BRDA 4 AND BRDA 5 EMBANKMENT RAISES - YR 26-28

South32 Limited | ACN 093 732 597

Attachment 3B –

Works Approval Supporting Document.

Prepared by

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28 November 2024

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Terms and Abbreviations

Term	Description
AHA	*Aboriginal Heritage Act 1972*
AHD	Australian Height Datum
ANCOLD	Australian National Committee on Large Dams
BBM	Boddington Bauxite Mine
BRDA	Bauxite residue disposal area
CQA	Construction Quality Assurance
CRS	Controlled Residue Solids
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EOR	Engineer of Record
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FoS	Factor of Safety
FWL	Freshwater Lake
FY	Financial Year
GISTM	Global Industry Standards of Tailings Management
IBRA	Interim Biogeographic Regionalisation for Australia
mAHD	Meters Australian Height Datum
m/s	Metres per second
Mtpa	Million tons per annum
NPHD	Northern Pipe Head Dam
PDWSA	Public Drinking Water Source Area
PHDs	Pipe Head Dams including NVPHD and SVPHD
PMP	Probable Maximum Precipitation
QCS	Quality Control System
RCL	Refinery Catchment Lake
RDS	Residue Deposition Strategy
Refinery	The Worsley Refinery
RIWI Act	*Rights in Water and Irrigation Act 1914*
RL	Reduced Level
RLA	Refinery Lease Area
SEP	Solar Evaporation Pond
SPHD	Southern Pipe Head Dam

TARP	Triggered Action Response Plan
The Project	Worsley Bauxite-Alumina Project
TSF	Tailings Storage Facility
The Worsley State Agreement	*Alumina Refinery (Worsley) Agreement Act 1973*
The Project	Worsley Bauxite-Alumina Project
t	Tonnes
WJV	Worsley Joint Venture
Worsley	South32 Worsley Alumina Pty Ltd

1 Introduction

South32 Worsley Alumina Pty Ltd (Worsley) operates the Worsley Bauxite-Alumina Project (the Project) at the Boddington Bauxite Mine (BBM), the Worsley Refinery (the Refinery) and the Port Facility at Bunbury. The Project is located 130 km southeast of Perth, approximately 15 km north-west of Collie and at the Port of Bunbury, in the South West region of Western Australia (WA) (Figure 1-1). Worsley is the manager of the operations on behalf of the Worsley Joint Venture (WJV) – Bauxite Alumina Operations. Construction of the Refinery commenced in 1980, and the first alumina was produced in April 1984.

The Project's mining, processing and associated operations are currently authorised under the *Alumina Refinery (Worsley) Agreement Act 1973* (the Agreement Act) and Ministerial Statement 719, issued under Part IV of the *Environmental Protection Act 1986* (EP Act).

The BBM is located approximately 5 km from the town of Boddington and is primarily situated on Mining Lease M258SA, granted under the Agreement Act. The Refinery is located on Crown Lease L150306. The Refinery is authorised under Part V of the EP Act, through Licence L4504/1981/17 (the Licence), to produce up to 4.7 Mtpa of alumina.

Bauxite ore mined at the BBM is crushed at crushing facilities within the mining area and then transported via an overland bauxite conveyor to the Refinery. The process of refining ore into alumina comprises a four stage Bayer Process involving digestion, clarification, precipitation, and calcination.

Residual sand and mud (bauxite residue) from the process is pumped as an alkaline slurry to the Bauxite Deposition Disposal Area (BRDA) where excess caustic and liquor is collected in pipe head dams and recycled through the process back to Refinery Catchment Lake (RCL).

Alumina produced at the Refinery is then transported by train to Bunbury Port, where it is shipped to aluminium smelters around the world.

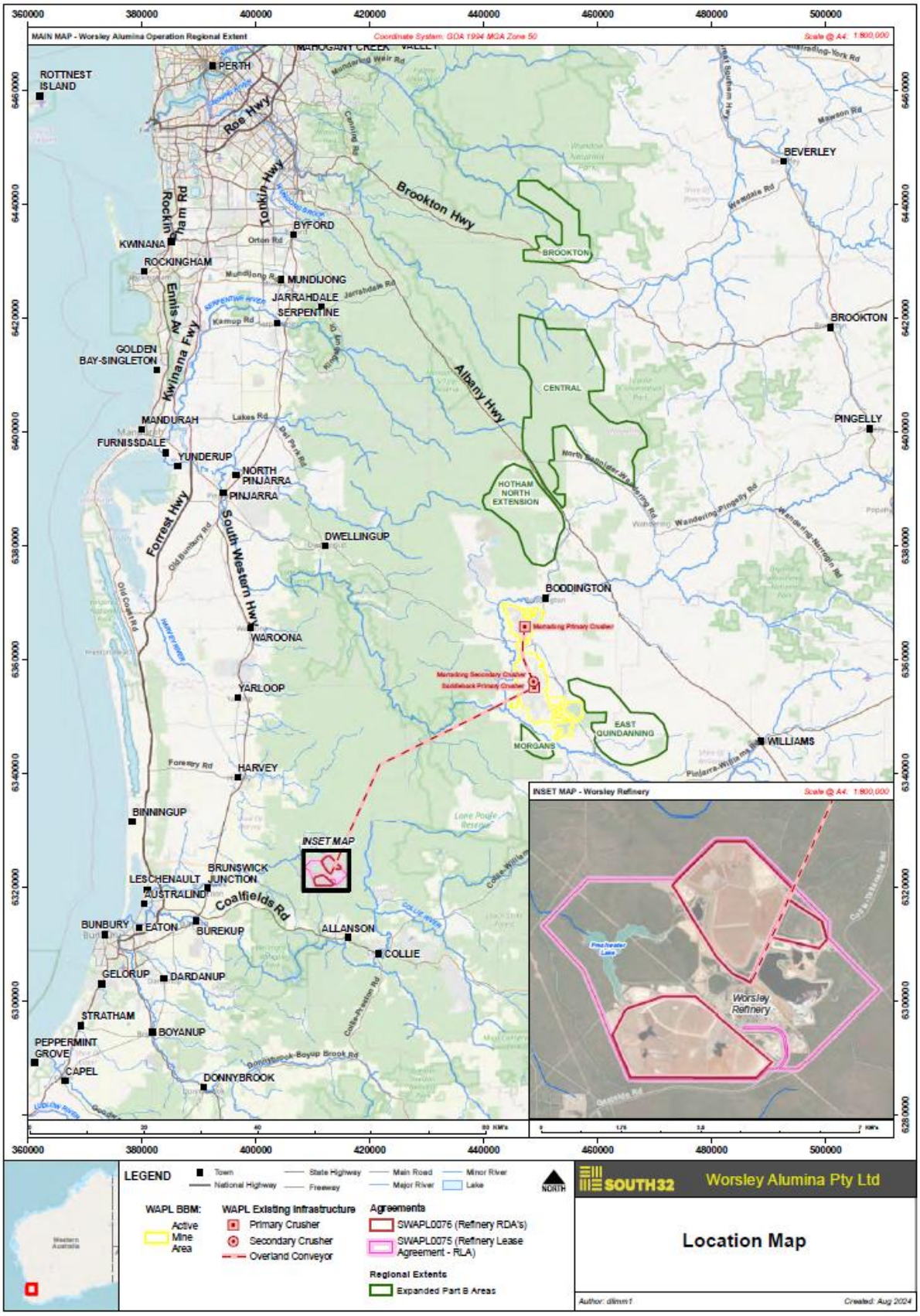

Figure 1-1 : Location Map

2 Part 2: Application Details

This Works Approval application supporting document has been prepared in support of a Works Approval application under Section 53 of the EP Act for works at the prescribed premises which may alter or increase the discharge of wastes or emissions to the environment. The Refinery is a licensed prescribed premise under Schedule 1 of the Environmental Protection Regulations 1987 for bauxite refining, including the operation of BRDAs, as defined under the Licence held by South32 Worsley Alumina Ltd.

This Works Approval application is to authorise works relating to staged 5 m lifts to BRDA 4 and BRDA 5 for financial year (FY) 26-28. This supporting document provides technical information relevant to the application for the construction of embankments and related structures relevant to the FY26-28 lifts to BRDA 4 and BRDA 5. The content of this document and additional requirements, as may be imposed by the Department of Water and Environmental Regulation (DWER), will inform the conditions for the development of and the post-construction Environmental Compliance Report and Critical Infrastructure Containment Infrastructure Report.

3 Part 3: Premises Details

The Refinery is located approximately 15 km north-west of the town of Collie with the primary function of processing bauxite mined from the nearby BBM into calcined alumina via the Bayer process. The Bayer process used at Worsley has the following key elements:

- Grinding – Bauxite is delivered to the refinery via overland conveyor from the Boddington Bauxite operations. It then passes through a crushing/grinding circuit;
- Digestion – Crushed/ground bauxite is mixed with caustic at high temperature and pressure liberating odorous volatile organic compounds;
- Clarification – Washing, settlement and filtration of digested liquor (and diversion of “red mud” to BRDAs);
- Precipitation/Seed Preparation – The clarified liquor is cooled and seeded with precipitation of hydrated alumina crystals;
- Liquor Burning – Liquor and oxalate streams are passed through a high-temperature furnace to remove dissolved organic material and destroy oxalate. Solar Evaporation Ponds (SEPs) that have been converted into temporary oxalate storage dams;
- Calcination – Dehydration of hydrated alumina in high-temperature furnace to produce calcined alumina (a fine white powder); and
- Bauxite Residue Disposal Area – Residual sand and mud (bauxite residue) from the process is pumped as an alkaline slurry to the residue drying area where excess caustic and liquor is collected and recycled through the process.

This process results in the production of emissions and discharges that classify the Refinery as a prescribed premise requiring authorisation under Part V of the EP Act. Schedule 1 of the Environmental Protection Regulations 1987 describes the activities that require licensing.

Table 3-1 provides a list of the approved prescribed activities under the Licence that are undertaken at the Refinery.

Table 3-1: Prescribed activities under Licence L4504/1981/17

Prescribed premises category description (Schedule 1, Environmental Protection Regulations 1987)	Assessed production / design capacity
Category 46: Bauxite refining	4.7 million tonnes (t) per annual period assessed production capacity
Category 52: Electric power generation	260 Mega Watts per annual period design capacity
Category 53: Flyash disposal	110,000 t per annual period assessed production capacity
Category 54: Sewage facility	270 cubic metres per day design capacity
Category 61: Liquid waste facility	100 t per annual period assessed production capacity
Category 63: Class I Inert landfill site	15,000 t per annual period assessed production capacity
Category 89: Putrescible landfill site	500 t per annual period assessed production capacity

The Refinery has two areas where BRDAs are currently in operation. To the north of the Refinery, within the Northern Valley BRDAs are: BRDA 1; BRDA 2, BRDA 4 (cells 1 & 2) and BRDA 4X (cells 1 & 2 have been merged) and to the south of the Refinery lies the Southern Valley BRDA which consists of BRDA 5 (Cells 1 – 7).The Worsley BRDA operations are located within the boundary of the Refinery Lease Agreement (Figure 3-1). A more detailed layout of BRDA's 4 and 5 are provided in Figure 3-2 and Figure 3-3.

