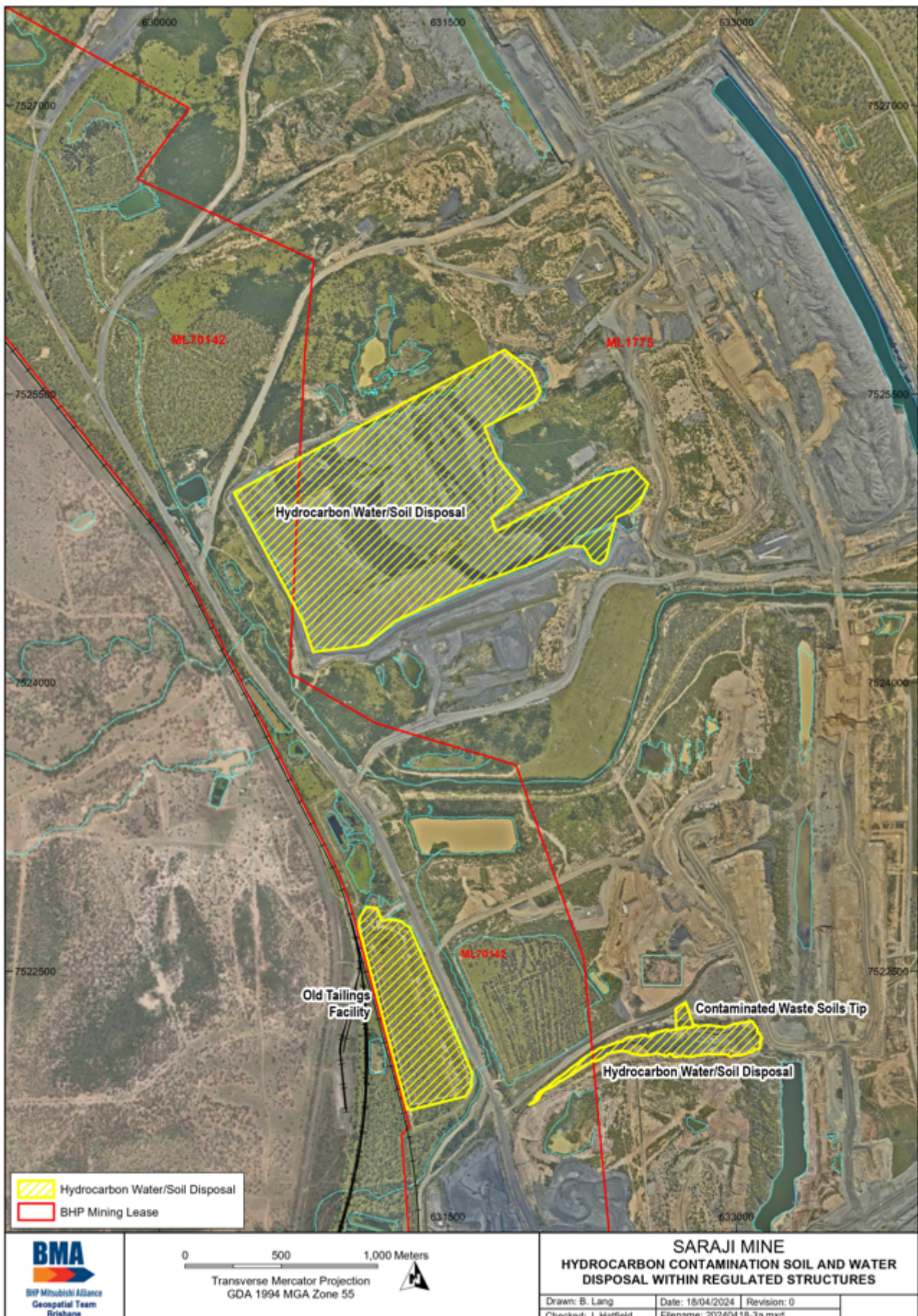


Figure 4: SRM hydrocarbon contaminated water and soil disposal locations

5.2 SSM Disposal Locations

- 3 The locations of waste burial and/or onsite disposal, and hydrocarbon contaminated water and soil at SSM is provided in *Figure 5*.

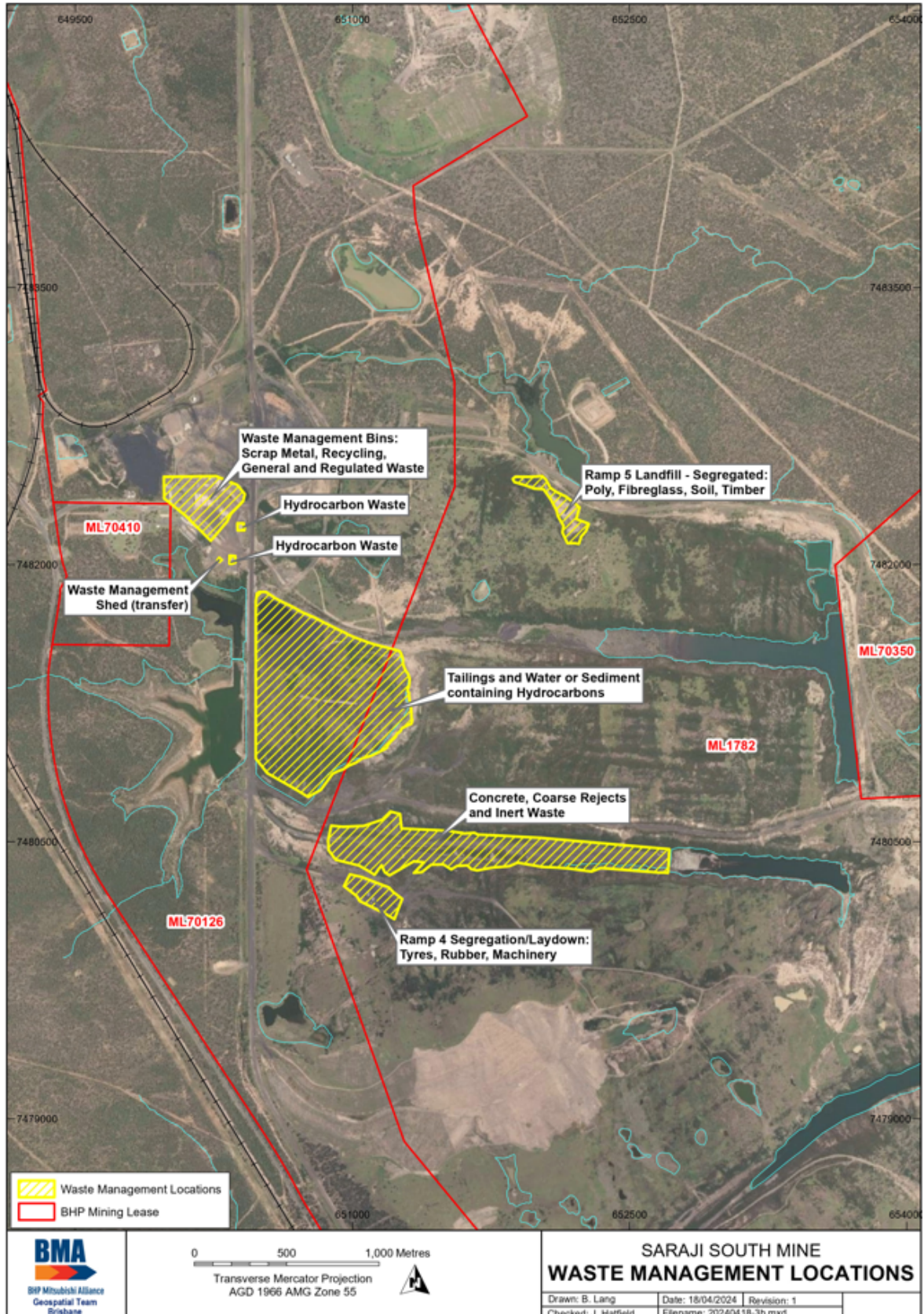


Figure 5: SSM waste disposal locations

5.3 SRM Transfer Locations

- 4 The location where waste is stored in preparation for processing or transport at SRM is provided in Figure 6.



Figure 6: SRM Waste Transfer Locations as of FY24

5.4 SSM Transfer Locations

- 5 The location where waste is stored in preparation for processing or transport at SSM is provided in Figure 7.



Figure 7: SSM Waste Transfer Locations as of FY22

5.5 SRM Reprocessing Locations

- 6 The location where waste is stored in preparation for processing or transport at SRM is provided in Figure 8.

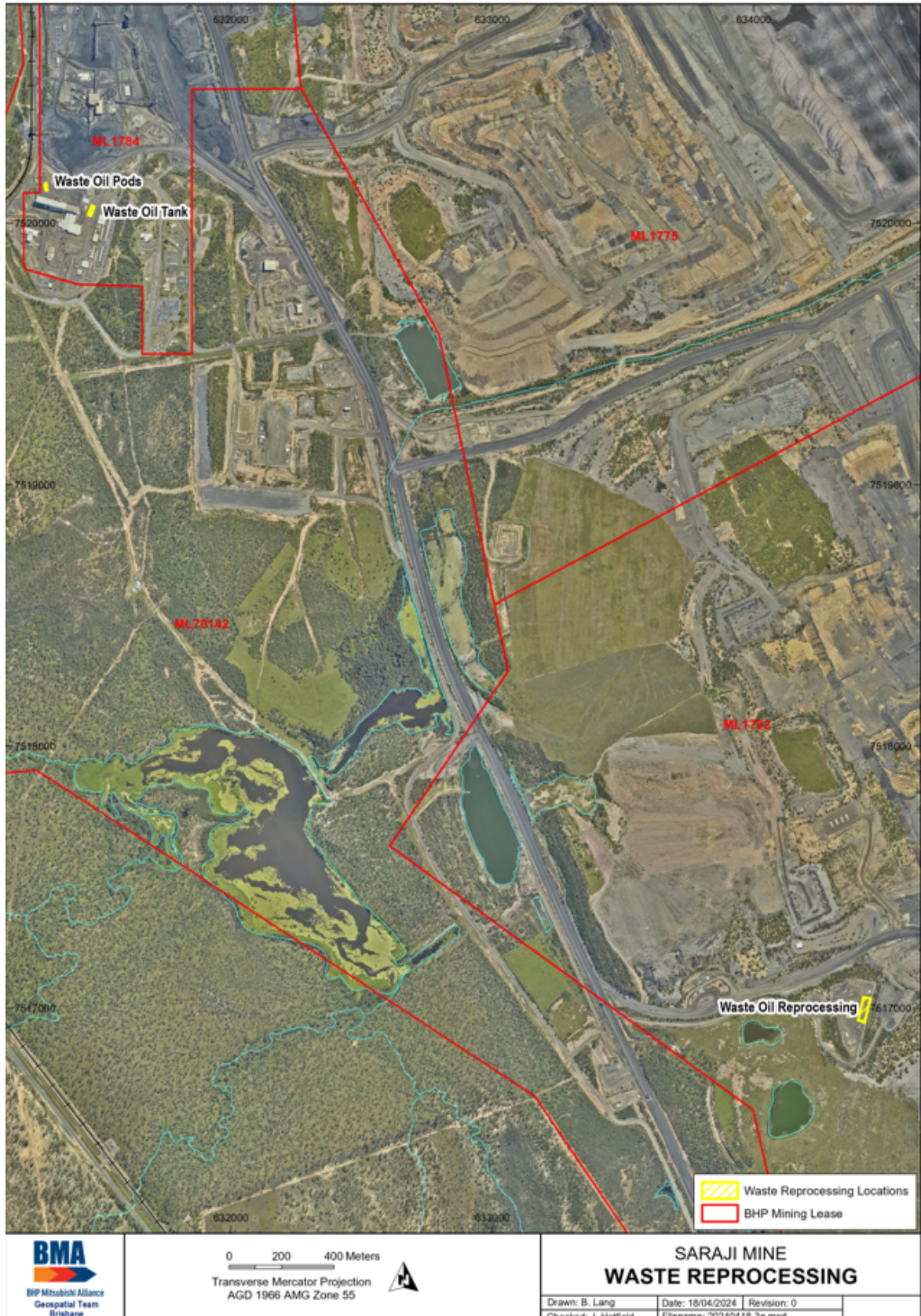


Figure 8: SRM Reprocessing Locations as of FY24

6 Waste Management Controls

6.1 Waste Management Strategy

- 1 SRM and SSM use the waste management hierarchy as a framework for prioritising waste management practices to achieve the best environmental outcome. The production of waste is avoided where possible on-site. However, where the production of waste is unavoidable, waste re-use is the preferred option, followed by waste recycling and finally disposal.
- 2 The sections below describe the measures in place at SRM and SSM to manage waste with respect to the waste management hierarchy (*Figure 9*).

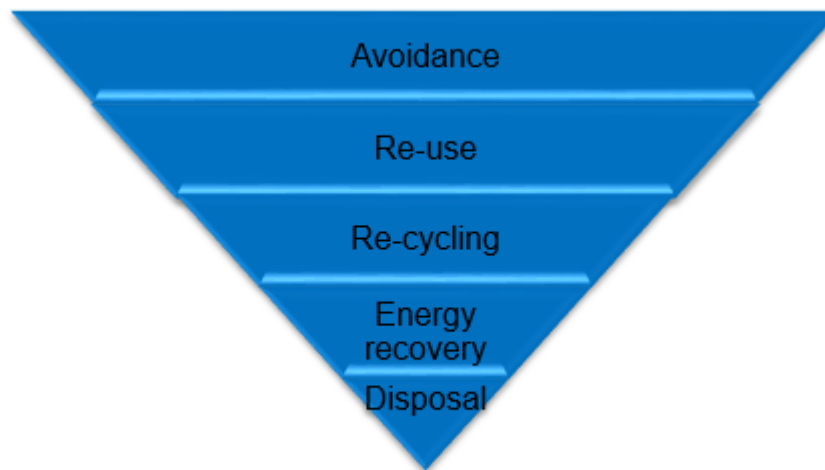


Figure 9: SRM and SSM Waste management hierarchy

6.2 Avoidance and Reduction

- 3 Avoidance and reduction of wastes at SRM and SSM has been achieved in a variety of ways including:
 - a Bulking up – materials such as lubricants, chemicals and other high use materials are purchased and stored in bulk to reduce associated packaging waste;
 - b Rationalisation Programs – where product varieties are restricted and consequently the number of different waste streams reduced;
 - c Materials Tracking Programs – enables the tracking of material usage and distribution to assist with the identification of inefficiencies and development of strategies to reduce material usage;
 - d Compaction – Most general waste produced on site is compacted prior to disposal by the waste contractor; and
 - e One of the largest sources of waste for mine sites is the various packing materials which accompany equipment and material shipped to site. Shipping and packing specifications at SRM and SSM require packing materials to be minimised and; where unavoidable, the use of environmentally responsible packaging materials. Additionally, the choice of returnable containers, reusable packing material and biodegradable materials is preferred over synthetic, non-recyclable packing material.

6.3 Waste Segregation

- 4 The waste that is generated at SRM and SSM can be separated into the following main groups:
 - a general waste;
 - b recycled waste;
 - c regulated waste;
 - d scrap metal;
 - e timber;
 - f poly pipe; and
 - g used scrap tyres - (refer to ***BHP PRO QLD Coal Tyre Storage and Disposal Procedure***)
- 5 The various waste streams have dedicated waste disposal receptacles or laydown areas.
- 6 The waste contractor attends site on an as needs basis to empty front lift bins and retrieve full skips. Waste streams such as scrap metal and bulked waste hydrocarbons are removed as required.
- 7 Waste skips, bins and drums exist for each of the waste streams (excluding process wastes). All skips and bins are clearly labelled and colour coded for easy identification by personnel and to assist in appropriate disposal of waste (refer to *Table 5*).

Colour of Bin / Skip	Type of Waste
Blue (Darker)	Scrap metal
Lilac	Recyclables (paper, cardboard, cans, plastics carrying the recycle symbol)
Green	General waste
Green (Timber written on side)	Timber
Green (Electrical written on side)	Electrical (bins at Lilly Pilly office)
Brown	Regulated waste (oily rags, oil spill mops)
Tan	Oil drums
Blue	Used oil filters

Table 5: SRM and SSM Waste Disposal Streams

- 8 The SRM waste transfer station is shown above in *Figure 6* and consists of one undercover, concrete bunded area for storage of waste oil and regulated waste, and an earthen bunded area for general skips.
- 9 JJ Richards supply and own front lift waste skips and roll on roll off skip bins at workshops and across site.
- 10 Emptying of roll on roll off skip bins are serviced by JJ Richards. If maintenance is required i.e. labelling, leaks and general health, please contact Mine Infrastructure Maintenance Department or Environment Department for assistance.

- 11 Emptying of front lift bins are the responsibility of the area they reside, if the area has the appropriate equipment and prior approval from the Mine Infrastructure Maintenance Department – front lift bins can be taken to the waste transfer yard. If there is no equipment available JJ Richards will empty the front lift bins. Area owners with mechanical aid and self-service capabilities wanting to swap out bins at the transfer yard, see Figure 6 for location. If maintenance is required i.e. labelling, lids, wheels, general health, please contact Mine Infrastructure Maintenance Department or Environment Department for assistance.
- 12 Small wheelie bins are owned by BMA. Servicing wheelie bins are the responsibility of the bins area owner. If maintenance is required i.e. labelling, lids, wheels, general health, please contact Mine Infrastructure Maintenance Department or Environment Department for assistance.
- 13 Spill kits are owned by BMA. Maintenance i.e. labelling, lids, wheels, general health is responsibility of the area owner, please contact Mine Infrastructure Maintenance Department or Environment Department if required to assist.

6.4 Re-use and Recycling

- 14 In order to facilitate and optimise recycling at SRM and SSM, waste shall be classified and sorted into the categories:
 - a timber, lumber and wood;
 - b steel/iron;
 - c plastics labelled for recycling;
 - d tyres;
 - e paper and carton; and
 - f used oil.
 - g aluminium cans:
 - h electrical waste;

6.5 Offsite Transport

- 15 SRM and SSM has engaged JJ Richards as our total waste management contractor.
- 16 JJ Richards is responsible for transporting all waste off-site in a safe manner, and ensuring only licensed facilities are used to handle respective waste streams.
- 17 JJ Richards have a waste oil contract for removal. Create Energy have a waste oil contract to reprocess into blasting product.
- 18 Infrabuild has been engaged to remove and dispose of scrap metal and electrical waste.

6.6 SRM Sewage Treatment

- 19 SRM currently has one (1) operating Sewage Treatment Plant (STP) on site.
- 20 Sewage collected from the mobile crib huts and offices is pumped on a regular basis by the waste management contractor and then placed in the STP located on site for treatment, see *Figure 10* below.
- 21 Sewage on site is treated to ensure that the effluent is compliant when released from the STP. Monthly monitoring is undertaken by the Environment Department and/or sampling contractor at the STP outflow. Weekly monitoring is conducted to test plant performance by the Mine Infrastructure Maintenance Team. The old STP (now redundant) drained into the polishing ponds. The new STP reports into the SRM MAW System, see *Figure 10* below.
- 22 The SRM STP is maintained and controlled by suitably qualified and competent personnel.

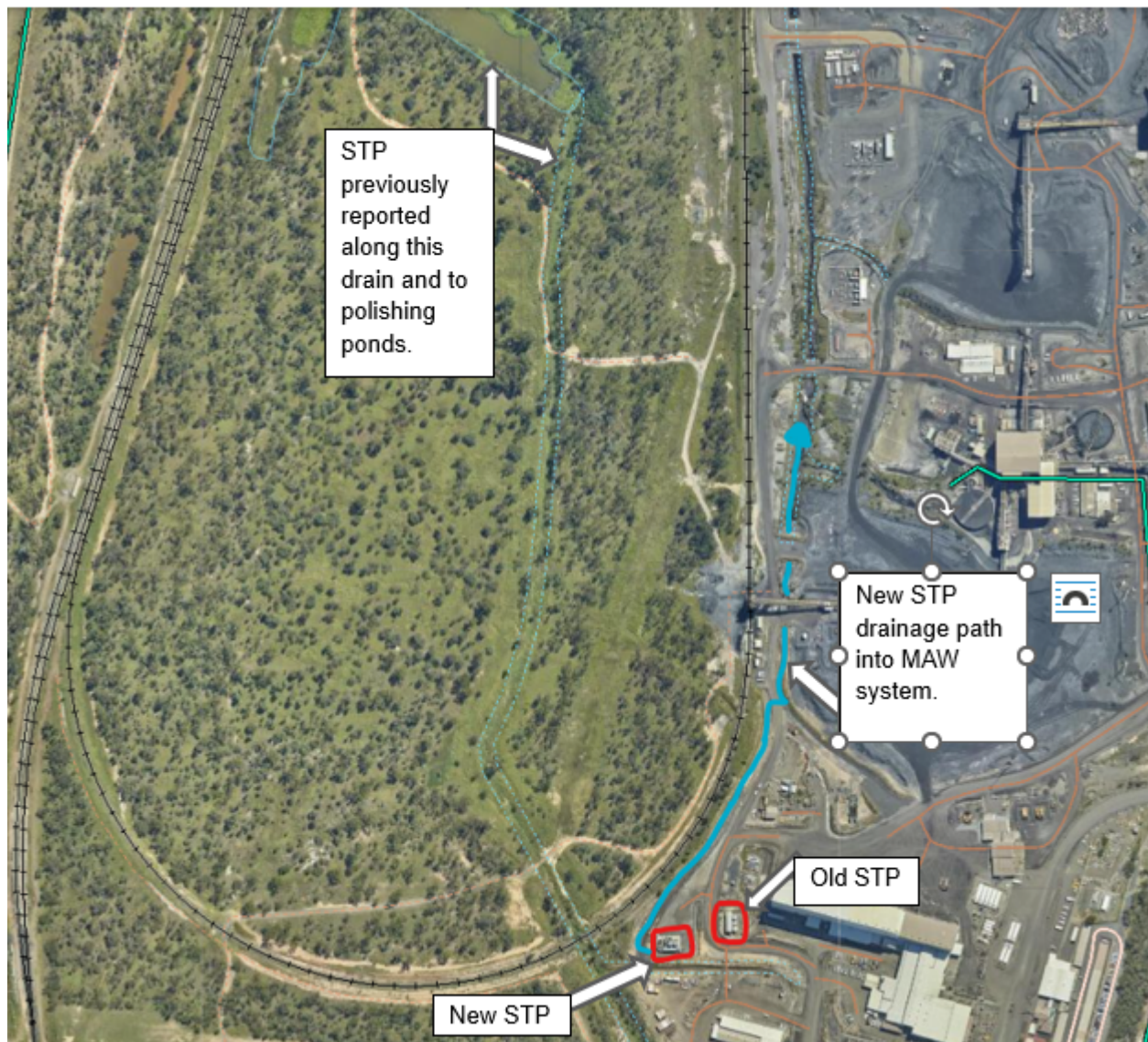


Figure 10: Location of New and OLD SRM STP and Previously used Polishing Ponds and Drain

6.7 SSM Sewage Treatment

- 23 SSM currently has no operating Sewage Treatment Plants (STPs) on site, however is due to have one with new bath house development in FY2025. Raw sewage generated in the Southern MIA (Mine Industrial Area) and Other Mobile Toilet Facilities is collected by the waste contractor and transported to Saraji Mine (SRM) for treatment.

6.8 Hazardous Waste Management

- 24 Details of the management and handling of hazardous/regulated wastes on site can be found in the SHMS.
- 25 The preferred method of removal of unnecessary hazardous waste is through the supplier for re-use.
- 26 Where the supplier is unable to remove the waste it is collected and transported by an authorised contractor and disposed at an approved hazardous waste disposal site in accordance with the *EP Act 1994* and the waste product's SDS.
- 27 Any PFAS or potential PFAS contamination identified at SRM and SSM will be managed in accordance with the *Mau Environment PFAS – contaminated waste management standard*, all PFAS waste will be treated as regulated waste and will be handled/disposed of by a licensed contractor to an appropriately licensed facility.

6.9 Monitoring and Control Verification

- 28** Monitoring and tracking of waste is an important element of waste management, providing a mechanism for assessing against SRM's and SSM's performance indicators and statutory requirements.
- 29** Monitoring at SRM and SSM includes:
- a** Volume of general waste with specific area breakdown;
 - b** Percentage of contamination in general and recyclable bins;
 - c** Volume of recyclable waste;
 - d** All forms of regulated waste are tracked, either electronically or by a waste tracking certificate;
 - e** DESI Waste Transport Certificates are forwarded by the waste management contractor. A copy is retained by the waste contractor and also DESI. The certificates outline the type and amount of regulated waste, the name of the waste producer and the nominated disposal/treatment/storage facility;
 - f** Waste oil, oily water, oily sludge, grease, oily rags and absorbent is recorded in litres;
 - g** The number of oil filters and drums leaving site is recorded; and
 - h** Types and volumes of scrap metal generated and monthly reimbursement amount.
- 30** Most of the monitoring described above is incorporated into the waste contractor's monthly reports which are discussed on a monthly basis with all relevant stakeholders on site.
- 31** Monitoring results are reported to SRM and SSM on a monthly basis by JJ Richards (JJR). The report is reviewed by the Environment Department for accuracy and to detect trends.
- 32** Verification of the effectiveness of implemented controls is conducted through:
- a.** monthly compliance sampling activities;
 - b.** periodic review of this Waste MP and environment risk assessments;
 - c.** internal audits, including PT&E Assurance audits and site based compliance audits;
 - d.** field Leadership activities; and
 - e.** review of SAP events.
- 33** As SSM has been in care and maintenance since 2012, and only recently restarted operations in the northern pits, the waste volumes generated are expected to be minimal.

7 Roles and Responsibilities

1 Roles and responsibilities which hold relevance for waste management at SRM and SSM are outlined in *Table 6*.

Role	Responsibility
General Manager Operations	<ul style="list-style-type: none"> Fulfilment of all applicable laws, regulations and requirements in relation to waste management and reporting.
Manager Mine Scheduling	<ul style="list-style-type: none"> Identify and incorporate waste disposal locations into Operational Mine Plans. Provide spatial file and other record of waste disposal during the annual ERC process. Where required obtain and follow the <i>BHP PRO Permit to Disturb Procedure</i>
Manager Maintenance	<ul style="list-style-type: none"> Manage waste management contractor; Identify and implement continuous improvement initiatives to reduce waste generation and to re-use and recycle waste; and Provide data for waste management reporting. Maintain site waste management infrastructure to an acceptable standard.
Mine Services Superintendent	<ul style="list-style-type: none"> Manage on site disposal locations and waste burial. Where required obtain and follow the <i>BHP PRO Permit to Disturb Procedure</i>
Managers / Risk Owners	<ul style="list-style-type: none"> Provide input and ideas to identify opportunities for improvement; and Provide the necessary resources such that waste management performance indicators can be achieved; and Implement any actions of this plan for which they are responsible. Comply with waste management and/or disposal requirements in accordance with the scope of activities authorised and/or licensed by the Administering Authority and BHP procedures and processes
Superintendent Environment	<ul style="list-style-type: none"> Development and review of site Waste MP; Support line management in building an understanding of, and compliance with, relevant Environment Our Requirements and legal requirements; Identify and measure environmental impacts of waste associated with the sites operations; Execution of scheduled compliance and verification monitoring activities Advise on improvement initiatives relating waste management and meeting regulatory commitments. Provide education and training to Coal Mine Workers (CMW) relating to waste management activities. Monitor and report environmental nuisance of waste management associated with the sites operations.
All other Superintendents	<ul style="list-style-type: none"> Adhere to and implement waste management requirements for the mining operations.

Role	Responsibility
Superintendent Geospatial	<ul style="list-style-type: none"> Maintain geospatial database of land use, disturbance and contaminated sites
Manager Closure Planning	<ul style="list-style-type: none"> Provide guidance on rehabilitation and contaminated sites management.
Waste Management Contractor(s)	<ul style="list-style-type: none"> Provide input and ideas to identify opportunities for improvement; and Comply with waste management / disposal requirements associated with their role and activities in accordance with procedures.

Table 6: Roles and Responsibilities of relevance to Waste Management

8 Awareness and Training

8.1 Learning Management System

- 1 Training will be undertaken in accordance with the BMA Learning Management System (LMS).
- 2 All SRM and SSM visitors, employees and contractors are inducted in accordance with the BMA LMS and the site access procedure. This process provides individuals new to site with a level of environmental awareness training appropriate to the level of risk associated with their activities on site.

8.2 General Awareness

- 3 Specifically, BMA requires that employees, contractors and visitors are aware of:
 - a Their roles and responsibilities:
 - i general environmental duty Environmental Protection Act 1994 (section 319);
 - ii duty to notify environmental harm Environmental Protection Act 1994 (section 320-320G);
 - iii offence of causing environmental nuisance Environmental Protection Act 1994 (section 440); and,
 - iv obligations under the SRM and SSM EA;
 - b The environmental impacts, potential or actual, of their activities on site.

9 Reporting

9.1 External Reporting

- 1 Reporting on performance against the applicable data from monitoring schedules shall be provided to the Superintendent Environment in accordance with regulatory conditions.
- 2 When monitoring results do not conform to the identified requirements, the Environment department shall advise and consult with management responsible for the non-conforming plant or process. The event will be reported in EMS to ensure that corrective/preventative actions can be identified.
- 3 Records of waste management must be kept for a minimum of 5 years.
- 4 In the event of emergencies, exceptions or incidents, all reasonable actions must be taken by Operations to minimise environmental harm and written notification must be given to the Administering Authority, within 24 hours of becoming aware in accordance with the **SRM EA** and **SSM EA**.
- 5 It is the responsibility of the Superintendent Environment or his/her delegate to report all significant environmental events to the regulator in accordance with the **SRM EA** and **SSM EA**.

9.2 Internal Reporting

- 6 Refer to the *BMA HSE STD Event Management Standard* and the *BMA STD HSE Investigation Protocol*.
- 7 Event reporting is to be entered into the EMS via the Fiori tile found on the BHP Digital Landing Page. The EMS will provide oversight by the operations and relevant internal stakeholders.
- 8 Any incident can be reported by any CMW, if the CMW does not have access to Fiori and/or the EMS then they may provide the detail to their supervisor, or the Environment department, for entry.

9.3 Complaint Management

- 9 A community complaint is defined as a verbal or written complaint made directly to a BHP representative by a member of the community relating to an adverse impact on the community from the Company's activities/and/or employee in part or in whole.
- 10 Community complaints are to be managed in accordance with the *BHP Community Complaints and Grievance Procedure*.
- 11 It is recommended in the event of a complaint or grievance that one first contacts the Specialist Community, Community BMA NSWEC for advice and to include the information on the Stakeholder Engagement Register.

10 Terms and Definitions

Term	Definition
CFC	Chlorofluorocarbon
CMW	Coal Mine Worker
EA	Environmental Authority
EMS	Environmental Management System
EP Act	Environmental Protection
ERC	Estimated Rehabilitation Cost
Event	An emergency or incident that is entered into SAP event reporting system.
GPS	Global Positioning System
HCFC	Hydrochlorofluorocarbon
PT&E	Planning Technical & Environment
LMS	Learning Management System
ODS	Ozone Depleting Substance
PCB	Polychlorinated Biphenols
PET	Polyethylene terephthalate (A plastic compound)
QLD	Queensland
Regulated Waste	As defined in the Environment Protection Regulation 1998: means non-domestic waste mentioned in Schedule 7 Regulated Wastes in the Environment Protection Regulation 1998 (whether or not it has been treated or immobilised), and includes: For an element – any chemical compound containing the element; and anything that has contained the waste.
SDS	Safety Data Sheet
Shall	The word 'shall' is to be understood as mandatory.
Should	The word 'should' is to be understood as non-mandatory, advising or recommended.
SSM	Saraji South Mine
STP	Sewage Treatment Plant
TEO	Target Environment Outcomes
Waste	The definition of 'waste' is in the Environmental Protection Act 1994 (EP Act). In brief, it includes anything that is (a) left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity; or (b) surplus to the industrial, commercial, domestic or other activity generating the waste. A thing can be a waste whether or not it is of value. In summary, waste is "any gas, liquid, solid or energy or a combination of wastes that is surplus to, or unwanted from, any industrial, commercial, domestic or other activity, whether or not of value".
Waste MP	Waste Management Plan

Table 7: Terms and Definitions

11 References

Reference Number	Title	Document Number
Legislative Requirements Documents		
EXT-RPT-0002	<i>Environmental Protection - Environmental Authority (EA) EPML00862313 - Saraji Mine</i>	012585797
EXT-RPT-0001	<i>Environmental Protection - Environmental Authority (EA) EPML00865013 - Norwich Park Mine (now Saraji South Mine)</i>	012585787
	<i>Environmental Protection Act 1994 (QLD)</i>	
	<i>Environmental Protection Regulation 2019 (QLD)</i>	
	<i>Waste Reduction and Recycling Act 2011 and Regulation 2011 (QLD)</i>	
Technical Reference Documents		
	BHP Coal Landform Design Guideline	Coal Technical Portal
BHP/BMA Documents		
	BHP Our Requirements: Risk Management	
	BHP Our Requirements: Environment and Climate Change	
	BHP Our Requirements: Health, Safety, Environment and Community Reporting	
	BHP Our Requirements: Closure	
	Mau Environment PFAS – contaminated waste management standard	
BMA-PRO-0056	BMA PRO Permit to Disturb Procedure	000205251
BHP-GDL-0004	BHP GDL Environmental Authority Definition of Mine Affected Water	012479022
BMA-MAN-0080	BHP MAN Rehabilitation Manual	000199330
BMA-PRO-0005	BHP PRO Community Complaints Grievance Procedure	000197140
BMA-STD-0008	BMA HSE STD Event Management Standard	000205066
BMA-STD-0006	BMA STD HSE Investigation Protocol	000199191
BHP-PRO-0005	BHP PRO QLD Coal Tyre Storage and Disposal Procedure	000198694
Site Documents		
SRM-PLN-0057	SRM PLN Material Risk Management Plan	000198693
SRM-PLN-0051	SRM PLN Water Management Plan	000204603

Reference Number	Title	Document Number
SRM-PLN-0101	SRM PLN Water Management Plan (South)	013084828
SRM-JSA-0002	SRM JSA Environmental Risk Register	013675670
SRM-PRO-0014	SRM PRO Mine Affected Water Release and Notification Procedure	000205331
SRM-REG-0031	SRM REG Asbestos Register	000182197
SRM-PLN-0014	SRM PLN Erosion and Sediment Control (North) Plan	000196864
SRM-PLN-0089	SRM PLN Erosion and Sediment Control (South) Plan	012754555
SRM-PRO-0133	SRM PRO Blasting Operations	015185337

Table 8: List of reference documents

12 Version Management

Version	Details	Date
1.0	New BHP Environment A&I TEMPLATE WMP	19 March 2018
7.0	Migration from Hummingbird – reviewed no changes required	06 November 2018
8.0	New EA Conditions and conversion to SRM Template.	23 December 2020
9.0	Biannual revision	25 November 2022
10.0	Amalgamation of SRM and SSM waste management plans	22 December 2022
11.0	Minor admin reference update as a result of the SHMS Rationalisation Project. Refer to MOCBMA013711	10 April 2025

Table 9: Version Managemnt



SRM-PLN-0051

BHP Mitsubishi Alliance

SRM PLAN

Water Management

Status: Approved

Version: 7.0 (09 October 2024)

Business Owner: BMA SRM Environment
Operations Superintendent

Document ID # 000204603



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1 Introduction

1.1 Purpose

- 1 The main purpose of this Water Management Plan (WMP) is to ensure water management strategies are in place at Saraji Mine (SRM) to control and manage potential environmental risks and impacts on the receiving environment from site activities.
- 2 This WMP describes the SRM Mine Water Management System (MWMS) and associated planning, operational and, reporting requirements for preventing and minimising impacts within the defined Area of Influence (AOI) for water resources.
- 3 The content of the WMP is intended to meet the obligations of the **SRM Environmental Authority (EA) EPML00862313** and the **BHP Environment Global Standard**.

1.2 Scope

- 4 This WMP applies to all personnel conducting activities at SRM, including planning, exploration, operational, ancillary and closure activities that have the potential to impact on the immediate or surrounding receiving environment identified in the site AOI.
- 5 This WMP deals with management of raw water, stormwater, groundwater and Mine Affected Water (MAW) (see **Section 4.1.1.1** for descriptions of each water type).
- 6 The impacts to human health from water supply at SRM are out of scope for this WMP and are managed through the **Global Health Standard** and the **BMA STD Drinking Water Quality**.
- 7 SRM operates under the BMA Environmental Management System (EMS), which is aligned with **ISO14001:2015 Environmental Management Systems**. This WMP forms part of the SRM EMS documentation and is laid out to follow the 'Plan-Do-Check-Act' continuous improvement cycle as shown in **Appendix A: Alignment to ISO:14001**.

2 Operating Context

2.1 Background Environment

- 1 The SRM complex is 20 km north of Dysart in the Bowen Basin coalfields. The mine encompasses Mining Leases (ML) 1775, ML1782, ML1784, ML2360, ML2410, ML70142, ML70294, ML70298, ML70328 and ML700021 totalling approximately 10,500 hectares. These leases are held by the joint venture partners BHP and Mitsubishi Development (the **EA** holders).
- 2 **Figure 1** shows the site layout in relation to surrounding waterways and catchments.

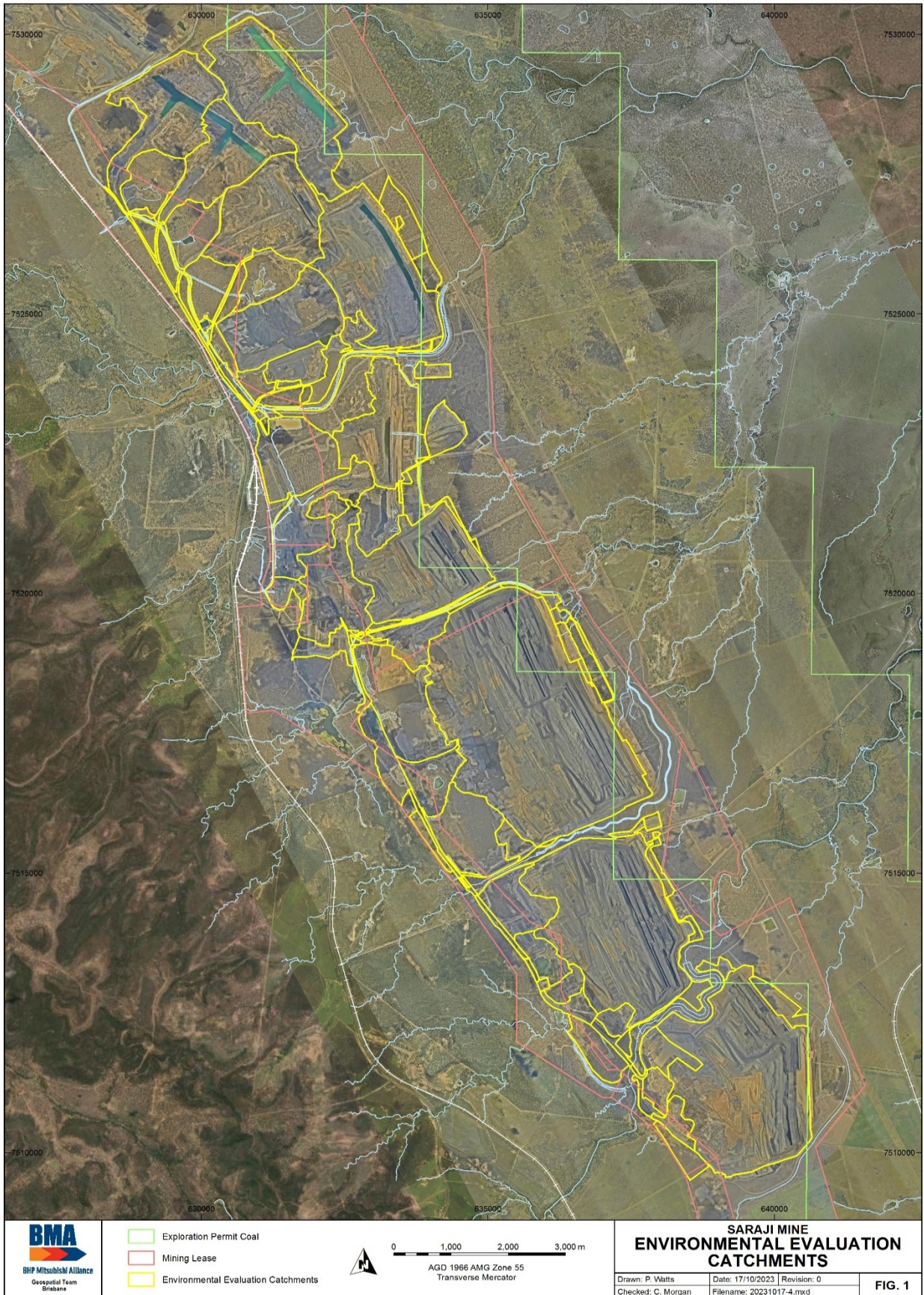


Figure 1: Site layout of SRM showing catchments

2.1.1 Climate

- 3 A summary of long-term regional climatic data is presented in **Table 1**. The data was obtained from the Bureau of Meteorology Station, Moranbah (Station Number 034038). Data was selected from Moranbah due to proximity of the station and accessibility of the information.