BRDA 4 construction commenced in 1994, with a 3 m starter embankment, with subsequent upstream raised completed over a number of years. Along the eastern perimeter, the BRDA is integral with the former downstream batter of BRDA2, and along the norther perimeter, the BRDA is integral with BRDA4X. It is currently an average height of 59 meters, and the upstream raise method was used.

The Southern valley consist solely of BRDA5. BRDA 5 construction began in 1997, with a 30 m high starter embankment along the west perimeter, and subsequent upstream raises to the starter embankment have been completed over a number of years. Completion of the final floor area was completed in FY16. It is currently an average height of 60 meters. The valley which BRDA5 occupies slopes from east to west. As such, the depth of the residue at the western perimeter will be at its deepest, decreasing toward the east.

In addition, the following key structures form part of the BRDA operations:

- Northern Pipe Head Dam (NVPHD): All residue and groundwater underdrains from Northern Valley BRDAs discharge by gravity to the NVPHD. The NVPHD collects rain runoff, decant liquor, and groundwater underdrain discharges, and pumps the combined "process water" to the RCL.
- Southern Pipe Head Dam (SVPHD): All residue and groundwater underdrains from Southern Valley BRDAs discharge by gravity to the SVPHD. The SVPHD collects all underdrain discharges and pumps them to the RCL via sump.
- Solar Evaporation Ponds (SEPs): Temporary storage of oxalate is provided through SEPs. SEPs include SEP1, SEP2A, SEP3 and SEP4. Water Body 1 (WB1): This facility is primarily used for the storage of excess residue liquor that accumulates in the wet season and provides water balance

along to RCL.

- Refinery Catchment Lake (RCL): The RCL receives residue liquor from the NVPHD, the SVPHD and the BRDAs as well as Refinery process water. It is equipped with pumps and piping to transfer excess residue liquor to WB1 and to return the residue liquor to the Refinery.
- Freshwater Lake (FWL): The FWL has a roughly rectangular shaped main water body and north and south arms that extend northeast and southwest up the northern and southern valleys, respectively. The north and south arms extend to just below the NPHD and SPHD, respectively. The lake stores clean run- off water from the water diversion trenches, and the surface run-off. The northern valley being open liquor, the runoff reports to the RCL. BRDA1 runoff reports to the FWL. The southern valley embankment outer slope runoff does not contact process water and reports directly to the FWL.