Climatic Characteristic	Value
Annual Average Rainfall	614.2mm
Annual Average Evaporation	2336mm
Mean Maximum Temperature	29.7°C
Mean Minimum Temperature	16.7°C
Mean Max Temperature Range	23.7 - 34.0°C
Mean Min Temperature Range	9.9 - 21.9°C
Prevailing Wind Direction	E-SE at 2 to 5 m/sec

Table 1: Regional Climatic Data (Moranbah Water Treatment Plant data 1972-2012)

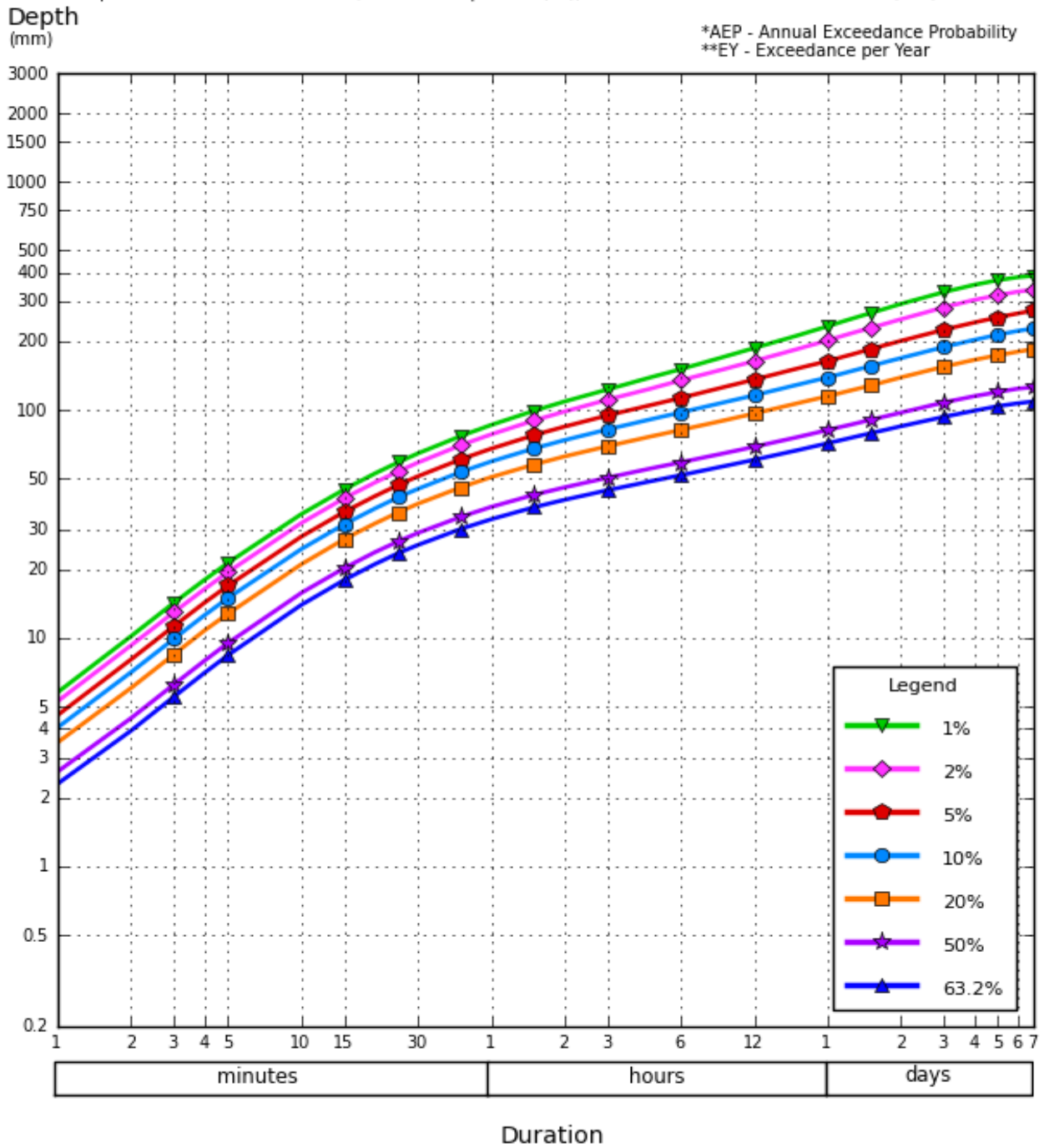
- 4 The climatic conditions of SRM are classified as sub-tropical. Saraji rainfall data shows that 80% of annual rainfall is received in the 'Wet Season' as described in the **SRM EA** (November to March), with 47% of the annual total received in the three-month period December to February. The average number of rain days per year is 51, with 31 of these occurring during the Wet Season period. Rainfall of medium to high intensity can occur during this Wet Season period due to cyclonic rain depressions or summer thunderstorms.
- 5 A typical rainfall pattern for SRM may include:
- a Thunderstorms during late spring/early summer (i.e. October – December) with erratic frequency and rainfall
 - b Wet season rainfall (typically through January – March) with heavy soaking falls for periods of up to several days.
 - c Dry season winter/early spring (i.e. April – September) with infrequent falls from passing cold fronts.
- 6 Open water surface evaporation exceeds median rainfall by a significant margin, and it is only during periods of storm or cyclone related activity that rainfall exceeds evaporation.
- 7 High intensity rainfall events are common and surface runoff can be substantial. Water stress is expected to be a significant factor in the performance of future rehabilitation of disturbed land, particularly on slopes or where topsoil thickness is limited, and the underlying spoil may be compacted.
- 8 Long term climate data used to assist with the statistical description of prevailing climatic conditions has been sourced from the BoM climate data at the Moranbah Water Treatment Plant. The Intensity-Frequency-Duration (IFD) chart for SRM is provided in **Figure 2**.

Requested coordinate Latitude: -22.4201 Longitude: 148.2903
Nearest grid cell Latitude: 22.4125 (S) Longitude: 148.2875 (E)

IFD Design Rainfall Depth (mm)

Issued: 19 July 2024

Rainfall depth in millimetres for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).



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Figure 2: SRM IFD Chart up to 1 in 100 AEP sized rainfall events

2.1.2 Land/Topography

- 9 The natural topography of SRM is characterised by a range of topographic settings ranging from level to gently undulating plains to gravely ridgelines and low hills. The two main surface geological groups are the erosional surfaces of highly weathered Permian sediments and depositional surfaces within the Tertiary zone.
- 10 Soils of the area have formed from weathered parent materials under the influence of time, land relief, moisture, temperature changes and organisms. Predominant soil types are generally related to their position on the slopes of the catchment and can be broadly divided into the following types:
 - a Mountains and Ridges Assemblage - Shallow, coarse textured and rocky siliceous sand (uniform soils);
 - b Stony Hills Assemblage - Hard pedal duplex soils with colour range from red through brown to yellow or mottled yellow, neutral to alkaline;
 - c Foot slopes and Lowlands Assemblage - Hard pedal duplex soils with colour range of red, brown and mottled yellow, alkaline reaction.;
 - d Weathered Clay Plains Assemblage- Hard pedal duplex soils with colour range of red, brown, yellow and black, alkaline reaction;
 - e Brigalow Plains Assemblage- Self-mulching, cracking clay. Uniform soil, colour range of red and brown to black;
 - f Alluvial Plains and Terraces Assemblage - Hard pedal duplex soils with colour range or red, brown and yellow.

2.1.3 Surface Water Features

- 11 SRM is located close to the western edges of the catchment of the Isaac River, a major drainage area of the Fitzroy catchment (**Figure 3**). The Isaac River is the main watercourse situated east of the mine. The Isaac River converges with the Connors and Mackenzie Rivers and eventually joins the Fitzroy River, which flows initially north and then east towards the east coast of Queensland. The Fitzroy River flows into the Coral Sea at Rockhampton (adjacent to Casuarina Island).
- 12 The Isaac River has a catchment area of approximately 1,215 km². At a broader regional scale, the greater Isaac-Connors sub-catchment area (at the junction with the Mackenzie River) is approximately 22,000 km² and the total Fitzroy Basin catchment area to the coast is approximately 140,000 km². From a broad regional context, the mine area represents a very small part of greater regional catchments and is located very high in the headwaters of the catchment.
- 13 All creeks intersecting with the SRM ML are augmented in a general easterly direction, rising in the Cherwell Range immediately west of SRM. The creeks comprise of eight ephemeral creeks, and minor tributaries which flow eastwards across some, or all of the mining operations. These creeks from north to south include: Boomerang, Plumtree, Hughes, Barrett, One Mile, Spring, South and Phillips Creeks. The catchments of these local creeks are shown in **Figure 4**. Flows are towards the Isaac River, which is approximately 20km to the east of the mine. The Isaac River flows southwards for approximately 130km to join the Mackenzie River, which flows onwards for approximately 150km to the Fitzroy River, a major river which enters the sea east of Rockhampton. Flow mainly occurs for a short period during and immediately after rainfall events. Assessment of available stream flow data indicates that base flow is limited and appears to be sustained by surface base flow stores rather than distinct groundwater contribution. Base flow that recedes after rainfall events is typically limited to a few days (up to approximately one or two weeks) after surface runoff (quick flow) has drained from contributing sub-catchments.
- 14 Grazing is the dominant land use in the catchment and would be expected to contribute large quantities of sediment-laden runoff into creeks upstream of the mine area during storm events. Use of the water up and downstream of the mine is limited because of the ephemeral nature of the creeks. Permanent waterholes do not exist in the creeks which cross lease areas. The first permanent waterholes occur in the Isaac River.
- 15 Hydrological studies of the environment surrounding SRM have been undertaken and include:

- a SRM Q1000 Review - undertaken in August 2012. This involved a Mining Pit Highwall Creek Ingress Investigation, which provided estimates of levee alignment and levee level requirements for an AEP 1 in 1000 design flood event.
- b SRM Flood Study – undertaken in July 2018. This involves the assessment of flood risks to mining pits and site infrastructure, identification of flood mitigation measures and the provision of flood information for mine planning. This flood study was further updated in 2021 by Engeny.
- c Receiving Environment Monitoring Program (REMP) – **SRM EA** requirement. Includes a hydraulic overview and aquatic condition assessment of the impacts of MAW releases on downstream watercourses (the receiving environment). Also included in the REMP is an overview of the local environmental values and water quality objectives of the receiving environment. REMP has been replaced with FRREMP in the **SRM EA** as of September 2023.
- d Aquatic Ecosystem Health Project (AEHP) - completed six wet season sampling regimes. AEHP investigates the potential impacts of the release of MAW on the receiving waters, sediments and biota downstream of SRM.



Figure 3: Regional Drainage and Location Map for SRM

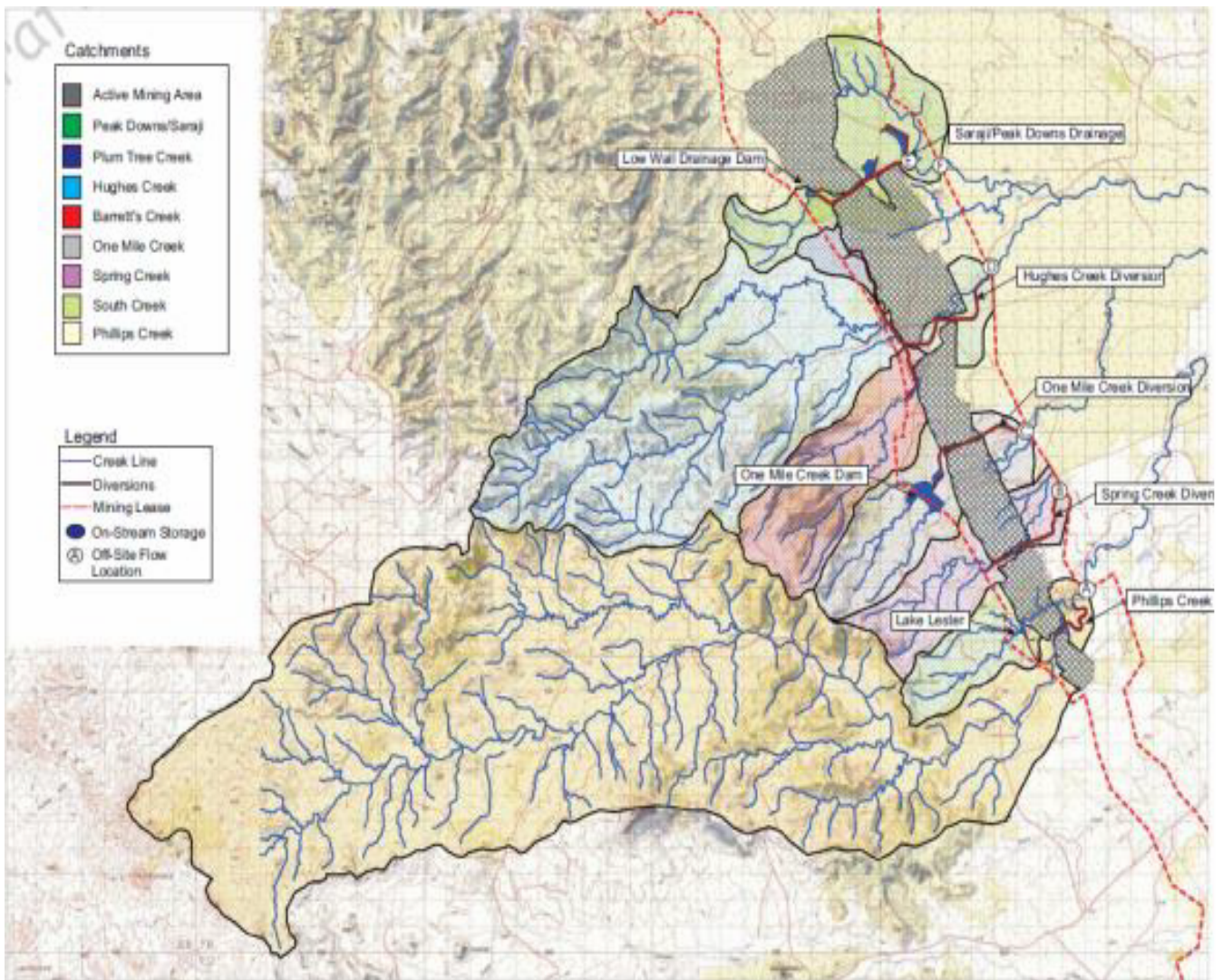


Figure 4: Catchments of Local Creeks at SRM

2.1.4 Groundwater Features

- 16 A regional groundwater investigation of SRM and its surrounds was conducted in 2007. The study was undertaken specifically to address the requirements of the **SRM EA**.
- 17 The study found that on a regional basis, the hydro-geological regime is relatively simple consisting of:
 - a Confined coal seam aquifers containing poor quality water, which is generally unsuitable for stock use.
 - b Overlying unconfined to semi-confined basal Tertiary sand/gravel aquifers of maximum three (3) meters thickness and thin inter-bedded, lensoid sand aquifers within the Tertiary, containing reasonable quality water suitable for stock use.
 - c Localised unconfined alluvial aquifers containing good quality water associated with the watercourses and creeks.
- 18 The **SRM RPT Groundwater Monitoring and Management Program Review** was completed at SRM in December 2023. This report shows there are no mining related impacts on groundwater levels or groundwater quality at any of the monitored landholder bores. Monitoring for this program continues to occur on a quarterly basis.
- 19 Overall, there is limited use of groundwater on the adjoining properties with most landholders relying to a large degree on dams or the Mackenzie River pipeline for their water supplies.

- 20 Groundwater bores have also been established near the R2/3 Tailings Dam to monitor for possible leachate from the dam and are listed as part of the *SRM PLN Ramps 2-3 TSF Stage 5 Raise Dam Operations Plan*.
- 21 BMA has finalised with the administering authority the redefinition of the groundwater contaminant trigger values in accordance with the updated DES guidelines.
- 22 A map of the groundwater monitoring sites and the groundwater flow directions is shown below in *Figure 5*.

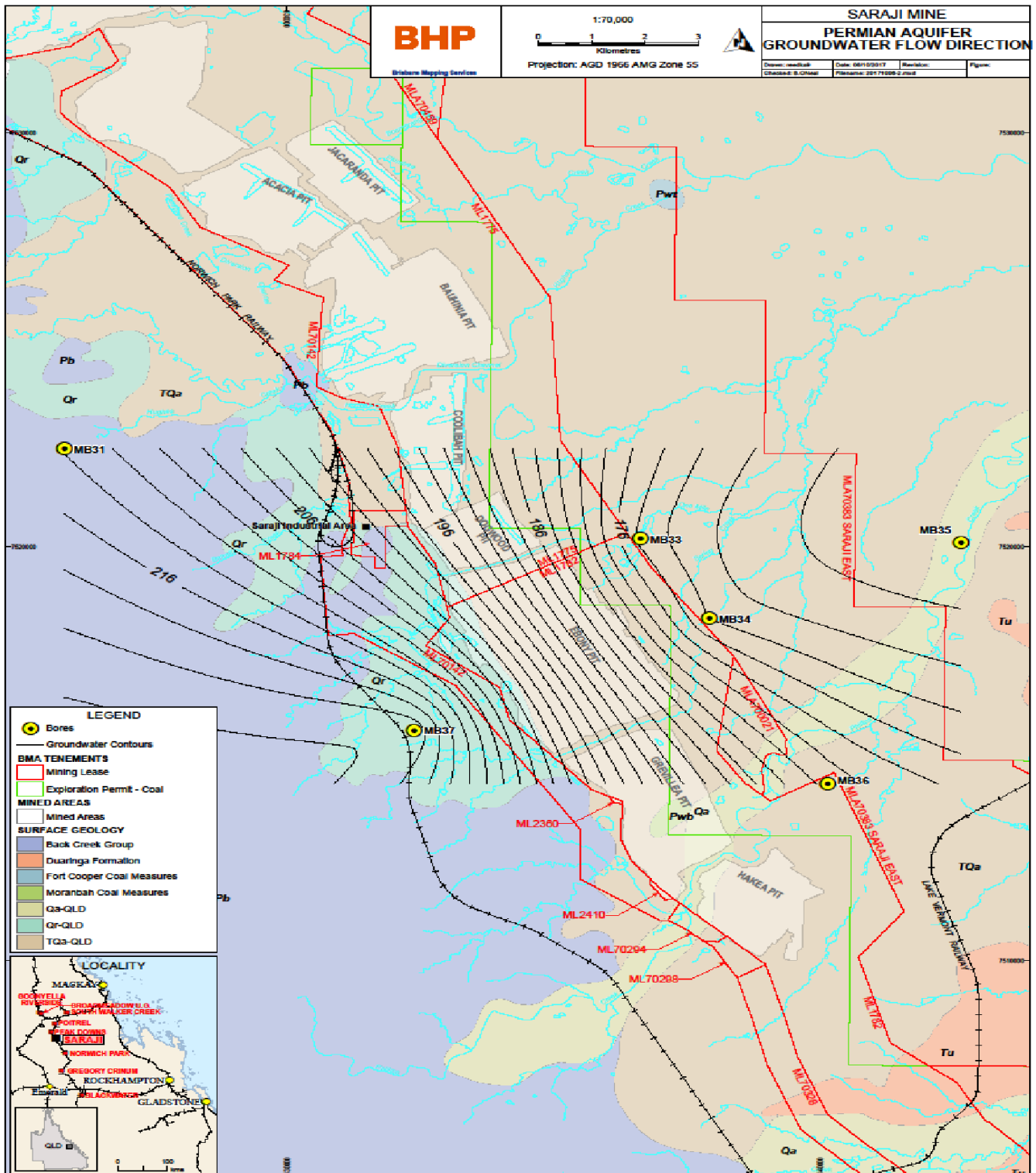


Figure 5: SRM Groundwater Flow Map

2.1.5 Surface Water Quality

- 23 The environmental values and water quality objectives relevant to SRM Catchments are described in [Section 2.4.1](#).

2.1.6 Groundwater Quality

- 24 Water quality results from the Quaternary and Tertiary aquifers show the groundwater to be relatively fresh to slightly saline, with electrical conductivity (EC) ranging from 700 to 2,400 $\mu\text{S}/\text{cm}$ (MB32). pH was observed to be slightly acidic to slightly alkaline, ranging from 6.4 to 8.2 (MB32). Results also show the groundwater chemistry to be a magnesium-bicarbonate type, indicative of recently recharged groundwater.
- 25 EC recorded in the Permian aquifer ranges broadly depending on proximity to recharge sources. The Moranbah Coal Measures within the mining area recorded as saline with an EC of 16,000 to 28,000 $\mu\text{S}/\text{cm}$ (MB33 and MB34), compared to outcropping recharge areas to the west of the mine which recorded a brackish EC of 2,500 to 14,800 $\mu\text{S}/\text{cm}$ (MB31 and MB37).
- 26 To the east of the mine, in close proximity to Phillips Creek, an EC of 1,000 to 2,000 $\mu\text{S}/\text{cm}$ was recorded (MB35). Historical pH recorded across the Permian aquifer has fluctuated from slightly acidic to alkaline, generally ranging within 6.5 to 8.5.
- 27 The water quality results from the Permian aquifer present predominantly as sodium-chloride dominant, however, with increasing proximity to the Phillips Creek alluvial aquifer, this trend changes towards sodium-bicarbonate dominant.
- 28 MB36 (Lake Vermont Property) reported 3 consecutive groundwater level increases following the introduction of the amended [SRM EA](#) in June 2022. Groundwater level increases are potentially associated with seepage from a nearby highwall dam. The administering authority was notified of these exceedances on 20 June 2023. The notification included BMA's assessment that the likelihood of environmental harm from this exceedance was low. BMA has completed an investigation to understand the sources and potential impacts associated with these groundwater level changes and provided this investigation to the administering authority.
- 29 Groundwater level drawdown is particularly prevalent in MB34 (downgradient – One Mile Creek) with 3 consecutive exceedances recorded from monitoring events in 2023. Investigations have identified that the observed declining groundwater level, is likely associated with pit expansion. The administering authority was notified of these exceedances on 20 June 2023. The notification included BMA's assessment that the likelihood of environmental harm from this exceedance was low. BMA has completed an investigation to understand the sources and potential impacts associated with these groundwater level changes and provided this investigation to the administering authority.

2.2 Overview of Operation

- 30 The SRM open cut operation consists of ten pit complexes over a strike length of approximately 30 kilometres. The open cut operation also consists of concurrent dragline and truck/shovel operations and one coal handling and processing plant (CHPP) where mined coal is sorted, washed, and blended to meet supply demand specifications.
- 31 The major features of the mine relevant to water management are shown below in [Figure 6](#), and include but are not limited to the following:
- a 6 open cut pits being actively mined (Acacia Ramp 1A, Coolibah Ramp 5/6, Dogwood 8S, Ebony Ramp 9/12, Grevillea Ramp 13/14, Hakea Ramp 15/16);
 - b 5 open cut pits not currently being mined at the time of publication (Jacaranda Ramp 0/17, Acacia Ramp 0, Acacia Ramp 1, Bauhinia Ramp 2/4, Dogwood 8N);
 - c Overburden, Run of Mine (ROM) coal, reject and topsoil stockpiles;
 - d Haul roads and light vehicle access roads;
 - e Mine infrastructure areas, including 2 heavy vehicle workshop/s (Main MIA, Ramp 4);

- f** 1 Coal Handling and Preparation Plant/s (CHPP) including ROM coal transfer and sizing infrastructure, 2 product coal stockpile/s, a rejects staging stockpile, fuel storage area, and rail loop and train load out facilities;
- g** Water storages as listed in **Table 7**;
- h** 1 Active Tailings Storage Facility (TSF);
- i** 2 remote bulk fuel storages;
- j** 1 Active and 1 Inactive sewage treatment plants;
- k** 3 Shutdown Pads (Ramp 9, Ramp 12 & Ramp 13)

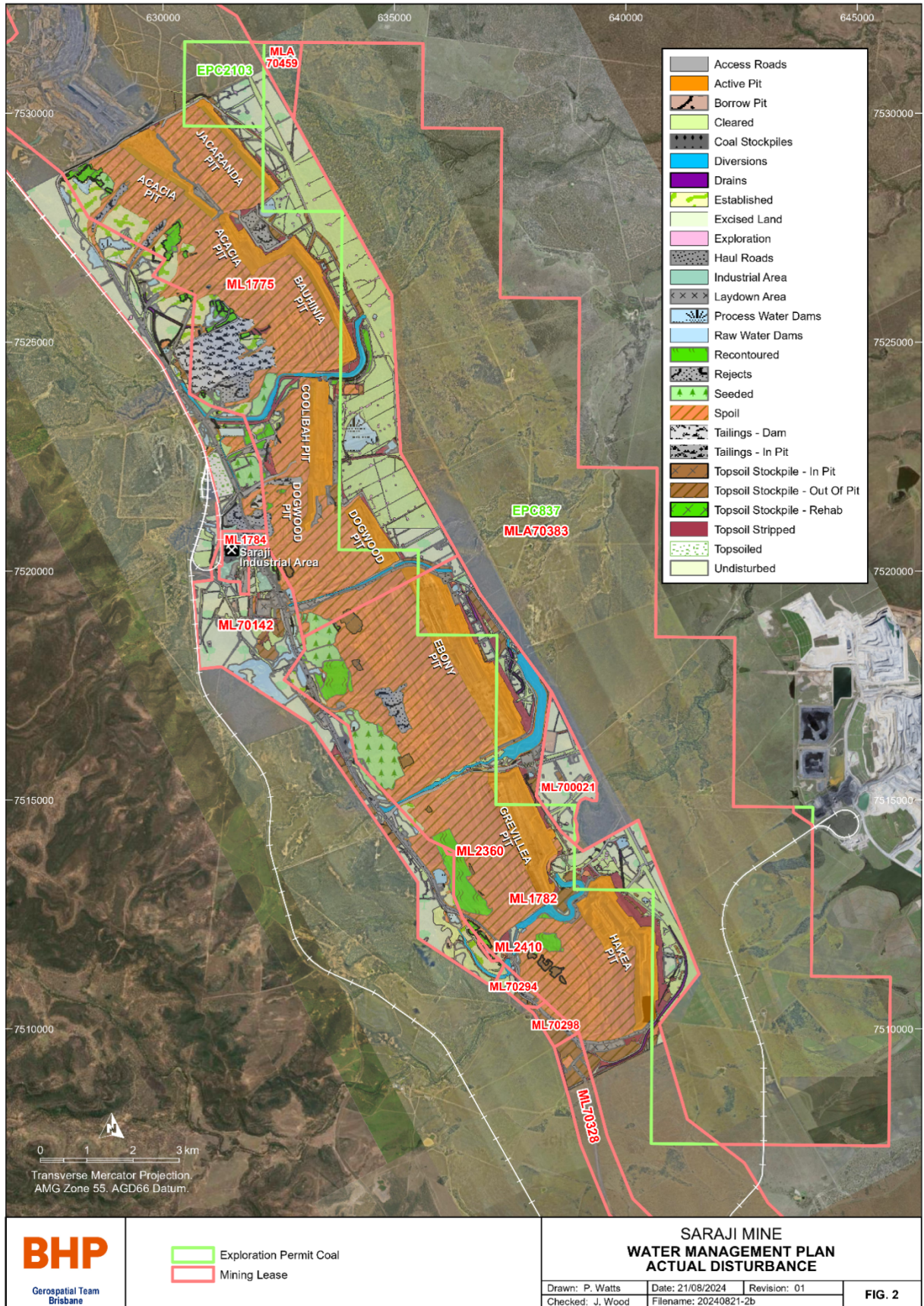


Figure 6: Layout of major features at SRM

2.2.1 Potential sources of contamination

- 32** Operating open cut coal mines have a range of well recognised contaminant sources which have significant potential to adversely impact downstream water quality. These mine sites require management either at source of contamination, or at drainage collection points to prevent impact downstream. The major potential source of contamination is related to land disturbance, whereby deeper sediments are exposed to overland flow and surface water runoff. Such land disturbance and sources of contamination at SRM are associated with a number of particular disturbance categories including but not limited to the following:
- a** Spoil areas - Large areas of exposed spoil can be a substantial source of salt and sediment during runoff events and also potential seepage.
 - b** Open pits - A large quantity of saline alkaline water collects in operational pits during intense wet periods. This water must be pumped to other storages to enable mining operations to continue.
 - c** Haul roads - Very high runoff coefficient associated with the heavily compacted road surface can exacerbate sediment loads.
 - d** Industrial Areas - Very high runoff coefficient exacerbates sediment loads.
 - e** Tailings Dams and Disposal Areas - Dams with insufficient freeboard or structural faults can allow coal wastes to escape an impoundment.
 - f** Topsoil stripped areas - Subsoils in the area are often saline, hence topsoil stripped areas can generate saline surface runoff as well as high turbidity colloidal suspensions.
 - g** CHPP - Water network – major piping and drainage infrastructure.
 - h** Coal stockpiles - Storm events can generate saline runoff and coal fines and leachate from stockpiles of coal.
 - i** Reject stockpiles - Storm events can generate saline runoff and coal fines and leachate from reject areas.
 - j** Rejects disposal areas - drainage from these areas has potential for acid leachate generation.
 - k** Rehabilitation areas - Newly developed rehabilitation – e.g., top-soiled and seeded carries high erosion risk until vegetation cover is satisfactory. Potential for significant sediment yield as well as some saline water.

- 33 A summary of the potential sources of contamination, the type of contamination and mechanism of contamination is presented below in **Table 2**.

Potential Contaminant Source	Potential Contaminants	Mechanisms of Contamination
Runoff from disturbed land	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic spoils (elevating pH), acid generating rejects (lowering pH)
Runoff from rehabilitated land (contaminant loading expected to be significantly lower than disturbed areas)	Suspended Solids (Turbidity), Dissolved Solids, +/- pH, Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic soils (elevating pH)
Release of recycled waters from tailings dams, sewage treatment plants, industrial areas, etc.	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, hydrocarbons, pathogenic micro-organisms, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, spills, acid generating rejects (lowering pH), ineffective sewage treatment, release from sewage ponds
Release of waters from pits and storages	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, etc.
Release of waters from pipe infrastructure including the Central Region Water Network (CRWN)	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Releases from pipe infrastructure (leaks, valve failures, ruptures)
Release of waters from sediment dams	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	By wash, capacity reduced due to sedimentation
Spilt or leaking hazardous substances	Hazardous or toxic products, +/- pH, metals	Contamination of land and surface runoff causing impact to regional water systems

Table 2: Summary of potential sources of water contamination at SRM

2.3 Objectives

- 34 Environmental Aspirations and Targets (EATs) have been identified for BMA in consideration of the operational context, outcomes from EMS effectiveness assessments, EMS Management Reviews and plans for managing strategic environmental aspects.
- 35 As committed in the BHP Water Stewardship Position Statement, Asset-level Context Based Water Targets (CBWT) have been set for BMA and are as follows:
- a Support water stress reduction in the Fitzroy Basin through better use of water in our operations; and
 - b Support equitable access to water in the Fitzroy Basin by making more water available for other users.

2.4 Area of Influence

- 36 The **BHP Environment Global Standard** and the **Environmental Management Global Specification** requires each operation to map its 'Area of Influence', plotting potential direct, indirect, and cumulative impacts on the environment. 'Key Features' such as existing waterways within the AOI are also required to be mapped.
- 37 The process for defining and mapping the area of influence is detailed in the **BMA PLN ORECC Environment Implementation Plan**.
- 38 Maps of the Key Features and the Area of Influence for SRM are available in the **Mine2Map QLD Area of Influence Viewer**.

2.4.1 Environmental values and water quality objectives

- 39 Environmental values (EVs) and water quality objectives (WQOs) are being progressively determined for Queensland waters under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. EV's and WQO's provide purpose and direction for the management of approved activities within Queensland's catchments.
- a SRM is located within the Fitzroy River Basin, in the Isaac River sub-basin catchment. The scheduled EVs and WQOs for the sub-basin are published within the *Isaac River Sub-Basin Environmental Values and Water Quality Objectives* (DESI, 2011a) and the *Fitzroy River Sub-basin Environmental Values and Water Quality Objectives* (DESI, 2011a).
- 40 EVs define the uses of the water by aquatic ecosystems and for human uses, which need to be protected from disturbance, contamination (runoff and releases) and changes in flow to ensure safe and healthy waterways. The EVs are identified for the Isaac River sub-basin catchment in **Table 3**, and Fitzroy River sub-basin catchment in **Table 4**.

Environmental Value	Isaac River Sub-Basin Catchment
Aquatic Ecosystems	✓
Irrigation	✓
Farm Supply/Use	✓
Stock Water	✓
Aquaculture	✓
Human Consumer	✓
Primary Recreation	✓
Secondary Recreation	✓
Visual Recreation	✓
Drinking Water	✓
Industrial Use	✓
Cultural and Spiritual Values	✓

Table 3: Environmental Values applicable to “Isaac Western Upland Tributaries – Developed Areas” catchment within the Isaac River Sub-Basin Catchment

Environmental Value	Fitzroy River Sub-Basin Catchment
Aquatic Ecosystems	✓
Irrigation	✓
Farm Supply/Use	✓
Stock Water	✓
Aquaculture	✓
Human Consumer	✓
Primary Recreation	✓
Secondary Recreation	✓
Visual Recreation	✓
Drinking Water	✓
Industrial Use	✓
Cultural and Spiritual Values	✓

Table 4: Environmental Values applicable to “Fitzroy main channel above barrage (fresh water) – Developed Areas” catchment within the Fitzroy River Sub-Basin Catchment

- 41 WQOs define target objectives for the physical, chemical, and biological characteristics of the water in order to protection, maintain and/or improve the identified EVs. Site-specific water release trigger levels and background thresholds have been developed for SRM to ensure the EV’s listed above are not impacted beyond approved disturbance and are conditioned in the **SRM EA**. The WQO’s within the sub-basin plan listed above are used by site teams in cases where a specific target is not listed in the **SRM EA** (e.g. testing for algae, toxicants or macro-invertebrates).

2.5 Legal & Other Requirements

- 42 Details of SRM’s legal obligations regarding water management are specified in the online *Environment Essentials* compliance register for BMA, and the *Coal Legal Obligations Register* (CLOR).
- 43 Relevant legislation for water management includes but is not limited to:
- a *Environmental Protection Act 1994* and Regulation 2009 (Qld);
 - b *Water Act 2000* and Regulation 2016 (Qld);
 - c *Environmental Protection (Water and Wetland Biodiversity) Policy 2016* (Qld);
 - d *Mineral Resources Act 1989* and Regulation 2013 (Qld);
 - e *Planning Act 2016* (Qld); and
 - f *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth).
- 44 Legal and regulatory obligations sourced from approvals and licences are managed through the CLOR and include:
- a **Environmental Authority – Permit Number EPML00862313;**
 - i Contains conditions relating to managing raw water and MAW, any applicable pollution limits and monitoring requirements.

- 45 Internal requirements are sourced from:
- a ***BHP Environment Global Standard;***
 - b ***Technical Centre of Excellence & Legacy Assets: BHP Water Management Standard;***
 - c ***BMA STD Erosion & Sediment Control and Mine Affected Water Standard;*** and
 - d ***BHP HSEC Reporting, Event Management, and Investigation Global Standard.***

2.5.1 Water Licences

- 46 SRM holds the following Water Licences for impoundments, levees and diversions:
- a *Water License 172682 (Phillips Creek Haul Road Diversion)*
 - b *Water License 178206 (Phillips Creek Diversion)*
 - c *Water License 27661F (One Mile Creek Dam)*
 - d *Water License 30970F (Barret Creek Diversion)*
 - e *Water License 30971F (Campbell's Dam)*
 - f *Water License 30972F (One Mile Creek Diversion)*
 - g *Water License 34346F (Plumtree Creek Diversion)*
 - h *Water License 34358F (Hughes Creek Diversion – Upstream Section)*
 - i *Water License 426546F (Hughes Creek Diversion – Downstream Section)*
 - j *Water License 46127F (Spring Creek Diversion)*
 - k *Water License 46302F (Phillips Creek Southern Creek Diversion Dam – Lester Dam)*
 - l *Water License 46303F (Southern Creek Diversion)*
 - m *Water License 52666F (Hughes Creek Diversion – Middle Section)*
 - n *Water License 623114 (Spring Southern Creeks)*
- 47 Water licence obligations are maintained in the CLOR, and managed between Water Planning (reporting), the Environment Operations Department (day to day management of compliance), and Dam Engineering (impoundments and levees).

2.5.2 Associated Water

- 48 Under section 334ZP of the *Mineral Resources Act 1989*, the holder of a mining lease (ML) or mineral development licence (MDL) is required to measure or (if the take is the result of evaporation) to estimate the volume of associated water taken, and to report the volume of associated water taken to the chief executive. The requirements for measuring and reporting the volume of associated water taken are set out in the *Mineral Resources Regulation 2013*.
- 49 For MLs or MDLs that did not have an Environmental Authority (EA) prior to 6th December 2016, an Associated Water License may be required, and is calculated and reported by the BMA Water Planning Department.

2.6 Roles & Responsibilities

50 The roles and responsibilities for all personnel with respect to this Water Management Plan are outlined below in **Table 5**.

Department	Responsibilities
Planning Technical and Environment, (PT&E) Heritage, Approvals and Sustainability site environmental team	<ul style="list-style-type: none"> Understand the operation’s environmental legal requirements in regard to water management. Incorporate water management controls into the Permit to Disturb (PTD) for proposed disturbance works, and complete field inspections to verify compliance. Undertake water releases and water quality monitoring in accordance with the site EA and associated procedures. Ensure accurate reporting of relevant data to both internal and external stakeholders. Review and update this plan as per Section 6.1.
PT&E HAS Water Planning	<ul style="list-style-type: none"> Develop Tactical Water Plans for incorporation into the Site mine planning and budgeting processes Maintain and update the site water balance. Maintain a groundwater modelling, groundwater monitoring and management plan for SRM Engage with the Environmental team regarding any changes required to the MWMS.
Dam Engineers Department	<ul style="list-style-type: none"> Ensure TSF’s and mine water storages are managed as per the relevant Dam Operational Plan. Ensure regulated structure inspections and associated reporting is completed annually as required by the site EA. Maintain the site regulated structures register.
Mine Planning	<ul style="list-style-type: none"> Consult the Environment Team when planning for mine progression to identify and manage potential impacts to the MWMS or receiving environment.
Maintenance	<ul style="list-style-type: none"> Maintain work areas and associated water management infrastructure and plant to avoid unauthorised releases of contaminants to the MWMS or receiving environment. Maintain water release infrastructure and conduct water releases in accordance with the Site Mine Affected Water Release Procedure.
Mine Services	<ul style="list-style-type: none"> Maintain the site network of pipelines, pumps, drains and erosion and sediment control (ESC) structures.
Operations	<ul style="list-style-type: none"> Comply with the conditions of PTDs relating to work areas. Report any identified spills or uncontrolled/unauthorised water releases
CHPP Operations	<ul style="list-style-type: none"> Maintain coal processing infrastructure, storage areas and associated water management infrastructure and plant to avoid unauthorised releases of contaminants to the MWMS or receiving environment.
All Coal Mine Workers	<ul style="list-style-type: none"> All coal mine workers share the responsibility of maintaining the Licence to Operate which includes managing risks relating to water. Specific roles and responsibilities are referenced where applicable in operational control documentation such as Procedures and Safe Work Instructions.