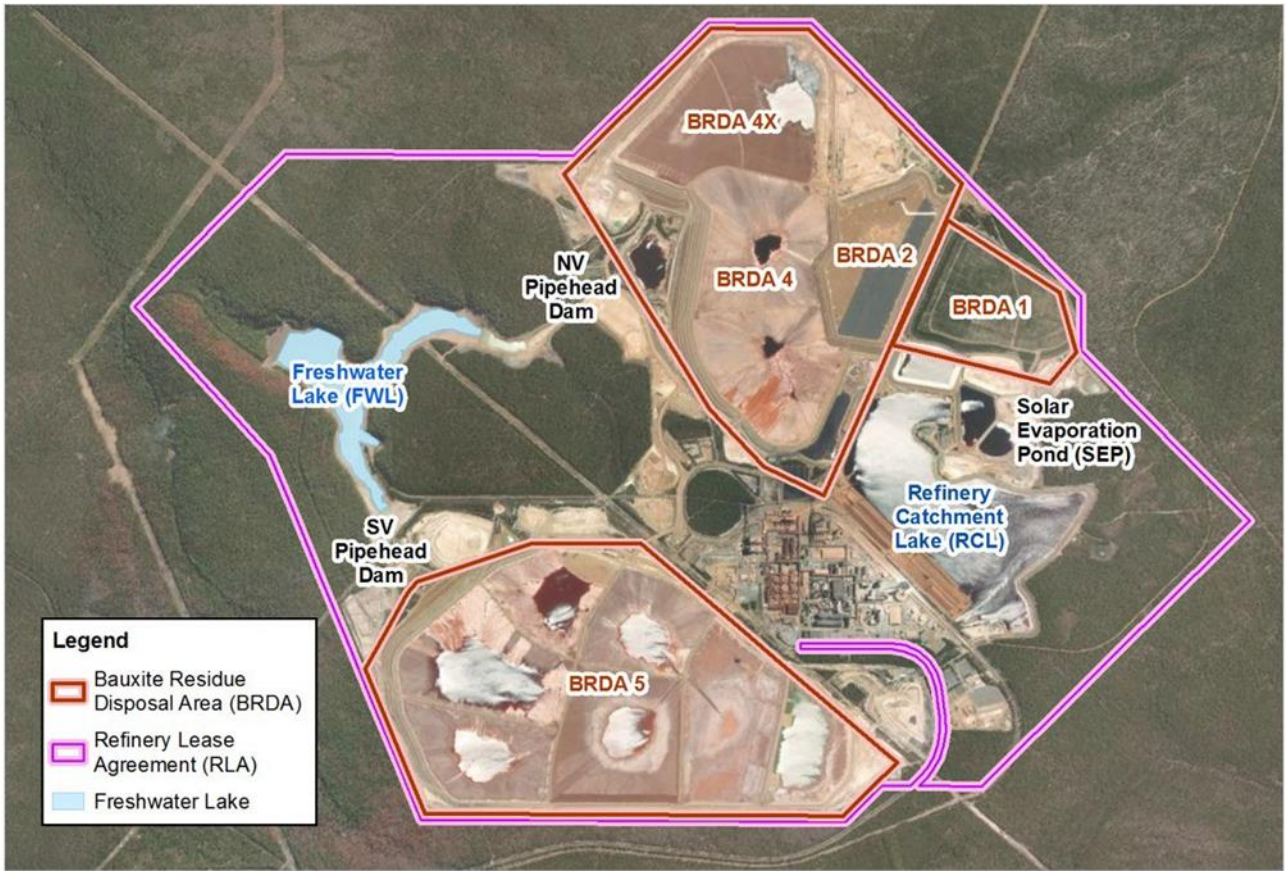

Figure 3-1: BRDA Layout within Refinery Lease Area

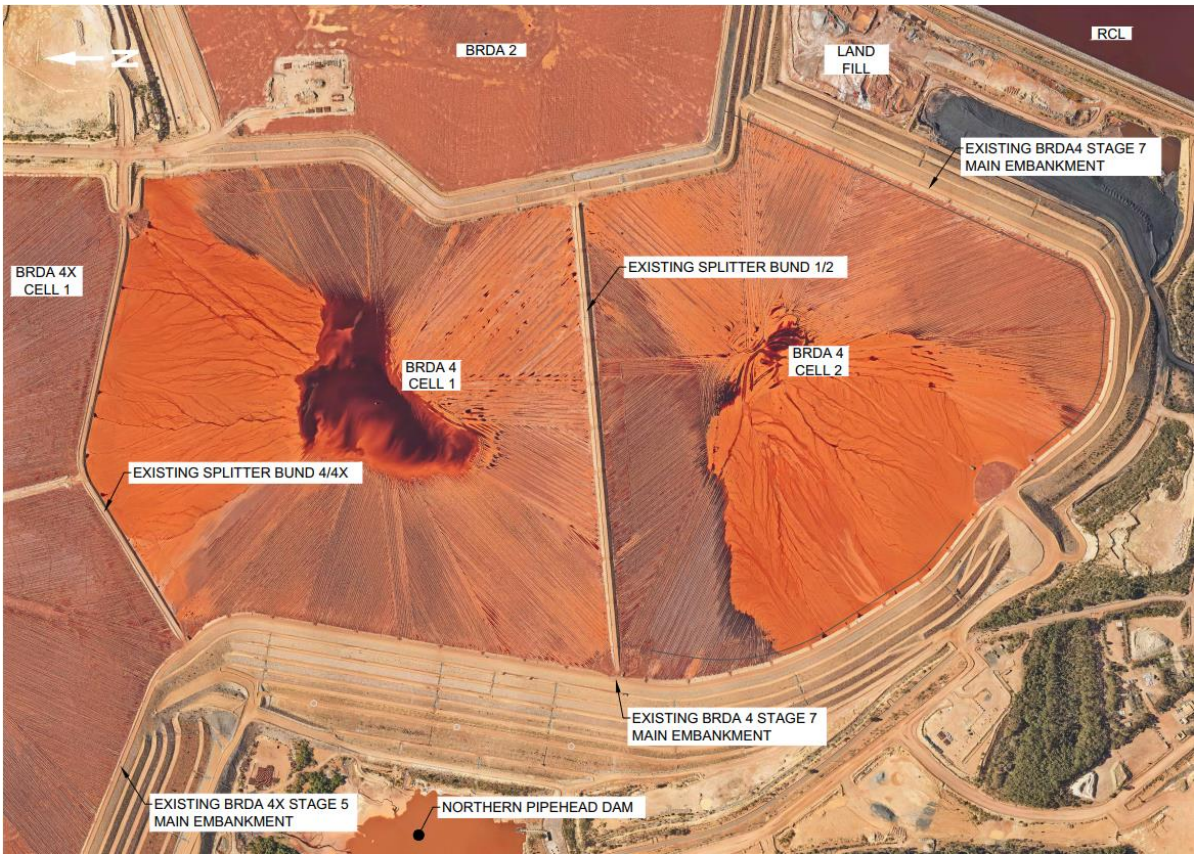

Figure 3-2: BRDA 4 Current Layout

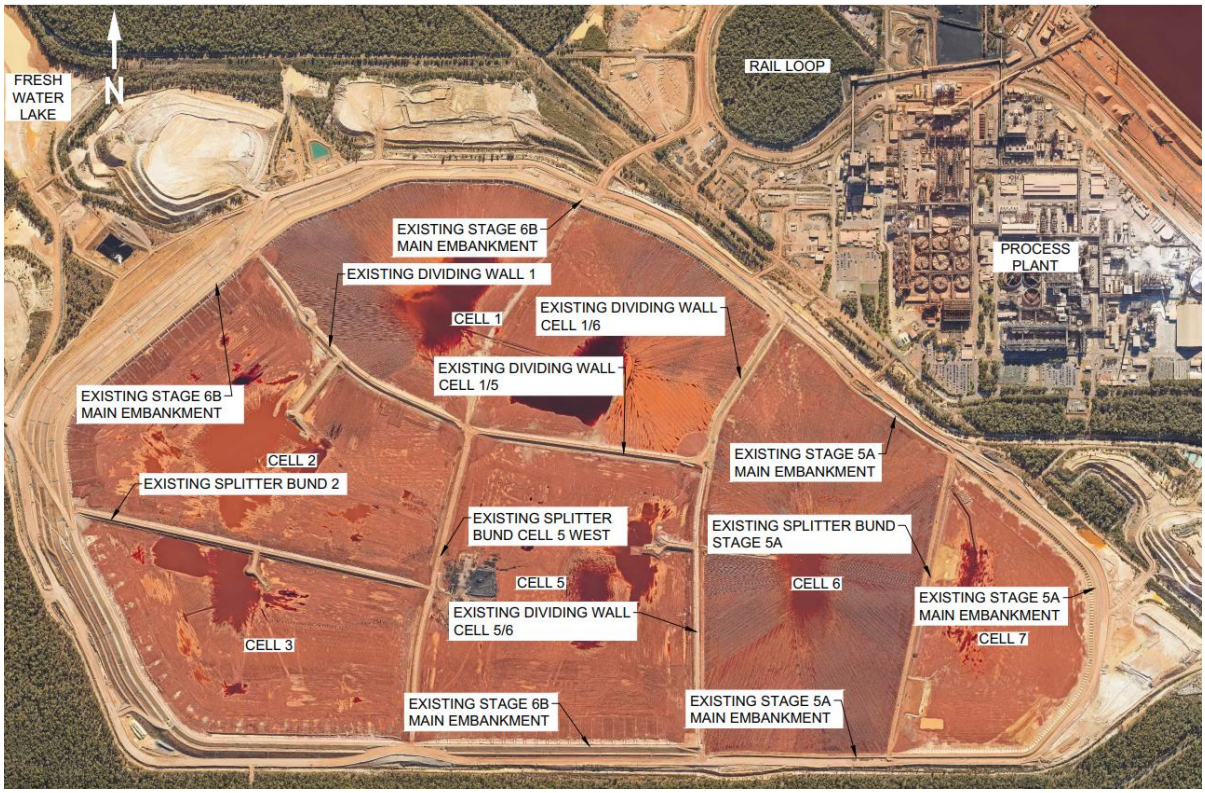

Figure 3-3: BRDA 5 Current Layout

The hazard class for both BRDAs has been assessed under the Australian National Committee on Large Dams (ANCOLD), Department of Mines, Industry Regulation and Safety (DMIRS) and Global Industry Standards of Tailings Management (GISTM) as described in

Table 3-2.

Table 3-2: Hazard Class

BRDA	ANCOLD	DMIRS	GISTM
4	High B	Category 1 (High Hazard)	Very High
5	High B	Category 1 (High Hazard)	Very High

An ANCOLD rating, of “High B” consequence category dams is defined as potentially 10 to 100 people at risk, with potentially “major” severity level impacts ($100m - >$1B damage cost, depending on BRDA and potential for consequential failure).

The DMIRS classification is based on the maximum embankment or structure height being greater than 15 m and the high significance of impact to life and/or property due to failure or uncontrolled release (DMP, 2013).

In regard to the GISTM ratings, the BRDAs classification of ‘Very High’ consequence category dams means very high economic losses affecting important infrastructure or services and high relocation/compensation to communities < US$1B.)

Advanced technical studies completed by third parties and validated by International Experts have validated that BRDAs at Worsley are well managed and constructed to a high standard. The bauxite residue is well compacted to required strength and density using Amphirollers with good water management practices to allow for future raises using upstream construction.

4 Part 4: Proposed Activities

4.1 Design Overview

The proposed scope of works outlined in this section are for FY26-28. BRDA 4 Stage 8 will require the construction of a 5 m embankment raise to RL 309 mAHD along the BRDA 4 perimeter (Figure 4-1). BRDA 5 Stage 7 also consists of a 5 m embankment raise to RL 295.5 mAHD to the perimeter of Cell 1-6 (Figure 4-2). The raises incorporate a number of components which are identified in Table 4-1.

Table 4-1: Scope of Construction Works FY26-28

BRDA 4 Stage 8	BRDA 5 Stage 7
Upstream embankment construction (western and southern perimeter)	Partial centerline construction (splitter bunds and dividing walls)
Splitter bund (Cells 1/2)	Upstream construction (perimeter embankments) and small portion of downstream embankment on the north of Cell 6
Extending decant tower (No. 5 &6)	Extension of decant towers (No. 1, 2, 3, 4, 6, 7, 8, 12 and 13)
Operational access for inspection and maintenance	Decant Access causeways (cells 1, 2, 3, 5, & 6)
Storm water runoff features from perimeter embankments	Amphiroller ramps and maintenance pads
Amphiroller ramps and maintenance pads	Operational access for inspection and maintenance
Toe buttress	Stormwater runoff features from perimeter embankments

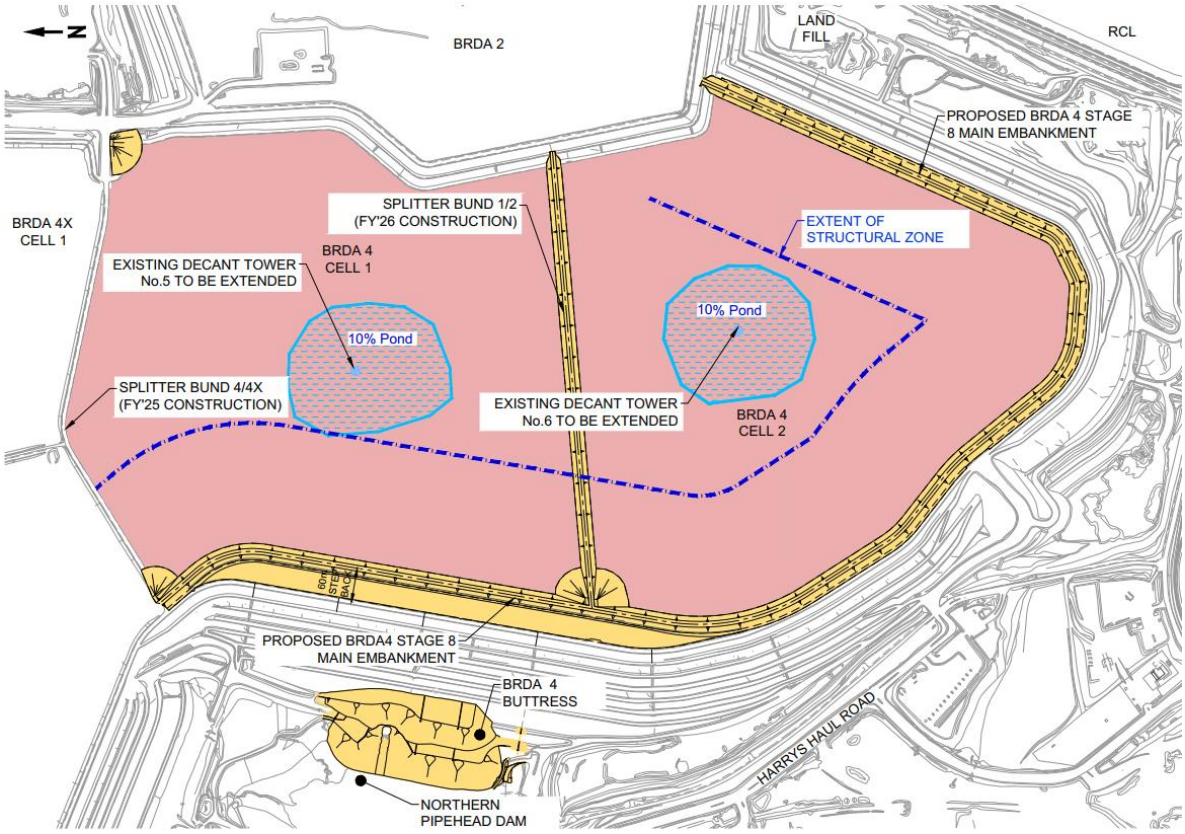

Figure 4-1: BRDA 4 Stage 8 Proposed Cell Configuration

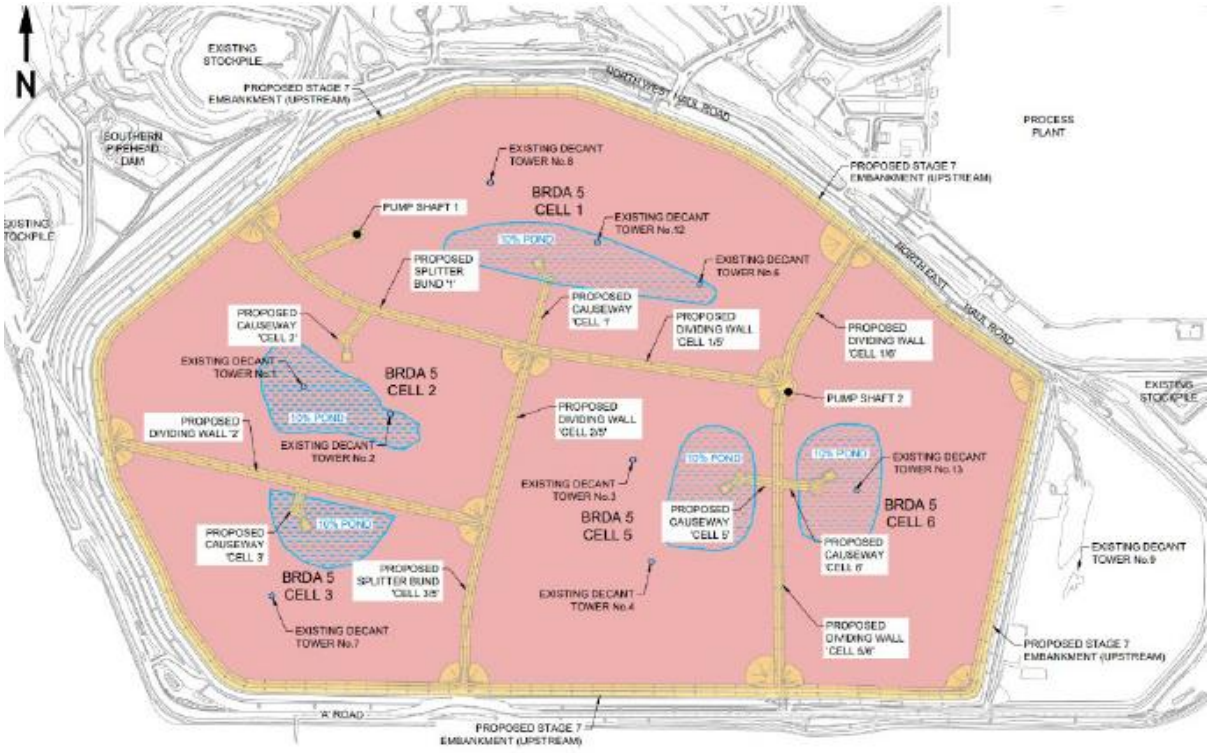

Figure 4-2: BDRA 5 Stage 7 Proposed Cell Configuration

4.2 Proposed Staging of Embankments and Raises

4.2.1 BRDA 4 STAGE 8

BRDA 4 Stage 8 will be predominately constructed as an upstream embankment raise (constructed on residue). Monitoring of embankment settlement during construction will be via settlement plates installed prior to construction of the upstream lift (LOM, 2023a).