Table 5: Roles and Responsibilities relating to water management at SRM

3 Risks & Opportunities

- 1 Risks associated with water management at SRM have been assessed as part of the *SRM JSA Environmental Risk Register* in accordance with the *BHP Risk Management Framework*.
- 2 Priority water management activities and opportunities for SRM include but are not limited to:
 - a Ensuring stormwater runoff is discharged via ESC structures;
 - b Managing water quality within mine affected water storages to maximise opportunities for water releases;
 - c Maintaining local groundwater levels and/or background quality;
 - d Managing site water inventory in cooperation with upstream and downstream operations;
 - e Investigating opportunities to reduce raw water demands from the CHPP circuit;
 - f Coordinating controlled water releases with upstream and downstream BMA operations to manage potential cumulative impacts;
 - g Managing acid or saline producing spoils in disturbance areas;
- 3 Opportunities are investigated and only implemented where shown to be relevant and practical.
- 4 Any activities identified that trigger Material Risk thresholds must be managed in accordance with the *BHP Risk Management Framework*.

4 Control Implementation

4.1 Mine Water Management System

- 1 The general approach to water management at SRM is to implement controls through a Mine Water Management system (MWMS) grouped into the following broad themes:
 - a **Understand** the water availability, operational needs and risks by maintaining a Water Balance;
 - b **Avoid** producing excess MAW by diverting clean runoff water away from areas affected by mining activities, preventing contaminants from entering the MWMS and preventing production of saline or acidic drainage;
 - c **Contain** water affected by mining processes or from areas disturbed by mining activities;
 - d Sustainably **Manage** water, monitor to support management decisions and discharge water suitable for release; and
 - e **Review** the MWMS to identify opportunities for **improvement** and develop a corresponding Tactical Water Plan for implementation.
- 2 The outcomes and learnings from each component of the MWMS are used to improve the system as a whole.

4.1.1 Understand

4.1.1.1 Types of water managed onsite

- 3 Water managed on-site is categorised into the following 4 groups:
- a **Raw** water supplied to site by pipeline, truck or other infrastructure.
 - b **Diverted** water, which refers to stormwater runoff that has not come into contact with mining processes or land disturbed by mining and associated activities, for example:
 - i Stormwater runoff from undisturbed areas within or around the active disturbance site (whether diverted around site or not);
 - ii Stormwater runoff from stable rehabilitated areas not prone to erosion; and
 - c **Sediment affected** stormwater, which many include runoff from areas that are disturbed by mining operations and potentially contains sediment loads but are not likely to have properties that would cause environmental harm (i.e. not MAW). Sediment affected water may be released through ESC structures constructed and managed in accordance with the ***SRM PLN Erosion and Sediment Control Plan (ESCP), BMA STD Erosion & Sediment Control and Mine Affected Water Standard*** and, water infrastructure that is installed and operated in accordance with this WMP.
 - d **MAW** (operational water) is defined in the site EA and includes:
 - i Pit water;
 - ii Runoff from areas that are potentially contaminated, such as coal stockpiles, industrial and processing areas and areas of waste rock;
 - iii Groundwater ingress into the pits;
 - iv Sewage effluent; and
 - v Any of the above types of water transferred from other mine sites under the Transfer Agreement described in ***Section 49(d)***.

4.1.1.2 Water Balance

- 4 Operational predictive water balance modelling is a means to provide capability to understand water use across the mine site, simulate environmental and physical processes, and quantify water in areas where direct measurement is not possible. These models provide the ability to forecast water demand and uses at a mine site level, increasing capacity to manage risk associated with climate variability across sites.
- 5 BMA Water Planning have developed operational predictive water balance using GoldSIM software for each of our coal operations and Port facility (Hay Point). The simulation platform accounts for the water balance and transport of dissolved salt mass as an integrated water balance/water quality model. GoldSIM is considered an appropriate choice due to its capacity for complex modelling in terms of handling of data arrays, measurement unit continuity, error reporting and user interface. GoldSIM is capable of deterministic and probabilistic modelling as well as providing sensitivity analyses.
- 6 Models are maintained and run as a predictive tool in accordance with ***TSV PRO Operational Predictive Water Balance Model Governance Procedure***. Model outputs align with the CAP timeline and form key inputs into strategic; tactical and operational water planning and inform engineering designs in capital projects. The SRM Water Balance Model (WBM) schematic is attached to the end of this WMP in **Appendix B**.
- 7 The Central Regional Water Network (CRWN) WBM schematic is attached to the end of this WMP in **Appendix C**
- 8 The ***inputs and sources*** of usable water for SRM encompass the following components:
- a Raw water supply sourced from Bingegang Pipeline (input);
 - b Potable water supply produced on site via treatment of raw water (internal source);

- c Stormwater runoff captured in ESC structures, pits and other drains and storages, including floodwaters that may bypass flood protection measures from time to time (input);
- d Groundwater infiltration into voids (input);
- e Transfer agreement (input and/or output);
- i A **Transfer of Water Between Sites Agreement** exists between Caval Ridge Mine (CVM), Peak Downs Mine (PDM), Saraji Mine (SRM) and Saraji South Mine (SSM). In the Agreement, the mine sites have committed to complying with the following relevant EA conditions:
 - a) The volume, pH and electrical conductivity of water is monitored and recorded;
 - b) Water is used in a way as to prevent environmental harm and health incidences; and
 - c) Awareness of the General Environmental Duty is communicated.
- f MAW (internal source);
- g Sewage effluent (internal source).

9 A summary of operational water requirements is presented below in **Table 6**.

Operational use	Source	Water quality requirements	Estimated annual demand
Coal washing	Jacaranda Pit	MAW (Input) MAW (Output)	4GL
Dust suppression (Road Watering)	Ramp 2 Fill Point Dam Bulge Dam Ramp 14 Fill Point Dam	MAW (Input)	3.5GL
Dust suppression (CHPP)	One Mile Dam	Raw Water (Input)	~100ML
MIA – raw water (e.g. workshop and vehicle washdown)	One Mile Dam	Raw Water (Input)	~100ML/year of Raw Water
MIA – drinking water	SRM Water Treatment Plant – Supplied by One Mile Dam	Potable Water (Output) Raw Water (Input)	
Remote crib huts – drinking water and ablutions	Potable Water Truck – Filled from SRM Water Treatment Plant – Supplied by One Mile Dam	Potable Water (Output) Raw Water (Input)	

Table 6: Summary of SRM operational water requirements

- 10 **Outputs** of water from site are through the following mechanisms:
- a Stormwater released from ESC structures installed and operated in accordance with the **SRM PLN Erosion and Sediment Control Plan (ESCP)**, **BMA STD Erosion & Sediment Control and Mine Affected Water Standard** and, water infrastructure that is installed and operated in accordance with this WMP.
 - b Treated effluent released to the MWMS via a dedicated drain in accordance with the conditions of the **SRM EA**;
 - c Authorised releases of MAW in accordance with the conditions of the **SRM EA**; and
 - d Evaporative losses and ground water seepage from pits and surface water storages.
- 11 The SRM water balance model is reviewed and maintained on a periodic basis by the BMA Water Planning Department.

4.1.1.3 Flood Modelling

- 12 Hydrology study and flood modelling is a means to describe the processes of rainfall, catchment response, surface water runoff and their interactions with areas of interest (i.e. the mine areas) and the local environment. It is intended to provide a definitive and quantitative understanding of the surface water flow regimes in the mine area and its surroundings.
- 13 Modelling outcomes provide key knowledge to help quantitatively identify and communicate potential flood risks (safety, production loss, flooding to infrastructure, environmental risks...etc.) as well as to inform risk management and mitigation plan development in other processes i.e. Strategic Water Planning and Tactical Water Planning. The base knowledge provided through this process can also be used as inputs for waterways structure design and risk assessment for specific projects and hydrology studies i.e. design of diversions, risk assessment of dams, etc.
- 14 Models are maintained and run by BMA Water Planning Department in accordance with **BMA TSV PRO Hydrology Study and Flood Modelling Procedure**. The process includes but is not limited to:
 - a Data collection and review
 - b Meteorological study and characterisation
 - c Catchment study and characterisation
 - d Fluvial flood modelling
 - e Pluvial flood modelling (Rain on Grid – RoG)
 - f Generate flood mapping outputs
- 15 The main trigger for the flood modelling process is calendar based and driven by the Life of Asset (LoA) planning process. It can also be triggered by major topographic and infrastructure changes (i.e. mine progression, commissioning of new roads, diversions, etc.) and major flood events or incidents.
- 16 Flood model outputs are reviewed annually for material changes. The updates of hydrology and flood models is scheduled for every 2 years; or more or less frequently based on any material changes identified.
- 17 Interactive view of fluvial and pluvial flood modelling results can be accessed via QLD Water Risk and Hazard Viewer.

4.1.2 Avoid

4.1.2.1 Creek / River Diversions

- 18 SRM has diverted ephemeral creeks to allow for the continuation of mining and/or diverting water away from active mining areas. These are licensed under previous mining regulations (e.g. *Central Queensland Coal Associates Agreement Act* (CQCA Act)), the **SRM EA**, or individual Water Licences.
- 19 The mine has diverted the following surface water systems:
 - a Plumtree Creek (Water License 34346F)
 - b Hughes Creek (Water Licenses 34358F, 52666F & 426546F)
 - c Barrett Creek (Water License 30970F)
 - d One Mile Creek (Water License 30972F)
 - e Spring Creek (Water License 46127F)
 - f Southern Creek (Water License 46303F)
 - g Phillips Creek (Water Licenses 178206 & 172682)

4.1.2.2 Impounding Water from Creek Diversions

- 20 SRM has multiple on-stream water storages located on various creek diversions within the Mining Lease to allow for the continuation of mining and, to divert water away from active mining areas. These are licensed under previous mining regulations (e.g. *Central Queensland Coal Associates Agreement Act* (CQCA Act)), the **SRM EA**, or individual Water Licences.
- 21 The mine impounds water from Creek Diversions at the following locations:
 - a Lake Lester (Water License 46302F)
 - b One Mile Dam (Water License 27661F)
 - c Campbells Dam (Water License 30971F)

4.1.2.3 Levees

- 22 Levees may be classified as regulated structures in accordance with the **SRM EA** and are generally constructed to (1) divert contaminated waters into a dam or to protect the structural integrity of a dam, or (2) prevent ingress of flood waters into an area. As required by the **SRM EA**, levee designs are subject to assessment by a suitably qualified person prior to construction to determine if the levee will be classified as a regulated structure.
- 23 The details of flood protection structure in place onsite are listed in **Table 7**, and include regulated flood protection levees, unregulated flood protection levees, and contaminated water/dam structural integrity levees. The details of Regulated levees are also maintained within the **SRM Regulated Structures Register**, as required by the **SRM EA**.
- 24 A map detailing the locations of each respective flood protection structure on site is shown below in **Figure 7**.

Flood Protection Structure	Levee Type	Function	Design flood immunity	Regulated Structure
Jacaranda Pit Levee Crest	Landform	Jacaranda Pit protection from Plumtree Creek Northern Diversion	Less than 1% AEP	No
Ramp 4 Corridor Road	Landform	Bauhinia Pit protection from Hughes Creek Diversion	1% AEP	No
Hughes Creek Levee – Bauhinia Back Access Road (BAR)	Non-regulated Levee	Bauhinia Pit protection from Hughes Creek Diversion	Less than 1% AEP	No
Hughes Creek Levee – Coolibah Endwall	Non-regulated Levee	Coolibah Pit protection from Hughes Creek Diversion	Less than 1% AEP	No
Barrett Creek Levee	Regulated Levee	MIA protection from Barret Creek Diversion	0.1% AEP	Yes
Ramp 9 LV Access Road	Non-regulated Levee	Dogwood 8S Pit protection from One Mile Creek Diversion	Less than 1% AEP	No
Ramp 9 Corridor Road	Non-regulated Levee	Ebony Ramp 9 Pit protection from One Mile Creek Diversion	1% AEP	No
One Mile Creek Northern Landform	Landform	Dogwood 8S Pit protection from One Mile Creek Diversion	0.1% AEP	No
Spring Creek Levee – Ebony Pit	Non-regulated Levee	Ebony Ramp 12 Pit protection from Spring Creek Diversion	0.1% AEP	No
Ramp 12 BAR (Back Access Road)	Landform	Ebony Ramp 12 Pit protection from Spring Creek Diversion	Less than 1% AEP	No
Spring Creek Levee – Grevillea Pit	Non-regulated Levee	Grevillea Ramp 13 Pit protection from Spring Creek Diversion	1% AEP	No
Ramp 13 LV Access Road	Landform	Grevillea Ramp 13 Pit protection from Spring Creek Diversion	1% AEP	No
Phillips Creek Levee (Grevillea Pit)	Regulated Levee	Grevillea Ramp 14 Pit protection from Phillips Creek Diversion	1% AEP	Yes
Ramp 14 BAR (Back Access Road)	Landform	Grevillea Ramp 14 Pit protection from Phillips Creek Diversion	1% AEP	No
Phillips Creek Levee (Hakea Pit)	Non-Regulated Levee	Hakea Pit Ramp 15 Pit protection from Phillips Creek Diversion	0.1% AEP	No
Ramp 15 End Wall Road	Landform	Hakea Pit Ramp 15 Pit protection from Phillips Creek Diversion	1% AEP	No
Ramp 16 BAR (Back Access Road) (South)	Landform	Hakea Pit Ramp 16 Pit protection from Phillips Creek Southern Tributary	1% AEP	No
Ramp 16 BAR (Back Access Road)	Landform	Hakea Pit Ramp 16 Pit protection from Phillips Creek Southern Tributary	Less than 1% AEP	No

Table 7: Flood protection structures in operation at SRM

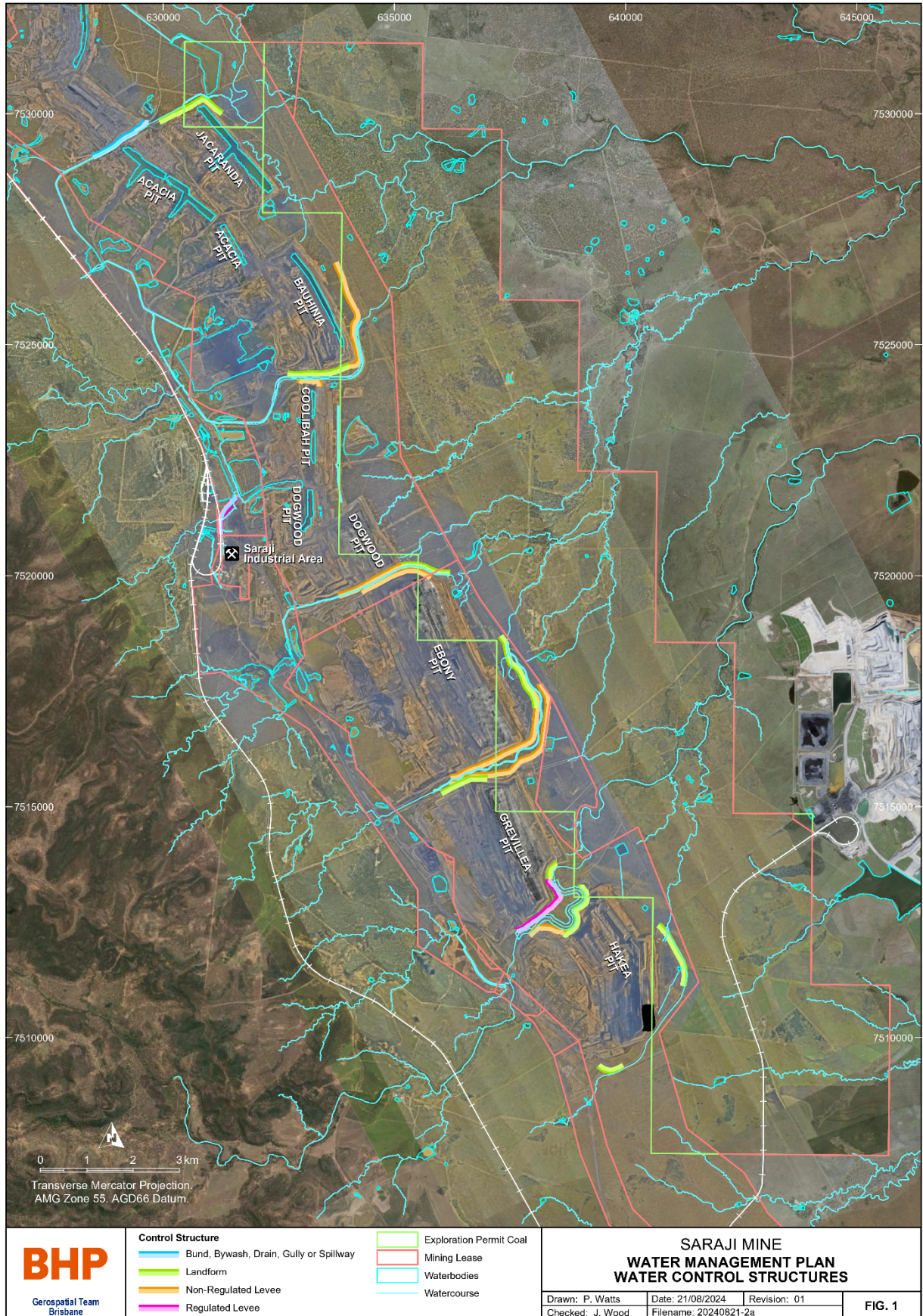


Figure 7: Flood protection structures/water control structures at SRM

4.1.2.4 Hazardous substance handling and storage

- 25 The storage and handling of hazardous substances is managed on site through the **SRM PLN Hydrocarbon Management Plan** and **BMA Coal SOP Hazardous Materials**. The procedure includes controls to prevent the accidental release of hazardous substances to the receiving environment such as:
- a Inspections of operational areas are completed through scheduled Field Leadership activities to ensure that controls required by the **BMA Coal SOP Hazardous Materials** are in place and effective, and corrective actions are completed where required.
- 26 Spills are contained, cleaned up and reported in accordance with the **BMA PRO QLD Coal Spill Prevention and Response Procedure**.
- 27 Bulk fuel storage areas are located at **the Mine Industrial Area (MIA) Main Workshop, Ramp 11 Fuel Farm, and Ramp 16 Fuel Farm**. Smaller mobile or remote fuel storages are located around the site to enable refuelling of mobile equipment close to where it is operating.
- 28 These storage facilities have been constructed and maintained to meet the requirements of AS1940: *The storage and handling of flammable and combustible liquids*. To manage the risk of release of hazardous substances to the receiving environment:
- a Fuel storages are subject to inspection and maintenance regimes managed by the site Maintenance department through the SAP work management system;
 - b Site environmental personnel are accountable for conducting regular inspections of bulk fuel storage areas to ensure that controls are in place to prevent the release of hazardous substances to the receiving environment should the primary bunding or other AS1940 required controls fail (e.g. verifying that the area is draining to the MAW system).

4.1.3 Contain

4.1.3.1 Water Storages

- 29 Water storages have been constructed onsite to contain and manage the water types listed in **Section 4.1.1.1**.
- 30 Water storages containing MAW are managed to reduce the risk of uncontrolled and unauthorised overtopping to the receiving environment. ESC structures are managed to passively release stormwater runoff in accordance with the **SRM PLN Erosion and Sediment Control Plan (ESCP)**.
- 31 Raw water storages are managed to avoid overtopping and conserve water supplies; however, due to the uncontaminated nature of raw water, any inadvertent overtopping of these structures is not considered an environmental event.
- 32 **BMA STD Erosion & Sediment Control and Mine Affected Water Standard** details the requirements for design, construction and maintenance of new water storages planned after the publication of the standard, which also covers upgrades to existing storages. In some cases, existing water storages may be transitioned to meet the requirements of the standard.
- 33 Regulated structures are designed, constructed and operated in accordance with **Schedule G** of the **SRM EA** and the **BMA STD Erosion & Sediment Control and Mine Affected Water Standard**:
- a Consequence category assessments are completed prior to the design and construction of new structures and prior to any change in the purpose or nature of the stored contents to determine if the structure should be classified as a regulated structure.
 - b Regulated structures are inspected annually as required by the **SRM EA**, and recommended corrective actions are scheduled for completion.

34 SRM water storages are summarised below in **Table 8** and shown in **Figure 8**.

Storage Type	Storage Name/ID	Total Design Capacity (ML)	Function/Purpose	Overflow destination
MAW – regulated structure	Ramp 2/3 TSF	6,673	- Tailings Containment Facility	Hughes Creek
	Ramp 2/3 TSF Decant Pond	139	- Decant water transfer from TSF Facility to dedicated MAW Storages	Ramp 2/3 TSF
MAW – non-regulated structure	Acacia Ramp 0/1 Pit	12,938	- Primary MAW Storage - Inactive Long Term Storage Pit	No credible overflow scenario
	Jacaranda Ramp 0/17 Pit	19,875	- Primary MAW Storage - Inactive Long Term Storage Pit - CRWN Network Storage	No credible overflow scenario
	Stubline 1A Dam	60	- MAW Transfer Staging Dam	Jacaranda Ramp 0/17 Pit
	Bauhinia Ramp 2/4 Pit	14,080	- Inactive Pit Void - Contingency MAW Storage for Severe Weather Events	No credible overflow scenario
	Ramp 2 Fill Point Dam	43	- MAW Storage Dam - Water Truck Fill Point	Plumtree Creek
	Coolibah Dam	55	- MAW Transfer Staging Dam	Eastern Lease Boundary (Offsite)
	Polishing Ponds	30	- Inactive Treated Effluent Storage	Barrett Creek
	Ramp 6 Header Dam	0	- Inactive TSF - Conveys CHPP Drainage into Dogwood 8N Pit	Dogwood 8N Pit
	Wilkie Dam	253	- MAW Containment Dam from MIA Runoff	One Mile Creek
	Dogwood 8N Pit	3,830	- MAW Transfer Staging Pit - Dust Suppression Supply to Central/Southern Fill Points	No credible overflow scenario
	Stubline 10 Dam	55	- MAW Transfer Staging Dam - Authorised MAW Release Point (RP7)	One Mile Creek
	Stubline 13 Dam	38	- MAW Transfer Staging Dam	Phillips Creek
	Ramp 13 Low Wall Sump	6	- MAW Catchment Dam	Spring Creek
Bulge dam	487	- MAW Containment Dam - Water Truck Fill Point - CRWN Network Storage	Campbells Dam	

Storage Type	Storage Name/ID	Total Design Capacity (ML)	Function/Purpose	Overflow destination
	Ramp 14 Fill Point Dam	550	- MAW Containment Dam - Water Truck Fill Point	Southern Creek
	Ramp 15 Highwall Dam	117	- MAW Transfer Staging Dam - Authorised MAW Release Point (RP4)	Phillips Creek
	Stubline 16 Dam	19	- MAW Transfer Staging Dam	Hakea Pit
ESC	C1 Sediment Dam	28	- Sediment Containment Dam	Hughes Creek
	C2 Sediment Dam	34	- Sediment Containment Dam	Barret Creek
On-Stream Structure (Diverted Water)	Lake Lester	154	- Part of Southern Creek Diversion - Authorised MAW Release Point (RP1)	Southern Creek
	Campbells Dam	208	- Part of One Mile Creek Diversion - Authorised MAW Release Point (RP5)	One Mile Creek
	One Mile Dam	600	- Part of One Mile Creek Diversion - Only Raw Water Storage Dam at SRM	Campbells Dam
	Dudleys Dam	752	- Part of Barret Creek Diversion - Authorised MAW Release Point (RP2)	Hughes Creek
	Plumtree Creek Dam	TBC	- Part of Plumtree Creek Diversion	Plumtree Creek
Minor Diverted Water & ESC Storages	Mels Waterhole	N/A	- Rehab runoff storage	Acacia Ramp 0/1 Pit
	Ramp 1 Dam	N/A	- Historic ESC containment dam	Plumtree Creek
	Ramp 2A Dam	N/A	- Historic ESC containment dam	Hughes Creek
	Ramp 3 Dam	N/A	- Offsite Tributary flow through dam	Hughes Creek
	Ramp 4 LW Sump	N/A	- ESC passive flow through dam	Hughes Creek
	TSF3 Dam	N/A	- ESC passive flow through dam	Barret Creek
	Ramp 9 LW Sump	N/A	- Rehab runoff storage	One Mile Creek
	Ramp 10 Dam	N/A	- Rehab runoff storage	Bulge Dam
	Ramp 12 LW Sump	N/A	- ESC passive flow through dam	Spring Creek
	Vermont Road Dam	N/A	- Upper Spring Creek Tributary flow through dam	Spring Creek

Table 8: Water storages at SRM

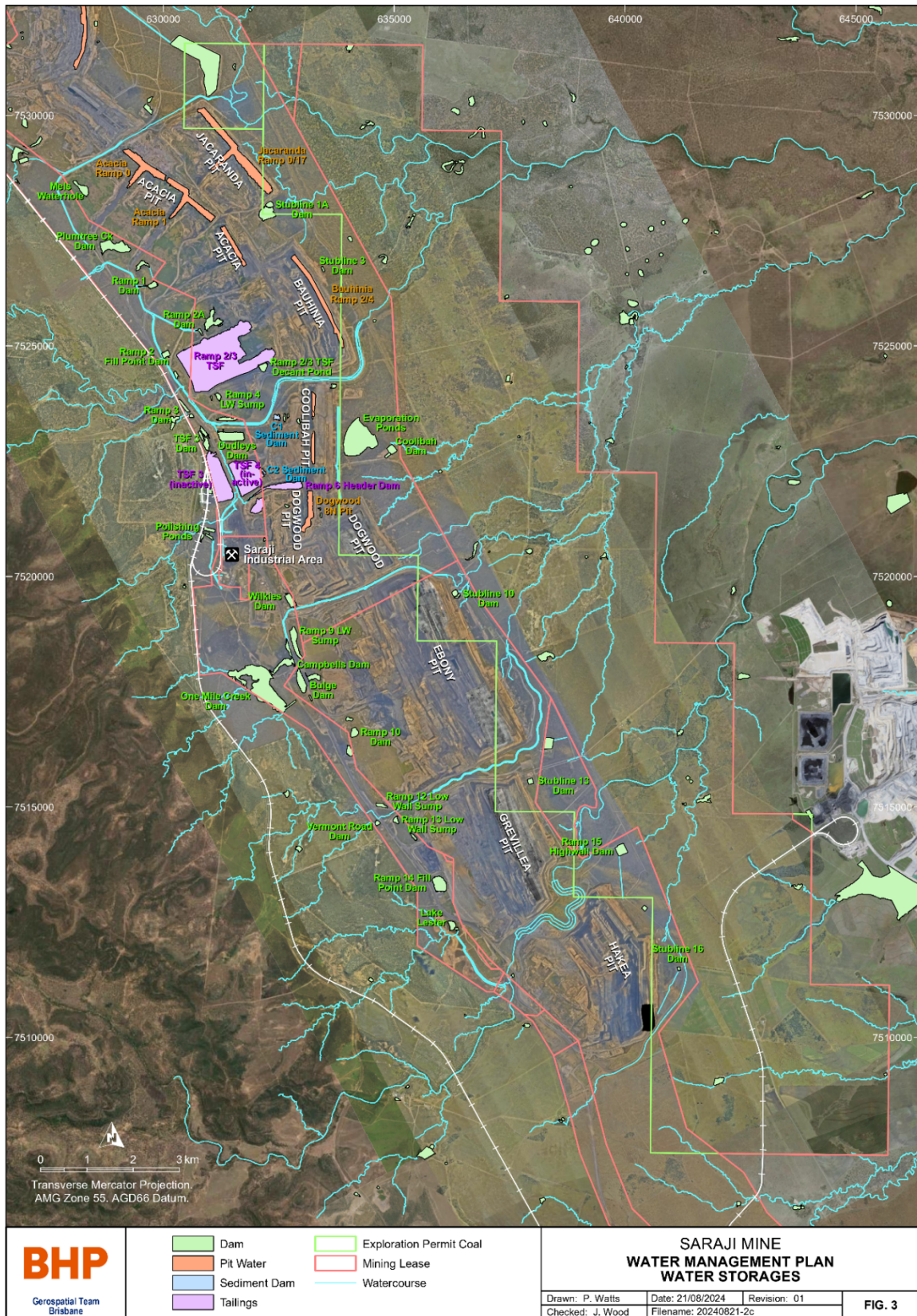


Figure 8: Water Storage Locations at SRM

- 35 Ongoing maintenance programs, as well as regular inspections and completion of corrective actions are critical for ensuring the integrity of water storages and reducing the risk of uncontrolled releases:
 - a Maintenance and inspection regimes for MAW structures are listed in the **SRM PLN Dam Safety Management Plan**. Identified corrective actions are raised and tracked through SAP and AIMS.
 - b ESC structures are inspected and management pre and post wet season in accordance with the **SRM PLN Erosion and Sediment Control Plan (ESCP)**.
- 36 The regulated structures listed in **Table 7** are recorded in the *SRM Regulated Structures Register* which is maintained by the SRM Dams Engineering Team. The register contains the regulatory information relating to each structure and must be submitted to the administering authority as part of the **SRM EA** annual return process.

4.1.3.2 Tailings Storage Facilities

- 37 Tailings produced during the coal washing process are pumped from the CHPP to a regulated tailings storage facility (Ramp 2/3 TSF) listed in **Table 7**.
- 38 The Ramp 2/3 TSF is actively being used for tailings deposition (at the time of publication). Water management for this TSF is conducted in accordance with the **SRM PLN Ramps 2-3 TSF Stage 5 Raise Dam Operations Plan**. Dewatering pumps are in place to transfer supernatant water from the Ramp 2/3 TSF Decant Pond to Stubline 1A Dam.
- 39 There are four (4) inactive TSFs at SRM:
 - a TSF2
 - b TSF3
 - c TSF4
 - d Ramp 6 Header Dam (Also known as Ramp 6 TSF)
- 40 TSFs are routinely inspected at the frequencies outlined in the **SRM PLN Dam Safety Management Plan** by the SRM Dams Engineering Team to identify any potential defects that require actioning. Defects are listed and tracked through the Asset Integrity Maintenance System (AIMS).

4.1.4 Manage

4.1.4.1 Water transfers & pumping

- 41 SRM has constructed a drain, pipe and pump network designed to transfer water actively (by pumping) and passively (through drains) to required operational infrastructure (e.g. pumping water to CHPP for coal processing, directing stormwater from disturbed areas along drains to ESC structures). Transferring water around site also meets the following operational needs:
 - a Processing or treatment;
 - b Transferring MAW to authorised release points to conduct water releases when **SRM EA** release criteria are met;
 - c Dewatering of sumps, pits, and/or groundwater to allow for the continuation of mining;
 - d Managing risk of overtopping of MAW storages;
 - e Dust suppression; and
 - f Mine expansion/construction activities.
- 42 The layout of major MAW drains onsite at SRM is outlined in **Appendix B**.
- 43 **Table 9** summarises the pumping infrastructure in use at SRM. Pumps may be in place long-term or moved around site based on water movement needs and priorities. Due to the dynamic nature of their use, mobile pumps used incidentally around site have not been listed in **Table 9**.

Infrastructure Name	Pump Rate (L/sec)	Type	Function
PUE101	240L/sec	Electric	CHPP Water Supply Feed (CRWN Pump)
PUE201	240L/sec	Electric	CRWN Pump to Lotus Dam (Saraji South)
PUE395	680L/sec (Combined)	Electric	Transfer Pump (Stubline 10 Dam to Coolibah Dam)
PUE396		Electric	Transfer Pump (Stubline 10 Dam to Coolibah Dam)
PUE397		Electric	Transfer Pump (Stubline 10 Dam to Coolibah Dam)
PUE401	600L/sec (Combined)	Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE402		Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE403		Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE404	600L/sec (Combined)	Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE405		Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE406		Electric	Transfer Pump (Coolibah Dam to Jacaranda/Acacia Pit)
PUE52	170L/sec	Electric	Transfer Pump (TSF2/3 Decant Pond to Stubline 1A Dam)
PUM138	680L/sec (Combined)	Diesel	Transfer Pump (Stubline 13 Dam to Stubline 10 Dam)
PUD0245A		Diesel	Transfer Pump (Stubline 13 Dam to Stubline 10 Dam)
PUD0249A		Diesel	Transfer Pump (Stubline 13 Dam to Stubline 10 Dam)
PUD0256A		Diesel	Transfer Pump (Stubline 13 Dam to Stubline 10 Dam)
PUD0127M	200L/sec	Diesel	Ramp 14 Fill Point Dam Medium Vehicle Truck Fill
PUM140	300L/sec	Diesel	Diesel redundancy Transfer Pump (Stubline 10 Dam to Coolibah Dam) – Also RP7 discharge pump.
PUM141	240L/sec	Diesel	CHPP Water Supply Feed Redundancy (Stubline 1A Dam to CHPP)
PUM143	250L/sec	Diesel	Transfer Pump (Ramp 15 Highwall Dam to Stubline 13 Dam) – Also RP4 discharge pump
PUD0248	100L/sec	Diesel	Transfer Pump (Ramp 13 Low Wall Sump to Stubline 13 Dam)
PUD0250	220L/sec	Diesel	Transfer Pump (Stubline 16 Dam to Ramp 15 Highwall Dam)
PUD0257M	200L/sec	Diesel	Bulge Dam Medium Vehicle Fill Point – Also Transfer Pump (Bulge Dam to Stubline 13 Dam)
PUD290M	200L/sec	Diesel	Ramp 2 Fill Point Dam Medium Vehicle Truck Fill
PUD042M	300L/sec	Diesel	Bulge Dam Heavy Vehicle Truck Fill
PUD0343	240L/sec	Diesel	CHPP Water Supply Feed Redundancy (Jacaranda Pit to Stubline 1A Dam)
TRF127	300L/sec	Diesel	Ramp 14 Fill Point Dam Heavy Vehicle Truck Fill
TRF290	300L/sec	Diesel	Ramp 2 Fill Point Dam Heavy Vehicle Truck Fill

Table 9: Summary of Transfer Pumping in place at SRM

- 44 Management of pumps, pipelines and drains across site are the responsibility of the Mine Services Department. Maintenance of pipelines and drains across site are the responsibility of the Mine Services Department. Maintenance of the pumps across site are the responsibility of the Ancillary Maintenance Department.

4.1.4.2 Water monitoring programs

- 45 Water monitoring programs have been designed for SRM to ensure compliance with **SRM EA** conditions, to inform water planning and water management decisions, and to understand potential environmental impacts. The monitoring programs implemented at SRM include but are not limited to the following:
- a Receiving waters – creek and river water quality and level;
 - b Release and water storages – water quality and level;
 - c Groundwater quality and levels;
 - d Water transferred to Peak Downs Mine (PDM) or Saraji South Mine (SSM) under a transfer agreement;
 - e Water received from Peak Downs Mine (PDM) or Saraji South Mine (SSM) under a transfer agreement;
 - f Treated water released from the sewage treatment plant; and
 - g Weather (rainfall volume and intensity).
- 46 Program-specific monitoring procedures and Standard Work Instructions (SWIs) published for SRM include but are not explicitly limited to the following:
- a ***SRM PRO Mine Affected Water Release and Notification Procedure;***
 - b ***BMA PRO FBA Regional Receiving Environment Monitoring Program (REMP)***
 - c ***SRM PLN Groundwater Monitoring and Management Program;***
 - d ***SRM SWI Shallow Groundwater Sampling***
 - e ***SRM SWI Water and Soil Sampling***
 - f ***SRM SWI Water Quality Maintenance & Calibration***
 - g ***SRM SWI Mine Affected Water Release HMI Operation***
- 47 Monitoring procedures (or equivalent documents) for monitoring programs conducted as a condition of the **SRM EA** must at a minimum outline the following:
- a Program objectives and relevant regulatory requirements;
 - b Equipment used to meet the requirements of the program, and calibration requirements. Equipment can include telemetry equipment, in-situ analysis probes, continuous and grab sampling equipment:
 - i The site Environmental team is accountable for ensuring all equipment used for EA-mandated water quality monitoring is identified and documented.
 - ii Field equipment must be maintained and calibrated in accordance with manufacturers' guidelines and the Department of Environment, Science and Innovation (DESI) Water Monitoring and Sampling Manual (*DESI, 2018*).
 - c The requirement for all determinations of water quality to be:
 - i Performed by a suitably qualified person or body possessing the appropriate experience and qualifications to perform the required measurements.
 - ii Made in accordance with methods prescribed in the latest edition of the *DESI Water Monitoring and Sampling Manual (DESI, 2018)*.
 - d Quality assurance and quality control (QA/QC) processes relevant to the program, and the requirement for improvement actions to be implemented based on interpretation QA/QC results;

- e The requirement for all laboratory analysis to be conducted by a NATA accredited laboratory with an internal QA/QC and auditing process.
 - f How monitoring results are to be interpreted against program objectives and regulatory thresholds and actioned accordingly in the short term, and how long-term trends are to be analysed and actioned.
 - i This includes consideration of follow-up investigative monitoring that may be required to understand causes or impacts of a non-conformance.
 - g How data and records are managed using the Environmental Data Management System (EDMS) and Documentum document management system.
 - h Reporting of results in accordance with **Section 5.3** and **Section 6.2** of this WMP.
- 48 Monitoring programs are reviewed at the frequency listed in the respective procedures, or on an ad hoc basis using Field Leadership (i.e. Planned Task Confirmations), or following events. The findings of reviews are used to continuously improve the monitoring program.

4.1.4.3 **Groundwater management**

- 49 A Groundwater Monitoring and Management Plan (GMMP) has been prepared for SRM to:
- a Satisfy BHP's internal groundwater requirements, including to ensure that the understanding of the hydrogeological regime, requirements and risks associated with each of the operations remain valid, suitably quantified and adequately managed.
 - b Satisfy **Conditions I1 to I9** of the **SRM EA**, including:
 - i Identifying potential groundwater impacts;
 - ii Presenting a site conceptual groundwater model;
 - iii Describing the sampling and monitoring methodology;
 - iv Detailing a quality assurance and quality control program;
 - v Providing the process for notifying the administering authority and investigating exceedances;
 - vi Describing a Groundwater Monitoring Program which details when, from which bores and which groundwater quality and standing water levels must be monitored;
 - vii The frequency for reviewing the GMMP;
 - viii Reiterating that submission of groundwater monitoring data must be completed annually to the administering authority via WaTERS by 30 September each calendar year; and
 - ix Describing the manner in which construction, management, maintenance and decommissioning of groundwater monitoring bores must be undertaken.
- 50 The GMMP at a minimum must include the following:
- a Review and assessment of hydrogeological data and other relevant data;
 - b Development of a conceptual hydrogeological model;
 - c Documentation of operational impacts and risks; and
 - d Monitoring and mitigation measures as required including a program of monitoring which should be undertaken to manage identified risks.

4.1.4.4 **Saline drainage & acidic and metalliferous drainage management**

- 51 Risks associated with saline drainage and acid and metalliferous drainage (AMD) have been identified in the **SRM JSA Environmental Risk Register**.

- 52 As described in the *SRM JSA Environmental Risk Register*, Saline Drainage at SRM is managed through a variety of controls including but not limited to:
- a SRM/SSM Water Working Group (WWG);
 - b *SRM PLN Erosion and Sediment Control Plan (ESCP)*;
 - c Saline waste characterisation study for the SRM Progressive Rehabilitation and Closure Plan (PRCP); and
 - d Catchment Risk Assessment Mapping
- 53 As described in the *SRM JSA Environmental Risk Register*, AMD at SRM is managed through a variety of controls including but not limited to:
- a Spoil, tailings and coarse rejects geochemical monitoring program;
 - b Global Acid and Metalliferous Drainage Standard; and
 - c *BMA STD Erosion & Sediment Control and Mine Affected Water Standard*
- 54 The water management system provides a range of measures for capturing mine-affected saline waters, which are pumped to the Northern Inactive Pit Water Storages (Acacia Ramp 0/1 and Jacaranda Ramp 0/17) for secure containment and reuse in supporting mine operations such as coal processing and dust suppression. Several storage dams have been constructed with the capability to redirect mine-affected saline waters to other storage areas. This is to prevent an unauthorised release, or to enable compliant releases when stream flow conditions and stored water quality meet the *SRM EA* conditions.
- 55 SRM has developed a comprehensive spoil inventory database to improve rehabilitation outcomes by understanding the characteristics of its spoils and overburden prior to planning rehabilitation treatments. The site spoil inventory is predominantly alkaline as shown by the water quality in surface storages and pits, however, minor volumes of delineated strata of the Permian carboniferous shales and mudstones are very saline and can generate very low pH when weathering.
- 56 Management measures for these hostile materials include but are not limited to the following:
- a Selective placement of newly excavated spoil to areas in pre-strip dumps which will be encapsulated by benign spoil as the dump develops;
 - b Capping hostile in situ spoil with benign spoil before applying rehabilitation treatments, such as top-soiling, rock mulch and drainage works;
 - c Directing drainage to retention dams for reuse in mining processes; and
 - d Ongoing rehabilitation monitoring programs aimed at detecting surface and near surface changes in pH and salinity. Ongoing water quality monitoring programs on storages and pits which store surface runoff and leachate from mine-affected areas and structures.