The typical BRDA 4 Stage 8 embankment cross sections are shown on Figure 4-3 and typical buttress cross section Figure 4-4. Embankment modifications to Stage 8 (relative to Stage 7) and the corresponding reason/justification for each modification are presented in Table 4-2.

Table 4-2 : Embankment Modification and Justification

Embankment Modification	Justification
Upstream embankment Western Alignment	Based on the BRDA 4 foundation assessment (LOM, 2023a) and subsequent embankment stability assessments (LOM, 2024) requires an embankment toe buttress and embankment step back is required to achieve Factor of Safety against instability of > 1.5. Approximately 40m of exposed residue area between Stage 7 and 8 will be covered with a minimum 1-meter thick clay cover.
Drop Structure	Drop Structure spacing in Stage 8 at 150m. The functionality of toe drainage and drop structures and limit remediation works required over the life of operations and at closure, spacing between drop structures is limited to 150m in length

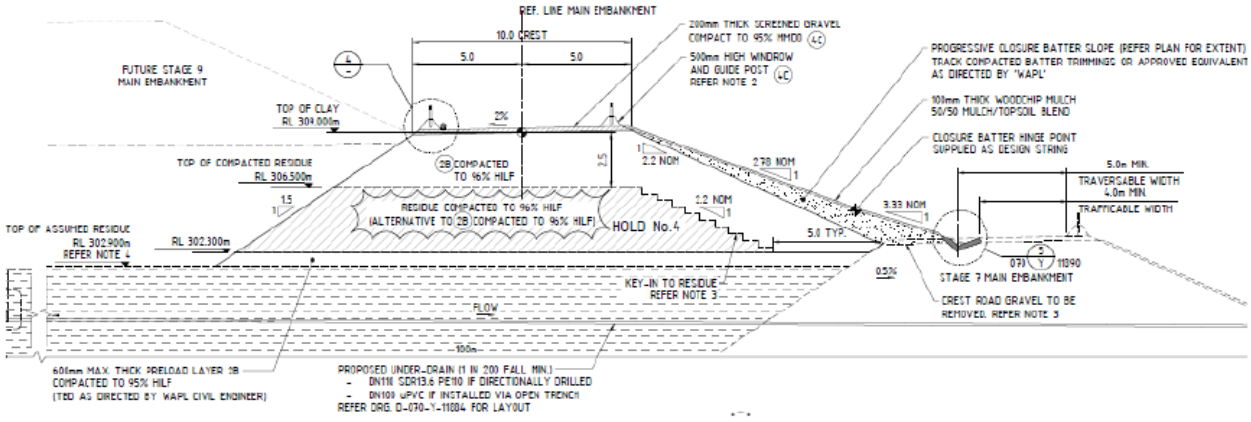

Figure 4-3: BRDA 4 Stage 8 Section View (Typical)

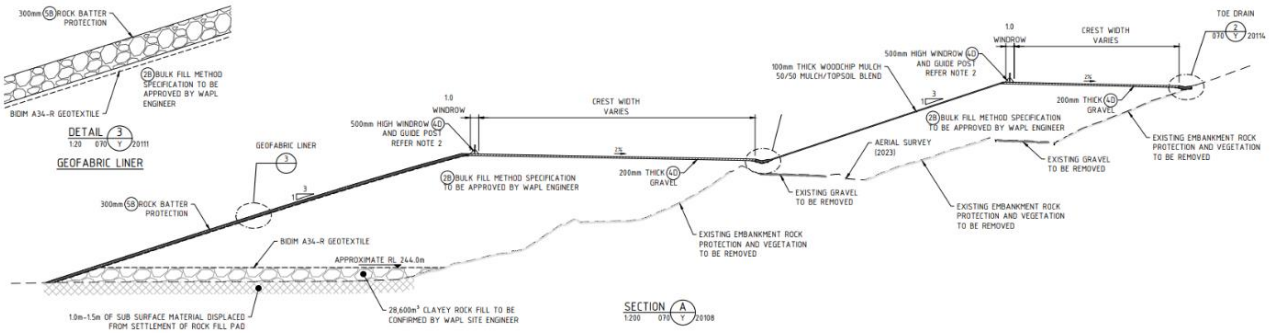

Figure 4-4 BRDA 4 Stage 8 Buttress View (Typical)

The Construction Quality Assurance (CQA) is managed onsite under the control of the BRDA Construction Superintendent. The CQA program has been developed over the 34-year life of the BRDAs. In addition, an independent NATA registered soils testing laboratory is located onsite, specifically for CQA testing of earthwork materials. No major changes are proposed to the current CQA program for BRDA 4 Stage 8. The earthworks specification has been developed by Worsley over the life of the BRDAs, into a comprehensive document, and has been updated by Worsley for the FY26-28 construction season. The control/management of deviances in construction and testing tolerances is managed by Worsley (LOM, 2023a).

The analysis of residue strength and BRDA stability undertaken as part of the Going Higher Study (AECOM, 2018) has confirmed that the BRDAs can be safely constructed to an elevation of a reduced level (RL) 345mAHD, or higher if required, limited only by considerations of practical construction and operation of smaller cell areas as the height increases. Using conservative strength parameters, the factor of safety against dam wall instability exceeds current industry guidelines for both operational and closure performance (LOM, 2023a).

4.2.2 BRDA 5 STAGE7 OVERVIEW

BRDA 5 Stage 7 Cell 1 to 6 will be completed at RL 295.5mAHD with a 5m raise. The raise will be predominantly constructed in an upstream configuration around the perimeter, with a partial centreline construction and extension of decant towers as shown in Figure 4-5 (LOM, 2023b).

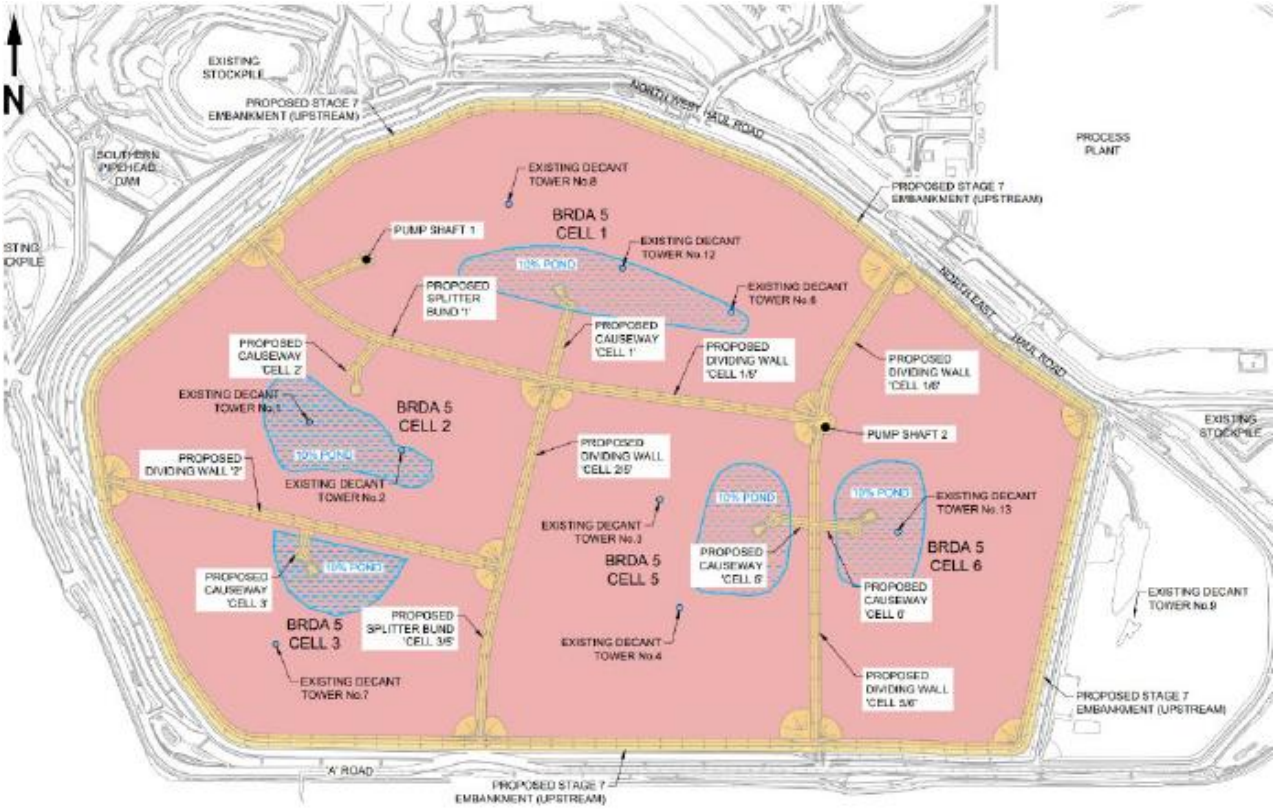

Figure 4-5 : BDRA 5 Stage 7 Construction Plan

Embankment configuration

The embankment modification to Stage 7 and the corresponding reason/justification for each modification, as identified by LoM (2023b), are presented in Table 4-3. The typical Stage 7 embankment cross sections are shown on Figure 4-6 and Figure 4-7.

Table 4-3: BRDA 5 Stage 7 Embankment Features and Justification

Embankment	Justification
Cell 6/7 splitter bund	Splitter Bund Cell 6/7 to be constructed as Upstream Embankment Configuration. Cell 7 is currently under PFS to be converted to a Decant Pond.