4.1.4.5 *Wet season readiness*

- 57 SRM completes a wide range of wet season readiness activities including but not limited to:
- a Critical Drains and Culverts are visually inspected twice per year as part of Pre-Wet and Post-Wet Season Inspections;
 - b Telemetry stations and authorised MAW release points access for the purpose of executing the release of MAW is confirmed twice per year as part of Pre-Wet and Post-Wet Season Inspection;
 - c Wet Season Readiness (WSR) Checklist facilitated by Mine Planning Department prior to commencement of Wet Season;
 - d Water Working Group Meetings;
 - e Release procedure and notification review;
 - f Mock operational testing of release infrastructure; and
 - g Stream flow gauging station calibration.

4.1.4.6 **Controlled water releases**

- 58 The **SRM EA** details the conditions for releasing mine affected water from authorised release points. Conducting controlled releases allows SRM to prevent excessive accumulation of water onsite, manage the risk of an uncontrolled release and return water to the receiving environment.
- 59 The **SRM PRO Mine Affected Water Release and Notification Procedure** describes:
- a The modelling and monitoring systems in place to predict when a compliant release can be initiated;
 - b Accountabilities for operational, compliance and reporting/notification actions; and
 - c Monitoring to be conducted before, during and following a release.
- 60 The release points listed in **Table F1** of the **SRM EA** are the only authorised MAW discharge points. Further details regarding release criteria and associated monitoring of the receiving environment are documented in the **SRM EA**.
- 61 Remote monitoring systems and release infrastructure are maintained by the Infrastructure and Field Maintenance Department using a work management schedule in SAP.
- 62 Updating of rating curves will be performed on an annual basis to ensure data accuracy, this is scheduled in SAP and completed by an appropriately qualified third-party service provider.

4.1.4.7 **Treated sewage effluent.**

- 63 Treated sewage effluent produced on-site must only be released in accordance with the relevant conditions of the **SRM EA**. Where the treated effluent is to be used for the purposes of dust suppression, irrigation (surface or sub-surface), and/or discharge to receiving waters, sampling of treated effluent is conducted as per the **SRM EA** requirements.
- 64 Site operates one Sewage Treatment Plant/s (STP):
- a Main Industrial Area (MIA) STP – Treated water is released to the CHPP Dirty Water Drain and subsequently into the MWMS.

4.1.4.8 **Re-use**

- 65 The MWMS has been configured to maximise the re-use of water on site with the aim to reduce the amount of raw water consumed by the operation.
- 66 All operational truck fill points for dust suppression are recharged utilising the MWMS.
- 67 Treated effluent is discharged into the MWMS for use as dust suppression.
- 68 Coal processing utilises water from the MWMS, with wastewater from coal processing recycled through the MWMS.

4.1.4.9 **Other water management controls**

- 69 The **BMA PRO Permit to Disturb Procedure** is implemented at SRM to ensure potential water impacts associated with disturbance activities are identified and controlled.
- a Work areas operated under a PTD are inspected as specified in the permit and as required by the **BMA PRO Permit to Disturb Procedure**.
- 70 Disturbed areas are progressively rehabilitated as they become available, which over time will minimise the volume of stormwater runoff contributing sediment or other contaminants to the MWMS.
- 71 Runoff from workshop areas and vehicle washdowns is directed through an oily water separator (OWS) prior to entering the MWMS (MAW drains and dams).
- a OWS are maintained by the Infrastructure and Field Maintenance department through a work management schedule in SAP.
- 72 Temporary interference to waterways is approved and managed following the **BHP FRM QLD COAL HSE Template – Activities in a Watercourse – Self Assessment** and conditions of approved PTDs.

4.1.5 Review and improvement

- 73 The MWMS infrastructure, controls and structures are reviewed annually by the Water Planning Department with support from the site Environment Operations Department to identify opportunities to:
- a Improve monitoring or management processes;
 - b Upgrade existing or implement new physical surface water or groundwater controls;
 - c Update inspection regimes.
- 74 The actions required to address identified issues/opportunities are compiled into a Tactical Water Plan and budgeted for input to the 2 Year Mine Plan:
- a Actions involving capital works for existing or new infrastructure are budgeted by BMA or SRM Engineering teams.
 - b Actions involving expenditure relating to operational activities are budgeted by the relevant team as agreed through the Tactical Water Planning process.
 - c All capital and operational budget planning is conducted in line with the ***BHP Corporate Alignment Planning Global Standard***.

4.2 Emergency Preparedness & Response

- 75 Potential emergency situations relating to water management include:
- a Loss of containment or overtopping of a regulated Dam/TSF;
 - b Loss of containment or overtopping of a non-regulated Dam/TSF;
 - c Failure of a flood protection structure;
 - d Failure of MAW release infrastructure;
 - e Failure of a Creek Diversion;
 - f Land contamination by hazardous substances, chemicals and/or hydrocarbons.
- 76 In the event of emergencies, all reasonable actions must be taken to minimise environmental harm, or the risk thereof. If required, the Environmental Operations Department must also notify the Administrating Authority as per ***SRM EA*** conditions.
- 77 Emergencies and contingency planning related to water management for SRM are covered in the following key documents:
- a ***SRM Incident Management Team (IMT) Manual***;
 - b ***SRM PLN Ramps 2-3 TSF Stage 5 Raise Dam Operations Plan***
 - c ***SRM PLN Dam Safety Management Plan***
 - d ***SRM Emergency Management Plan***
 - e ***SRM Severe Weather Trigger Action Response Plan (TARP)***
 - f ***SRM STD Working in and Around a Body of Water***
 - g ***SRM Regulated Dam Operational Plan – Barretts Creek Levee***
 - h ***SRM Ramp 6 TSF Operational Plan***
 - i ***SRM TSF 2,3 & 4 Operations, Maintenance and Surveillance Manual and Emergency Action Plan***
- 78 Regular emergency preparedness and response exercises are undertaken by staff, personnel, contractors and service providers in accordance with BMA and SRM training requirements.

4.3 Training & Awareness

- 79 Water management is a key environmental risk area for BMA sites, involving roles and responsibilities across multiple departments. Awareness of water-related risks and training in water management requirements is critical for effective site water management.
- 80 The SRM site training matrix defines the induction and training requirements for employees based on the type of work and the work environments that each work group is exposed to.
- 81 Where required as part of monitoring procedures or as per **SRM EA** conditions, the Environment Operations Department shall ensure that personnel undertaking monitoring are competent.
- 82 General environmental awareness is delivered to all BMA personnel through the *BMA General Environment Induction*, which includes water management awareness and responsibilities.

5 Control Monitoring & Reporting

- 1 On-going monitoring of control implementation and effectiveness is critical to ensuring that controls are appropriate, in place and operating as expected. Control monitoring relies on various activities as described below, and findings are reported internally and externally as required.

5.1 Inspections

- 2 Inspections are required to ensure water management controls are in place and effective, and the requirements of the **SRM EA** are met.
 - a The frequency and timing of water management control inspections and reviews depends on the department accountable for each control, as listed in each preceding section.
 - b As detailed throughout **Section 4**, inspections and maintenance activities are scheduled, and corrective actions are allocated and tracked, using SAP.
- 3 As detailed in the **BMA STD Erosion & Sediment Control and Mine Affected Water Standard**, Pre-wet season inspections are carried out each year by the Environment Operations Department with support from the Water Planning Department, to ensure that SRM is prepared for the onset of the wet season. Post-wet season inspections are carried out to ensure that any impacts on physical controls from increased water movements during the wet season are identified and addressed.
 - a Inspections are scheduled, and corrective actions are allocated and tracked, using SAP. Ad hoc inspections are also conducted during the wet season and corrective actions are allocated and tracked using SAP.

5.2 Control Verification

- 4 Verification of the Water Management Critical Control is conducted through CCV activities scheduled and executed through SAP. Any deficiencies are recorded, and corrective actions are developed and tracked via a remediation plan.
- 5 Monitoring and verification of the effectiveness of implemented controls is conducted through:
 - a Periodic review of this WMP and environmental risk assessments;
 - b Internal audits, including HSE Assurance audits and site-based compliance audits;
 - c Inspections of sediment and erosion control infrastructure when 24hr rainfall totals exceed the thresholds listed in **BMA STD Erosion & Sediment Control and Mine Affected Water Standard**.
 - d Field Leadership activities; and
 - e Review of SAP events.
- 6 Water quality monitoring provides a mechanism for assessing performance against the EATs and statutory requirements.

5.3 Communication & Reporting

- 7 Reporting on performance against water monitoring program shall be in accordance with the SRM EMS, *HSEC Reporting, Event Management and Investigation Global Standard*, the *SRM EA* and any other regulatory conditions.
- 8 Internal communications relating to water management include but are not limited to the following:
 - a Toolbox talks relating to the importance of reporting issues such as spills, unauthorised water releases, leaking water infrastructure and following risk mitigation practices to mine planning and operational teams;
 - b Sharing of learnings from events or experiences across BMA sites (e.g. implementation of innovative physical controls);
 - c Reporting on water management performance and risk profile health throughout various levels of the business through the *EMS Management Review*.
 - d Monthly Water Performance Report provided to key internal stakeholders, detailing month to month changes in MAW inventory, MAW release readiness, and water level management in dedicated water storage structures.
- 9 External communications are conducted in accordance with the *SRM EA*, including but not limited to the following:
 - a Annual ROWIT submission;
 - b Annual Regulated Structures Inspection Report as per **Condition G22** of the *SRM EA*;
 - c Annual Groundwater Monitoring Data as per **Condition I8** of the *SRM EA*;
 - d Annual Water Monitoring Data as per **Condition F28** of the *SRM EA*;
 - e 2 Yearly Review Groundwater Monitoring and Management Program (GMMP) as per **Condition I6 & I7** of the *SRM EA*
 - f The administering authority must be notified of any emergency scenarios or events that result in the release of water contaminants not in accordance with the *SRM EA* conditions, within the timeframes listed in the *SRM EA*.
- 10 Reporting associated with Group Environment requirements is facilitated by the HSE Reporting Function. Data required for reporting is maintained in the environmental data management system (EDMS) database, refer to *HSE Data Collection and Recording Procedure*.

6 Improvement

6.1 Improvement Actions

- 1 Improvement actions identified through control monitoring and verification activities are tracked and closed out using SAP/Fiori, defects registers, the field Leadership System, and the BHP Management of Change (MOC) system.
- 2 The SRM Environmental Operations Department is accountable for reviewing and improving this WMP annually, as required by the **SRM EA**. The findings from these reviews shall be used to ensure the effectiveness of and continually improve the management of impacts to water quality. Reviews may also occur on an ad hoc basis in response to directions from the administering authority, outcomes of events or changes to the operation that have the potential to impact water quality management.
- 3 Reviews of this WMP shall at a minimum consider the following:
 - a The latest version of the **SRM JSA Environmental Risk Register**;
 - b Identification of best water management practices and consideration of incorporation into BMA or SRM procedures and processes;
 - c Outputs from the Tactical Water Plan, including proposed changes to the MWMS and associated infrastructure;
 - d The outcomes and recommendations of event investigation or learnings from other sites;
 - e Results of control verification activities listed in **Section 5.2**;
 - f Any changes to the potential contamination sources listed in **Section 2.2.1**;
 - g Water quality monitoring data trends; and
 - h Water-related performance data presented in site Environmental Management Reviews.
- 4 Monitoring data shall be regularly reviewed by the SRM Environment Operations Department to ensure continuity and compliance with the monitoring program requirements and identify opportunities for improvement.

6.2 Non-conformances

- 5 Water-related events shall be managed and reported in accordance with the **BMA Event Management Standard** and **SRM Event and Investigation Management Procedure**.
- 6 If monitoring required by the **SRM EA** identifies an exceedance of defined limits or trigger levels, corrective actions shall be put in place so that emissions do not result in environmental nuisance:
 - a The SRM Environment Operations Department shall advise and consult with the risk owner responsible for the non-conforming plant or process and provide input into corrective or preventative actions.
- 7 In the event of non-conformances, all reasonable actions must be taken to minimise environmental harm, or the risk thereof. If required, the SRM Environment Operations Department must also notify the administering authority as per **SRM EA** conditions.
- 8 The Administering authority shall be notified in relation to any event(s) which trigger reporting requirements as per the **SRM EA**.

6.2.1 Investigative Monitoring

- 9 The **SRM EA** requires investigative monitoring to be undertaken following uncontrolled discharge of MAW, or a release event where the downstream water quality characteristics for the receiving environment exceed the upstream results.
- 10 The details of investigations, monitoring data and the actions taken to prevent environmental harm must be documented with the event details in SAP (Event Management System). Reporting of monitoring results and any other requested data must be completed within the timeframes in the **SRM EA**, or as requested by the administering authority.

6.2.2 Complaint Management

- 11 External complaints must be entered into SAP as an event and managed in accordance with the **BMA PRO Community Complaints Grievance Procedure** and **SRM EA** requirements:
 - a The **SRM EA** lists the details that must be recorded on receipt of a complaint. These details must be recorded in the SAP event entry for the complaint.

7 Terms and Definitions

Term	Definition
Acidic and metalliferous drainage (AMD)	The movement of waters with low pH and contaminated with metals as a result of disturbance during mining
Area of Influence	As defined in the <i>BHP Environmental Management Global Specification</i>
BoM	Australian Bureau of Meteorology
CLOR	Coal Legal Obligation Register
DESI	Department of Environment, Science and Innovation
Discharge	Discharges via spillway or dam overflow
ESC	Erosion and Sediment Control
FRREMP	Fitzroy Regional Receiving Environment Monitoring Program
Key Features	As defined in the <i>BHP Environmental Management Global Specification</i>
Levee	A raised embankment or earthworks built to protect infrastructure or parts of a floodplain from inundation
Mine Affected Water / MAW	Water affected by mining processes as defined in the site EA
MWMS	Mine Water Management System - the overarching system in place to that guides how water resources are managed onsite.
NPI	Non-Process Infrastructure
Raw water	Untampered water imported to site from treated sources (e.g. a town water supply), or untreated sources (e.g. piped in from a regional dam such as Eungella Dam).
Regulated Structure	Regulated structures are dams or levees on a site that is regulated by an environmental authority, and which if improperly constructed and maintained, could have a serious or damaging impact on the environment and/or human health
Release	Active initiation of release of water via pipe or pump
REMP	Receiving Environment Monitoring Program
Saline drainage	The movement of waters contaminated with salts as a result of disturbance during mining
Stormwater	Surface water runoff associated with rainfall as defined in the site EA
Water MP	Water Management Plan

Table 10: Terms and Definitions

8 References

Reference Number	Title	Document Number
Legislative Requirements Documents		
EXT-RPT-0002	SRM Environmental Authority – Permit Number EPML00862313	012585797
	Environmental Protection Act 1994 and Regulation 2019 (Qld)	
	Water Act 2000 and Regulation 2016 (Qld)	
	Environmental Protection (Water and Wetland Biodiversity) Policy 2016 (Qld);	
	Mineral Resources Act 1989 and Regulation 2013 (Qld)	
	Planning Act 2016 (Qld)	
	Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)	
	Phillips Creek Diversion Water Licence 178206	000346413
	Campbells Dam Water License 30971F	000346445
	Plumtree Creek Diversion Water License 34346F	000354290
	Barrett Creek Diversion Water License 30970F	000355735
	Hughes Creek Diversion (Upstream) Water License 34358F	000364614
	One Mile Dam Water License 27661F	000379418
	Phillips Creek Southern Diversion Dam Water License 46302F	000379419
	Hughes Creek Diversion (Downstream) Water License 426546F	000384877
	Spring Creek Diversion Water License 46127F	000389286
	Hughes Creek Diversion (Middle) Water License 52666F	000402844
	Phillips Creek Haul Diversion Road Water License 172682	000408902
	One Mile Creek Water License 30972F	000473531
	Southern Creek Diversion Water License 46303F	000473840
	Spring Southern Creeks Diversion Water License 623114	012706484
Technical Reference Documents		
	(DESI, 2018) Water Monitoring and Sampling Manual	
	(DESI, 2011a) Fitzroy River Sub-basin Environmental Values and Water Quality Objectives	
	(DESI, 2011b) Fitzroy River Sub-basin Environmental Values and Water Quality Objectives	
BHP/BMA Documents		
PSD-GSTD-00003	BHP Corporate Alignment Planning Global Standard	
GENV-GSTD-00003	BHP Environment Global Standard	
GENV-GSPC-00001	BHP Environmental Management Global Specification	
GSFT-GSTD-00041	HSEC Reporting, Event Management, and Investigation Global Standard	
GRIA-GTD-00003	Risk Management Global Standard	
RCOE-GSTD-00026	BHP Water Management Global Standard	
GHHG-GSTD-00002	BHP Health Global Standard	
BMA-STD-0027	BMA STD Drinking Water Quality	
	BMA Coal Legal Obligations Register (CLOR)	
BMA-POR-0101	BMA PRO Community Complaints and Grievance Procedure	013912842
BMA-HSE-AD-9572641	BMA Emergency Management Standard	000197154
BMA-STD-0030	BMA STD Erosion & Sediment Control and Mine Affected Water Standard	012962628
BMA-PRO-0056	BMA PRO Permit to Disturb Procedure	000205251
BMA-PLN-0021	BMA PLN ORECC Environment Implementation Plan	013194107
TSV-PRO-0029	TSV PRO Operational Predictive Water Balance Model Governance Procedure	014002060
TSV-PRO-0010	TSV PRO Hydrology Study and Flood Modelling Procedure	013903535
BMA-PRO-0126	BMA PRO FBA Regional Receiving Environment Monitoring Program (REMP)	014635986
Site Documents		
SRM-PLN-0095	SRM Emergency Management Plan	012530542

Reference Number	Title	Document Number
SRM-PRO-0102	SRM Event and Investigation Management Procedure	011804611
SRM-PN-0079	SRM PLN Dam Safety Management Plan	001843679
SRM-JSA-0002	SRM JSA Environmental Risk Register	013675670
SRM-PLN-0014	SRM PLN Erosion and Sediment Control (North) Plan	000196864
SRM-PLN-0057	SRM PLN Material Risk Management Plan	000198693
SRM-PLN-0106	SRM PLN Groundwater Monitoring and Management Plan	014089407
SRM-PRO-0014	SRM PRO Mine Affected Water Release and Notification Procedure	000205331
SRM-TAR-0007	SRM Severe Weather Trigger Action Response Plan (TARP)	012777743
SRM-STD-0016	SRM STD Working in and Around a Body of Water	000198682
	SRM Regulated Structures Register	012380104
	NPM-CVM-SRM-PDM Transfer Agreement 2017	012646139
SRM-PLN-0076	SRM PLN Regulated Dam Operational Plan – Barretts Creek Levee	000285592
SRM-PLN-0091	SRM PLN Ramps 2-3 TSF Stage 5 Raise Dam Operations Plan	000274973
SRM-PLN-0077	SRM PLN Ramp 6 TSF Operational Plan	011726178
SRM-MAN-0016	SRM MAN TSF 2, 3 & 4 Operations, Maintenance and Surveillance Manual and Emergency Action Plan	014716786
SRM-RPT-0001	SRM RPT Groundwater Monitoring & Management Program Review 2023	014273856

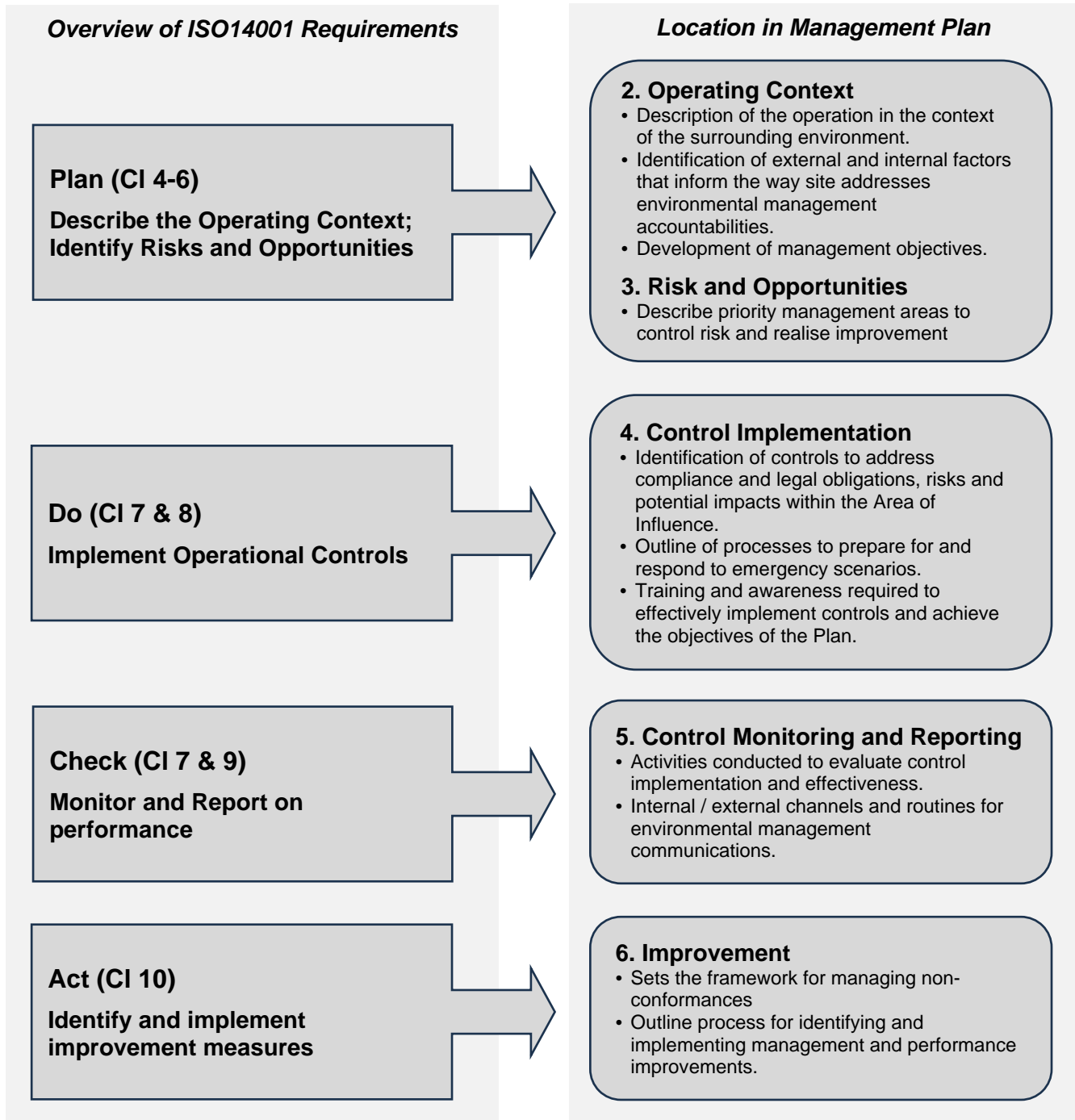
Table 11: List of reference documents

9 Version Management

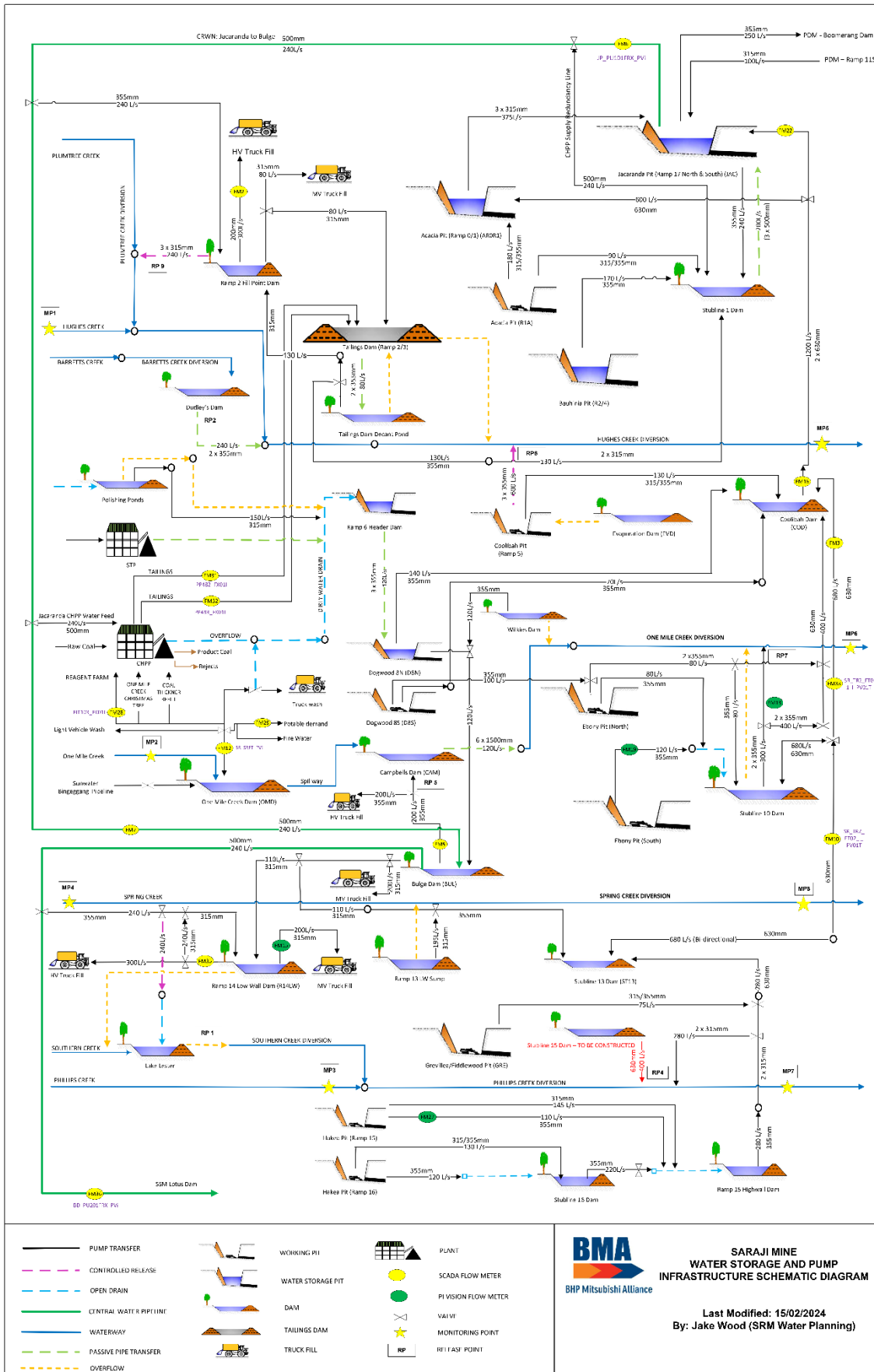
Version	Details	Date
1.0	Initial Release	
2.0	Updated to align with changes to GLD.009 and to EMS framework	
2.A	Updated to align with changes to GLD.009 and BMA Water Management Standard	
3.0	Updated to align with Our Requirements for Environment and Climate Change	July 2017
4.3	Updated to legislative requirements	04 June 2020
4.6	Published	27 August 2020
4.9	Published	24 June 2021
5.0	Annual Review	10 November 2022
6.0	Major update – align to ISO14001 and BHP environment Global Standard requirements and address regulatory feedback regarding content	March 2024
7.0	Major update – Existing WMP aligned with new Template and extensively reviewed for currency.	09 October 2024

Table 12: Version Management

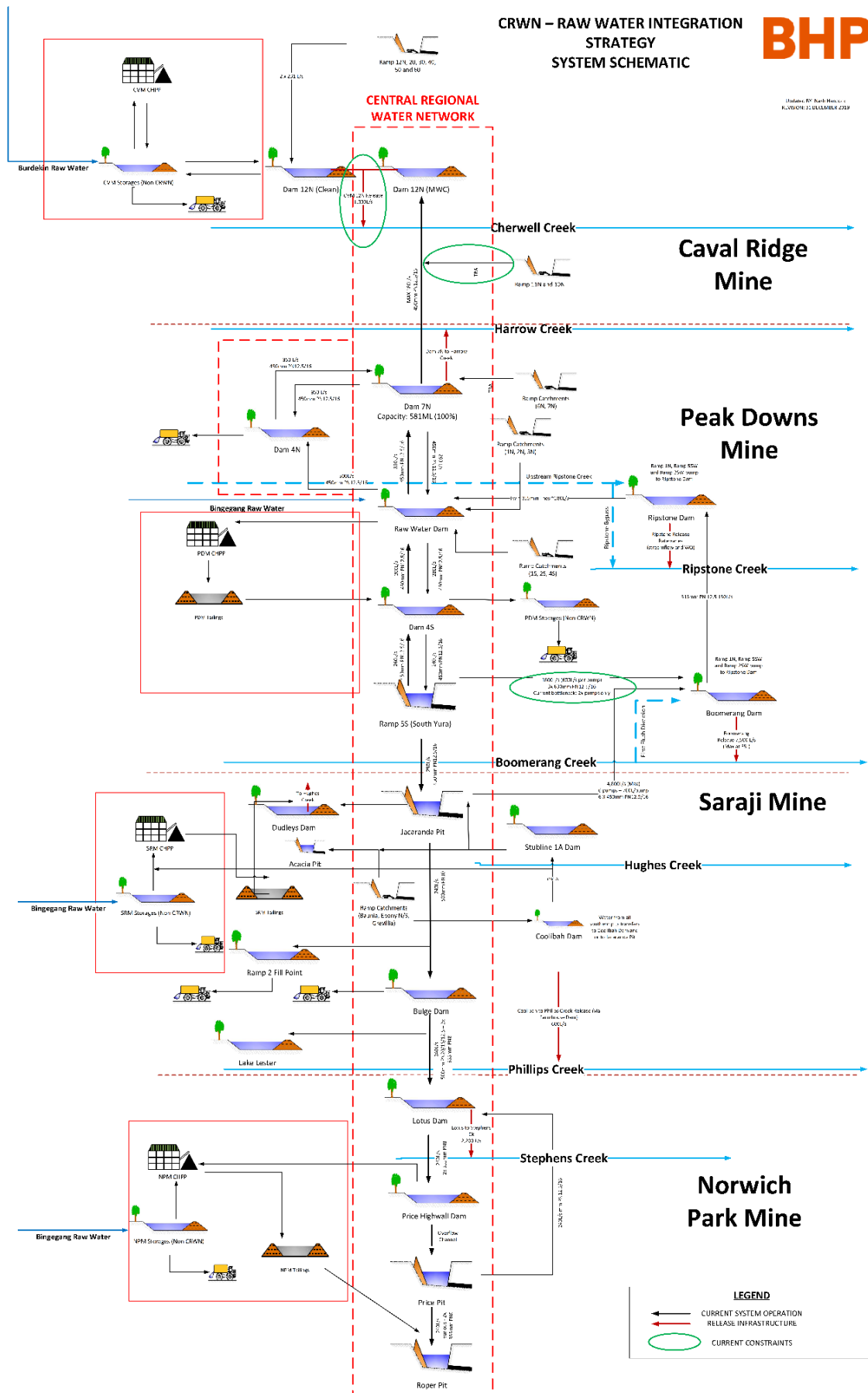
10 Appendix A: Alignment to ISO:14001



11 Appendix B: SRM WBM Schematic



12 Appendix C: CRWN WBM Schematic





SRM-PLN-0106

BHP Mitsubishi Alliance

SRM PLN Groundwater Monitoring & Management Program

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1 Introduction

- 1 This Groundwater Monitoring and Management Program (GMMP) has been prepared to satisfy the groundwater monitoring and reporting regulatory conditions (Conditions I1 to I9 relating to groundwater) for BHP Mitsubishi Alliance (BMA), as operator of the Saraji (SRM) coal mine, on behalf of the holders of Environmental Authority (EA) – EPML00862313
- 2 This EA was issued and is administered by the Queensland Department of Environment and Science (DES) for the SRM Project (activity of mining black coal on ML1775, ML1782, ML1784, ML2360, ML2410, ML70142, ML70294, ML70298, ML70298, ML70328 and ML700021).).
- 3 This GMMP was originally prepared for BHP by suitably qualified hydrogeologists of AQ2 Pty. The GMMP was then revised in 2023 (this document) by suitably qualified BMA hydrogeologists.

1.1 Groundwater Conditions

- 4 A summary of the monitoring and reporting conditions is presented in Table 1. together with Figure 1. showing the coverage of the existing mining lease and the EA monitoring network.

Table 1. Summary of EA Groundwater Conditions – EPML00862313 – effective 15 June 2022

Condition Number	Condition / Obligation Text	Relevant GMMP Section
I1	The holder of this environmental authority holder must not release contaminants to groundwater.	Section 4
I2	Groundwater Monitoring and Management Program A Groundwater Monitoring and Management Program must be: a) developed by an appropriately qualified person; and b) implemented by the environmental authority holder for all stages of the mining activities.	Section 1
I3	The Groundwater Monitoring and Management Program required by condition I2 must: a) identify potential groundwater impacts due to the mining activities; b) include a site conceptual groundwater model; c) describe the sampling and monitoring methodology; d) detail an appropriate quality assurance and quality control program; and e) provide the process for notifying the administering authority and investigating exceedances in accordance with conditions I4-I5.	Sections 1 to 6 Section 4 Section 3 Section 5.3 Section 5.4 – 5.5 Section 6
I4	Groundwater monitoring Groundwater quality and standing water levels must be monitored: a) at the locations and at the frequencies specified in Table I1 – Groundwater Monitoring Program ; and b) for the quality characteristics specified in Table I2 – Groundwater Trigger Levels	Section 5.1 Section 6.1
I5	If the groundwater contaminant trigger levels defined in Table I2 (Groundwater Contaminant Trigger Levels) are exceeded on three (3) consecutive monitoring occasions, the environmental authority holder must complete an investigation into the potential for environmental harm and notify the administering authority within twenty (20) business days of receiving the analysis results.	Section 6
I6	The Groundwater Monitoring and Management Program must be reviewed by 30 November 2023 and thereafter every two (2) years by an appropriately qualified person. The review report must: a) analyse the results of groundwater monitoring to: i. describe any impacts to groundwater levels and groundwater quality due to the mining activity;	Section 7

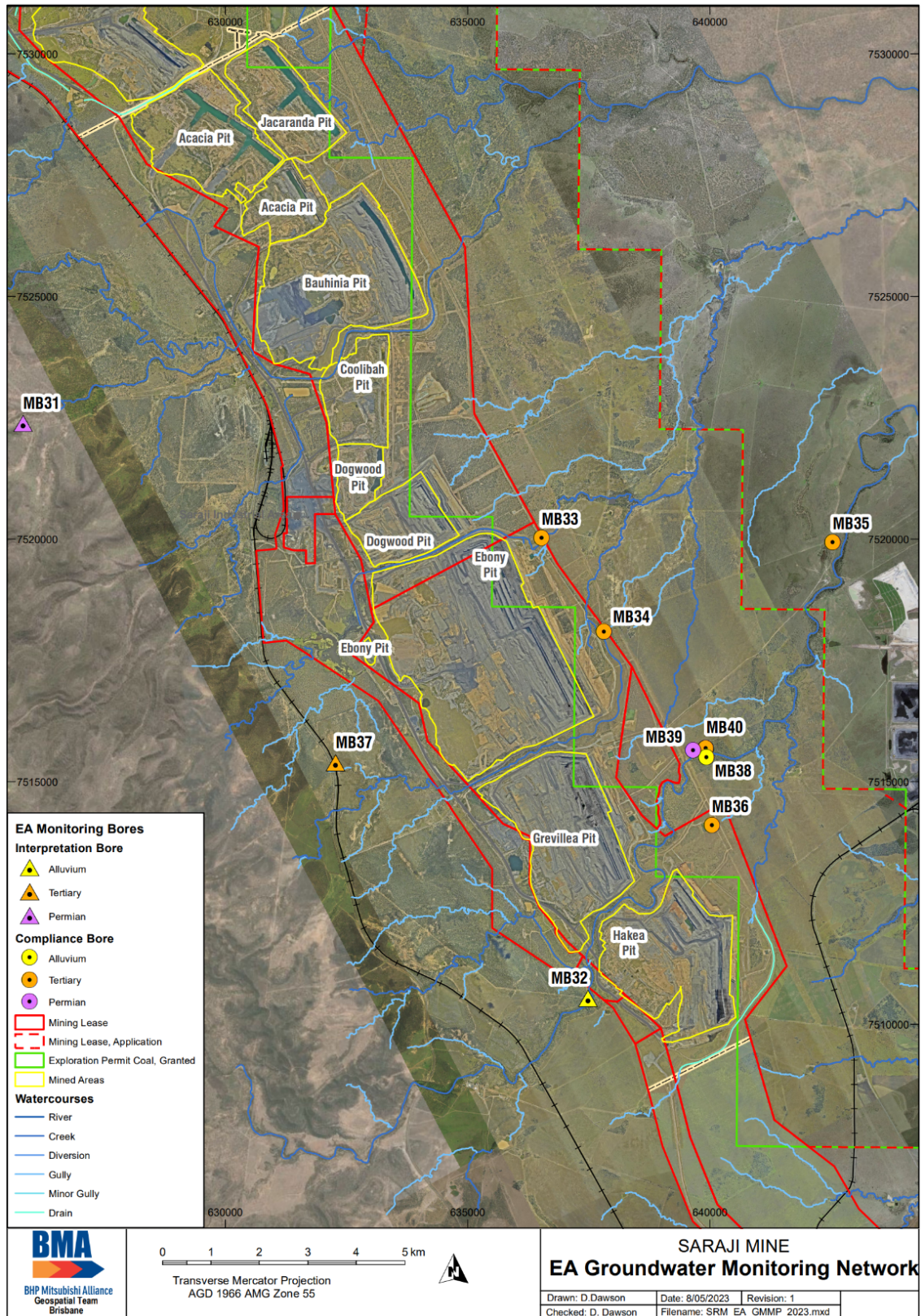
Condition Number	Condition / Obligation Text	Relevant GMMP Section
	<ul style="list-style-type: none"> ii. determine trends in groundwater levels and groundwater quality; b) assess the adequacy of the Groundwater Monitoring and Management Program; and c) provide recommendations to the environmental authority holder to address the findings of parts (a) and (b) of the review. 	
17	<p>Within twenty (20) business days of receiving the review report required by Condition 16, the environmental authority holder must provide to the administering authority:</p> <ul style="list-style-type: none"> a) the review report; b) if applicable, any actions being taken by the environmental authority holder to address the recommendations of the review report; and c) if action is not being taken to address a recommendation, the environmental authority holder must provide justification for not taking action. 	Section 7
18 ⁽¹⁾	Annual groundwater monitoring data must be submitted to the administering authority via WaTERS by 30 September each calendar year.	Section 7
19	<p>Bore construction</p> <p>The construction, management, maintenance and decommissioning of groundwater monitoring bores must be undertaken in a manner that:</p> <ul style="list-style-type: none"> a) prevents contaminants entering the groundwater; b) ensures the integrity of the bores to obtain representative groundwater samples from the target aquifer; and c) maintains the hydrogeological environment within the aquifer. 	Section 5.2

⁽¹⁾ The annual groundwater monitoring submission will include all data up to the 30th June for that calendar year.

2 Location & Site Layout

- 1 SRM is located 20 km north of Dysart and approximately 170 km southwest of Mackay, Queensland. The operation is located within ML1775, ML1782, ML1784, ML2360, ML2410, ML70142, ML70294, ML70298, ML70328 and ML700021. It comprises a series of open-cut pits and associated coal handling and processing infrastructure.
- 2 In July 2020, the Norwich Park mining lease (located immediately to the south of SRM) was absorbed in its entirety into that of the SRM. The two parts of the mine are referred to as Saraji Mine (SRM) and Saraji South Mine (SSM). The Environmental Authority for SSM is held under the former name (Norwich Park Mine).
- 3 Mining at SRM commenced in 1974 on ML1782 and ML1755. Currently, there are eight open-cut pits which are, from north to south, (along strike): Acacia Pit, Jacaranda Pit, Bauhinia Pit, Coolibah Pit, Dogwood Pit, Ebony Pit, Grevillea Pit, and Hakea Pit.

Figure 1. Saraji Mine & EA Groundwater Monitoring Network



- 4 As of July 2023 four pits (Acacia, Jacaranda, Bauhinia and Dogwood North) and 11 MAW dams were in active use for water management at SRM.
- 5 SRM uses the water collected in the storage dams for site water demands including dust suppression and mineral processing.
- 6 A Transfer of Water Between Sites Agreement exists between Saraji South (SSM) [formerly Norwich Park Mine (NPM)], Caval Ridge Mine (CVM), Peak Downs Mine (PDM) and SRM. Mine water from the SRM's mine water system may be pumped into either Jacaranda Pit or Bulge Dam where it may then be on-pumped via the Central Region Water Network (CRWN) to SSM or PDM (BMA, 2021).

3 Conceptual Hydrogeological Model

- 1 SRM is located on the western limits of the Bowen Basin, with the Saraji South Fault, Downs Creek Fault and the Isaac Thrust Fault truncating the project area into two structural domains: a north to north-west trending domain and a north to south trending domain.
- 2 The stratigraphy of the area is characterised by a thick sequence of Permian strata, comprising an interbedded sequence of coal, sandstone, and siltstone, overlain by Tertiary and Quaternary-aged sediments. (AECOM, 2016).
- 3 The SRM deposit lies within an area of flat to gently undulating terrain towards the north-east and east, which is between Harrow Range to the west, and the Isaac River to the east (GHD, 2019). The Isaac River flows south for approximately 230 km to join with the McKenzie River which flows onwards to the Fitzroy. There are also several west to east draining ephemeral creeks in the area, which include: Boomerang Creek, Hughes Creek, One Mile Creek, Spring Creek and Phillips Creek.
- 4 The following surface water systems have been diverted to enable mining: Phillips Creek, Hughes Creek, Spring Creek, One Mile Creek, Plumtree Creek, Barrett Creek and Southern Creek (BMA, 2021).

3.1 Hydrogeological Units

- 5 There are three hydro-stratigraphic units (HSUs) in the vicinity of SRM i.e. the Quaternary alluvium, Tertiary sediments (undifferentiated) and Permian coal measures. These HSUs are discussed in further detail below. A visual representation of the conceptual model is attached to this document as Figure 3. (GHD, 2021).

3.1.1 Quaternary Alluvium

- 6 Lithology; the Quaternary alluvium and colluvium consists of unconsolidated clay, silt, sand and gravel. Sand and gravel deposits form an unconfined aquifer, associated with the ephemeral surface water features within the SRM area (Phillips Creek, Hughes Creek and other surface water courses). The thickness of the alluvium increases along Phillips Creek to the east, with a maximum thickness of 36 m (AGE, 2007).
- 7 Recharge; primary recharge of the alluvial aquifers occurs by:
 - a Direct infiltration of rainfall.
 - b Vertical seepage of surface waters from ephemeral waterways during times of surface water flow (i.e. losing streams). This may include episodic rainfall and runoff events, where there is surface infiltration of direct rainfall and overland flow, where alluvium is exposed, and no substantial clay barriers occur in the shallow sub-surface. This is particularly noted along Phillips Creek at SRM.

- 8 Discharge; during periods of creek flow, the alluvial sediments may discharge to sub-cropping coal seams and/or underlying Tertiary sediment aquifers where they exist. Discharge mechanisms of the alluvium are expected to be significant, and include:
 - a Short duration baseflow from the permeable sands and gravels within the alluvium material.
 - b Evapotranspiration from vegetation growing in the creek beds and along the banks.
 - c Infiltration and recharge to the underlying formations where Phillips Creek intersects more permeable areas within these units.
 - d Discharge to the creek during or after flow events as base flow. Limited effective storage (recognised due to the dry bores in the alluvium) results in the alluvium dewatering under gravity, readily recharging from rainfall and creek flow and in turn, recharging underlying units (AECOM, 2016).
- 9 Depth to water; in the Phillips Creek alluvium immediately west of SRM the recorded depth was 12.8 metres below ground level (mbgl), measured at bore MB32 (Gauge, 2021). To the east of the mine area, in the vicinity of Hughes Creek, One Mile Creek and Phillips Creek, depth to groundwater is anticipated to be within a couple of metres of ground surface where sporadic, Palustrine systems (wetlands) (Queensland Government, 2013) have been mapped. Away from Phillips Creek, in the vicinity of Grevillea Pit, the groundwater level is observed to be 15 to 20 mbgl (AGE, 2007).
- 10 Groundwater flow direction; across the alluvial aquifer is likely to be topographically controlled, flowing from higher elevations to lower elevations in the north-east and east.

3.1.2 Tertiary Sediments

- 11 Lithology; the undifferentiated Tertiary sediments unconformably overly the Permian strata and range from 15 to 57 m in thickness. The sediments comprise discontinuous water-bearing sandy horizons and thin basal sands within clay dominated sediments. Overall, the Tertiary sediments have low to moderate permeability and semi-confined to confined properties (AECOM, 2016). An approximately 3 m thick basal sand and gravel sequence at the base of the Tertiary sediments is the primary water bearing unit, with a hydraulic conductivity of 20 to 30 m/d observed in Grevillea Pit (AGE, 2007). Sub-vertical faults zones may provide a pathway for interflow with other units, but only if these faults are sufficiently permeable in the tangential plane
- 12 Recharge; via direct infiltration of rainfall and overland flow where Tertiary sediments outcrop and no substantial clay barriers exist in the subsurface. Recharge also occurs via infiltration from overlying Quaternary alluvial aquifers.
- 13 Discharge; primary mechanisms in the Tertiary sediment aquifers are likely to be:
 - a Through flow into underlying and/or adjacent aquifers, such as subcrop or outcrop coal seams.
 - b Evapotranspiration.
 - c Groundwater extraction.
- 14 Depth to water; measurements, compiled during 2011 and 2012, indicate variable groundwater levels both across the study area and over time (AGE, 2012b). Sediments intersect groundwater at depth but often have insufficient groundwater for sampling, due to poor recovery / low permeability (AECOM, 2017). Stabilised levels, measured, indicate groundwater levels some 20 m below surface (IESA, 2012) and the EA monitoring network recorded water level ranges in 2020-21, from 12 – 27mbgl (Gauge, 2022).
- 15 Groundwater flow direction; due to the heterogeneity and discontinuity of the Tertiary sediment aquifers, the groundwater flow direction is likely to be topographically controlled, flowing from higher elevations to lower elevations. Direction of groundwater flow within the Tertiary aquifer is expected to reflect topography, from elevated areas in the west, towards lower topographic areas of surface drainage, towards the east.

3.1.3 Permian Coal Measures

- 16 Lithology; the Permian strata strikes north-west to north north-east, and dips gently 2 to 5 degrees to the east. The unit consists of low permeability and porosity interburden and overburden material (considered to act as aquitards) interspersed with coal seams (aquifers). The interburden and overburden comprise sandstone, siltstone and shales with low primary porosity and permeability. Joints, faults and fractures are present throughout the Permian strata, which provide localised secondary forms of porosity and permeability.
- 17 The Moranbah Coal Measures, which include the Harrow Creek Upper Seam (H16) and Dysart Seams (D14, D24 and D52), targeted for mining at SRM, are considered to act as the primary aquifer within the Permian sequence (AGE, 2007). The coal seam matrix has horizontal permeability through interconnected fractures (AECOM, 2016). The coal measures overly the semi-pervious Black Creek Group, which sub-crops and outcrops to the west of SRM.
- 18 Recharge; groundwater recharge in the Permian aquifer occurs via:
 - a Infiltration of rainfall and overland flow in outcrop areas.
 - b Downward seepage or throughflow from overlying or adjacent alluvial or tertiary aquifers where no significant clay barriers exist
 - c Leakage between aquifers by faulting and other structural discontinuities.
- 19 Discharge; mechanisms of discharge from the Permian coal seam aquifers are likely to be:
 - a Throughflow into adjacent (outcropping or sub-cropping coal seams) or seepage into underlying aquifers (via structural discontinuities).
 - b Downgradient Permian strata outcrop areas.
 - c Groundwater extraction from regional / local mine dewatering activities
- 20 Depth to water; no site-specific, pre-mining depth to groundwater information is available for the SRM Permian aquifer. MB31 records significant fluctuations due to landholder extraction for stock watering (Gauge, 2022) and MB39 at around 18mbgl.
- 21 Groundwater flow direction; considered to have been from coal outcrops in the north and west towards the Isaac River sub-catchment (AECOM, 2016). In the current SRM environment, groundwater flows towards the existing open-cut mine pits.

3.2 Water Quality

- 22 Water quality results from the Quaternary and Tertiary aquifers show the groundwater to be relatively fresh to slightly saline, with electrical conductivity (EC) ranging from 700 to 2,400 $\mu\text{S}/\text{cm}$ (MB32). pH was observed to be slightly acidic to slightly alkaline, ranging from 6.4 to 8.2 (MB32). Results also show the groundwater chemistry to be a magnesium-bicarbonate type, indicative of recently recharged groundwater.
- 23 EC recorded in the Permian aquifer ranges broadly depending on proximity to recharge sources. The Moranbah Coal Measures within the mining area recorded as saline with an EC of 16,000 to 28,000 $\mu\text{S}/\text{cm}$ (MB33 and MB34), compared to outcropping recharge areas to the west of the mine which recorded a brackish EC of 2,500 to 14,800 $\mu\text{S}/\text{cm}$ (MB31 and MB37).
- 24 To the east of the mine, in close proximity to Phillips Creek, an EC of 1,000 to 2,000 $\mu\text{S}/\text{cm}$ was recorded (MB35). Historical pH recorded across the Permian aquifer has fluctuated from slightly acidic to alkaline, generally ranging within 6.5 to 8.5.
- 25 The water quality results from the Permian aquifer present predominantly as sodium-chloride dominant, however, with increasing proximity to the Phillips Creek alluvial aquifer, this trend changes towards sodium-bicarbonate dominant.
- 26 No significant or detrimental change in EA water quality parameters were observed in the 2021 annual review (Gauge, 2021).

3.3 Environmental Values

- 27 The environmental values (EVs) for groundwater in the Isaac River catchment (Isaac Groundwaters) are defined under the Environmental Protection (Water) Policy 2009 (EPP (Water)) in the Isaac River Sub-basin Environmental Values and Water Quality Objectives document prepared by the Department of Environmental Policy and Department of Environment and Heritage Protection (DEHP, 2011).
- 28 The EVs for groundwater have been reviewed in the context of the conceptual model, to identify those applicable to the SRM area and to identify the most sensitive of these EVs for protection (refer to Table 2). Of those identified, the Aquatic Ecosystem EV is considered the most sensitive for protection (GHD, 2020).
- 29 Existing groundwater users in the vicinity of SRM were assessed as part of the AGE census of landholders bores (AGE, 2007). The identified landholders / registered bores are presented in Figure 5 (from GHD, 2020). Data indicated the following regarding groundwater use:
- a The Quaternary alluvium is used, or has been used, for stock watering.
 - b Permian-age strata are intersected by registered bores recorded as being for the purpose of water supply. Whilst the bore database does not provide further details as to the use of the water, it is likely to include stock watering, given the AGE (2007) bore census identified 12 bores in the vicinity of SRM as being used for stock watering, of which four of the bores were to a depth of 50 m or greater.
 - c No water entitlements for groundwater were identified in the water entitlements database, indicating that groundwater is not used for activities requiring a water licence such as irrigation or town water supply.
- 30 Registered bores from a Department of Natural Resources Mines and Energy (DNRME), now the Queensland Department of Regional Development, Manufacturing and Water (DRDMW) database search in 2016 (AECOM, 2016) are presented in Appendix A.

Table 2 Summary of Environmental Values Applicable to the Saraji Mine area (GHD, 2021)

Environmental Value	Description	Is the EV Applicable to SRM?
Aquatic ecosystem	The mapped Palustrine systems (wetlands) to the east of SRM in proximity to Phillips Creek, One Mile Creek and Hughes Creek are considered to be supported by shallow groundwater perched within the Quaternary alluvium and Tertiary / Quaternary alluvium (GHD, 2019). The shallow groundwater is not anticipated to provide baseflow to surface water given the ephemeral nature of the creeks. Shallow groundwater is recharged by seepage from surface water courses in times of flow, as indicated by the major ion chemistry (GHD, 2019). The greater than 20 m depth to permanent groundwater and high salinity levels in the Tertiary and Permian aquifers suggest they are not suitable for groundwater dependent ecosystems (GDE) (AECOM, 2016).	Yes - Alluvium and Tertiary; No Permian
Irrigation	The shallow groundwater within the Quaternary alluvium is potentially suitable for irrigation use, given the EC in the order of 700 to 2,400 $\mu\text{S}/\text{cm}$. The deeper Permian groundwater is variably brackish to saline (2,500 to 28,000 $\mu\text{S}/\text{cm}$) and not considered suitable for irrigation. A search of the Water Entitlements Database (DRDMW), within a 10 km radius of SRM did not find any groundwater or surface water licences for the purpose of irrigation.	Yes - Alluvium, Tertiary, Permian Back Creek Group and Permian Fair Hill Formation; No Permian Moranbah Coal Measures
Farm Supply	The shallow groundwater within the Quaternary alluvium is potentially suitable for irrigation use, given the EC in the order of 700 to 2,400 $\mu\text{S}/\text{cm}$. The water is not however suitable for drinking without treatment. The deeper Permian groundwater is variably brackish to saline (2,500 to 28,000 $\mu\text{S}/\text{cm}$) and not considered suitable for farm supply.	Yes - Alluvium, Tertiary, Permian Back Creek Group and Permian Fair Hill Formation; No Permian Moranbah Coal Measures
Primary recreation	No appreciable water bodies have been identified in aerial photographs in proximity to SRM, however there is the potential for temporary pools to form	Yes - Alluvium and Tertiary;

	where shallow groundwater is recharged by seepage from surface water courses in times of flow. Temporary pools may be used for recreation.	No - All Permian groups
Stock Water	The shallow groundwater within the Quaternary alluvium is potentially suitable for irrigation use, given the EC is in the order of 700 to 2,400 $\mu\text{S}/\text{cm}$. Results of the bore census (AGE, 2007), indicated there are 12 bores registered for use of water supply to livestock. The deeper Permian groundwater is variably brackish to saline (2,500 to 28,000 $\mu\text{S}/\text{cm}$) and not considered suitable for livestock.	Yes - Alluvium, Tertiary, Permian Back Creek Group and Permian Fair Hill Formation; No Permian Moranbah Coal Measures
Drinking Water	Groundwater EC in the vicinity of SRM (ranging from 700 to 28,000 $\mu\text{S}/\text{cm}$ across all aquifers) is consistently higher than the Australian drinking water guideline maximum of 500 $\mu\text{S}/\text{cm}$, and is therefore considered unsuitable for human consumption without treatment. No licences for groundwater or surface water extraction for the purpose of town water supply were identified within a 10 km radius of SRM in a search of the Water Entitlements Database (DRDMW, 2018).	No
Cultural and spiritual values	There are no registered groundwater springs or seeps that supply surface water bodies within 150 km of SRM that are known to have significant Aboriginal and/or non-indigenous cultural heritage associations. However mapped wetlands are associated with some of the surface water sources and alluvial deposits that may have cultural and spiritual values.	Yes - Alluvium and Tertiary; Not documented - All Permian groups

4 Potential Groundwater Impacts

- 1 Potential impacts to groundwater at SRM due to mining activities are discussed in the Hydrogeological Regime and Impact Assessment (AGE, 2007) and are summarised as follows;
 - a groundwater interception by mining within the project area;
 - b drawdown in groundwater level in the adjacent alluvium, sediments and coal measures;
 - c groundwater quality and contamination of groundwater;
 - d impacts on private bores;
 - e drawdown at potential groundwater dependent ecosystems (GDEs); and
 - f cumulative impacts
- 2 In addition, predicted impacts assessed in the Underground Water Impact Report (UWIR) for the Saraji Open Cut Extension Project (AECOM, 2017) and the associated Groundwater Technical Report (AECOM, 2016) have been used to support the following sections.

4.1.1 Groundwater Interception

- 3 As mining progresses, pits intercept aquifers resulting in passive groundwater inflow to pits
- 4 Groundwater inflow generally occurs as damp or low flow seeps in the mining faces, making direct measurement of the groundwater inflow virtually impossible. The majority of the groundwater inflow evaporates directly from the mining face and remaining groundwater will pool at the base of pits, combining with direct rainfall and any surface water run-off. The water is then left to evaporate or is pumped out from the pit sump as necessary.
- 5 At SRM, the groundwater inflow volume is very low, the resulting total volume of water pumped from the pits is much greater than the actual groundwater inflow. Annual inflows to SRM (by mining lease ML1774 and ML1782) were estimated to be 1,515 ML/yr (BMA, 2022), for the reporting period (November 2021 to October 2022 inclusive). No continuous pumping of groundwater from any pits is necessary, the extent of the drawdown is expected to be relatively limited due to the low transmissivity of the sediments (AGE, 2007).
- 6 If the pits encounter the Quaternary alluvium, pit inflow will occur. Due to their shallow depth and lack of continuity and thickness, the Quaternary alluvium is not considered a significant aquifer. However, during periods of creek flow, the alluvium may become fully saturated and discharge to the pits.

4.1.2 Groundwater Drawdown

- 7 Mining has substantially modified the groundwater regime within the vicinity of the mine with local dewatering of all aquifers, but it is considered that the zone of influence of mining is within a few hundred metres of the mine pits and spoil (AGE, 1999).
- 8 The largest predicted drawdown extends within the target coal seams, which are not recognised to discharge into the down gradient Isaac River; in addition, the drawdown cones do not extent to the Isaac River to the east (AECOM, 2017)
- 9 Groundwater levels have gradually declined since 2017 in reference bores MB31 and MB32, and test bores MB34 and MB35, correlating with cumulative rainfall. MB31 records significant fluctuations due to landholder extraction for stock watering (Gauge, 2022)

4.1.3 Groundwater Quality & Potential Contamination

- 10 Groundwater quality is not suitable for drinking, too deep for surface ecosystems, and is often too saline for livestock watering (AECOM, 2017).
- 11 Given that the coal seam aquifer in the Upper Isaac catchment is already classified by the then DERM (2011) as saline, the threat is deemed to be insignificant. The risk is qualitatively deemed to be low (likely occurrence and negligible consequence).
- 12 There is potential for spills and contamination by metals and hydrocarbons from mine workshop, waste disposal and fuel storage areas. The risk of spills is reduced by the pit forming a long-term groundwater sink. The risk is qualitatively deemed to be moderate (unlikely occurrence with potential for a major consequence (BMA, 2012). Risks will be minimised by implementation of the contractor's construction environmental management plan and site environmental management plan.
- 13 There may be instances of groundwater restrictions where subsurface permanent structures (building foundations, road embankments) are constructed. This type of subsurface construction can cause groundwater flow to be impeded and pressure heads to build up on the up-gradient area and reduced down-gradient. Pressure head relief engineering solutions will be utilised in subsurface constructions, where required.

- 14 The prevention and management of hazardous substance leaks and spills is outlined in the **BHP PRO Spill Prevention and Response – BHP-PRO-0004**. This procedure applies to all hazardous substances (flammable and combustible liquids and chemicals) including, but not limited to: diesel, oils, hydrocarbons, greases, solvents, paints, coolants, flocculants and chemicals. The objective of this procedure is to ensure all sites comply with their Environmental Authority (EA) in relation to hazardous substance leak/ spill prevention and response. This procedure will ensure all hazardous substances are captured and disposed of in an environmentally responsible manner.
- 15 Any accidental spills will be assessed on a case-by-case basis and remediated.

4.1.4 Impact on Groundwater Users

- 16 Existing groundwater users in the vicinity of SRM were assessed as part of the AGE census of landholders bores (AGE, 2007). Permian-age strata are intersected by registered bores recorded as being for the purpose of water supply. Whilst the bore database does not provide further details as to the use of the water, it is likely to include stock watering, given the AGE (2007). The bore census identified 12 bores in the vicinity of SRM as being used for stock watering, of which four of the bores were to a depth of 50 m or greater. A more recent review of DNRM registered bores was conducted by AECOM in 2016 as part of the Saraji Open Cut Extension Project. That search identified 41 registered bores within the vicinity of SRM (AECOM, 2016), refer to Appendix A.
- 17 The Groundwater Impact Assessment, undertaken for the Saraji East Project (SEP), indicated that there are two registered bores and four un-registered bores located within the predicted zone of groundwater drawdown, which indicates these bores will be partially to fully dewatered as result of the proposed underground mine development. However, all other existing water supply bores are located beyond this drawdown extent and as such should not be influenced by the mine development (AGE, 2011).
- 18 Most of the 12 stock bores on the surrounding properties are located 3km to 6km from the open cut pits and are likely therefore well beyond the influence of pit dewatering (AGE, 2007).
- 19 As stated above, groundwater is not suitable for drinking and is often too saline for livestock watering. The exceptions are the shallow bores extracting from the alluvial sediments in Phillips Creek that are less than 1km from mine workings. The alluvial sediments in Phillips Creek are expected to be recharged by storm water flows in the creek and therefore are likely to be less sensitive to extraction from the open cut voids (AGE, 2007).
- 20 The combined impact of project-related depressurisation and existing regional coal seam depressurisation is not likely to be significant for agricultural users beyond the SEP area. The low permeability of the coal seams and the steep drawdown gradients results in minimal drawdown outside the immediate vicinity (BMA, 2012).

4.1.5 Aquatic Ecosystems

- 21 Surface water systems are separated from the predicted impacted groundwater resources by low permeable sediments, which reduce the potential to impact on the alluvium and surface water flows. The system in the area is ephemeral and therefore potential impacts (from the open cut extension) are considered low (AECOM, 2017).
- 22 The Quaternary sediments (recent deposits from Phillips Creek) were reported to be of limited extent and were dry in several bores.
- 23 A review of registered springs indicated that the closest springs are greater than 150 kilometres from Saraji Mine (AECOM, 2017).

4.1.6 Cumulative Impacts

- 24 The cumulative drawdown in Tertiary sediments and the target coal seams at the end of mining in 2042 is simulated to extend further to the south. The drawdown extent within the Tertiary and Permian aquifers, extends up to 3km east of the Saraji Mine operations. (AGE, 2011).

5 Groundwater Monitoring

5.1 Monitoring Program

- 1 Groundwater quality and standing water levels must be monitored:
 - a At the locations and at the frequencies specified in Table 3 – Groundwater Monitoring Locations and Frequency; and
 - b For the quality characteristics specified in Table 4 – Groundwater Trigger Levels.
 - c Figure 1. shows SRM groundwater monitoring network.

Table 3 Saraji Mine Groundwater Monitoring Bore Network

Monitoring Point ⁽¹⁾	Location	Status	Easting (GDA94)	Northing (GDA94)	Ground RL	Cased Depth (mbgl)	Screened Interval (mbgl)	Monitored Aquifer	Monitoring Requirement (Parameter, Frequency)	Monitoring Rationale
Interpretation Bores ⁽²⁾										
MB31	Saraji Station / Up-gradient of mine Reference Bore	Active	625942	7522560	NA	44.23	No borehole log, interpreted from geology (GHD, 2021)	Permian - Coal Seam	Quarterly WL Quarterly WQ	Background
MB32	Tay Glen Property Phillips Creek Reference Bore	Active	637595	7510716	NA	19.52	No borehole log (AGE, 2007)	Alluvium (Phillips Creek)	Quarterly WL Quarterly WQ	Background
MB37	Up-gradient of mining Reference Bore	Active	632389	7515571	234.8	42.5	34 - 42.5	Tertiary Interburden / Permian Overburden Weathered shale and fresh siltstone interburden	Quarterly WL Quarterly WQ	Background
Compliance Bores										
MB33	Down-gradient of mine One Mile Creek	Active	636640	7520199	194.8	37.5	30 - 36	Tertiary Interburden / Permian Overburden	Quarterly WL Quarterly WQ	Compliance
MB34	Down-gradient of mine One Mile Creek tributary	Active	637926	7518269	195.9	107.0	99.5 - 105.5	Tertiary Interburden / Permian Overburden	Quarterly WL Quarterly WQ	Compliance
MB35	Lake Vermont Property Phillips Creek	Active	642646	7520110	184.6	34.5	27 - 33	Tertiary Interburden / Permian Overburden	Quarterly WL Quarterly WQ	Compliance

Monitoring Point ⁽¹⁾	Location	Status	Easting (GDA94)	Northing (GDA94)	Ground RL	Cased Depth (mbgl)	Screened Interval (mbgl)	Monitored Aquifer	Monitoring Requirement (Parameter, Frequency)	Monitoring Rationale
MB36	Lake Vermont Property	Active	640150	7514283	197.8	32.0	24.5 - 30.5	Tertiary Interburden / Permian Overburden	Quarterly WL Quarterly WQ	Compliance
MB38 ⁽³⁾	Phillips Creek East of Grevillea Pit, collocated with MB39 and MB40	Active	640032	7515860	NA	8.5	5.5 - 8.5	Alluvium	Quarterly WL Quarterly WQ	Compliance
MB39	Phillips Creek East of Grevillea Pit, collocated with MB38 and MB40	Active	640018	7515876	NA	91.5	84.35 - 90.5	Permian	Quarterly WL Quarterly WQ	Compliance
MB40	Phillips Creek East of Grevillea Pit, collocated with MB38 and MB39	Active	640026	7515867	NA	21.0	14 - 20	Tertiary	Quarterly WL Quarterly WQ	Compliance



Note

1. Monitoring is not required where a bore has been removed as a direct result of the mining activity.
2. Interpretation bores must: (a) have a similar flow regime (b) be from the same bio-geographic and climatic region (c) have a similar geology, soil type and topography (d) not be so close to the test sites that any disturbance at the test site also results in a change at the interpretation bore.
3. MB38 is dry. Trigger levels unable to be set.

Water Level – WL Water Quality

5.2 Monitoring Bore Construction

- 2 The construction, management, maintenance and decommissioning of groundwater monitoring bores will be undertaken in a manner that:
 - a prevents contaminants entering the groundwater;
 - b ensures the integrity of the bores to obtain representative groundwater samples from the target aquifer; and
 - c maintains the hydrogeological environment within the aquifer.
- 3 Construction and decommissioning must be in accordance with the ***Minimum Construction Requirements for Water Bores in Australia (4th edition, 2020)***.

5.3 Monitoring Methodology

- 4 Groundwater monitoring will be conducted in accordance with methods described in the in the ***BMA PRO Groundwater Sampling Procedure***.
- 5 Monitoring equipment used will be maintained and calibrated according to manufacture specifications.
- 6 Monitoring is to be carried out by appropriately qualified persons.

5.4 Quality Assurance & Quality Control

- 7 Quality assurance and control protocols during sampling will be undertaken in accordance with the ***BMA PRO Groundwater Sampling Procedure***.
- 8 Samples will be transported to a NATA-accredited laboratory(s) under appropriately-documented chains-of-custody. Laboratory guidelines on holding times for samples will be complied with where practicable.
- 9 Laboratory and field results will be checked for accuracy on receipt of all sampling data and laboratory certificates of analyses. Errors or discrepancies will be cross-checked with field and laboratory records and further investigation initiated if required.

5.5 Data Management

- 10 Data from the monitoring program will be entered into the BMA Environmental Data Monitoring System (EDMS).

6 Triggers & Management Responses

- 1 Once acquired, processed and uploaded to the relevant groundwater database, groundwater level and quality monitoring data will be analysed against trigger levels for the various parameters, as prescribed in EA EPML00862313.

6.1 Triggers

- 2 Groundwater level and water quality trigger levels for Permian bores at SRM are defined in Table I2 of EA EPML00862313 (see Table 4).

Quality Characteristics	Units s	MB31, MB32, MB37	Trigger Levels					
			MB33	MB34	MB35	MB36	MB39	MB40
Water Level	RL	Monitored for interpretive reasons only – no triggers apply.	Fluctuations in excess of 2m per year excluding changes from pumping of licenced bores					
pH	pH Units		6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5
Electrical Conductivity	µS/cm		25,170	29,720	16,000	16,000	16,000	8,910
Sulphate	mg/L		2580	398	398	477	398	318
Dissolved Iron ⁽¹⁾	mg/L		1.6	0.7	1.7	2.6	0.7	0.7
Dissolved Aluminium ⁽¹⁾	mg/L		0.055	0.055	0.055	0.055	0.055	0.055
Dissolved Arsenic	mg/L		0.013	0.013	0.013	0.013	0.013	0.013
Dissolved Mercury	mg/L		0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Dissolved Antimony	mg/L		0.009	0.009	0.009	0.009	0.009	0.009
Dissolved Molybdenum	mg/L		0.034	0.034	0.034	0.034	0.034	0.034
Dissolved Selenium	mg/L		0.020	0.020	0.011	0.011	0.011	0.011
Dissolved Silver	mg/L		0.0014	0.0013	0.001	0.001	0.0012	0.001
Total Recoverable Hydrocarbons C6-C10	µg/L		20	20	20	20	20	20
Total Recoverable Hydrocarbons >C10-C40	µg/L	100	100	100	100	100	100	

Table 4 Saraji Mine Groundwater Trigger Levels

Note



All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger value

6.2 Exceedance Procedure

- 3 If the groundwater trigger levels defined in Table 4 are exceeded on three (3) consecutive monitoring occasions, the environmental authority holder must complete an investigation into the potential for environmental harm and notify the administering authority within twenty (20) business days of receiving the analysis results (Figure 2).

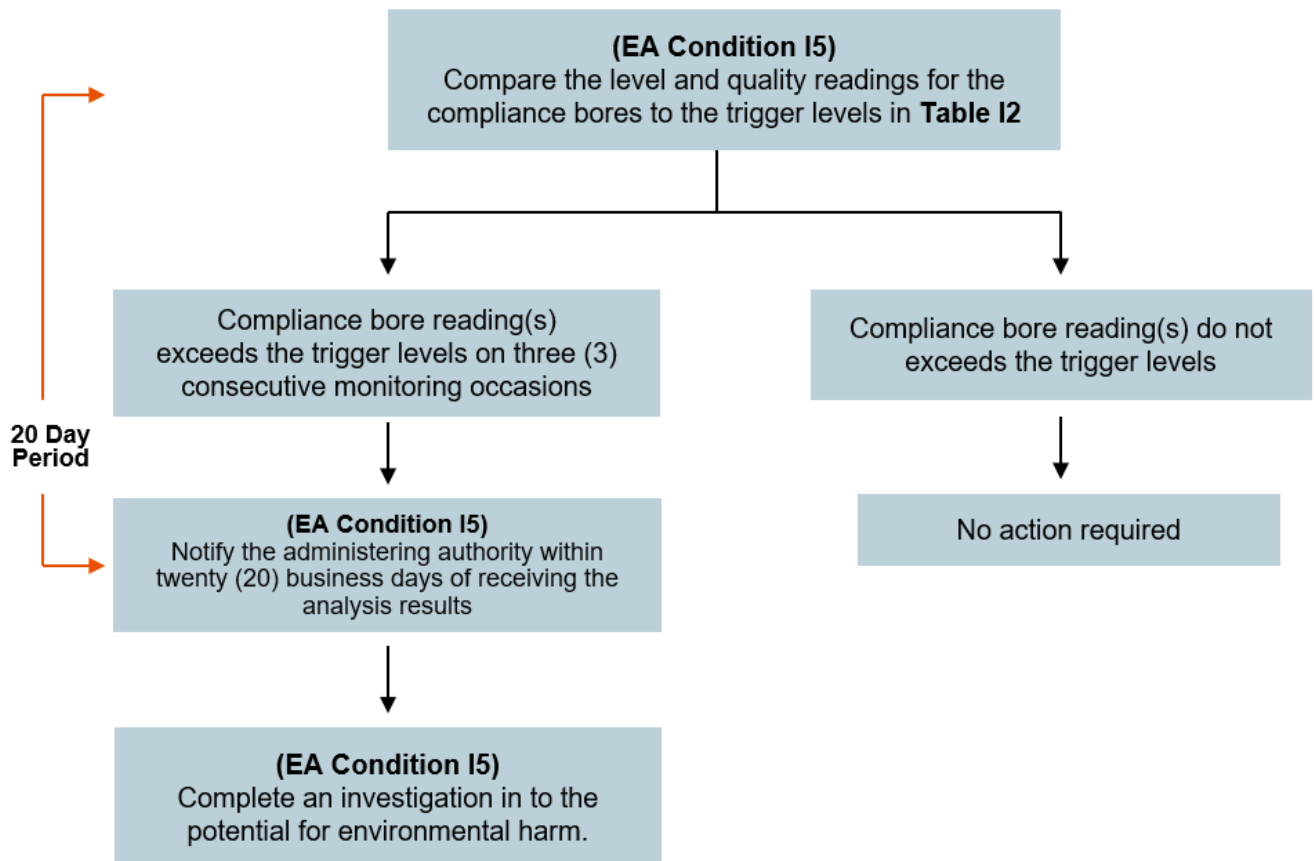


Figure: 2 Exceedance Procedure Summary, as per Condition I5 of the EA.

7 Review & Reporting

7.1 GMMP Review

- 1 The Groundwater Monitoring and Management Program must be reviewed by 31 November 2023, and thereafter every two (2) years, by an appropriately qualified person. The review report must:
 - a Analyse the results of groundwater monitoring to:
 - i describe any impacts to groundwater levels and groundwater quality due to the mining activity;
 - ii determine trends in groundwater levels and groundwater quality;
 - b Assess the adequacy of the Groundwater Monitoring and Management Program; and
 - c Provide recommendations to the environmental authority holder to address the findings of parts (a) and (b) of the review.
- 2 Within twenty (20) business days of receiving the review report, required by condition I6, the environmental authority holder must provide to the administering authority:
 - a The review report;
 - b If applicable, any actions being taken by the environmental authority holder to address the recommendations of the review report; and
 - c If action is not being taken to address a recommendation, the environmental authority holder must provide justification for not taking action.

7.2 Annual Groundwater Data Submission

- 3 Annual groundwater monitoring data must be submitted to the administering authority via WaTERS by 30 September calendar each year.

8 Terms and Definitions

Term	Definition
BMA	BHP Mitsubishi Alliance
CVM	Caval Ridge Mine
CRWN	Central Region Water Network
EA	Environmental Authority
GMMP	Groundwater Monitoring and Management Program
MAW	Mine Affected Water
SRM	Saraji Mine
SSM	Saraji South Mine
PDM	Peak Downs Mine

Table 5: Terms and Definitions

9 References

Reference Number	Title	Document Number
Legislative Requirements Documents		
	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC 2000)	
	Australian/New Zealand AS/NZS 5667.1.1: Water Quality – Sampling – Guidance on the design of sampling Programs, Sampling Techniques and the Preservation and Handling of samples.	
	Australian/New Zealand AS/NZS 5667.11: Water Quality—Sampling - Guidance on sampling of groundwaters.	
	DEHP, 2011. Environmental Protection (Water) Policy 2009 Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Isaac River Sub-basin (including Connors River). September 2011.	
	DES, 2018. Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government.	
	Department of Natural Resources, Mines and Energy (DNRM), 2018. Guideline - Quantifying the volume of associated water taken under a mining lease or mineral development licence Under the Mineral Resources Act 1989, March 2018.	
	DNRME, 2020. Guideline Quantifying the volume of associated water taken under a mining lease or mineral development licence. Updated October 2020.	

Reference Number	Title	Document Number
	DRDMW, 2018. Groundwater Database / Water Entitlements Database	
	Environmental Authority (EA) – EPML00862313 – 15 June 2022	
	Environmental Protection (Water) Policy 2009 (EPP (Water))	
	The Minimum Construction Requirements for Water Bores in Australia (4th edition, 2020).	
Technical Reference Documents		
	AECOM, 2016. BHP Saraji Open Cut Extension Project, Groundwater Technical Report. Appendix B to AECOM, 2017.	
	AECOM, 2017. BHP Saraji Open Cut Extension Project Underground Water Impact Report.	
	Australasian Groundwater and Environmental Consultants Pty Ltd (May 1999), "Report on Hydrogeological Regime of the Saraji Mine", Project No. G1046	
	AGE, 2007. Hydrogeological Regime and Impact Assessment	
	AGE, 2011. Project No. G1549 Saraji East Project	
	AGE, 2012b. Review of Groundwater Monitoring Data Saraji Mine, Project No. G1609, December 2012	
	BMA, 2012. Saraji East EIS Project – Chapter 7: Groundwater Resources.	
SRM-SWI-0359	BMA, 2020. Saraji Mine Standard Work Instruction: Shallow Groundwater Sampling. June 2020.	000205286
	BMA, 2022. AWT Reporting. Internal memo 29 th November 2022.	
SRM-PLN-0051	BMA, 2021. SRM Water Management Plan. 24 June 2021.	000204603
	Gauge Industrial & Environmental, 2022, Annual Groundwater Monitoring Report Saraji Coal Mine 2021 Prepared for BHP Billiton Mitsubishi Alliance. March 2022.	
	GHD, 2020. BHP BMA Saraji Groundwater Well Installation. Prepared for BHP. February 2020.	
	GHD, 2021. Saraji Mine Groundwater Contaminant Trigger Levels Report. Prepared for BHP. June 2021	
	IESA, 2012. Monitoring Saraji East Mine Monthly Service Records and Data Reporting, ref doc. SJIEMar12	
BHP/BMA Documents		
	BHP PRO QLD Coal Spill Prevention and Response Procedure	000205088
	BHP PRO QLD Groundwater Sampling Procedure	

10 Appendix A – Registered Bores

Details of Registered Bores

A review of DNRM registered bores was conducted by AECOM in 2016 as part of the Saraji Open Cut Extension Project (AECOM, 2016). The results are presented in Table 6.