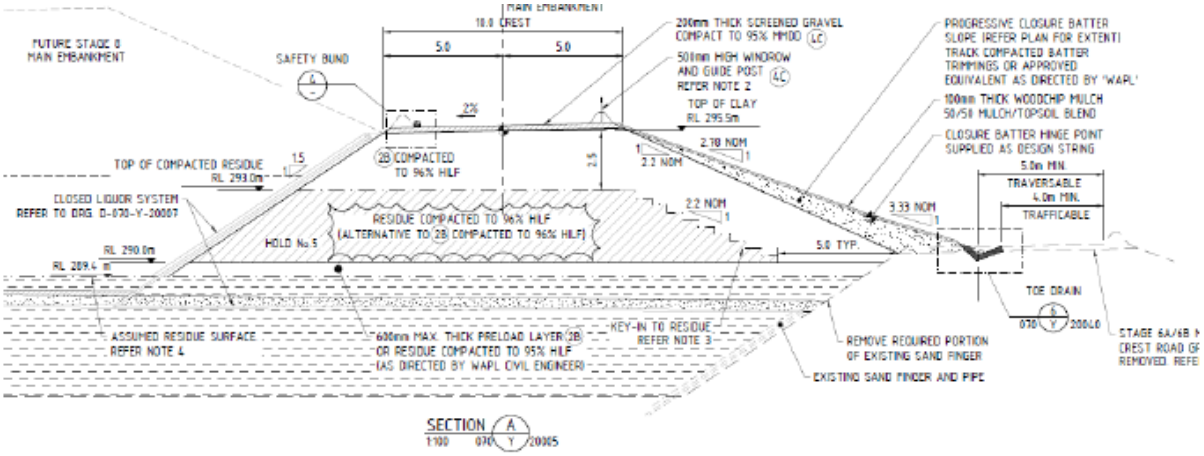

Figure 4-6: Typical Section - Upstream Embankment

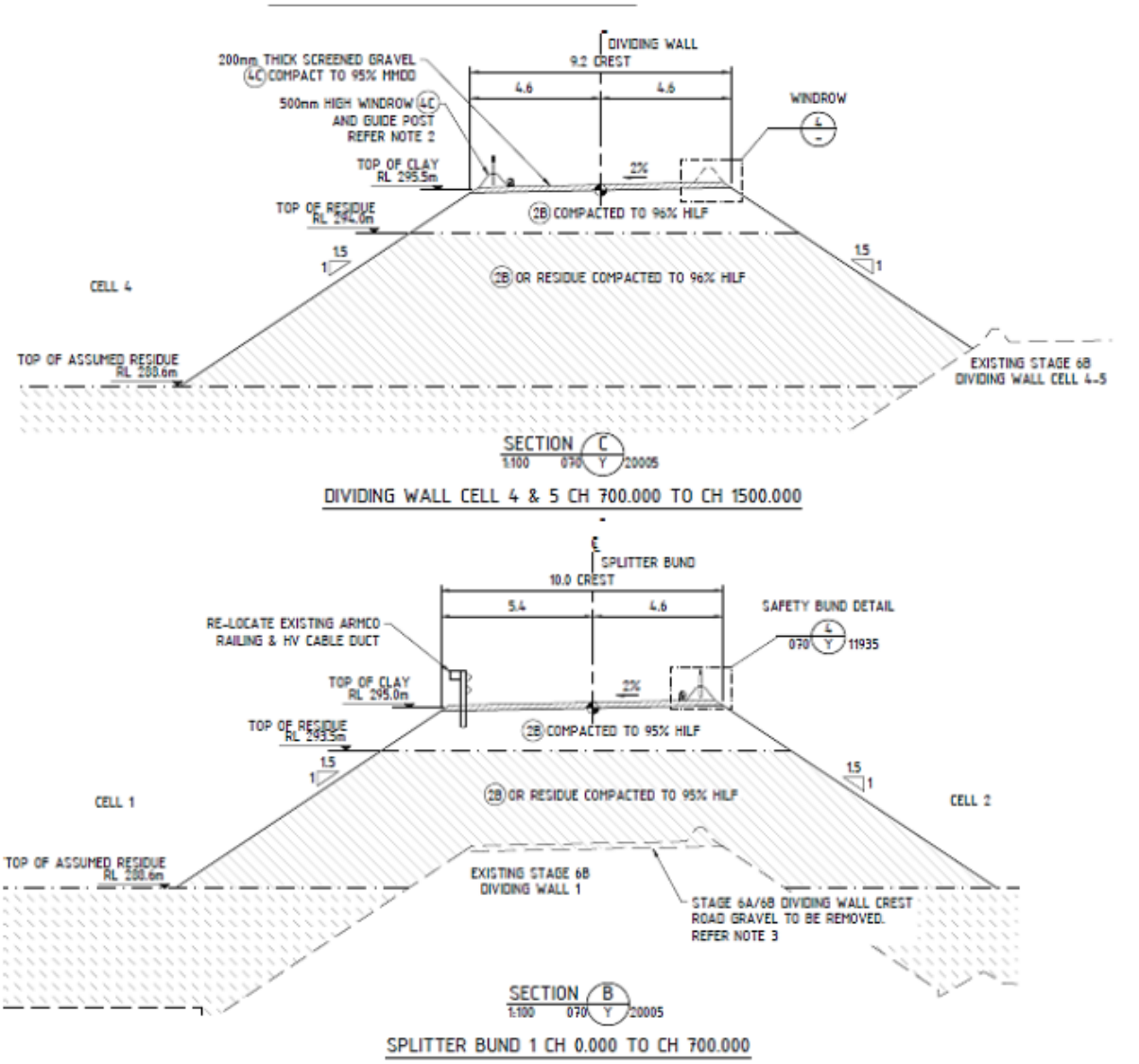

Figure 4-7: Typical Section – Dividing wall and splitter bund

Cell Configuration

The recent introduction of the "Structural zone" has a requirement to keep operational ponds at 10% of the total cell area to ensure water remains outside the structural zone. The existing decant towers in Cell 1 to Cell 5 are all located within Structural zone. The following changes are proposed for Stage 7 cell configuration (Figure 4-5):

- The northern perimeter of Cell 6 will be a downstream embankment raise (300m) where the existing topography allows before transitioning to a centreline embankment raise (310m) to align with the Cell 1 embankment
- Existing decant tower N0.13 extended to RL295.5m

Cell Optimization

Merging of Cell 2 and 3 was identified in the Decant Risk Assessment (LOM, 2023b Section 2.11.3) to assist with pond management in Cell 3. Cell1/4 is planned to be modified to synchronize the design of combination of Cell 2 and 3. However modifying both cells, Cells 1/4 and 2/3 in the same stage would put significant strain on the deposition plan (due to re-contouring of the residue beach slope). Floating decants will be used in cell 3 to manage the pond and locate it outside of the structural zone. The plan and design of merging cells 2 and 3 requires further internal approval however it would not affect the fundamentals of Stage 7 design.

CQA for BRDA 5 is managed onsite under the control of the BRDA Construction Superintendent. No major changes are proposed to the current CQA program for BRDA 5 Stage 7. The earthworks specification has been developed by Worsley over the life of the BRDAs, into a comprehensive document, and has been updated by Worsley for FY26-28 construction season. The control/management of deviances in construction and testing tolerances is managed by Worsley.

4.2.3 BRDA 5 STAGE7 FY27

BRDA 5 Stage 7 construction is divided into two parts and will be completed in FY27 and 28 respectively. The Cells 1 and 2 raise incorporates several components including:

- Upstream embankment construction (perimeter)
- Internal embankment construction (splitter bund and dividing walls)
- Extending existing Decant towers (No. 1, 2 &7)
- Amphiroller ramps

The general configuration of BRDA Stage 7 FY27 is show in Figure 4-8.

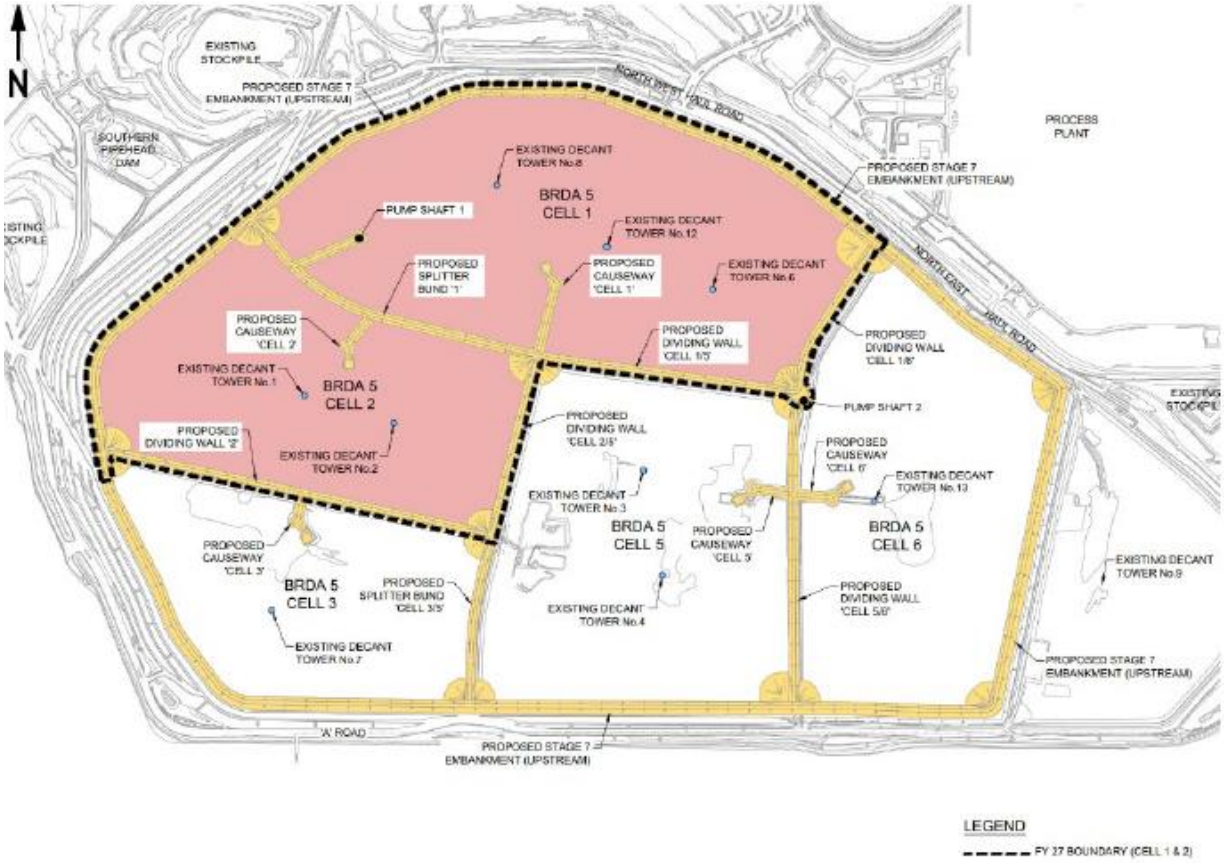

Figure 4-8 BRDA 5 Stage 7 - FY27 Design configuration

4.2.4 BRDA 5 STAGE7 FY28

BRDA 5 Stage 7 southern part (Cell 3, 5 & 6) incorporates several components including:

- Upstream embankment construction (southern and eastern perimeter)
- Internal embankments construction (splitter bund and dividing wall)
- Decant access causeway into Cell 3, 5 and 6
- Stormwater runoff features from perimeter embankments
- Operation access for inspections and maintenance

The general configuration of BRDA Stage 7 FY28 is shown in Figure 4-9.

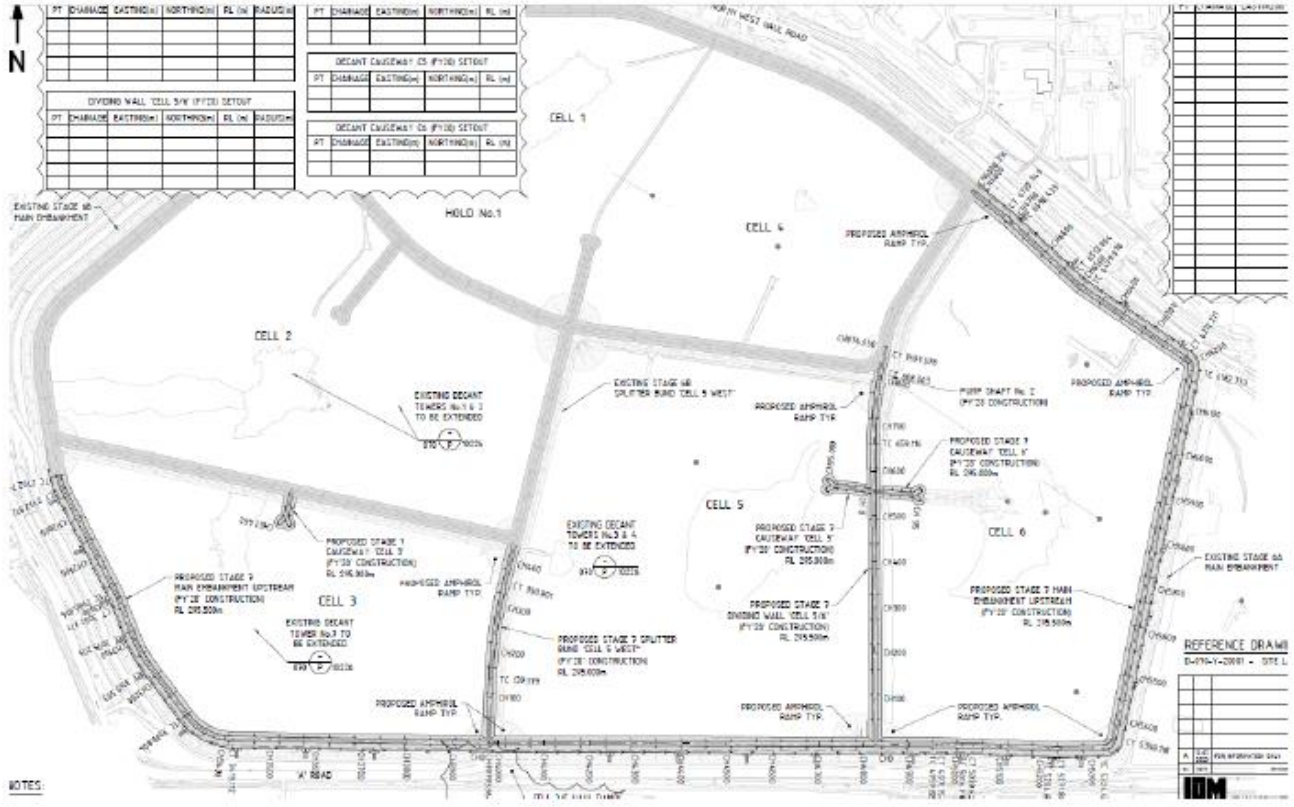

Figure 4-9 BRDA Stage 7 FY28 Southern Cells Design configuration

4.3 Tailings Properties and Deposition

For the effective deposition of tailings, Worsley have set a minimum solids content target of 55% percentage of weight (wt). From past experience, a 54% solids content affects the beach angle development, the decant pond size and the dewatering cycle times and Amphiroller passes. On the other hand, exceeding 58% (wt) solids content can impose limitations within the refinery with respect to pumping (particularly to BRDA 4X, which is 30 m higher than BRDA 5). Testing of minimum solids content between July 2023 to November 2023 yielded an average between 55.7% to 56.1% (wt) (South32, 2023a).

Table 4-4: General Tailings Properties

Property	Description
Tailings type	Non-settling thickened tailings, 10.5 Mtpa (1,250 tons per hour).
Pump pressure at Geho pump	8500 kPa through 2 x 250 mm diameter steel mud lines (typical)
Initial solids content	55% (average – measured daily via nuclear density meter on discharge pipe) at nominally 100 to 200 centipoises
Final solids content	72% (minimum – measured via survey, monthly and in situ annually) and 28kPa shear strength (target minimum). Note: solids content assumes -2% soda: 74% with soda included
Time to reach 72% solids content:	30 days in summer, 60 days in winter, annual average 42 days with amphirolling. 18 months without amphirolling in upper 1.5m crust only
Soil classification:	Sandy SILT
Specific gravity:	3.65 to 3.90, average 3.78
Dry density:	1.56 to 1.86 t/m^3
Voids ratio, e_0:	1.09 – 1.31
Plasticity index:	4 to 10%, average 7%
Beach angle:	0.6% but varies daily based on depth of pour (suction of underlying desiccated residue), on plasticity index and solids content- determined by monthly laser scanning of active cells.
Rate of rise:	1.7m/year
Permeability:	$1x10^{-6}$ m/s on deposition decreasing to $5x10^{-8}$ m/s at 72% solids.
Soda content of deposited residue:	2.03% (based on liquor density)
pH of deposited residue:	12.3

Tailings deposition at BRDA 4 and BRDA 5 are managed by a team of engineers and technicians, under the direction of the Worsley BRDA Execution Superintendent. No changes are proposed to the operation of the BRDAs 4 and BRDA 5, as a result of construction of BRDA 4 Stage 8 and BRDA 5 Stage 7 respectively. The following points are of relevance to the design process:

- Spigots are managed four-hourly around the cell perimeter in areas of short pours and overnight in areas of significant beach length, to maintain the pond around the decant. The design of regular shaped cells is therefore preferred from an operability viewpoint.
- A beach length of around 500 m has been found to be about optimum with 55% solids content, which forms a 0.6-degree beach slope.
- As part of the mud deposition strategy at Worsley, Amphirollers are used to plough the residue surface until a minimum undrained shear strength of 28 kPa is achieved for each layer. This is tested opposite every discharge spigot around the full perimeter of each cell, at 50 m out from the

embankment, and recorded as a performance target; the 28 kPa shear strength approximating a final solids content of 72%.
- For handover to construction for the next stage, the shear strength of the final 1 m (top 1 m) must be a minimum of 100 kPa (now changed to 70 kPa by Worsley in 2020) to avoid bearing capacity failure during construction of the upstream raise. Shear strength testing via handheld vane shear will be undertaken prior to construction to confirm that minimum shear strength requirements have been met.
- The in situ vane shear strength of the mud is tested by Worsley's civil engineer prior to commencement of construction, in order to verify that the required mud strength has been achieved. The scope of this testing is outside of this design report.

Extensive monitoring of the performance of the BRDAs wall stability and water management is conducted and includes:

- Daily and weekly surface and embankment inspections;
- Drone surveys: Pond size & location; deposition performance and beach slopes;
- Satellite surveys that can measure < 5 mm disturbances in the embankments;
- Piezometer readings of pore pressure in embankments; and
- Full depth residue samples to verify residue strength.

Before each of the 5 m upstream raises are initiated, measures are implemented to ensure that the deposited residue has sufficient strength to support the planned raise. Tailings strength is achieved by the drying and consolidation of deposited tailings through a combination of installed drainage systems, evaporation through wind and sun action, and active compaction and drying methods using GPS tracked Amphirollers/mud farming, dozer plowing and compaction to achieve a controlled residue solids (CRS) percentage. This is especially important where an upstream embankment raising method is used, as this method consists of the construction of new, raised retaining embankments on consolidated tailings.

4.4 Construction Quality Assurance

4.4.1 CONSTRUCTION QUALITY CONTROL SYSTEM

Worsley has established a Quality Control System (QCS) that is applicable to the construction of the BRDA 4 Stage 8 and BRDA 5 Stage 7 lifts. The relevant objectives of the QCS are to ensure that:

- All sections of the works are completed in accordance with the Drawings, Specification and any specific Site Instructions;
- Material quality and compaction standards are met;
- Zone material thickness, pipe placement and other construction tolerances are adhered to;
- Rework is minimised;
- Relevant key performance indicators are agreed, monitored and reported to all personnel employed on the project works;
- There is continuous improvement in the practical and collaborative application of the QCS; and
- The construction equipment, methodology and layer thicknesses adopted in the Contractor's method statement are recorded in the Annual BRDA Construction Report.

4.4.2 CONSTRUCTION QUALITY ASSURANCE REQUIREMENTS

Specific measures relating to the quality assurance of upstream raise embankment construction shall include:

- In advance of construction, a method statement shall be finalised that will detail the equipment used to place and compact the embankment, as well as planned lift thicknesses and the planned minimum number of passes of the compaction equipment for each lift;
- Compaction control techniques, including the taking of sampling and testing methodologies shall

be in accordance with the requirements of AS 1289, as set out in the BRDA Earthworks Specification;
- A risk-based change management procedure, including the written amendment of the method statement, will be implemented where the need for changes are identified;
- The offset at each compacted lift of the embankment shall be marked along the edge as construction progresses;
- Layer depth sampling and testing by a Materials Testing Laboratory shall be conducted as specified in the BRDA Earthworks Specification;
- A minimum of three (3) nuclear density tests (one (1) test on each side of the embankment and one (1) random location) shall be performed for each lift per construction bay. The maximum length of a construction bay shall be 200 m; and
- All materials used for construction shall be in strict accordance with the requirements of the BRDA Earthworks Specification, manufacturer's recommendations and the Worsley BRDA Civil Engineer's written instructions.

4.4.3 POST-CONSTRUCTION SIGN-OFF

Once construction is complete, a construction report is prepared detailing all construction works and technical queries if raised. The report is signed by Engineer of Record (EOR) and the Worsley Site Senior Executive to validate that the design intent was met during construction.