Registration Number	Easting	Northing	Depth (m)	Geology	Water Level (mbgl / mAHD)	Yield (L/s)	Type / Name
100291	626431	7542882	-	-	-	-	-
141386	626507	7544152	52	Coal	17.97 / 198.99		DNRM
141382	628490	7542693	52	Shale	18.36 / 196.2	0.02	DNRM
100252	633893	7538053	-	-	-	-	-
162506	621205	7534682	42	Sandstone	5	1.89	
13040283	627834	7527375	68.5	Coal	40.56 / 178.29	-	DNRM
132631	635440	7528179	328	Back Creek sandstone	31.0 / 156.88	15?	-
136689	635868	7528234	-	Duaranga Fm	157.13 mAHD	-	-
13040179	649627	7535053	14.32	Alluvial sand	-	-	-
13040178	651167	7535107	10.05	-	-	-	-
122458	644983	7526770	50.5	Permian overburden	26.0 / 149.11	-	-
165123	647515	7526007	136	Rangal Coal Measures	-	-	VWP
158014	636640	7520199	37.5	Moranbah Coal Measures	21.28 / 172.83	0.08	MB33
158013	637926	7518269	107	Moranbah Coal Measures	23.10 / 172.51	0.05	MB34
158012	632389	7515571	41.4	Back Creek Group	12.80 / 221.86	0.02	MB37

165162	629499	7513228	100	No data	-	-	-
136092	633416	7512196	22	Back Creek Group	12	1.1	-
44336	634975	7509310	54.86	No data	36.6	2.5	-
43639	638939	7511033	43.9	Tertiary to 22 m, coal, sandstone	29.49	0.75	Lost
57747	640392	7509441	126.5	Back Creek Group Basalt	-	4.42	-
158686	643499	7508708	210	MCM	60.0 / 141.15	0.13	MW9P
90475	645463	7513291	76.2	Blackwater Group	-	0.01	abandoned
165323	637620	7515091	15	Alluvial sand	-	-	Piezometer
165324	638481	7514161	15	Alluvial clay	-	-	Piezometer
158011	640150	7514283	32	Fair Hill Fm	17.96 (178.97 mAHD)	0.09	MB36
165326	640296	7515897	35	Quaternary sand and clay	-	-	Abandoned
165325	640296	7515897	18.5	Quaternary	-	-	Piezometer
84538	641354	7516737	109.7	No strata data	18.3	0.07	-
100248	641645	7518640	-	No data	-	-	-
158010	642646	7520110	34.5	Fair Hill Fm	18.41 (166.87 mAHD)	-	MB35
165122	644067	7520357	40	Rangal Coal Measures	VWP4 144.6 mAHD	-	LV2183 VWP
			61		VWP3 155.4 mAHD	-	
			71		VWP2 135.6 mAHD	-	
			83		VWP1 144.1 mAHD	-	
158485	643131	7521947	22	Quaternary clay	Dry	-	LV2371W
158481	643132	7521949	38	Rangal Coal	VWP4 162.5 mAHD	-	LV2226 VWP

			56	Measures	VWP3 157.9 mAHD	-	
			74		VWP2 154.5 mAHD	-	
			94		VWP1 153.6 mAHD	-	
158482	645525	7522752	65	Rangal Coal Measures	VWP4 152.1 mAHD	-	LV2218 VWP
			86		VWP3 149.0 mAHD	-	
			116		VWP2 147.1 mAHD	-	
			137		VWP1 146.8 mAHD	-	
158483	645524	7522752	20	Quaternary	Dry	-	LV2369W
158480	649801	7522051	94	Tertiary to 56 m then Rangal Coal Measures	-	-	LV1235C
158484	648037	7523878	19	Quaternary	157.7 mAHD	-	LV2370W
132628	648220	7524052	120	Duaranga Fm	77.0 / 95.61	0.8	-
165124	648038	7523864	82	Rangal Coal Measures	-	-	LV2375W VWP
132627	649564	7525028	70	Duaranga Fm	30 (141.29 mAHD)	0.95	-
13040180	667759	7516513	32	Isaac River Alluvium	17.2 (140.71 mAHD)	-	DNRM

Table 6: Registered Bores in the vicinity of Saraji Mine (from AECOM, 2016)

Additional information for registered bores located within the predicted area of impact associated with the Saraji Open Cut Extension Project is presented in Table 7 (from AECOM, 2017).

Bore RN	Easting	Northing	Depth (mbgl)	Geology / Aquifer	Use	Status	Comment
165323*	637620	7515091	15	Alluvial sand	Monitoring		Existing. Not licenced.
43639	638939	7511033	43.9	Blackwater Group	Unknown	Abandoned / Destroyed / Not screened within affect aquifers	Abandoned and destroyed
57747	640392	7509441	126.5	Back Creek Group	Unknown	Abandoned / Destroyed / Not screened within affect aquifers	Existing. Not licensed. Screened in Layer 11 (Back Creek Group) which is located below MCM and not predicted to be impacted.
158011	640150	7514283	32	Fair Hill Formation	Monitoring	Abandoned / Destroyed / Not screened within affect aquifers	Existing. Not licensed. Located in Layer 2 and impacts predicted to be less than 1 metre.
158013	637926	7518269	170	Moranbah Coal Measures	Monitoring	Abandoned / Destroyed / Not screened within affect aquifers	Existing. Not licensed. Located in Layer 3 and impacts predicted to be less than 2 metres.
158014	636640	7520199	37.5	Moranbah Coal Measures	Monitoring	Abandoned / Destroyed / Not screened within affect aquifers	Existing. Not licensed. Located in Layer 2 and impacts predicted to be less than 1 metre.
165324	638481	7514161	12.0	Alluvial Clay	Monitoring	Abandoned / Destroyed / Not screened within affect aquifers	Existing. Not licensed. Located outside IAA for Layer 1

Table 7: Registered Bores within the Predicted Area of Impact (from AECOM, 2017)

It is noted that bore RN165323 is owned by BMA and this bore is located immediately adjacent (west) to the Grevillea Pit.

Note. Six bores (RN43639, RN57747, RN158011, RN158013, RN158014 and RN165324) are located within the predicted area of impact but are either abandoned, destroyed or not screened within the affected aquifer.

11 Attachment A – Conceptual Model

FIGURE 3-1 SARAJI MINE CONCEPTUAL MODEL

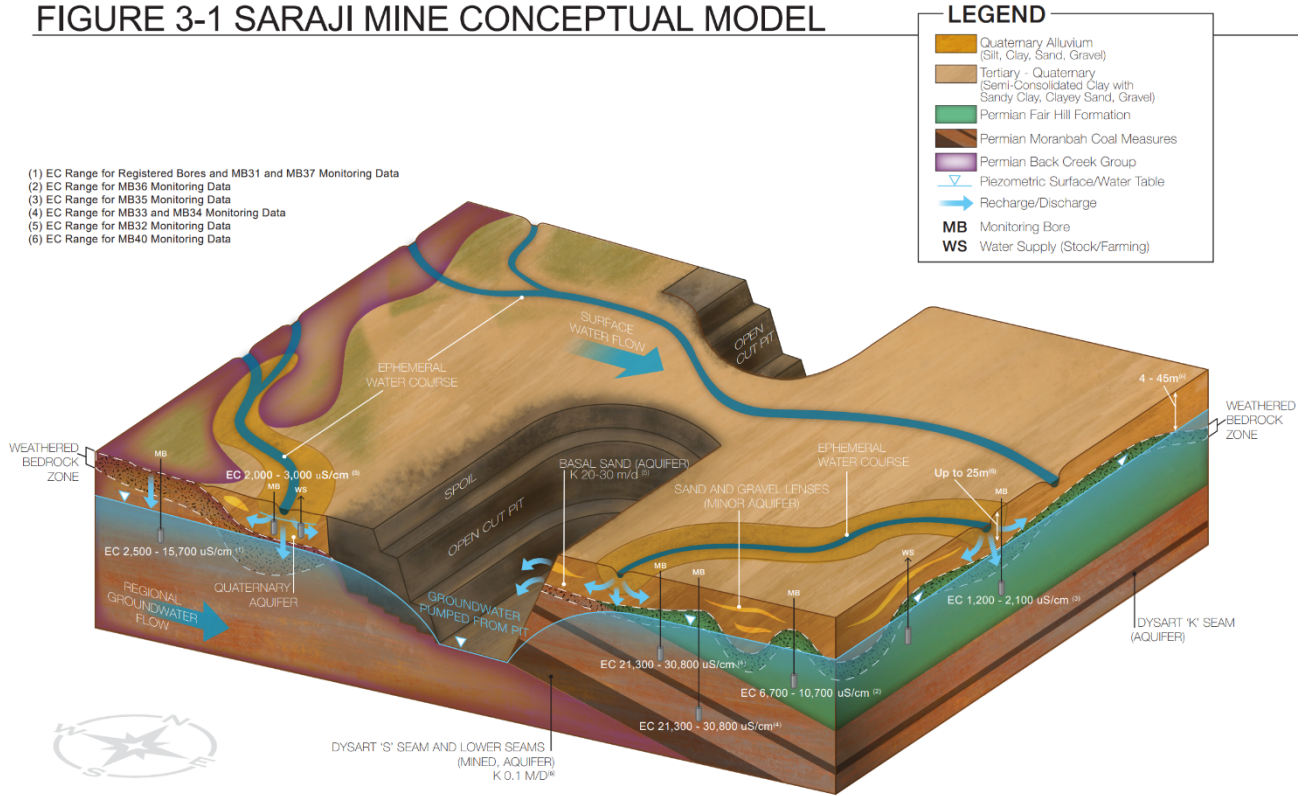


Figure 3. Saraji Mine Conceptual Model (GHD, 2021)

12 Version Management

Version	Details	Date
1.0	Initial Release	14 November 2023

Table 8: Version History



BHP Mitsubishi Alliance

Groundwater-dependent Ecosystem Monitoring & Management Plan

**Saraji Mine
Grevillea Pit Continuation Project
EPBC 2023/09757**

Status: Final

Version 1.4 (16 March 2026)

Business Owner: Superintendent Environment Ops SRM



Declaration of accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cwth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed _____

Full name (please print) _____

Organisation (please print) _____

Date ____/____/____

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1 Introduction

- 1 This Groundwater Dependent Ecosystem Management and Monitoring Plan (GDEMMP) has been developed to support the Grevillea Pit Continuation Project (the Project; EPBC 2023/09757) at Saraji Mine (SRM).
- 2 The outcomes of a groundwater dependent ecosystem (GDE) significant impact assessment (SIA) completed for the Project has been used to inform this document. The GDE SIA is based largely on groundwater modelling which predicts the extent and rate of groundwater drawdown as a result of the Project.
- 3 The GDE SIA concluded that no significant impacts to GDEs were likely, however, this GDEMMP will be implemented in line with the precautionary principle to validate that conclusion and respond to any unforeseen outcomes.

1.1 Nomenclature

- 4 Nomenclature used in this GDEMMP is consistent with that developed for the GDE SIA (2rog 2025), and includes (refer [Figure 2-1](#)):
 - a **Project** – Grevillea Pit Continuation Project (EPBC 2023/09757).
 - b **Project Area** – The area encompassing ML700021.
 - c **Predicted Drawdown Extent** – The area in which groundwater drawdown is predicted from the model (SLR 2025), and where this may potentially impact on GDEs.
 - d **Assessment Area** – Includes both the **Project Area** (ML700021) and **Predicted Drawdown Extent**, as modelled by SLR (2025).

1.2 Objective and Performance Criteria

- 5 This GDEMMP's objectives are to:
 - a Validate the identification and characterisation of GDEs in the Project's Assessment Area.
 - b Confirm no significant impacts are likely to materialise, consistent with the outcomes of the GDE SIA (2rog 2025) and broader impact assessment documentation.
 - c Identify and facilitate timely implementation of appropriate monitoring and management in the event adverse impacts to GDEs, as a result of the Project, are greater than those predicted.
- 6 This plan pertains to two types of GDEs as defined by Eamus et al. (2006a), with varying objectives for each:
 - a Terrestrial GDEs (TGDEs), which are defined as vegetation communities that require access to groundwater to meet all or some of their ecological water requirements (Richardson et al. 2011; Eamus et al. 2006a). Objectives for TGDEs include:
 - i Mapping the relevant Assessment Area for TGDEs.
 - ii Detailing lines of evidence used to support impact assessment, including:
 - a) Desktop analyses.
 - b) Groundwater modelling.
 - c) Field investigation/s.
 - iii Describing and mapping ecosystems likely to be TGDEs, based on the above evidence.
 - iv Detailing the methodology and timing for the monitoring of TGDEs, including:

- a) Baseline data (pre-impact).
 - b) Ongoing monitoring (post-impact).
 - c) Trigger thresholds for (1) investigation and (2) corrective actions.
 - d) Corrective actions to rectify and/or account for any unanticipated impacts.
 - v Details of the investigations and adaptive management that will be undertaken if trigger thresholds are reached.
- b Subterranean GDEs, specifically including groundwater that exhibits the presence of stygofauna (i.e. micro species that exist between rock formation and sediments within the aquifer). Objectives for stygofauna include:
 - i Detailing the likely presence of stygofauna within alluvial groundwater across the Assessment Area, based on the current impact assessment.
 - ii Outlining stygofauna monitoring, which will include:
 - a) A pilot survey (pre-impact baseline) methodology; and (if detected)
 - b) Ongoing monitoring (post-impact).
 - iii Trigger thresholds for (1) investigation and (2) corrective actions.
 - iv Corrective actions to rectify and/or account for any unanticipated impacts.
 - v Details of the investigations and adaptive management that will be undertaken if trigger thresholds are reached.

Note

*The implementation of ongoing monitoring and management of stygofauna is contingent on the results of the pilot survey (refer Section 5.2.1). If stygofauna are identified as present within alluvial groundwater in the Project's Assessment Area, requirements under **Section 1, lines 6-b-ii-b and 6-b-iii** through **v** will be implemented. If no stygofauna are present, no further actions relating to this suite of GDEs will be undertaken.*

- 7 The performance criterion for the monitoring and management of GDEs relating to the execution of the Project can be described as follows:
 - a TGDEs – no statistically significant change in condition indicators (refer **Section 5.1.6**) attributable to the Project.
 - b Stygofauna (if applicable) – no statistically significant change in alluvial groundwater species richness attributable to the Project.

1.3 Structure of the Plan

- 8 The key sections of the GDEMMP include:
 - a A description of how this plan is consistent with the GDE toolbox (Richardson et al. 2011).
 - b A summary of the GDE values within the Assessment Area.
 - c A description of potential impacts to GDEs associated with the Project.
 - d Monitoring details and a management framework for TGDEs and stygofauna (if applicable) including:
 - i The monitoring program for GDEs across the pre-impact and impact phases of the Project.
 - ii Triggers for groundwater and ecological values associated with TGDEs.

- iii Details of mitigation and management measures to be implemented, in response to unanticipated impacts, including corrective actions.
- e Voluntary reporting and review schedule/s to enable adaptive management.

1.4 Background Information

- 9 The presence and potential impacts to TGDEs, as a result of the Project, are documented in the following reports:
- a BHP Mitsubishi Alliance Saraji Mine Grevillea Pit Continuation Preliminary Documentation (EPBC 2023/09757) (BMA 2025)
 - b Saraji Mine Grevillea Pit Continuation Groundwater-Dependent Ecosystem Impact Assessment Technical Report (2rog 2025)
 - c Groundwater Model Assessment and Tech report (SLR 2024)
 - d Groundwater Model Update Memo (SLR 2025)
 - e Groundwater Impact Assessment IESC Advice Response (SLR 2025)

1.5 Consistency with GDE Toolbox

- 10 This management plan has been developed to be consistent with the approach detailed in the GDE Toolbox (Richardson et al. 2011) as described in the following sections.

1.5.1 GDE Toolbox Stage 1 – GDE location, classification and conceptualisation

- 11 GDE Toolbox Stage 1 assessment focuses on developing a baseline understanding of where GDEs exist, classification of ecosystem type and conceptualisation of the eco-hydrogeological setting (Richardson et al. 2011).
- 12 Classification and conceptualisation of GDEs associated with the Assessment Area was completed as part of the impact assessment process. This monitoring plan will incorporate additional baseline data collected to further develop the classification and conceptualisation of GDEs relevant to the Project. This includes the results of a Stygofauna Pilot Survey (refer [Section 5.2.1](#)).

1.5.2 GDE Toolbox Stage 2 – Characterisation of groundwater reliance

- 13 GDE Toolbox Stage 2 assessment seeks to characterise potential reliance of identified GDEs on groundwater. To determine the groundwater interactions and degree of dependency for each GDE, collection of time-series data is required to quantify the seasonal use of groundwater. The timing of groundwater use by each of the GDEs is a consideration in the development of ecological water requirements (EWRs; Richardson et al. 2011).
- 14 Characterisation undertaken for the impact assessment has included:
- a Modelling of groundwater, surface water and conceptualisation of groundwater-surface water interactions.
 - b Review of prior field investigations and analysis of groundwater use by vegetation communities within the Assessment Area.
 - c Analysis of remotely sensed indexes that provide indication of GDE presence and groundwater reliance, including:
 - i Normalized Difference Vegetation Index (NDVI); and
 - ii Normalized Difference Moisture Index (NDMI).

- 15 The monitoring design for this GDEMMP has been developed to verify the predicted potential reliance, whilst collecting additional data that may be used to further characterise any detected reliance.
- 16 Where stygofauna are detected during the pilot survey, additional analysis of groundwater levels and quality will be undertaken to characterise the use of groundwater systems by the stygofauna community.

1.5.3 GDE Toolbox Stage 3 – Characterisation of ecological response to change

- 17 GDE Toolbox Stage 3 involves creating a detailed and quantified understanding of the ecological and biotic responses of GDEs to fluctuations and changes in groundwater.
- 18 For TGDEs, this will primarily be achieved through monitoring designed to detect any decline in condition of vegetation. Such characterisation will occur by understanding the pre-impact condition (i.e. including response to natural seasonal variation) and impact condition (i.e. response to mining-related impacts), as well as monitoring condition of control sites. Monitoring will focus on the biotic responses of TGDEs.
- 19 For stygofauna (if found), monitoring will focus on detecting changes in the presence and condition of stygofauna communities.

2 Assessment Area/s

- 20 The identification and assessment of impacts to GDEs were informed via desktop analyses, field investigation and a remote sensing approach (refer Section 3). GDEs have been identified within the Predicted Drawdown Extent (i.e. the area of modelled groundwater drawdown associated with the Project, that may potentially impact GDEs). *Figure 2-1* displays the Predicted Drawdown Extent and the Project Area, which collectively provide the Assessment Area for the GDE SIA (2rog 2025) and this GDEMMP.



Figure 2-1 Assessment Area/s for GDEs

3 GDEs associated with the Project

- 1 Eamus et al. (2006a) identifies three main types of GDEs:
 - a **Aquatic GDEs.**
 - b **Subterranean GDEs (stygo fauna).**
 - c **TGDEs.**

- 2 The likely presence of GDEs was assessed in the GDE SIA (2rog 2025). Key outcomes of this assessment include:
 - a Aquatic GDEs are **unlikely** to occur within the Assessment Area considering:
 - i The ephemeral nature of waterways.
 - ii Limited extent of wetland ecosystems.
 - iii Absence of surface expression of groundwater during historic field investigations.
 - b Subterranean GDEs (stygo fauna) are considered **unlikely** to occur, noting:
 - i Brackish to saline nature of groundwater in deeper strata being un conducive to their presence.
 - ii Lack of contemporary investigations in alluvium requires field validation of stygo fauna absence (addressed in this GDEMMP).
 - c TGDEs are **likely** to occur within the Assessment Area, in association with riparian ecosystems along Phillips Creek (refer [Figure 3-1](#)).

- 3 GDEs were identified, and their use of groundwater characterised, using a cumulative evidence-based decision approach (CEDA) (i.e. multiple lines of evidence). This included (where relevant):
 - a Desktop assessment
 - i GDE and Regional Ecosystem (RE) mapping:
 - a) Review of available mapping products to identify potential GDEs (e.g. Bureau of Meteorology GDE Atlas; Map of Queensland Wetland Environmental Values).
 - b) Review of Queensland RE mapping and ground-truthed REs.
 - ii Review of the available bore monitoring data, within and surrounding the Assessment Area.
 - b Geological overview:
 - i Examination of geology associated with the Project (State Surface Geology mapping (DoR 2023)).
 - c Literature review:
 - i Vegetation communities associated with groundwater use.
 - ii Species known to utilise groundwater on facultative or obligate basis.
 - iii Ecological attributes critical to groundwater use (e.g. rooting depth).
 - iv Research into the presence of stygo fauna within the Bowen Basin.
 - d Remote Sensing Analysis – Application of the Groundwater Dependent Ecosystem Mapping (GEM) method (per Doody et al. 2019; Barron et al. 2012). Utilising:
 - i NDVI
 - ii NDMI.
 - e Groundwater modelling (SLR 2025), including:
 - i Existing depth to water (DTW).

- ii Predicted scale of drawdown (incremental and cumulative).
- iii Predicted Drawdown Extent.
- f Field surveys
 - i Review of previous GDE investigations across SRM.

3.1 TGDEs

- 4 Cumulatively, the above approaches identified vegetation communities that likely, or may potentially, function as TGDEs within the Project's Predicted Drawdown Extent. Likelihood of a vegetation community functioning as a TGDE was assessed as a factor of:
 - a Presence of known GDE indicator species (i.e. tree species that are known to use / rely upon groundwater).
 - b Likely rooting depth of GDE indicator species, noting that in order for vegetation to access groundwater, root structures need to access the capillary zone located immediately above the groundwater level.
 - c Sufficient DTW in strata under vegetation communities¹.
 - d The application of remote sensing diagnostics (indicating the use of groundwater within vegetation communities – i.e. via the GEM method).
- 5 Per the GDE SIA (2rog 2025), 1.1 ha of vegetation communities occurring within the Assessment Area are considered to be likely TGDEs. These areas are primarily riparian communities associated with RE 11.3.25 and adjacent woodland communities (REs 11.3.4 and 11.5.3). These values are displayed in [Table 3-1](#).
- 6 Based on available literature, the modelled groundwater table, and field investigations, likely TGDEs were determined to comprise facultative phreatophytes, utilising groundwater when available, though, not considered dependent on access for ongoing persistence. All other vegetation within the Predicted Drawdown Extent were considered unlikely to be groundwater dependent. A summary of the REs identified as likely TGDEs is provided in [Table 3-1](#).

Table 3-1: Likely TGDEs in Predicted Drawdown Extent

RE	Indicator Species	Area (ha)	TGDE likelihood and rationale
11.3.25	<i>Eucalyptus camaldulensis</i> <i>Eucalyptus tereticornis</i> <i>Corymbia tessellaris</i> <i>Corymbia clarksoniana</i> <i>Casuarina cunninghamiana</i>	1.0	<ul style="list-style-type: none"> • Likely TGDE (facultative): • Mapped as high potential by GDE Atlas. • Field assessments identify GDE indicator species in community • Present along Phillips Creek alluvium • Groundwater present in alluvium from 2 mbgl (identified in field investigation) • Groundwater modelled at ~20 mbgl within tertiary sediments • Analysis of NDVI and NDMI indicated persistent greenness and moisture during dry periods
11.3.4	<i>Eucalyptus camaldulensis</i> <i>Eucalyptus tereticornis</i> <i>Corymbia tessellaris</i> <i>Corymbia clarksoniana</i>	0.1	<ul style="list-style-type: none"> • Likely TGDE (facultative): • Areas mapped as high potential by GDE Atlas. • Field assessments identify GDE indicator species in community • Immediately adjacent to Phillips Creek • Groundwater present in alluvium from 2 mbgl (identified in field investigation)

¹ Eamus et al. (2006a) suggests that groundwater located greater than 10 meters below ground level (mbgl) has reduced importance to vegetation. The use of groundwater is generally considered likely where depth to water (DTW) is 0 to 10 mbgl, possible at depths of 10 to 20 mbgl and unlikely at depths greater than 20 mbgl (Eamus, Hatton, et al. 2006b).

RE	Indicator Species	Area (ha)	TGDE likelihood and rationale
			<ul style="list-style-type: none"> Groundwater modelled at ~20 mbgl within tertiary sediments Analysis of NDVI and NDMI indicated persistent greenness and moisture during dry periods
11.5.3	<i>Eucalyptus populnea</i> <i>Corymbia clarksoniana</i>	<0.1	<ul style="list-style-type: none"> Likely TGDE (facultative): Field assessments identify GDE indicator species in community Immediately adjacent to Phillips Creek Groundwater present in alluvium from 2 mbgl (identified in field investigation) Groundwater modelled at ~20 mbgl within tertiary sediments Analysis of NDVI and NDMI indicated persistent greenness and moisture during dry periods

3.2 Stygofauna

- 7 Approaches outlined in [Section 3](#) were used to develop a preliminary assessment of the likelihood of stygofauna in the Assessment Area, these included:
 - a Review of the available bore monitoring data, within and surrounding the Assessment Area.
 - b Review of previous GDE investigations across SRM.
 - c Analysis of literature on stygofauna within the Bowen Basin.
- 8 This assessment indicated that stygofauna are unlikely to be present within lower strata (i.e. Tertiary sediments and coal seams).
- 9 In the Bowen Basin, stygofauna have typically been detected in alluvium (relative to other water bearing strata); though no evidence currently exists to support their presence in the Assessment Area.
- 10 In the absence of contemporary and targeted field investigations, a pilot survey will be undertaken to confirm the current understanding of stygofauna presence in alluvial groundwater, and to inform (if present) ongoing monitoring and management. To this end:
 - a Where pilot survey identifies presence of stygofauna within the Assessment Area alluvium, ongoing stygofauna monitoring and management will be developed in line with the general guidance set out below in this GDEMMP.
 - b Where pilot survey does not show presence of stygofauna within the Assessment Area alluvium, no further management actions relating to this type of GDE will be undertaken.

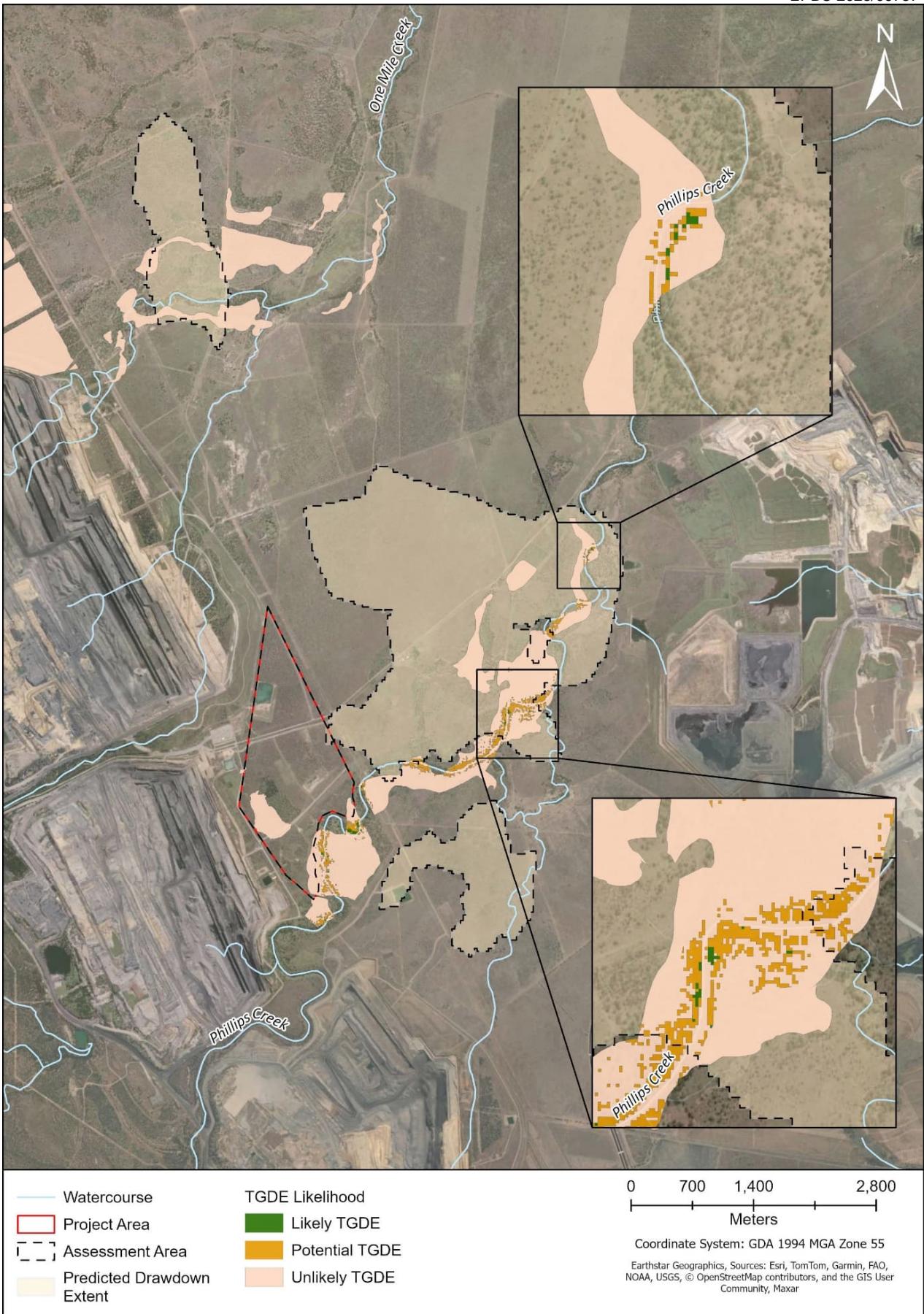


Figure 3-1 Likely and Potential TGDEs in the Predicted Drawdown Extent

4 Potential Impacts

4.1 TGDEs

- 1 Potential impacts to TGDEs have been collated from relevant policy documents (e.g. Barnett et al. 2012; IESC 2024; Richardson et al. 2011; DCCEEW 2022) and the GDE SIA (2rog 2025). These include:
 - a Direct disturbance – in the event vegetation clearing is required.
 - b Groundwater drawdown – specifically, reduced access to groundwater for some species.
 - c Changes in groundwater quality – including if there is a spill event that leads to groundwater contamination.
 - d Changes in surface water quality and flows – noting the facultative nature of the GDE indicator species identified. An event that leads to a deterioration of surface water quality also has potential to impact TGDE.
- 2 A formal risk assessment was undertaken with respect to the above impacts (2rog 2025). This assessment provides a comprehensive analysis of the likelihood, consequence and resultant risk from each type of impact, both prior to, and after the application of appropriate mitigation measures. This assessment determined a ‘low’ or ‘insignificant’ residual risk rating for all potential impacts to TGDEs, as a result of the Project.
- 3 The following sub-sections provide an overview of the extent, likelihood, and significance of these potential impacts to TGDEs, as essential context for the development of the monitoring and management framework ([Section 5](#)).
- 4 Potential impacts have been assessed with respect to vegetation communities considered likely to function as TGDEs.

4.1.1 Direct disturbance

- 5 Direct clearing will remove remnant and high-value regrowth vegetation (14 ha total) within the Project Area. Vegetation within the Project Area is not considered to function as TGDEs, due to (2rog 2025):
 - a Modelled DTW.
 - b Remote sensing criteria.
- 6 As no TGDEs are considered present in the Project Area, no potential impacts to TGDEs are associated with direct disturbance of vegetation.

4.1.2 Groundwater drawdown

- 7 Potential impacts to TGDEs may indirectly occur as a result of the mining process, increasing the DTW in present groundwater units. Impacts may manifest where the function of a TGDE is altered as a result of movement of groundwater away from the vegetation root zone of indicator species identified within relevant vegetation communities. The extent to which this process occurs depends on a range of factors, including the extent of drawdown, the rooting depth of species potentially utilising groundwater (based on literature review) (refer 2rog 2025, Section 3.2.2), local geology of alluvial sediments and their permeability to water movement.
- 8 The risk of impacts to TGDEs has been examined (2rog 2025) and is described in [Figure 4-1](#) and the text below.
 - a Where the groundwater level remains above root zone at maximum drawdown, TGDEs are unlikely to be impacted as access to groundwater will be maintained.
 - b Where the groundwater level remains within 1 m above root zone at maximum drawdown, TGDEs may potentially be impacted by drawdown as access to groundwater may be affected.

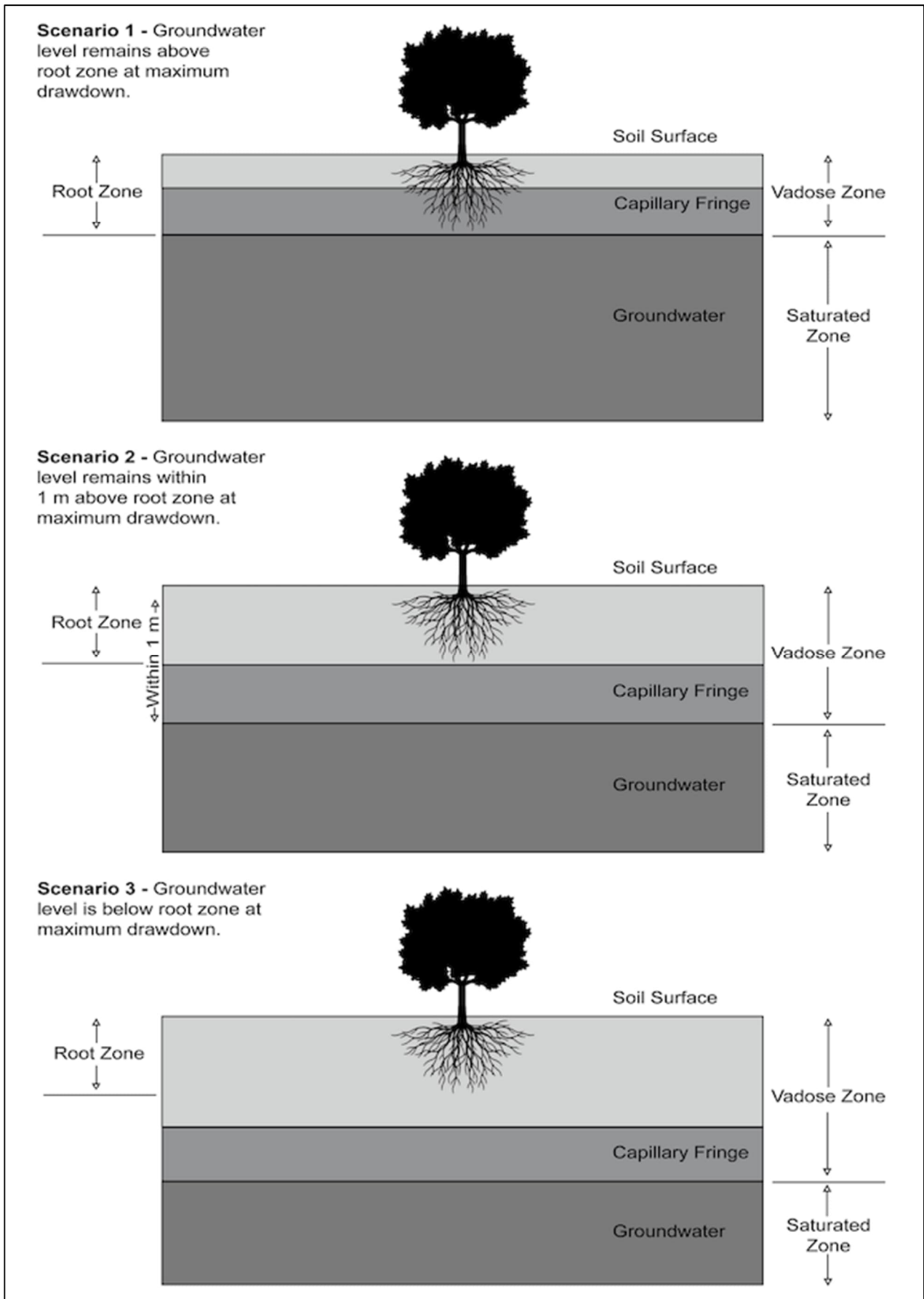


Figure 4-1 Conceptual Model of Groundwater Drawdown Scenarios

4.1.3 Change in groundwater quality

- 10 Potential impacts on groundwater quality may indirectly occur where:
- a The primary limiting factor of quality (i.e. salinity) exceeds the tolerance range for GDE indicator species who may access groundwater resources.
 - b Leaks, spills, and improper disposal of wastes, including waste rock, leads to the leaching of compounds into groundwater following rainfall events.
- 11 Changes in salinity that exceeds the tolerance levels of GDE indicator species may cause significant impacts. These potential impacts have been assessed (2rog 2025) and are considered unlikely to occur, given the following:
- a During mining, a cone of depression will develop around the pit footprint due to incidental pit dewatering. This will result in localised groundwater flow towards the pit, limiting potential for impact on surrounding groundwater including the existing groundwater quality environmental values (SLR 2024).
 - b There is hydraulic disconnection between Permian and upper (i.e. regolith / alluvium) strata, and recharge via surface flows / precipitation (3D Environmental; SLR 2024).
- 12 Contamination of groundwater (due to leaks and spills) can impact the condition and health of TGDEs as they access this water source in the root zone. These potential impacts have been assessed (2rog 2025) and are considered unlikely to occur, given the following:
- a Implementation of appropriate mitigation measures outlined within the conditions of the existing Environmental Authority (EA), including:
 - i Monitoring of groundwater quality to identify trends and changes over time (as per Condition 14 of EA EPML00862313).
 - ii Fuel, dangerous goods and, hazardous chemicals will be managed as outlined by current standards, guidelines and in compliance with statutory requirements.
- 13 Additional monitoring programs / plans exist that are designed to detect change in groundwater quality within SRM and in the surrounding region. Data from these programs may be used to support the GDEMMP where required (refer [Section 5.1.3](#)). These include the:
- a SRM Groundwater Monitoring and Management Plan (GMMP).
 - b Fitzroy Regional Receiving Environment Monitoring Programs (FRREMP).

4.1.4 Change in surface water quality and flows

- 14 Potential impacts to TGDEs may indirectly occur via (2rog 2025):
- a Erosion and sedimentation.
 - b Reductions in quality of surface water, including uncontrolled (e.g. spills) and controlled releases (i.e. mine-affected water (MAW)) from identified release points.
 - c Changes to hydrological flows (affecting groundwater recharge and subsequent groundwater availability for TGDEs) due to mining operations.
- 15 Erosion and sedimentation control (ESC) protocols will include:
- a No vegetation clearing will occur on floodplains and/or near drainage lines. Impacts from erosion and sedimentation are therefore unlikely to occur.
 - b Project specific controls will be implemented consistent with the ESC measures at SRM, as required by the Project's EA conditions.
- 16 Uncontrolled and Controlled Releases are unlikely to reduce water quality, noting:
- a Surface contaminants and waste material (including general waste and that produce via the mining process) at SRM are currently controlled via management plans and systems as described under the conditions of the EA. These include:

- i Water Management Plan.
 - ii ESC Plan (ESCP).
 - iii Waste Management Plan.
 - b Monitoring of surface water quality is undertaken consistent with the EA.
 - c Controlled releases are undertaken at SRM in accordance with EA release criteria.
- 17 Changes to hydrological flows are unlikely considering:
 - a The Project is expected to create only a minor reduction in the potential run-off area in the downstream catchment of Phillips Creek. Loss of streamflow will have negligible impact on flow volumes and duration characteristics in Phillips Creek (as well as One Mile / Boomerang Creeks) (Engeny 2024). The continuation of established flows will ensure replenishment of soil moisture within the unsaturated zone around alluvium; groundwater perched in alluvium and the movement of water into Tertiary groundwater system during flood conditions (where Tertiary sediments are (semi-)permeable).

4.1.5 Significance of impacts

- 18 A significant impact assessment has been undertaken (2rog 2025) and has determined the following:
 - a No significant impacts are likely to occur from direct disturbance due to the absence of TGDEs within the Project Area.
 - b No significant impacts are likely to occur from groundwater drawdown as the magnitude and rate of drawdown will not inhibit GDE indicator species' ability to access groundwater, therefore, will not affect ecological function of the community.
 - c No significant impacts are likely to occur from changed groundwater quality as (1) no changes to salinity are expected in alluvial and tertiary groundwater units and (2) contaminations of surface flows will be avoided and/or managed by implementing established standards and guidelines.
 - d No significant impacts are likely to occur from altered surface water quality or flow as (1) reduction of flow in the main drainage feature (Phillips Creek) is negligible and (2) no impacts from contaminants or MAW are expected.

4.2 Stygofauna

- 19 Field and desktop assessments indicate stygofauna are unlikely to occur within the Project's Assessment Area.
- 20 Groundwater in deeper strata (Tertiary sediments and coal measures) is brackish to saline and unsuitable for most stygofauna species.
- 21 Although stygofauna are more often found in alluvium in the Bowen Basin, groundwater in the Phillips Creek alluvium (within the Assessment Area) is limited, seasonally variable, and hydrologically disconnected from broader aquifer systems.
- 22 No contemporary records of stygofauna exist for the Assessment Area.
- 23 Predicted Project-related groundwater drawdown does not occur in alluvium and is <1 m in the regolith, meaning potential stygofauna habitats (if present) would not be measurably impacted.
- 24 A precautionary stygofauna pilot survey will be undertaken pre-impact to validate the above. If stygofauna are detected, this section of the GDEMMP will be updated accordingly and ongoing monitoring initiated.