4.5 Storage Capacity

As per the recent survey data (as of August 2024) provided, a summary of the storage capacity for all BRDAs and waterbodies is given in Table 4-5.

Table 4-5: BRDA Storage Capacity as of August 2024

BRDA	Avg. toe (m AHD)	Operational freeboard (m)	Beach slope (avg.) (%)	Remaining deposition capacity to design surface (m^3)	Remaining deposition capacity to freeboard for 1 in 1000 AEP storm (m^3)	PMP volume (m^3)	Remaining deposition capacity to freeboard for 6 hr PMP (m^3)
BRDA 2, S8	312.07	2.36	-1.31	1,206,378	1,109,427	280,478	1,352,530
BRDA 4, S7(Cell 1)	297.65	3.06	-0.64	1,906,310	1,906,310	359,629	1,826,685
BRDA4, S7(Cell 2)	298.03	4.13	-0.77	2,527,345	2,527,345	354,805	2,427,969
BRDA 4X, S5	300.69	1.02	-0.89	1,484,127	1,484,127	572,648	1,482,967
BRDA 5, S5B (Cell 1)	288.24	5.37	-0.65	3,840,206	3,840,206	458,261	2,779,154
BRDA5, S5B (Cell 2)	285.57	6.02	-0.46	4,164,729	4,164,729	379,739	4,055,044
BRDA5, S5B (Cell 3)	284.66	6.20	-0.67	2,730,181	2,714,720	266,647	2,602,085

BRDA5, S5B (Cell 5)	284.84	6.14	-0.83	4,189,802	4,189,802	377,830	4,120,607
BRDA5, S5A (Cell 6)	283.22	0.81	-0.63	469,516	469,516	381,008	367,690
BRDA5, S4A (Cell 7)	280.04	6.81	-0.75	2,084,745	2,191,840	268,442	2,364,788

5 Part 7: Other Approvals and Consultation

5.1 *Alumina Refinery (Worsley) Agreement Act 1973*

Worsley currently operates under the *Alumina Refinery (Worsley) Agreement Act 1973* (Worsley State Agreement). The Worsley State Agreement provided the initial basis for the Project to proceed. Clause 5A of the Worsley State Agreement Act required the RWJV to submit a detailed Environmental Review and Management Programme (ERMP) for assessment and approval in order for the Project to begin. Reporting against the sections c5A(3) & section c16(10) of the Worsley State Agreement Act is undertaken annually through submission of the Worsley 10-Year Plan and Annual Review process.

5.2 *Mining Act 1978*

BRDA 4 and BRDA 5 are governed under Crown Lease Agreement I154246, which effectively covers three separate areas inside the RLA. The western portion of the RLA is overlaid by part of Mining Lease M258SA, thus permitting mining activity within the overlapping zone.

The design, construction, operation and closure of all tailings storage facilities (TSF) in Western Australian mines must comply with the *Mines Safety and Inspection Act 1994*, *Mines Safety and Inspection Regulations 1995* and *Mining Act 1978* as well as DEMIRS' codes and guidelines. Annual BRDA Audits are conducted by independent third parties and submitted to DEMIRS to ensure compliance with the following DEMIRS guidance:

- Code of Practice: Tailings storage facilities in Western Australia;
- Guide to Departmental requirements for the management and closure of TSF; and
- Tailings storage facility audit.

5.3 Part IV *Environmental Protection Act 1986*

Ministerial Statement 719 applies to the Refinery and the associated BBM. In relation to the current application, Worsley is required to implement the Water Resource Management Plan for the protection and management of nearby proclaimed water resources and to give effect to a zero discharge to these natural resources, and thereby not diminish their environmental value or use.

The Refinery operations were assessed in a 2005 application which was subsequently approved under Ministerial Statement 719 (and several subsequent Section 45C applications and approvals). The Refinery has an approved production rate of 4.7 Mtpa. Schedule 1 of Ministerial Statement 719 includes management limits for SO_2, NOx, Particulates and VOC's. These air emissions and associated targets and reporting are also currently regulated through the Environmental Protection Licence (L4504/1981/17) issued under Part V of the EP Act.

5.4 *Environment Protection and Biodiversity Conservation Act 1999*

In June 2004, Worsley's proposal to increase the production rate at the Refinery from 3.5 Mtpa to 4.4 Mtpa ("Worsley Alumina Efficiency and Growth"), included five additional mining areas: East Quindanning, Morgan's, Hotham North Extension, Central and Brookton, was assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through the Bilateral Agreement between the Commonwealth and the State of Western Australia. EPBC Act approval 2004/1566 was issued for the "Worsley Alumina Efficiency and Growth" aspects of the Project on 6 June 2007.

6 Part 9: Emissions, discharges and waste

The following potential emissions and discharges have been identified in relation to the proposed FY26-28 construction works.

6.1 Surface Water

BRDA 4 is located approximately 800 m east of FWL which feeds into the Augustus River. Surface water management features are in place to separately collect fresh water and residue impacted water and convey these separate streams to the FWL and RCL respectively. Construction activities will be conducted to ensure surface water flows from BRDA 4 flows via gravel lined spoon-drains at the toe of the embankments leading to rock-lined drop structures to the base of BRDA. From the base of BRDA 4, surface water then reports to the NPHD. The flow capacity of the main diversion channels around the BRDAs has previously been designed, by others, for a 6-hour Probable Maximum Precipitation (PMP) event.

BRDA 5 is located approximately 650 m south-east of FWL which feeds into the Augustus River. The FWL receives rainwater falling on the outside batters of BRDA 5, which is classed as forming part of the Refinery's clean water circuit. Water falling on the outside slopes is unaffected by bauxite residue and is therefore directed to the FWL via silt traps to intercept clayey silt that may be entrained from flowing over the outside batters. Construction activities will be conducted in a manner that promotes the drainage of rainwater falling on the construction areas to its upstream side, i.e. onto the BRDA. This is achieved by the establishment of a construction bund on the downstream edge of the construction area and by inclining embankment layers and road surfaces to the upstream side.

Surface water flow from BRDA 5 Stage 7 will be via gravel lined spoon-drains at the toe of the Stage 7 embankment leading to rock-lined drop structures to the base of BRDA 5. From the base of BRDA 5, surface water will report to the diversion drain through the southern valley silt trap and into the southern arm of the freshwater lake. The flow capacity of the main diversion channels around the BRDAs has previously been designed, by others, for a 6-hour PMP event, leading to significant overcapacity compared to the TSF Code of Practice (DMP, 2013) of a 1 in 100-year average return interval event.

Water monitoring at FWL is conducted monthly and includes parameters such as pH, EC, dissolved oxygen, turbidity, temperature, sodium chlorine and aluminium, as defined in the Water Management Plan (South32, 2021). In the event that adverse water quality from either BRDA is detected or exceedance of a trigger level occurs, a Trigger Action Response Plan (TARP) is activated. Actions from the implementation of the TARP will, amongst other action, include an investigation into the source of the exceedance and will implement corrective actions to address the cause and effects, if any.

FY26-28 construction activities performed outside the footprint of the BRDA, such as the loading and transport of construction materials, also have the potential to cause contamination of surface water, primarily through accidental releases of contaminants, such as hydrocarbons, and through the siltation of surface water flows. Accidental releases of hydrocarbons and other pollutants are managed under the Refinery's spill response and clean-up procedures. The potential siltation of surface water flows that may report to natural receptors, such as FWL and the Augustus River, is managed through on-site water drainage arrangements and the routing of water via sedimentation ponds before it is released to the FWL.

With the established management and monitoring procedures in place, it is highly unlikely that the construction activities for FY26-28 will result in poor water quality reaching the FWL. Surface water monitoring locations are shown in Figure 6-1.

6.2 Groundwater

Both BRDAs have low permeability clay liners that cover the entire footprint with under drainage systems to protect underlying groundwater from seepage from the residue areas via a network of underflow collection pipes. The underdrainage systems provide a defense against seepage to the groundwater by substantially lowering the hydraulic head at the base of the BRDA's deposit. Groundwater monitoring is currently undertaken downstream of the BRDAs to detect changes in water quality in accordance with Ministerial Conditions in Ministerial Statement 719. Monitoring locations are shown in Figure 6-1**Error! Reference source not found.**. No impacts to groundwater from the BRDA operations have been detected to date. Waste processing and containment infrastructure for the BRDAs are also managed in accordance with the Licence L4504/1981/17.

Liquor from the active deposition areas is drained to the closed liquor circuit via the decant system and the internal drains located around the inside perimeter of the BRDAs. Seepage of water from embankment raise activities performed as part of the FY26-28 works will therefore be captured by the above-mentioned liquor collection and drainage system and will be prevented from coming into contact with groundwater.

Construction activities performed outside the footprint of the BRDA, such as the loading and transport of construction materials, also have the potential to cause contamination of groundwater, primarily through the accidental releases of contaminants, such as hydrocarbons. These are managed under the Refinery's spill response and clean-up procedures.

The Refinery operates an extensive groundwater monitoring network, which comprises upstream reference bores, potential impact bores in the immediate vicinity and down gradient of potential contamination sources, as described in the Water Management Plan (South32, 2021). Data is compared to historic data for the site and specific trigger levels for each bore. In the event of an adverse trend or exceedance of a trigger level the TARP is activated.

Given the nature and size of the existing operations, it is unlikely that any material contamination to groundwater will occur during the construction of the BRDA embankment raise.