5 Monitoring and Management Framework

5.1 TGDEs

5.1.1 General Approach

- 1 **Section 5.1** has been developed to verify that no significant impacts to TGDEs materialise as a result of the Project, consistent with the GDE SIA (2rog 2025). Additionally, it provides a range of management measures in the event that impacts to TGDEs are outside those predictions.
- 2 The plan will monitor actual vegetation condition through time (as a proxy of ecosystem function). Monitoring will also assess areas located on the fringe of the Predicted Drawdown Extent, and in areas modelled as not subject to groundwater drawdown (control sites) to provide a dataset suitable for analysis.
- 3 A key component of the monitoring program within this GDEMMP is to provide a framework for intervention if significant impacts do occur, as a result of the Project. In this event, additional management / mitigation measures will be developed. Where monitoring demonstrates a significant loss of ecosystem function, other compensatory measures (e.g. offsets) will be explored.
- 4 An adaptive management framework has been established to review and assess the effectiveness of management and mitigation measures at the completion of each monitoring stage.
- 5 The overall monitoring and adaptive management approach of the GDEMMP is visualised in **Figure 5-1**. The approach was informed by and is consistent with the GDE Toolbox (Richardson et al. 2011), with consideration also given to the updated IESC Guidelines update (Australian Government 2024), and the GDE SIA (2rog 2025).
- 6 The approach is described in the following sections and includes:
 - a How an environmental baseline (i.e. pre-impact monitoring), inclusive of impact and control sites, will be determined.
 - b How and when verification (i.e. impact) monitoring will be undertaken, including:
 - i Indicators of TGDE condition and function.
 - ii The analysis required to compare baseline and impact monitoring results.
 - c The process of adaptive management, as it relates to the above, including:
 - i Investigating if mining activities are the source of any change in condition.
 - ii Established mitigation and management measures.
 - iii Action trigger thresholds.
 - iv Corrective actions.
 - v Updates to the GDEMMP (where necessary).

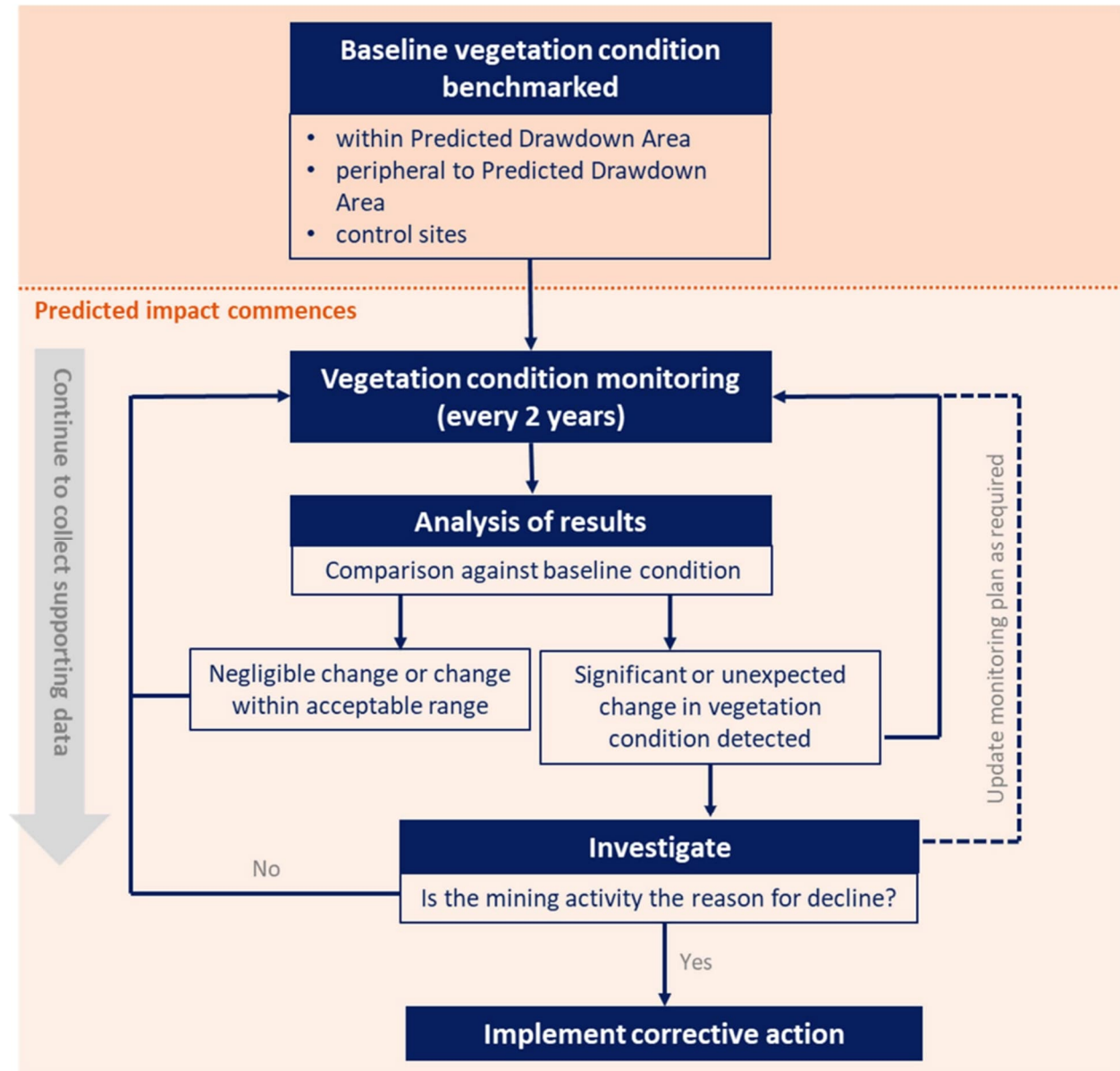


Figure 5-1 Adaptive Management Framework

5.1.2 Monitoring overview

- 1 The monitoring methodology described in the following sections is designed to enable the measurement and separation of mining and non-mining influences on the indicators for TGDEs. This is achieved, in part, through the effective designation of control and impact monitoring sites.
- 2 There are a number of key criteria that must be addressed through the implementation of the monitoring program:
 - a Accommodate natural variation in environmental variables, including those influenced by wet and dry seasons.
 - b Ensure that monitoring and investigation can distinguish between the influences / impacts of mining and non-mining activities through the various phases of the Project.
 - c Ensure that data are collected over an appropriate timescale that is relevant to the indicator being monitored.
 - d Ensure that the magnitude of change relevant to a trigger is likely to be detectable.
- 3 Preliminary locations of pre-impact and impact monitoring sites are presented in [Figure 5-2](#). These are indicative locations – final locations of impact and control monitoring sites will be updated / refined following consultation with field ecologists and groundwater experts at pre-impact surveys. Final locations will be based on the suitability of the sites with respect to presence of relevant ecological values and land access.²

² Note that monitoring locations for groundwater quality and surface water quality/flow are described in the associated Groundwater Management and Monitoring Plan (GMMP).

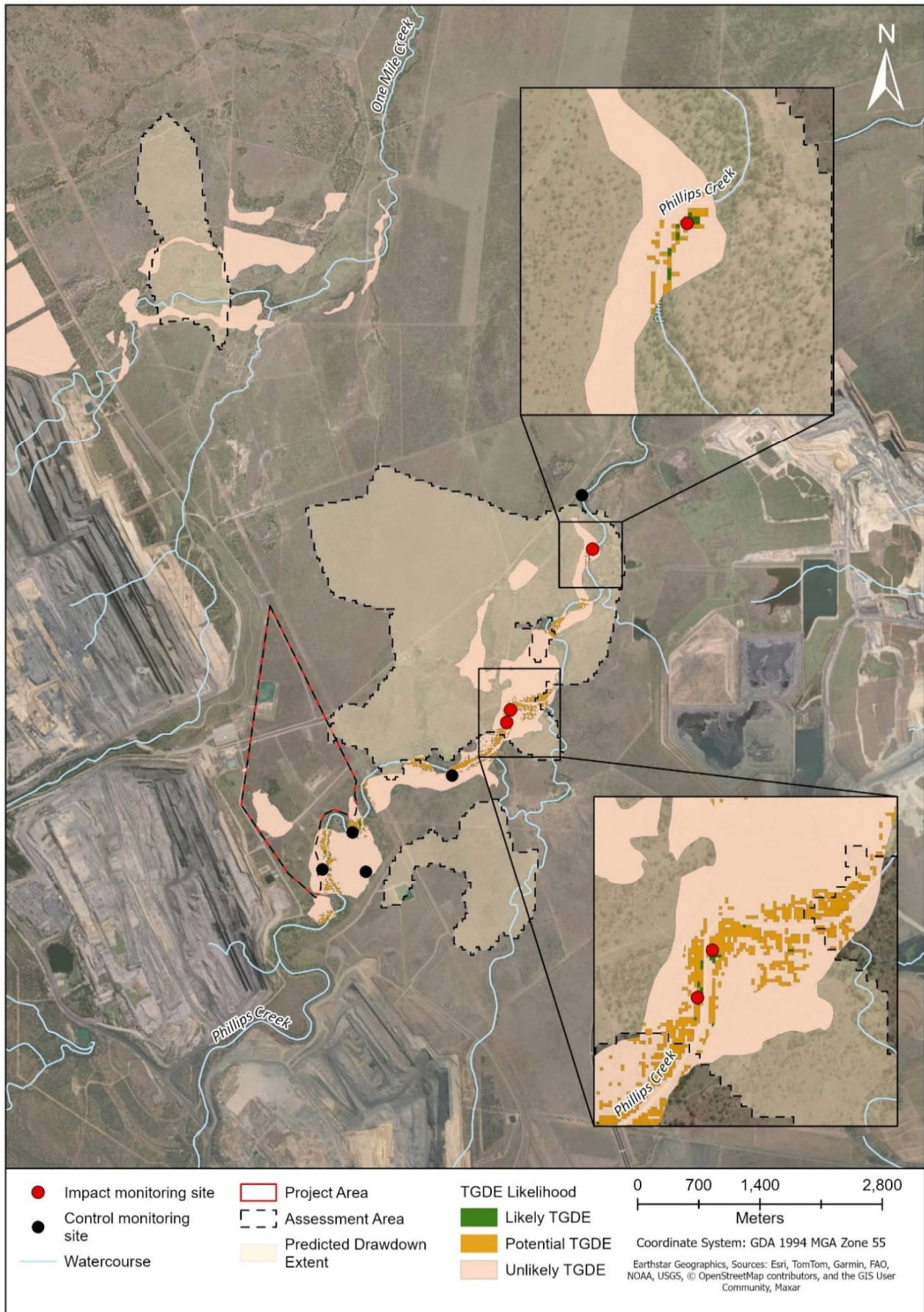


Figure 5-2 Indicative Monitoring Sites

5.1.3 Relationship to other monitoring plans

- 4 The existing activities at the mine operate under a series of management plans and processes (in accordance with existing approvals) and the Project will utilise data collected by existing monitoring programs where appropriate. Specifically, this includes results obtained from:
 - a SRM GMMP.
 - b FRREMP.
- 5 The results of the GMMP monitoring provide important supporting data to assess the condition of the TGDEs, with groundwater level at nearby monitoring bores providing a measurement of how drawdown is materialising in comparison to modelled outcomes.
- 6 **Table 5-1** summarises the monitoring frequency, duration, type and indicators for TGDEs. In the event a vegetation condition level is triggered (refer **Section 5.1.6**), data from the GMMP and REMPs will be available to support investigations and analysis relating to TGDE assessment as required.

Table 5-1: Monitoring supporting the GDEMMP

Monitoring description	Frequency and duration	Monitoring type	Indicators	Plan for implementation
TGDE condition surveys	Twice per year (wet and dry season) – over a minimum 12-month period pre-impact.	Pre-impact	Vegetation condition, vegetation health, foliage cover ³ . NDVI remote sensing.	GDEMMP
	Once a year every second year (wet season)*	Impact		
Groundwater levels	Quarterly or as per GMMP, Table 3	Supporting Data: Current and on-going and required by existing environmental approvals. In the context of this plan, data collection during both pre-impact and impact phases	DTW	GMMP
Surface water flow	During flow events OR As per Table 1 in FRREMP		Surface water flow	FRREMP
Groundwater quality	Quarterly or as per GMMP Table 3		Groundwater quality (including salinity)	GMMP
Surface water quality	During flow events OR As per Table 1 in FRREMP		Surface water quality (EC and pH only)	FRREMP

*Should significant declines in condition be recorded, monitoring frequency will increase to annually.

5.1.4 Pre-impact monitoring

- 7 Monitoring will be undertaken over a minimum 12-month period prior to when the relevant groundwater drawdown impacts are realised.
- 8 Pre-impact monitoring of vegetation condition will be undertaken for the TGDE communities identified as likely to or having the potential to be impacted by groundwater drawdown, as well as at suitable control sites. The monitoring results will be used to benchmark the pre-impact conditions at specific locations, including:
 - a Baseline health upon which potential impacts outside of those that have been predicted will be monitored.

³ Incorporated into BioCondition score

- b** Seasonal variability of vegetation communities and the nature of their groundwater use.
- 9** The location of pre-impact monitoring sites (refer [Figure 5-2](#)) is indicative and will be finalised during the first monitoring event.

5.1.5 Impact Monitoring

- 10** Impact monitoring of vegetation condition will begin after Project commencement but prior to predicted groundwater drawdown impacts. Following baseline surveys, BioCondition surveys of TGDEs will be assessed biennially (refer [Table 5-1](#)). As no impacts to TGDEs are anticipated to occur as a result of the Project, this initial frequency is considered appropriate. Should a decline of $\geq 50\%$ in TGDE BioCondition be observed at any point, or if groundwater drawdown exceeds the modelled predictions (see GMMP), frequency of monitoring will increase. Results from the impact monitoring will be evaluated within three months of data collection to assess whether there has been any change from baseline conditions.
- 11** Note that the purpose of this monitoring is to help verify that no significant impacts to TGDEs materialise as a result of the Project, consistent with the GDE SIA (2rog 2025). If significant impacts to TGDEs do occur as a result of the Project, ongoing impact monitoring will inform investigations and interventions (i.e. corrective actions; refer [Section 5.4.4](#)). In particular, monitoring will aim to inform an understanding of the 'Ecological Water Requirements' (EWR) and ecological response of the TGDEs to changes in groundwater (consistent with GDE Toolbox stage 3).

5.1.6 Indicators and triggers

- 12** In accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 – and 2018 revision), ecological indicator trigger levels have been determined for TGDEs. Ecological triggers aim to provide an early detection of potential impacts prior to ecological disturbance occurring and ensure appropriate management actions to minimise impacts.
- 13** These triggers follow the approach outlined in Section 3.2.4.2 of the ANZECC (2000) Guidelines, which seeks to identify a statistically significant deviation from baseline conditions. Triggers are established relative to the parameters of vegetation condition and community health captured by monitoring, which include:
 - a** BioCondition score (site-base attributes) ⁴.
 - b** Foliage cover.
 - c** Vegetation health (NDVI).
 - d** Spatial extent of TGDEs.
 - e** Condition of vegetation (evidence of poor health including fire damage, erosion or drought stress).
- 14** These parameters will be captured during the pre-impact and impact monitoring phases of the GDEMMP, designed specifically for the detection of change in ecological function and community health.
- 15** Where relevant vegetation condition triggers are reached or exceeded (refer [Table 5-2](#) and [Table 5-3](#)), an investigation (and depending on the results of the investigation, on-ground mitigation and compensatory measures) will be promptly undertaken.

⁴ Collection of site-based attributes as per Eyre et al 2015: https://www.qld.gov.au/_data/assets/pdf_file/0029/68726/biocondition-assessment-manual.pdf

Table 5-2: Indicators and triggers

Indicator	Relevant trigger	Design	Parameters
TGDE vegetation condition and community health	Reduction in vegetation health and condition indices as indicated in Table 5-3 .	BioCondition survey (plots) Foliage cover measures using either hemispherical cameras or wide-angle digital cameras from set positions at each monitoring sites NDVI remote sensing	BioCondition data – site-based attributes Foliage cover Vegetation health (NDVI) Spatial extent of terrestrial GDEs Condition of vegetation (evidence of poor health including fire damage, erosion or drought stress)

5.1.6.1 Vegetation condition and triggers for action

- 16 As the nature and magnitude of impacts to TGDE vegetation can vary significantly as a result of changes to ground- and surface water levels and/or quality⁵, a scaled system of impact rating has been adopted (refer **Table 5-3**). The scale focusses on the loss of ecosystem function within a TGDE community and also provides information on when action is required. Triggers for TGDE vegetation health are based on BioCondition indicators and scores, as well as signs of dieback in trees (e.g. loss of ecosystem function).

Table 5-3: Scaled ratings for impacts on TGDEs

Loss of ecosystem function scale	Impact description
Nil	No reduction, or gain, in BioCondition scores against baseline or pre-impact score. The regional ecosystem is retained as a functional ecosystem.
Negligible	<10% decline in BioCondition scores against baseline or pre-impact score. The regional ecosystem is retained as a functional ecosystem. There are reduced numbers of microhabitat features available for fauna.
Minor	>10% decline in the BioCondition Scores against baseline or pre-impact scores. The regional ecosystem is retained as a functional ecosystem. There are reduced numbers of microhabitat features available for fauna.
Moderate	50% decline in BioCondition Scores against baseline or pre-impact scores. Canopy cover < 50% of baseline or pre-impact condition, or canopy height <70% of baseline or pre-impact condition. Vegetation no longer meets the Regional Ecosystem description. Vegetation provides ecosystem services, including minimising erosion and some fauna habitat, but with elevated weed cover. There is limited microhabitat features for fauna, such as hollows.
Major	90% decline in the BioCondition Scores against baseline or pre-impact scores. Vegetation no longer meets the Regional Ecosystem description. Vegetation community still existing and provides some ecosystem services in limiting erosion, but significant change in structure and composition (increased weed cover) is evident, with reduced habitat values. Limited microhabitat features for fauna.

- 17 In addition to the assessment of BioCondition scores against the benchmark, foliage cover will be a key indicator of vegetation health, as measured using either hemispherical cameras or wide angel digital cameras from set positions at each monitoring site. If moderate signs of loss are observed, the foliage data can be further interpreted using leaf water potential, isotope and soil moisture potential data, to determine whether changes in the water stress of vegetation has occurred over time as a result of the Project.
- 18 Vegetation health will also be assessed using the remote sensing technique of NDVI (or similar greenness index). This is a numerical indicator that uses the visible and near-infrared bands of the electromagnetic spectrum and assists in assessing whether the target contains live green vegetation or not. The method is useful for identifying areas where vegetation and/or foliage dieback is occurring, with triggers associated with a statistically significant change from baseline and pre-impact values.

⁵ Notably, vegetation may also undergo variable condition changes as a result of other factors such as climate and seasonal influences.

5.2 Stygofauna pilot survey

- 19 The objective of the stygofauna pilot survey within the Assessment Area is to confirm the absence of stygofauna prior to when the relevant groundwater drawdown impacts are realised. The survey is designed and implemented in accordance with general advice for sampling subterranean aquatic fauna (stygofauna) for an environmental assessment process (DSITI 2015; DES 2018).

5.2.1 Survey timing

- 20 The pilot survey will be implemented prior to the commencement of the Project. Samples will be acquired during a single monitoring event, from five representative bores. Exact timing of survey will be contingent on local weather conditions prior to survey period. If stygofauna are detected, ongoing survey timing and monitoring schedule will be detailed within an updated Stygofauna Management and Monitoring Program (as described in [Section 5.3](#)).

5.2.2 Sampling bores

- 21 Sampling of stygofauna will target five bores or groundwater access points within SRM. This includes bores in aquifers relevant to the assessment process (refer 2rog 2025) and where stygofauna are most likely to be found (if present) (i.e. the alluvium). Sampling bores are located both within the Predicted Drawdown Extent (impact) and in areas nearby the Project (control). [Table 5-4](#) identifies relevant bores at SRM proposed to be utilised for the pilot survey. Where bores are unavailable for use (i.e. are non-functional or dry) sampling bore locations may change.
- 22 IESC (2019) guidance highlights that sampling for GDEs should be tailored to the hydrogeological context, ecological value and impact risk of the Project area while DETSI (2018) guidance identifies 10 bores should be appropriate to coverage for a pilot survey. Due to the small Project footprint, limited extent of alluvium and the limited nature of the saturated alluvium in this region, the sampling program will comprise five monitoring bores screened within the alluvial aquifer and regolith.

Table 5-4 Bores / water points for sampling as part of stygofauna pilot survey

Bore ID	Easting (GDA94)	Northing (GDA94)	Target Aquifer	Location (within/outside Predicted Drawdown)
MB32	637595	7510716	Alluvium	Outside Predicted Drawdown
MB38	639919	7515861	Alluvium	Outside Predicted Drawdown
MB40	640026	7515867	Tertiary	Inside Predicted Drawdown
MB20SRM06A	636594	7520186	Alluvium	Outside Predicted Drawdown
PZ07A	637998	7517816	Tertiary	Inside Predicted Drawdown

Note: Sampling locations and details to be confirmed prior to commencement of monitoring.

5.2.3 Sampling methods

- 23 Sampling methods will be consistent with the Queensland Monitoring and Sampling Manual⁶ (DES 2018) and Guideline for the Environmental Assessment of Subterranean Aquatic Fauna (DSITI 2015). Sampling methods for stygofauna may include haul netting and/or pumping as appropriate. During each survey, one stygofauna sample will be collected from each of the 5 bores sampling bores.
- 24 All samples will be preserved appropriately for subsequent laboratory analysis.

⁶ Refer specifically to the *Biological assessment – Background information on sampling bores for stygofauna* within the Manual

5.2.4 Supporting data

- 25 Measurement of in-situ physio-chemical parameters (dissolved oxygen, pH, electrical conductivity, temperature,) will be undertaken at each sampled bore to provide habitat context (after stygofauna sampling). Groundwater level and bore construction details will also be recorded.

5.2.5 Identification and data analysis

- 26 Morphological identification of stygofauna will be undertaken by appropriately qualified and experienced biologists (to an appropriate level of ID per DSITI 2015).
- 27 Data will be placed into a suitable format for use and dissemination (e.g. Microsoft® Excel).

5.2.6 Regulatory compliance

- 28 All relevant permits and approvals will be obtained prior to survey commencement, including any animal ethics and collection permits required under Queensland legislation.
- 29 Survey activities will comply with workplace health and safety procedures and biosecurity measures to prevent cross-contamination between sites.
- 30 Results of the stygofauna pilot survey will be reported to DCCEEW prior to groundwater drawdown impacts being realised.

5.3 Stygofauna monitoring and management

- 31 If stygofauna are detected during the pilot survey and subsequent assessment indicates a potential risk from Project-related groundwater drawdown or water quality changes, a Stygofauna Management and Monitoring Program will be developed and implemented via an update to this GDEMMP. The process will involve:
- a Undertaking a detailed impact assessment to determine the likelihood, scale, and significance of potential effects on stygofauna populations and their habitats.
 - b Preparing a targeted management and monitoring plan that addresses identified risks, establishes measurable objectives, and defines monitoring methods, indicators, and trigger thresholds.
 - c Consulting with the Commonwealth to ensure the plan meets regulatory requirements and incorporates best-practice methods.
 - d Implementing the approved plan, including baseline verification (using results of the pilot survey), ongoing monitoring, and adaptive management actions triggered by monitoring results.
 - e Reviewing and refining the framework as new data, technology, or regulatory guidance becomes available to ensure the ongoing protection of stygofauna values.
- 32 If stygofauna are confirmed present and Project-related drawdown or water quality changes may impact habitat, ongoing monitoring and adaptive management will aim to:
- a Confirm population persistence by tracking the presence, abundance, and diversity of stygofauna taxa within the Assessment Area and suitable control sites over time.
 - b Detect early signs of impact by identifying measurable changes in stygofauna community composition or abundance that may indicate groundwater stress or habitat alteration.
 - c Assess habitat condition by monitoring groundwater levels, quality, and connectivity to detect changes that could affect stygofauna persistence.
 - d Guide management responses by collecting information to trigger adaptive management actions.

- e Maintain ecological values by ensuring groundwater extraction or related activities are managed to maintain habitat suitability for stygofauna over the life of the Project.
- 33** The following principles will guide the design and implementation of stygofauna monitoring and management to ensure that, if potential impacts are identified, responses are precautionary, evidence-based, and integrated with broader groundwater management:
- a Precautionary approach
 - i In the absence of complete scientific certainty, adopt measures that minimise the risk of stygofauna decline.
 - b Evidence-based thresholds
 - i Establish site-specific ecological trigger values based on baseline data and relevant literature to guide management responses.
 - c Representative monitoring network
 - i Maintain monitoring at both impact and control locations to distinguish Project-related effects from natural variation.
 - d Integration with groundwater management
 - i Link biological monitoring results with hydrogeological and water quality data to enable robust cause–effect analysis.
 - e Timely adaptive action
 - i Implement appropriate management responses when trigger thresholds are exceeded.
 - f Transparency and reporting
 - i Provide clear, regular reporting of monitoring results and management actions to regulators and stakeholders.
 - g Continuous improvement
 - i Review and refine monitoring methods, trigger levels, and management measures based on new data, technological advances, and evolving scientific understanding.

5.4 Adaptive management and review

5.4.1 Adaptive management

- 34** An adaptive management framework will be employed to mitigate impacts from the Project and will include ongoing review of monitoring data to identify trigger exceedances, as well as a review of trigger levels during the course of the Project, particularly in response to long term monitoring and studies undertaken during each assessment and monitoring stage. In general, the approach to adaptive management will involve:
- a An investigation to determine whether fluctuations in vegetation condition are the result of mining activities, seasonal variation or neighbouring land use.
 - b Multiple stakeholder inputs, such as BHP Environment representative, suitably qualified specialists (e.g. hydrogeologists, modellers, ecologists).
 - c Documenting the nature and extent of any environmental harm in relation to GDEs.
 - d Development of suitable mitigation or corrective actions dependent on impact pathway (refer [Section 5.4.4](#)). Where items can be solved in the short term, work order notifications will be raised for implementation (e.g. eliminate contaminant source). For major actions, a plan for completion will be developed in consideration of budgeting cycle or if the work is considered urgent, escalated for prioritisation.
 - e Notification to the administering authority of the detection of Project-related impacts to GDEs.

- f Provide to the administering authority details of Project-related impacts, including any corrective actions and investigations already undertaken.
- g Update the GDEMMP if required.

5.4.2 Investigations

- 35 While no significant impacts to likely GDEs are expected to occur as a result of the Project (refer 2rog 2025), this GDEMMP allows for investigations to be undertaken where impacts are greater than those predicted.
- 36 If a vegetation condition trigger is reached (refer [Table 5-2](#) and [Table 5-3](#)) and groundwater levels are outside those predicted to occur (refer 2rog, 2025), an investigation will be conducted to determine whether the detected result is a direct result of Project mining activities. The first step of investigation will be to identify the key drivers/parameters that relate to the reduction in vegetation condition (e.g. the source of the impact, impact pathway). As described in [Section 4](#), impacts may relate to:
 - a Direct disturbance.
 - b Groundwater drawdown.
 - c Change in groundwater quality.
 - d Change in surface water quality or flows.
- 37 Investigations will be instigated by the site environment team, with support for subject matter experts as required. As a guide, the following approach will generally be applied and tailored to the environmental variables of interest:
 - a A detailed review of all existing data relevant to the environmental parameter will be completed, to quantify the nature, magnitude and reliability of the observed result.
 - b Site-specific investigations will be implemented involving the collection and interpretation of additional data (where required).
 - c A review will be completed of relevant data related to potential non-mining causes of variability in environmental variables (e.g. climatic data). This will seek to either identify or rule out the contribution of non-mining activities to the identified trigger exceedance.
 - d A detailed model of relevant environmental variables will be developed.
 - e Expert opinion on the potential for environmental harm will be sought.
 - f The investigation process should not delay the implementation of corrective actions, once identified, and should be completed as soon as possible. Results of investigations will be reported to DCCEEW.
- 38 The approach to investigations and responses for potential vegetation condition and groundwater level scenarios is presented in [Table 5-5](#).

Table 5-5 Summary of investigation approaches

Scenario	Vegetation condition	Trigger level	Groundwater level	Response	Notify DCCEEW	Update GDEMMP	Report kept of record
0	No negative, or uplift, in BioCondition scores against baseline	NA	Levels as modelled	No action required	N/A	N/A	N/A
1	<10% decline in BioCondition scores against baseline	Negligible	Levels as modelled	Continue to monitor Drawdown does not appear to influence potential TGDE. Review monitoring frequency and consider additional monitoring events to allow for early detection of potential decline.	N/A	N/A	✓
2			Levels outside modelled range		N/A	✓	✓
3	10-49% decline in BioCondition score against baseline	Minor	Levels as modelled	Continue to monitor Review monitoring frequency and consider additional monitoring events to allow for early detection of potential decline. Investigate (where subsequent monitoring events indicate scenario 3+).	N/A	N/A	✓
4			Levels outside modelled range		Investigate Increase monitoring frequency (annual). Review results against control sites. Review external factors (e.g. groundwater quality, climatic conditions, surface water changes). Where decline is determined to be a result of Project activities implement mitigations where appropriate. Inform regulator.	✓	✓
5	50-89% decline in BioCondition score against baseline	Moderate	Levels as modelled	Investigate Increase monitoring frequency (seasonal) and effort. Review results against control sites. Review external factors (e.g. groundwater quality, climatic conditions, surface water changes).	✓	✓	✓

Scenario	Vegetation condition	Trigger level	Groundwater level	Response	Notify DCCEEW	Update GDEMMP	Report kept of record
				Where decline is determined to be a result of Project activities implement mitigations where appropriate. Inform regulator.			
6			Levels outside modelled range	<p>Investigate</p> <p>Increase monitoring frequency (multi-seasonal). Review results against control sites. Review external factors (e.g. groundwater quality, climatic conditions, surface water changes). Undertake detailed ecological water requirement measures (e.g. leaf water potential, stable isotope and soil moisture) in addition to established monitoring. Where determined decline is a result of the Project activities implement mitigations where appropriate. Inform regulator.</p> <p>Compensatory Action</p> <p>Where decline is determined to be a result of Project activities compensatory measures may be required to account for loss of ecosystem function, in accordance with relevant offset policy (see Table 5-7 for specific scenarios requiring offsets).</p>	✓	✓	✓
7	90% decline in BioCondition scores against baseline	Major	Levels as modelled	<p>Investigate</p> <p>Increase monitoring frequency (multi-seasonal). Review results against control sites. Review external factors (e.g. groundwater quality, climatic conditions, surface water changes). Undertake detailed ecological water requirement measures (e.g. leaf water potential, stable isotope and soil moisture) in addition to established monitoring. Where determined decline is a result of the Project activities implement mitigations where appropriate. Consult on Compensatory Action with regulator.</p>	✓	✓	✓
8			Levels outside modelled range	<p>Compensatory Action</p> <p>Where determined decline is a result of Project activities compensatory measures to be developed to account for loss of ecosystem function, in accordance with relevant offset policy.</p>	✓	✓	✓

5.4.3 Roles and Responsibilities

- 39 Effective implementation of this GDEMMP requires clear understanding of the roles and responsibilities of internal staff and contractors who will monitor, manage, investigate and review the outcomes of the plan.
- 40 Roles and Responsibilities specific to this GDEMMP are outlined in [Table 5-6](#).

Table 5-6 Roles and Responsibilities for GDEMMP implementation

Role	Responsibilities
General Manager and Site Leadership Team	<ul style="list-style-type: none"> • Support implementation of management and monitoring activities outlined within this plan. • Ensure management activities identified within this management included in budget cycles.
SRM Site Environment Team	<ul style="list-style-type: none"> • Manage investigations if vegetation condition trigger is reached and groundwater levels are outside those predicted to occur (see Table 5-3). • Notification to the Commonwealth and State governments for any GDE vegetation condition decline, outside predicted (as detailed above). • Engaging and managing the suitably qualified GDE expert. • Coordination and management of implementation of TGDE corrective actions. • Notification to the Commonwealth and State governments identifying any GDE not previously identified and reported in the Predicted Drawdown Extent.
Suitably qualified GDE expert	<ul style="list-style-type: none"> • Prepare baseline description report confirming the field sampling plan requirements for impact monitoring. • Prepare reports as detailed in this plan. • Undertake monitoring as detailed in this plan. • Documenting investigations and assessments undertaken in response to monitoring results. • Review and update GDEMMP as required.
Technical environment teams (e.g. ecologists)	<ul style="list-style-type: none"> • Completing baseline and monitoring surveys. • Support investigation.

5.4.4 Corrective Actions

- 41 Appropriate corrective actions will be developed and implemented where impacts to TGDE condition, predicted as part of the Project impact assessment process, are greater than expected and investigation confirms these are the result of Project activities, and in the event early preventative actions are considered appropriate. This will follow the Plan-Do-Check-Act continuous improvement cycle (refer BMA 2025). Corrective actions will be tailored to the particular environmental variables or trigger levels of relevance, and in response to outcomes of investigations.
- 42 [Table 5-7](#) identifies the Project’s potential impact pathways (as described in [Section 4](#)), specific to Phillips Creek (including underlying geological) hydrology, which may result in declining TGDE condition and/or function. Notably, based on groundwater drawdown predicted and the various management plans to be implemented for the duration of the Project, it has been determined that significant impacts on TGDEs, as a result of the Project, are unlikely (i.e. the Project will result in no or negligible change to TGDE condition and function compared to the measured baseline). To track this overarching outcome’s achievement, condition and function of TGDEs through time will be determined via the monitoring framework outlined in [Section 5.1](#) (i.e. baseline TGDE BioCondition surveys with follow-up vegetation monitoring undertaken every two years thereafter). Importantly, corrective actions (and measures to determine effectiveness of management) have been devised in the event that monitoring reveals a decline in TGDE condition or function (see [Table 5-7](#)).
- 43 Implementation of corrective actions (should they be required) will support maintained condition and function of TGDEs along Phillips Creek for the duration of the Project. In the event impacts

occur as a result of the Project, as revealed by monitoring results and investigation, achieving this outcome may be resolved in one of two ways:

- a** In the event of groundwater drawdown and a decline in TGDE canopy health, approaches such as infill planting will be undertaken in addition to compensatory measures (i.e. offsets) with appropriate coordination with DCCEEW. Notably, canopy species will require considerable time to meaningfully re-establish this structural layer, and even at maturity, are unlikely to access lowered groundwater levels. Dependant on SME advice, revegetation may use non-obligate groundwater-dependent tree species capable of establishing under altered (i.e. no groundwater access) conditions. As such, the resulting vegetation community will not be a GDE. However, the novel community will still retain terrestrial ecological function and provide landscape connectivity for regional taxa.
 - b** In the event of altered surface water flow or a decrease in ground- or surface water quality, corrective actions (as outlined in [Table 5-7](#) below) will be actioned, in addition to further appropriate monitoring to ensure efficacy of the adaptive management.
- 44** Overall, the SRM Site Environment Team is responsible for managing the investigation process, follow up implementation of any corrective actions and monitoring of effectiveness of corrective actions.
 - 45** Corrective actions will also be carried out as required by other relevant plans (e.g. SRM GMMP).
 - 46** Revision of monitoring frequency, locations and parameters, where determined required from an investigation, will be undertaken within 3 months of conclusion of any investigation.
 - 47** For corrective actions implemented, activities will be conducted to evaluate effectiveness, and where determined ineffective, revised actions may be required.
 - 48** Compensatory actions, where required, will be developed in consultation with, and with approval of the appropriate administering authority (i.e. DCCEEW). Timeframes for delivery of the compensatory action will be determined through consultation with the administering authority at the time. The offset will be managed and monitoring in accordance with an appropriate plan developed.

Table 5-7 Impacts, management triggers and corrective actions

Impact pathway	Potential impact	Monitoring indicators*	Management trigger	Corrective actions
Groundwater drawdown	Decline in TGDE condition / function	<ul style="list-style-type: none"> DTW (at monitoring bores) Canopy health and foliage cover (per BioCondition surveys) Spatial extent of TGDEs NDVI remote sensing 	<ul style="list-style-type: none"> Increase in DTW beyond predicted If the above is recorded – decline in canopy health and/or foliage cover at or beyond 'Moderate' trigger threshold (see Table 5-3) 	<p>If decline in canopy cover exceeds thresholds to trigger mitigation (see Table 5-3) and is attributable to groundwater drawdown, within 12 months:</p> <ul style="list-style-type: none"> Increase frequency of BioCondition monitoring to every year (wet season) Design rehabilitation plan, including monitoring and reporting commitments, to support TGDE ecological function (to be approved by DCCEEW), and subsequently undertake infill planting of RE-appropriate canopy species or other appropriate approach Compensatory measures required – identify and present suitable offsets option to DCCEEW
Reduced / altered surface water flow		<ul style="list-style-type: none"> Surface water flow Vegetation condition, all strata (per BioCondition surveys) Spatial extent of TGDEs NDVI remote sensing 	<ul style="list-style-type: none"> Decrease in surface flow beyond trigger thresholds (see FRREMP) If the above is recorded – decline in vegetation (any strata) at or beyond 'Moderate' trigger thresholds (see Table 5-3) 	<p>If decline in vegetation exceeds thresholds to trigger mitigation (see Table 5-3) and is attributable to reduced surface water flow:</p> <ul style="list-style-type: none"> Increase frequency of BioCondition monitoring to every year (wet season) Within 6 months, review, amend and implement Project's ESCP to ensure appropriate drainage to Phillips Creek to achieve baseline / pre-impact flow (per FRREMP) Within 12 months, undertake infill planting of RE-appropriate species in each strata significantly affected In accordance with the Plan-Do-Check-Act continuous improvement cycle, develop monitoring and adaptive management program (pertaining to above management) to ensure desired outcomes are achieved – program and associated reporting submitted to DCCEEW

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Impact pathway	Potential impact	Monitoring indicators*	Management trigger	Corrective actions
Reduced / altered groundwater quality		<ul style="list-style-type: none"> Groundwater quality Canopy health and foliage cover (per BioCondition surveys) Spatial extent of TGDEs NDVI remote sensing 	<ul style="list-style-type: none"> Decrease in / altered groundwater quality beyond trigger thresholds (see GMMP) If the above is recorded – decline in canopy health and/or foliage cover at or beyond ‘Moderate’ trigger thresholds (see Table 5-3) 	<p>If decline in canopy cover exceeds thresholds to trigger mitigation (see Table 5-3) and is attributable to altered groundwater quality:</p> <ul style="list-style-type: none"> Increase frequency of BioCondition monitoring to every year (wet season) Within 3 months, assess for source of contamination and/or change in quality, and implement measures to amend via embedding in the Project’s ESCP (i.e. remove / contain pollutant source) Within 12 months, undertake infill planting of RE-appropriate canopy species In accordance with the Plan-Do-Check-Act continuous improvement cycle, develop monitoring and adaptive management program (pertaining to above management) to ensure desired outcomes are achieved – program and associated reporting submitted to DCCEE
Reduced / altered surface water quality		<ul style="list-style-type: none"> Surface water quality Spatial extent of TGDEs NDVI remote sensing 	<ul style="list-style-type: none"> Decrease in / altered surface water quality beyond trigger thresholds (see FRREMP) If the above is recorded – decline in vegetation (any strata) at or beyond ‘Moderate’ trigger thresholds (see Table 5-3) 	<p>If decline in vegetation exceeds thresholds to trigger mitigation (see Table 5-3) and is attributable to altered surface water quality:</p> <ul style="list-style-type: none"> Increase frequency of BioCondition monitoring to every year (wet season) Within 3 months, assess for source of contamination and/or change in quality, and implement measures to amend via embedding in the Project’s ESCP (i.e. remove / contain pollutant source) Within 12 months undertake infill planting of RE-appropriate species in each strata significantly affected In accordance with the Plan-Do-Check-Act continuous improvement cycle, develop monitoring and adaptive management program (pertaining to above management) to ensure desired outcomes

Impact pathway	Potential impact	Monitoring indicators*	Management trigger	Corrective actions
				are achieved – program and associated reporting submitted to DCCEEW
Accidental clearing	Loss of TGDE Decline in TGDE condition / function	<ul style="list-style-type: none"> Spatial extent of TGDEs Vegetation condition, all strata (per BioCondition surveys) 	<ul style="list-style-type: none"> Accidental clearing occurs within mapped extent of 'likely' and/or 'potential' TGDEs per Figure 5-2) 	<p>If accidental clearing of TGDEs occurs:</p> <ul style="list-style-type: none"> Within four weeks, report incident to DCCEEW Within four weeks, undertake improvements to site operational practices (e.g. review of Permit to Disturb process, and training of personnel) Within 12 months, identify and present suitable offsets option to DCCEEW as compensation for TGDE loss Within 12 months, design rehabilitation plan, including monitoring and reporting commitments, to recover and maintain TGDE ecological function (to be approved by DCCEEW).

*Monitoring (and associated reporting) schedule for each indicator can be viewed at [Table 5-8](#).

5.5 Reviews and reporting

- 49** This GDEMMP has been developed as a voluntary measure to assist in:
- a** Validating extent and characterisation of GDEs associated with the Project's Assessment Area.
 - b** Confirming no significant impacts to GDEs are likely to materialise, as per conclusion of the GDE SIA (2rog 2025).
 - c** Identifying and facilitating appropriate management in the event significant impacts do occur.
- 50** To facilitate and effectively communicate outcomes relevant to the above, a reporting and review schedule for the GDEMMP has been proposed in [Table 5-8](#), based on an indicative 10-year implementation schedule.
- 51** Reports will be generated throughout the implementation of the GDEMMP and include:
- a** Baseline reporting for TGDEs (internal).
 - b** Stygofauna Pilot Survey report (internal / regulator).
 - c** Monitoring events reports – TGDEs & Stygofauna (if applicable) (internal).
 - d** GDEMMP reviews (internal / regulator).
 - e** Tigger thresholds and Investigations reports (internal / regulator).
- 52** The GDEMMP will be available to all employees, contractors and subcontractors. The GDEMMP will be amended (where appropriate) in response to reviews, monitoring results and changes in legislation, in consultation with regulatory authorities.

Table 5-8 Indicative Reporting and Review Schedule

Monitoring	Frequency	Timing – Year of Operation											
		0	1	2	3	4	5	6	7	8	9	10	
TGDE Baseline	Bi-annual (Year 0 only)	✓	•	•	•	•	•	•	•	•	•	•	•
TGDE Condition	Biennial	•	•	✓	•	✓	•	✓	•	✓	•	✓	•
Groundwater levels	As per GMMP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surface water flow	Refer Table 5-1	•	•	•	•	•	•	•	•	•	•	•	•
Groundwater quality	Quarterly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surface water quality	Refer Table 5-1	•	•	•	•	•	•	•	•	•	•	•	•
Stygofauna Pilot	Bi-annual (Year 0 only)	✓	•	•	•	•	•	•	•	•	•	•	•
Stygofauna presence, diversity and abundance	Biennial (if applicable)	•	•	✓	•	✓	•	✓	•	✓	•	✓	•

Iconography	Description
	Internal Reporting (i.e. BMA)
	External Reporting (i.e. DCCEEW)
	GDEMMP Review
✓	Monitoring to be completed (e.g. structured monitoring period)
•	Monitoring may be completed (e.g. investigation)

5.5.1 No further action required under this Plan

- 53 This GDEMMP is designed to have both a validation and adaptive management requirement, and therefore, there are a number of circumstances in which no further action for TGDEs and/or stygofauna will be required under the Plan. When no actions at all are required under the Plan, it may be 'retired' and notice of this given to Commonwealth and State government agencies. Circumstances under which further action/s are to be ceased include those presented in [Table 5-9](#).

Table 5-9 GDEMMP retirement circumstance

Circumstance	Description
TGDE occurrence altered	Additional baseline data collection for TGDEs provides unequivocal evidence that TGDEs are unlikely to occur in the Assessment Area.
Consistently low-risk TGDE outcomes	After five rounds of biennial wet season monitoring (i.e. 10 years) and data analysis for TGDEs, the outcomes indicate Scenarios 0 or 1 per Table 5-5 have consistently occurred, i.e. drawdown is within the modelled extent and no or negligible declines in vegetation condition have been detected.
Stygofauna occurrence validated	The pilot stygofauna study returns no evidence of stygofauna presence in the Assessment Area.
Stygofauna present but no risk	Stygofauna are detected but follow-up impact assessment demonstrates that Project-related groundwater drawdown and/or water quality changes will not intersect habitat or cause measurable risk, with this conclusion confirmed through at least two further seasonal monitoring events.
Compensatory measures completed	At any point when a major trigger level has been reached (Scenarios 7 or 8 per Table 5-5) and suitable compensatory measures have been delivered in accordance with regulatory requirements.
Regulatory direction	Relevant Commonwealth agency advises in writing that further monitoring and management under this Plan is no longer required, based on available evidence.
Project cessation	Groundwater extraction or activities posing potential impact to GDEs have permanently ceased and hydrological modelling confirms no further drawdown or water quality impacts will occur.

6 Terms and Definitions

Term	Definition
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
Assessment Area	Includes both the Project Area (ML700021) and Predicted Drawdown Extent, as modelled by SLR (2025)
BMA	BHP Mitsubishi Alliance Coal Operations Pty Ltd
CEDA	Cumulative evidence-based decision approach
DTW	Depth to Water
EA	Environmental Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
EWR	Ecological Water Requirements
FRREMP	Fitzroy Regional Receiving Environment Monitoring Program
GDE	Groundwater Dependent Ecosystem
GDE SIA	GDE Significant Impact Assessment Technical Report (2rog 2025)
GEM	Groundwater Dependent Ecosystem Mapping
GMMP	Groundwater Management and Monitoring Plan
IESC	Independent Expert Scientific Committee
MAW	Mine affected water
NDMI	Normalised Difference Moisture Index
NDVI	Normalized Difference Vegetation Index
PD	Preliminary Documentation
Predicted Drawdown Extent	The area of which groundwater drawdown is predicted and is relevant to GDEs (per SLR 2025)
RE	Regional Ecosystem
SRM	Saraji Mine
TGDE	Terrestrial Groundwater Dependent Ecosystem
TGDEMMP	Terrestrial Groundwater Dependent Ecosystem Monitoring and Management Plan

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8 Version Management

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BHP Mitsubishi Alliance

BMA PROCEDURE

Weed and Feral Animal Management

Status: Approved

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Environmental A&I

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1 Introduction

- 1 This procedure describes the application of the minimum acceptable requirements for the management of weeds and feral animals at BMA Operations.
- 2 This procedure supports the site Land and Biodiversity Management Plans to manage the risks that weeds and feral animals pose to biodiversity, by:
 - a Preventing the introduction of new weeds onto BMA Operations through the early detection of, and rapid response to new weeds;
 - b Identifying and controlling the spread of weeds and feral animal populations on our Operations;
 - c Raising awareness and understanding of the risks associated with weeds and feral animals; and
 - d Ensuring compliance with regulatory and corporate requirements.
- 3 This procedure applies to all BMA weed and feral animal management activities, with the exception of offset areas, which shall be managed as per the approved Offset Area Management Plan, and BMA exploration activities which are outlined in ***GEO-PRO-0001 Weed Control and Management Procedure***.

1.1 Roles and Responsibilities

- 4 **Table 1** identifies the organisational roles and their obligations relevant to weed and feral animal management and control.

Role	Obligations
General Manager and Site Leadership Team	<ul style="list-style-type: none"> Support weed and feral animal control and management initiatives; and Participate in Field Leadership activities related to weed and feral animal management.
Site Health Safety and Environment (HSE)	<ul style="list-style-type: none"> Maintain reports and database of weed and feral animal data; Coordinate, review and assess the effectiveness of weed and feral animal control programs; Coordinate Service Providers / Contractors undertaking control program activities; Maintain a Land and Biodiversity Management Plan; Coordinate Field Leadership activities to confirm compliance with this procedure; and Develop and assist with the distribution of training material to personnel.
All Employees and Contractors	<ul style="list-style-type: none"> Report weed and feral animals observed on site, where required; and Ensure that vehicle, machinery and equipment inspection and wash down is carried out in accordance to this procedure and implement the checklist for inspecting and cleaning vehicles, machinery and equipment (Refer <i>Appendix 3 – Vehicle and Equipment Cleaning and Inspection Checklist</i>).

Table 1: Weed and Feral Animal Management Roles and Responsibilities

2 Legislation and Commitments

- 1 BMA have legal obligations to manage weeds and feral animals on the land we operate on in accordance with:
 - a The Qld *Environmental Protection Act 1994* (EP Act);
 - b Site Environmental Authority (EA) and Land and Biodiversity Management Plan;
 - c The Qld *Biosecurity Act 2014* (Biosecurity Act);
 - d *Agricultural Chemicals Distribution Control Regulation 2021* (ACDC Regs).
 - e *Medicines and Poisons Act 2019*
- 2 The Biosecurity Act protects Queensland's economy, biodiversity and people's lifestyles from the threats posed by invasive pests and diseases. Under Section 23 of the Biosecurity Act, individuals and organisations are responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is known as the general biosecurity obligation (GBO). The Biosecurity Act definitions and obligations applicable to BMA operations are listed in [Appendix 1 – Qld Biosecurity Act Definitions & Requirements](#)

2.1 Relevant weed and feral animal species

- 3 Weed and feral animal profiles relevant to BMA operations are included in [Appendix 2 – Weed and Feral Animal Profiles](#)

3 Risk Management

- 1 The site's relevant Environmental Risk Register shall document the key risks and control measures associated with weed and feral animal management.

3.1 Weed Risks and Identification

- 2 Risks associated with weed establishment and infestations include:
 - a Non-compliance with legal obligations to manage weeds;
 - b Potential to alter the natural diversity and balance of ecological communities;
 - c Contribution to biodiversity decline through the displacement of native species via competition for habitat, nutrients and sunlight;
 - d Vehicles have the potential to introduce and/or spread weed species and plant pathogens such as root-rot fungus in disturbed soil;
 - e The presence of weeds may affect rehabilitation and limit the achievement of acceptable post-mining land use; and
 - f Greater bushfire intensity through increased fuel loads.
- 3 A weed monitoring and tracking program should be used to quantify the extent of the weed risk at a site and identify the control programs required. The monitoring program shall inform the regular review of the site Environmental Risk Register. Refer to [Section 3.5.1](#) for specific monitoring requirements.

3.2 Weed Management Controls

- 4 Weed management controls will depend on the weed species and location. BMA have more scope to carry out weed management and control in on-lease areas or in areas owned by BMA. For off-lease areas, or areas owned by third parties (with access agreements for BMA), weed management needs to be tailored to the activity taking place, the nature of the site, and the willingness of the landowner to engage in such management or control.

3.2.1 Disturbance and Topsoil Management

- 5 Most weed species thrive on disturbed ground where there is a lack of competition from native species. The **BMA PRO 0056 Permit to Disturb** is a key control that helps to reduce the risk of weed establishment, spread and invasion in disturbed areas. Any disturbance of land (or a change in land use) will trigger the requirement to obtain and operate under an approved Permit to Disturb.
- 6 Movement of sand, gravel, rock, soil and organic matter must be controlled to ensure that it does not result in contamination by weed reproductive material, hence contaminating 'clean' material. Where possible, all reasonable efforts should be made to limit the application of topsoil containing weed seeds.
- 7 All rehabilitation materials (e.g. seed and hay) brought to site should be 'weed free' and recorded in the site's document management system.

3.2.2 Restriction of Vehicle and Equipment Movement

- 8 The risks associated with the spread of weeds from vehicle and equipment movements shall be assessed and, where considered appropriate, the following restrictions shall be implemented:
 - a No vehicles are to drive over, or within close proximity to, topsoil stockpiles unless conducting authorised topsoil movement;
 - b Vehicles are to remain on existing tracks and avoid driving over weed populations; and
 - c Vehicle access to neighbouring properties will only be undertaken with the permission of property owners, in clean weed free vehicles, and in accordance with the Biosecurity Act.

3.2.3 Vehicle Hygiene Protocols



Note

*Vehicle and equipment hygiene protocols specific to BMA exploration activities are outlined in **GEO-PRO-0001 Weed Control and Management Procedure**.*

- 9 Weed hygiene measures shall be implemented to prevent the spread of weeds and reduce the risk of further establishment:
 - a All vehicles, machinery and equipment accessing the mining lease or landowners' properties should be cleaned and prior to entering site.
 - b **Appendix 3 – Vehicle and Equipment Cleaning and Inspection Checklist** has been developed for use at BMA sites based on the Department of Agriculture and Fisheries (DAF) **Vehicle and Machinery Cleandown Procedure** (DAF Procedure).
 - i Section 4 'Specific Cleaning Checklists' of the DAF Procedures provide more specific guidance on cleaning machinery and equipment including excavators, tractors and loaders.
 - c All vehicles, machinery and equipment shall be cleaned at designated wash down bays / pads. Light and heavy vehicle wash down bays are available at all BMA operations throughout the Bowen Basin. Council wash down bays are located at Rockhampton, Springsure, Rolleston, Duaringa, Mackay, Nebo, Moranbah, Clermont, and Emerald. These facilities are managed by the Regional Councils;
 - d When moving around onsite, vehicles, machinery and equipment should be re-inspected when:
 - i Entering undisturbed areas of vegetation;
 - ii Entering vegetated areas within proximity to rehabilitated areas; and
 - iii Leaving areas with known established weed populations.
- 10 Wash downs are not required if all the following criteria are met:

- a** The vehicle or piece of equipment is working on a single tenement / project area;
- b** The vehicle or piece of equipment does not work, or transit through, a known area of weed infestation; and
- c** The vehicle or piece of equipment has previously been cleaned and will only transit to and from town on a sealed (bitumen) road.

3.2.4 Weed Treatment

- 11** Once weed populations have been identified, weed treatment options can be implemented to control (with the intent to eliminate) known weed populations. Selecting the appropriate method is important to achieve good results and optimise use of time and money. It is important to remember that ongoing control work and maintenance is likely to be required for any of these methods to successfully control an infestation. A selection of weed treatment methods are listed in [Table 2](#)

Weed Treatment Methods	
Manual/hand removal	<ul style="list-style-type: none"> • For small scale infestations. • The entire weed, including its roots, are removed from the soil by hand pulling. Hand tools such as broad knives and trowels can be used to remove underground parts of weeds that may reshoot.
Mechanical	<ul style="list-style-type: none"> • For large accessible sites, to control competitive weeds between trees. • Chainsaws, brush cutters, slashers, mowers, ploughing etc. Equipment must undergo weed hygiene practices.
Chemical	<ul style="list-style-type: none"> • Generally the most cost effective method. It is important to follow the safety precautions and use the most appropriate herbicide for the weed to be controlled, noting that there are broad spectrum and selective herbicides. • Methods include: <ul style="list-style-type: none"> • Foliar spraying (spraying over the foliage until every leaf is wetted); • Basal barking (spraying the full circumference of the trunk or stem of the weed); • Stem injection or iut & paint (cut stem & apply herbicide to stem); • Drill & fill (drill hole around trunk & fill with herbicide) • Cut stump (cutting off the invasive plant completely at its base using a chainsaw, axe, brush cutter or machete, then spraying the exposed surface of the cut stump • Wick applicator (a wick or rope is soaked in herbicide from a reservoir).
Biological	<ul style="list-style-type: none"> • Biosecurity Queensland undertakes research into biological weed control and their website contains information on research projects about specific weed species.
Other	<ul style="list-style-type: none"> • Crash grazing (high intensity grazing for short time periods).

Table 2: Weed Treatment Methods

- 12** The frequency of weed treatment programs shall be determined by site HSE taking into account the classification of the weed species, location/extent of populations and potential impact on non-infested areas.
- 13** For detailed information on specific weed treatment chemical controls and herbicide application, refer to the DAF invasive weed species fact sheets for registered chemical controls and herbicide application rates.
- 14** Any chemicals to be used on site for the purposes of weed control shall be reviewed based on the Safety Data Sheet (SDS) and chemical label to ensure they are appropriate for the target species. In conjunction with this, all safety and environmental requirements will be addressed based on the SDS. All chemicals used shall be approved in ChemAlert.
- a** Employees or contractors undertaking chemical weed treatment shall be appropriately trained and licenced.

- a Traps shall be placed in areas least likely to interfere with non-targeted species (i.e. native animals);
- b Traps shall be positioned so there is shade for animals. Traps must have water available for trapped animals;
- c Captured animals shall be handled and managed with techniques that involve the least amount of stress possible;
- d Traps shall be inspected early each morning (ideally before first light);
- e Animals shall to be euthanized using methods listed in [Section 3](#) of the BMA [Coal Wildlife Interactions and Handling Procedure](#).

3.4.2 Baiting

- 21 Feral dogs and feral pigs can be controlled using 1080 (sodium fluoroacetate) poisoned baits. When conducting a baiting program, neighbouring landowners shall be informed and consulted at least one month prior to bait setting.
- 22 Refer to [Appendix 4 – Baiting Program Requirements](#) for detailed baiting program requirements.

3.5 Monitoring and Review

3.5.1 Weed Monitoring

- 23 HSE shall review records of weed sightings and/or undertake surveys to confirm the need to implement weed control programs. Surveys should also be used post control implementation to verify the effectiveness of the control program.
- 24 Inspections of disturbed areas (e.g. tracks, roads, cleared areas, exploration pads) and disturbance activities shall be undertaken by HSE. The information recorded should include (but not be limited to):
 - d Name and class of weed;
 - e Location of weed (GPS coordinates);
 - f Cover and density of the weed;
 - g Proximity to sensitive receptors; and
 - h Recommended control method.
- 25 A Weed Inspection and Treatment Form Template is provided in [Appendix 5 – Weed Inspection Form](#) Template.
- 26 HSE shall ensure any new outbreaks of weeds are captured in the relevant mapping system (i.e. GIS) and undertake a comparison with the baseline or previous survey data.

3.5.2 Feral Animal Monitoring

- 27 HSE shall review records of feral animal sightings and/or undertake monitoring to confirm the need to implement feral animal control programs. Furthermore, monitoring may be required post control implementation to verify the effectiveness of the control program.
- 28 The following should be considered when undertaking feral animal monitoring:
 - a Location of recently sighted feral animals or signs of feral animals (e.g. diggings, footprints, faeces, plant damage);
 - b Water or food sources (i.e. pigs are often found near dams; cats are often found near mobile crib huts); and

- c When the target species is most active (i.e. mornings/ evenings when the temperature is cooler).

4 Education and Awareness

- 1 HSE shall promote education and awareness on the impacts and risks associated with weeds and feral animals. Weeds and feral animal awareness should also form a regular part of toolbox talks, and up-to-date identification and control materials displayed around the work sites.
- 2 The Permit to Disturb for activities that present a risk to land and biodiversity should assess the threat of weed establishment and spread, vehicle hygiene protocols, and feral animals. Project pre-starts are an ideal opportunity to ensure that the weed and feral animal controls identified in a project Permit to Disturb are communicated to the relevant work crews.

5 Reporting

- 1 Weed and feral animal management records and completed forms must be saved in Documentum and kept for a minimum of five years. As stated above, there are obligations to report certain weeds and feral animals to Biosecurity Queensland and/or local authorities, and a social duty to inform neighbouring landowners of certain weeds and feral animals and planned control programs.

6 Terms and Definitions

Term	Definition
Biosecurity Act	<i>Biosecurity Act 2014</i>
BMA	BHP Mitsubishi Alliance
DAF	Queensland Department of Agriculture and Fisheries
DAF Procedure	Department of Agriculture and Forestry Vehicle and Machinery Cleardown Procedures 2019
EA	Environmental Authority, environmental approval, under <i>the Environmental Protection Act 1994</i> , that authorises an Environmentally Relevant Activities (ERAs), including exploration, mining, bulk material handling and auxiliary activities.
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GBO	Under section 23 of the Biosecurity Act, individuals and organisations have an obligation to take all reasonable and practical steps to prevent or minimise each biosecurity risk. This is known as the 'General Biosecurity Obligation' (GBO).
SDS	Safety Data Sheet
Shall	The word 'shall' is to be understood as mandatory.
Should	The word 'should' is to be understood as non-mandatory but advisory or recommended.
WONS	Weed of National Significance

Table 3: Terms and Definitions

7 References

Ref Number	Title	Document Number
Legislative Requirements Documents		
	Qld <i>Environmental Protection Act 1994</i> - https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1994-062	
	<i>Biosecurity Act 2014</i> - https://www.legislation.qld.gov.au/browse/inforce#/act/title/b	
	List of prohibited, restricted and other invasive animals in Queensland https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/pests/invasive-animals	
	List of prohibited, restricted and other invasive plants in Queensland https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants	
Technical Reference Documents		
	Australian Pest Animal Strategy 2017 to 2027 - https://www.agriculture.gov.au/pests-diseases-weeds/pest-animals-and-weeds/review-aus-pest-animal-weed-strategy/aus-pest-animal-strategy	
	Australian Weeds Strategy 2017 to 2027 https://www.agriculture.gov.au/pests-diseases-weeds/pest-animals-and-weeds/review-aus-pest-animal-weed-strategy/aus-weeds-strategy#:~:text=Australian%20Weeds%20Strategy%202017%20to%202027,of%20weeds%20on%20the%20environment.	
	Central Highlands Regional Council Biosecurity Plan 2017-2020 http://www.centralhighlands.qld.gov.au/wp-content/uploads/2016/09/ECM_1150510_v2_Central-Highlands-Regional-Council-Biosecurity-Pla.pdf	
	Isaac Region Biosecurity Plan - Isaac Region Biosecurity Plan	
	Department of Agriculture and Forestry Queensland Biosecurity Manual 2019 https://www.daf.qld.gov.au/_data/assets/pdf_file/0004/379138/qld-biosecurity-manual.pdf	
	Department of Agriculture and Fisheries Vehicle and Machinery Cleandown Procedures 2019 https://www.daf.qld.gov.au/_data/assets/pdf_file/0011/58178/cleandown-procedures.pdf	
	Toxin 1080: A guide to safe and responsible use of sodium fluoroacetate in Queensland https://www.daf.qld.gov.au/_data/assets/pdf_file/0010/1274185/IPA-Toxin-1080-Guide.pdf	
	Weeds of National Significance (WONS) http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html	
BHP/BMA Documents		
	BMA Wildlife Interactions and Handling Procedure	000199462
	BMA Pro 0056 Permit to Disturb Procedure	000205251
	GEO-PRO-0001 Weed Control and Management Procedure (Exploration Procedure)	000197525

Table 4: List of reference documents

8 Version Management

Version	Details	Date
1.0	Creation of document by Environment Analysis & Improvement (A&I)	07 January 2022
1.2	Cross-references updated	16 Februeary 2022

Table 5: Version Management

9 Appendix 1 – Qld Biosecurity Act Definitions & Requirements

- 1 The Biosecurity Act details measures to safeguard Queensland's economy, biodiversity and people's lifestyles from the threats posed by invasive pests and diseases.
- 2 **Table 6** outlines key biosecurity definitions under the Biosecurity Act.

Key Term	Definition
General Biosecurity Obligation	Individuals and organisations whose activities pose a biosecurity risk must: <ul style="list-style-type: none"> - Take all reasonable and practical steps to prevent or minimise each biosecurity risk; - Minimise the likelihood of causing a 'biosecurity event', and limit the consequences if such an event is caused; and - Prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse.
Biosecurity Event	A biosecurity event is an event comprising something that: <ul style="list-style-type: none"> - Has, or may have, a significant harmful effect on human health, social amenity, the economy, or the environment; and - Is caused by a pest, disease or contaminant.
Biosecurity Risk	A biosecurity risk is the risk that exists when you deal with: <ul style="list-style-type: none"> - Any pest, disease or contaminant - Something that could carry a pest, disease or contaminant (e.g. animals, plants, soil, equipment—known as 'carriers').
Biosecurity Carrier	A carrier is any animal or plant, or part of any animal or plant, or any other thing: <ul style="list-style-type: none"> - Capable of moving biosecurity matter attached to, or contained in, the animal, plant or other thing from a place to another place; or - Containing biosecurity matter that may attach to or enter another animal or plant, or part of another animal or plant, or another thing.

Table 6: Key definitions under the Biosecurity Act

- 3 Under the Biosecurity Act, a 'biosecurity matter' includes things that may pose a risk to the biosecurity of Queensland. A biosecurity matter includes plants, pests and pathogens, invasive animals, animal diseases and contaminants. The Biosecurity Act defines two types of biosecurity matter: prohibited matter and restricted matter.
 - a Prohibited matters, are listed in Schedule 1 of the Biosecurity Act. Prohibited matter is not found in Queensland, but would have a significant adverse impact on health, way of life, the economy or the environment if it entered the state. If found, they must be reported to Biosecurity Queensland within 24 hours, by calling 13 25 23. A person must take all reasonable and practical steps to minimise the risk of the prohibited matter until they receive advice from an authorised officer.
 - b Restricted matters are listed in Schedule 2 of the Biosecurity Act. Restricted matters are found in Queensland and have a significant impact on human health, social amenity, the economy or the environment. Restricted matter can include:
 - i diseases, viruses or parasites
 - ii invasive animals or plants (e.g. pest animals or weeds)
 - iii noxious fish
 - iv insect pests.
 - c There are seven categories of restricted matter under the Biosecurity Act:

- i** Category 1: must be reported to an inspector within 24 hours. Examples include fire ants, electric ants, Asian honey bees, and certain animal diseases, aquatic diseases and pathogens;
 - ii** Category 2: must be reported to an inspector or authorised person within 24 hours. Examples include noxious fish, weeds and pest animals such as spotted gar and red-eared slider turtle;
 - iii** Category 3: must not be distributed either by sale or gift, or released into the environment. Examples include weeds, pest animals and noxious fish (e.g. gambusia, dingoes, yellow crazy ants);
 - iv** Category 4: must not be moved. Examples include specific weeds, pest animals and noxious fish such as the bitou bush, feral pig or giant cichlid;
 - v** Category 5: must not be possessed or kept. Examples include weeds, pest animals and noxious fish such as Mexican feather grass, rabbits and carp;
 - vi** Category 6: must not be fed. Examples include invasive animals such as feral deer, foxes, rabbits and wild dogs and noxious fish such as carp, gambusia and tilapia; and
 - vii** Category 7: must be killed. Examples includes noxious fish such as carp, weatherloach, climbing perch, gambusia and tilapia.
- d** Several restriction categories apply to some restricted matter. In such cases, the requirements of all restriction categories must be followed. For example, the Biosecurity Act lists rabbits as category 3, 4, 5 and 6 restricted matter. This means that rabbits must not be:
- i** given;
 - ii** distributed;
 - iii** sold or traded;
 - iv** moved within Queensland;
 - v** kept by a person or in their control;
 - vi** fed (except during baiting programs); and
 - vii** must not be released into the environment or disposed of other than in the way prescribed under a regulation.
- 4** At a Federal level, key strategies relevant to pest and weed management are:
- a** The Australian National Weeds Strategy (2017 – 2027) which identifies Weeds of National Significance (WONS) requiring management and control.
 - b** The Australian Pest Animal Strategy (2017 – 2027) which provides guidance to address the impacts of exotic vertebrate animals that have become feral animals in Australia.
- 5** Local governments are responsible for ensuring management of invasive plants and animals that are a prohibited or restricted matter. Local governments have developed strategies and plans to coordinate weed and feral animal management within their region (e.g. Isaac Region Biosecurity Plan 2020-2023).
- 6** Weed and feral animal control on sites should consider the requirements of these plans and coordination of activities at a regional level in addition to consultation with neighbouring landholders.

10 Appendix 2 – Weed and Feral Animal Profiles

10.1 Weed Profiles

- 1 Eleven flora species listed as restricted invasive plants under the provisions of the Biosecurity Act and/or declared a WONS have been recorded on or within close proximity to BMA Operations:
 - a [Bellyache Bush](#) (*Jatropha gossypifolia*) – Category 3 / WONS;
 - b [Giant Rats Tail Grass](#) (*Sporobolus pyramidalis* and *Sporobolus natalensis*) – Category 3;
 - c [Harissa Cactus](#) (*Eriocereus martini*) – Category 3;
 - d [Hymenachyne](#) (*Hymenachne amplexicaulis*) – Category 3 / WONS;
 - e [Lantana](#) (*Lantana camara*) – Category 3 / WONS;
 - f [Mother-of-Millions](#) (*Bryophyllum delagoense*) – Category 3;
 - g [Parkinsonia](#) (*Parkinsonia aculeata*) – Category 3 / WONS;
 - h [Parthenium weed](#) (*Parthenium hysterophorus*) – Category 3 / WONS;
 - i [Prickly Acacia](#) (*Vachellia nilotica*) – Category 3 / WONS;
 - j [Prickly Pears](#) (including Prickly Pear, Tiger Pear and Velvety Tree Pear) (*Opuntia spp*) - Category 3 / WONS;
 - k [Rubber Vine](#) (*Cryptostegia grandiflora*) – Category 3 / WONS;
- 2 Two environmental weeds are also commonly found in areas surrounding QLD Coal mining leases:
 - a [Castor Oil Bush](#) (*Ricinus communis*); and
 - b [Leucaena](#) (*Leucaena leucocephala*).

10.2 Feral Animal Profiles

- 1 There are several species of restricted invasive animals that have been recorded on BMA Operations. The most common feral animals include:
 - a [European Red Fox](#) (*Vulpes vulpes*) – Category 3, 4, 5 and 6;
 - b [European Wild Rabbit](#) (*Oryctolagus cuniculus*) – Category 3, 4, 5 and 6;
 - c [Feral Cat](#) (*Felis catus*) – Category 3, 4 and 6;
 - d [Wild Dog](#) (*Canis familiaris*) – Category 3, 4 and 6;
 - e Dingo (*Canis familiaris dingo*) – Category 3, 4, 5 and 6;
 - f [Feral Pig](#) (*Sus scrofa*) – Category 3, 4 and 6;
 - g [Chital Deer](#) (*Axis axis*) - Category 3, 4 and 6; and
 - h [Feral Rusa Deer](#) (*Cervus timorensis*) - Category 3, 4 and 6.
- 2 Specific to the Hay Point Coal Terminal, the Colonial Sea Squirt is a prohibited marine animal which is known to occur in Mackay where it is predominantly found growing on submerged and floating man-made structures such as pontoons, pylons and moorings.
 - a [Colonial Sea Squirt](#) (*Didemnum perlucidum*).
- 3 In addition, although not a prohibited or restricted invasive animal, the cane toad (*Bufo marinus*) is a significant threat to biodiversity in Australia and should be managed under the GBO.
 - a [Cane Toad](#) (*Bufo marinus*).

11 Appendix 3 – Vehicle and Equipment Cleaning and Inspection Checklist

Vehicle / Equipment Type:		Vehicle Registration / Equipment Number:	
Inspection Completed by:		Role and Contact Details:	
Date:		Location:	

Cleaning and Inspection Checklist from DAF Vehicle and Machinery Cleardown Procedures Section 4.1 Specific cleaning checklists – cars, trucks and four-wheel drives

Area	Actions	Clean and Inspected
Interior	Check and clean the foot wells	
	Check the carpets and mats	
	Check and clean the seatbelts	
Boot	Check and clean the carpet (checking for deposits of hay, weed seeds, burrs and/or soil)	
	Check and clean the spare tyre area	
	Check and clean other recesses in the boot or rear of the vehicle	
Engine bay	Check and clean the radiator	
	Check and clean the grill	
	Check and clean the top of the transmission gearbox	
	Check and clean the recess under the windscreen wipers	
	Check and clean the air filters	
Underside	Check and clean the wheel arches, wheel trims, flares, step treads and bumpers	
	Check and clean the mudflaps	
	Check and clean the tyre rims (particularly the near side)	
	Check and clean the axles and differentials	
	Check and clean the spare tyres on four-wheel drives and station wagons. These are often suspended underneath <i>Note: These are high-risk areas, as contaminants collect inside the horizontally positioned rim.</i>	
Other areas	Check and clean the back or tray of trucks and four-wheel drives	
	Wash equipment (e.g. toolboxes, buckets, blades, tines, rippers, ladders and storage compartments)	
	Clean any tools and equipment used in the field	
	Brush down trouser legs (check inside any cuffs), ensuring all seeds and plant material is removed	
	Clean boots to ensure they are free of plant material, soil or mud	

12 Appendix 4 – Baiting Program Requirements

12.1 Feral Dog Baiting

12.1.1 Baiting Program

- 1 Feral dogs are controlled utilising 1080 (sodium fluoroacetate) poisoned baits. The baits are fresh meat with the 1080 injected into the bait at a measured rate. Dog species have the lowest known tolerance to 1080 and as such only a small dose is required per bait. Dog control programs are carried out in conjunction with neighbouring landholders where possible to maximise results.

12.1.2 Location of Bait Lines

- 2 Dog baiting programs are run along a predetermined baiting line, with baits placed every 300 to 400 metres. Baiting lines are chosen in consultation with neighbouring landholders. Bait lines are run within the boundaries of the Operation, generally following internal boundary fences. Other easements might be used as well, such as power lines and access tracks.
- 3 Within the document "Toxin 1080: A guide to safe and responsible use of sodium fluoroacetate in Queensland", a number of distance requirement and exclusion zones for the placement of 1080 baits are highlighted. In light of these points in should be noted that:
 - a No baits are to be laid within five metres of a fenced boundary;
 - b No baits are to be laid within twenty metres of permanent or flowing water bodies, and;
 - c No baits are to be laid within fifty metres of the centre line of a declared road.

12.1.3 Bait Preparation

- 4 1080 poison may only be loaded by an authorised person. The authorised person injects the 1080 poison into the prepared fresh meats baits at the appropriate concentration. A record shall be kept documenting the number of baits loaded and the amount of 1080 used. A BMA representative must sign an indemnity form which also states the land that the baits may be used on.

12.1.4 Notification

- 5 Signs are to be erected at all entrances to the property where baiting is occurring and along the boundary fence to a public thoroughfare. Signs are provided by the authorised person. Notification of intent to bait will be given to the Operation's leadership team through the Superintendent HSE, and the OCE's (or equivalent) will be notified of the baiting location and timeframe.

12.1.5 Bait Laying

- 6 Prepared baits are only to be handled by approved personnel utilising appropriate personal protective equipment (PPE). Baits are to be kept in the bags provided by the authorised person until placed at the identified baiting location. Baits are to be buried in shallow holes and covered with loose material or placed in mounded material as required. PPE is to be disposed (or decontaminated with water where appropriate) after the handling of each bait to minimise exposure to 1080.

12.1.6 Monitoring and Recording

- 7 Baits are placed along a predetermined line at 300-400 metre intervals. The actual location of each bait is to be recorded with GPS and identified with flagging tape to allow for easy recovery. Baits are to be regularly checked for the period of the baiting program, with all taken baits recorded.

12.1.7 Bait Recovery and Clean Up

- 8 At the cessation of the baiting program (7 days after initial baiting), all remaining baits are to be buried in a deep pit (>1m). All reasonable efforts are to be taken to remove deceased animal carcasses and bury them in the pit. Collection of remaining baits is to be undertaken using appropriate PPE.

12.2 Feral Pig Baiting

12.2.1 Baiting Program

- 9 Feral pigs are controlled using 1080 grain baits. Fermented corn is used as the grain bait and is tumble mixed with a predetermined amount of 1080. The concentration of 1080 in grain baits is significantly higher than that used in dog baits, however there is less requirements to handle the baited material. An authorised person loads the baits into pre-soaked grain.

12.2.2 Location

- 10 Feral pig baiting is conducted wherever activity has been detected, either through visual identification or by tracks and furrowing activity. All pig baiting is conducted away from mining activity to avoid interaction with mine workers.
- 11 Within the document "**Toxin 1080: A guide to safe and responsible use of sodium fluoroacetate in Queensland**", a number of distance requirement and exclusion zones for the placement of 1080 baits are highlighted. In light of these points in should be noted that:
 - a No baits are to be laid within five metres of a fenced boundary;
 - b No baits are to be laid within twenty metres of permanent or flowing water bodies, and;
 - c No baits are to be laid within fifty metres of the centre line of a declared road.

12.2.3 Trap Establishment

- 12 Feral pig baiting is conducted within purpose built traps. The traps are steel panels with wire mesh screening and have one way entry doors. The traps are transported to the baiting location and installed by experienced personnel. Two people will erect traps as a minimum. Traps are to be installed utilising appropriate PPE with adherence to the SOP Manual Handling (or equivalent).

12.2.4 Pre-Feeding

- 13 Traps are free fed for a period prior to baiting to allow feral pigs to locate and become accustomed to the trap. Traps are monitored with infrared cameras to assess the number of pigs visiting the trap. This allows for an appropriate amount of grain to be baited. Monitoring during free feeding also allows for the identification and control of non-targeted species prior to baiting.

12.2.5 Baiting Traps

- 14 The loaded grain is placed into feeding receptacles within the trap. The trap is set in order to keep 1080 affected animals in the trap to allow for appropriate disposal of carcasses. The baited trap is visited daily to remove any deceased animals. In the event that non deceased animals are discovered in the trap, further baited grain is supplied to effect mortality.

12.2.6 Carcass and Bait Disposal

- 15 The trap is to be checked each day with all deceased carcasses removed for burial in a deep pit (>1m). Handling of carcasses is to be kept to a minimum, and be undertaken using appropriate PPE and manual handling techniques. Where possible and as required, mechanical means of carcass removal shall be employed (i.e. loaders or backhoes to remove carcasses to burial pit). Handling of intact carcasses poses no threat of exposure to 1080, however other hygiene issues need to be considered.

- 16 If no further pig activity is occurring in the trap, the baited grain is to be collected and disposed of in a deep pit (>1m). All feed bins are to be washed out with a large volume of water to remove any 1080 residue. Bins should be left upside down whilst the 1080 degrades (14 days) before free feeding use.

12.2.7 Recording

- 17 The location of each trap for each baiting event is to record using GPS. The number of feral pigs destroyed is to be recorded. These details shall be kept along with the date of the program and the quantity of bait used.

12.3 Safety

12.3.1 1080

- 18 1080 is the trade name given to sodium fluoroacetate. Sodium fluoroacetate is a naturally occurring compound found in some native flora species. Due to this, native fauna can have an increased tolerance to the poison in comparison to introduced species which makes it a useful targeted poison for the control of introduced feral animals.
- 19 1080 should only be handled by a competent person. The authorised person prepares the baits on behalf of the landholder. The landholder then places the baits in the desired locations. No 1080 poison is kept or stored onsite. Only prepared baits are used onsite.

12.3.2 Fresh Meat Baits

- 20 Fresh meat baits are prepared using pre-cut meat, with a measured dose of 1080 injected into the meat. The effective concentration of 1080 in fresh meat baits is 0.0034% 1080 by weight or 6mg 1080 per 125g of fresh meat. As the product is diluted below 0.1%, it is not classified as a hazardous substance or dangerous goods. The baits may only be handled using elbow length heavy PVC gloves which must be washed well between each use to avoid skin contact with 1080.

12.3.3 Grain Baits

- 21 Grain baits are made using fermented corn. The corn is tumble mixed with a predetermined dose of 1080 by the authorised person. Green food dye is added to deter grazing by birds. The effective concentration of 1080 in grain baits is 0.02% 1080 by weight or 72mg 1080 per 250g of fermented grain. As the product is diluted below 0.1%, it is not classified as a hazardous substance or dangerous goods. The baits may only be handled using appropriate PPE including elbow length heavy PVC gloves which must be washed well between uses to avoid skin contact with 1080.

12.3.4 SDS and First Aid

- 22 The SDS for both fresh meat 1080 baits and 1080 grain baits is stored in ChemAlert. The SDS should be referred to for information regarding PPE, first aid and toxicology.

13 Appendix 5 – Weed Inspection Form Template

PART 1 – WEED INSPECTION		
Record Number		
Date		
Locality		
Purpose of Visit (e.g. weed treatment / inspection / survey)		
GPS Coordinates of the outmost boundary of the weed infestation / treated area <i>Projection UTM, Datum eg. AGD 1984; AMG Zone 55</i>		
Total area of infestation (ha)		
Common name and category of weed species	Weed Name	
	Weed Category (e.g. 1, 2, 3)	
Cover / density of the weed species	Cover (% per m2)	
	Density (# per m2)	
Stage of development (juvenile, flowering / seeding, mature)		
Proximity of weed infested area to nearest track, road, waterway or drain (m)		
PART 2 – ADDITIONAL INFORMATION		
Proximity to protected areas / vegetation		
Condition of protected areas / vegetation		
Is this in compliance with weed control measures stipulated in the Permit to Disturb?		
	SAP #	
Have personnel completed a Vehicle Hygiene Checklist upon demobilisation?		
Visible signs of new weed infestations within proximity to treated area?		
If applicable, do topsoil stockpiles show any signs of weed establishment?		