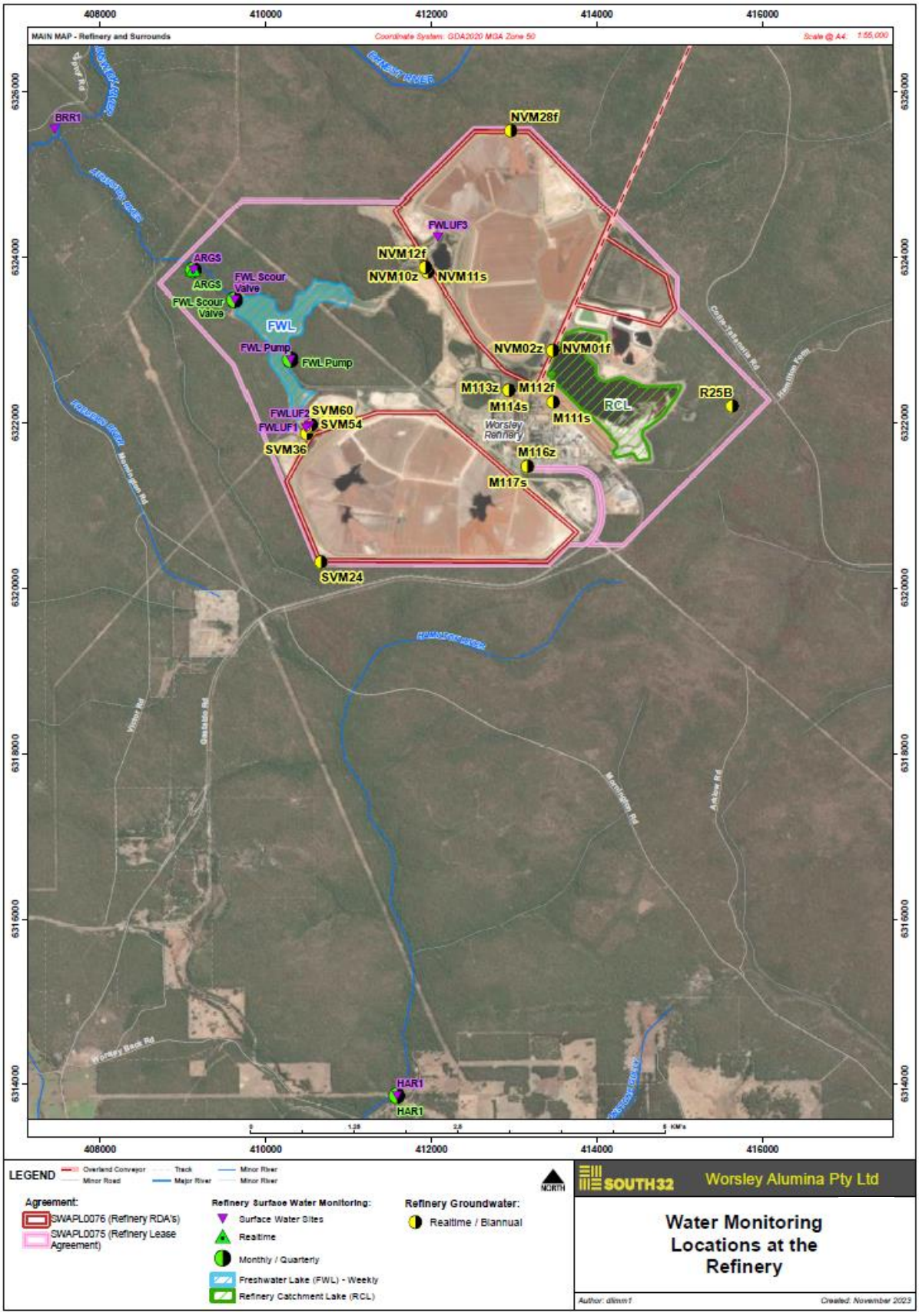

Figure 6-1 Refinery Surface and Groundwater Monitoring Locations

6.3 Air Emissions and Dust

The BRDAs surface tends to dry out as the weather warms and rainfall decreases later in the year. As wind speeds traditionally increase through October/November, the potential of BRDA dust liberation increases dramatically. To suppress dust, the BRDAs surface will be hydromulched with the addition of Gluon 500 polymere to increase resistance to summer rain events and sustained strong winds.

Dust may also be generated during the construction of the FY26-28 embankment raise from the loading, transport and delivery of construction materials, through construction plant and vehicle movements and through physical earthworks. Water carts will be used as required during the construction phases to assist with the management of fugitive dust. Other management strategies that are employed at Worsley to manage dust on the BRDAs include the use of surface binding agents and the use of dust suppressant where required. Much of the potential for dust generation with be avoided by adherence to construction material moisture requirements.

The management of dust emissions during construction works at the BRDA will continue to be carried out in alignment with the draft Air Quality and Dust Management Plan – RLA (Attachment 8D). The Refinery conducts ongoing investigations into the use of different dust controls in the BRDA areas, including the use of a combination of dust suppressant, surface binding agents and ripping of the BRDA surfaces. Fixed dust monitoring stations are installed on the Refinery boundary (Figure 6-2). Two Tapered Element Oscillating Microbalances and one E-Sampler, targeting particulate matter with a diameter of 10 microns (PM_{10}) particles, are used to monitor dust impacts from the BRDAs, roads, tracks and construction areas (including material handling) at the Refinery. PM_{10} particles are monitored according to the National Environment Protection Measures – Ambient Air Quality Standard and are reported in Worsley's Annual Environmental Report (AER). No exceedances due to BRDA activities have been recorded at sensitive receptors. Worsley will continue to track and investigate complaints made from the community in relation to dust in accordance with the Worsley Community Complaint Procedure.

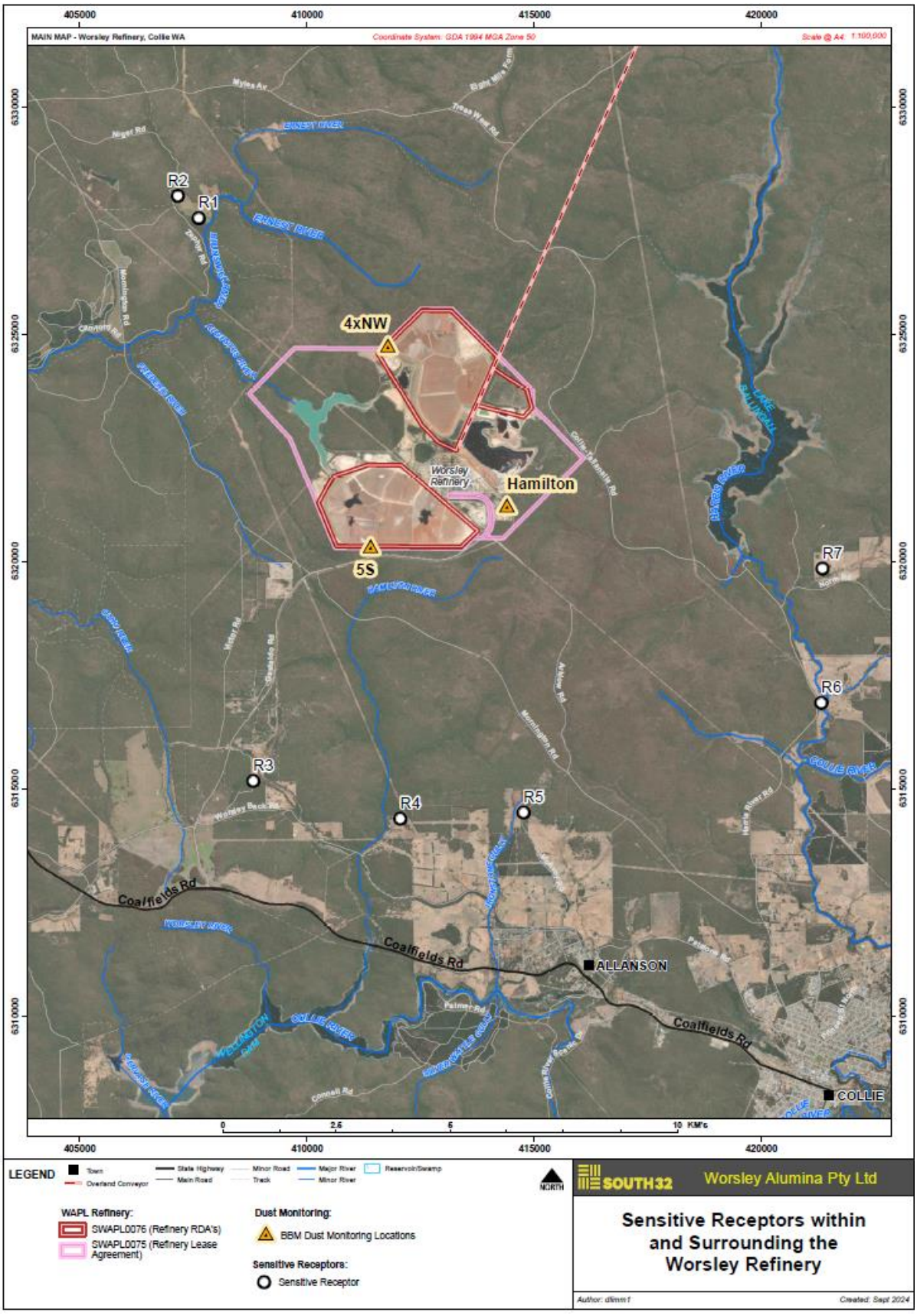

Figure 6-2 Dust Monitoring Locations and Sensitive Receptors

7 Conceptual Site Model/Risk Assessment

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered are detailed in Table 7-1 which also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary. The Conceptual Site Model/Risk Assessment is applicable for BRDA 4 and BDRA 5.

Table 7-1: Conceptual Site Model (CSM) table for BDRA 4 and BRDA 5

Source / Activities	Potential emissions, pollutants, or contaminants of concern	Potential pathway	Potential receptors	Potential impacts	Proposed controls and contingencies
Construction					
Transport, mixing, compaction of materials for the construction of embankments, internal causeways, splinter bunds, construction ramps, vehicle movements, lift-off from stockpiles and/or stored product, earthworks etc.	*Dust*	*Air/ windborne pathway*	*Single rural dwelling approximately 6 km due south and north of premises*	*Health and amenity impacts*	*Water carts.* *Surface binding agents.* *Adherence to construction material moisture requirements.* *Cessation of a particular operation or an amendment to operational procedure when dust cannot be controlled.* *Air Quality Management Plan*
	Noise	*Air/ windborne pathway*	*Single rural dwelling approximately 6 km due south and north of premises*	*Health and amenity impacts*	*All onsite machinery compliant with vehicle noise emission requirements.* *Site will conduct works in accordance with Section 4 of AS 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites (standards Australia 2010)* *Separation distances are such that any noise and vibration from construction works is sufficient that will not occur*
Mobilisation of stormwater	*Sediment laden runoff. Potentially contaminated stormwater*	*Overland runoff*	*Augustus River approximately 2km north west of the BRDAs*	*Reduced surface water quality and ecosystem disturbance.*	*Outside batters of BRDA 4 and BRDA 5 are captured by toe drains, diversion culverts to the FWL via silt traps.* *Construction of a bund on the downstream side of the construction areas so that loose materials subject to mobilisation to stormwater runoff will be undertaken such that the drainage of rainfall falls to the upstream side of embankments where possible.* *Water quality monitored within the FWL include parameters for turbidity. If a trigger level is exceeded, as defined in the sites TARP, an investigation into the source of the exceedances and implementation of corrective action will occur to address the cause of the incident.*
Embankment failure (Dam Break)	*Bauxite residue Slurry water: containing Al_2O_3, Na_2, CO_3, and SO_4*	*Direct discharge and overland flow to nearby land and water*	*Augustus River approximately 2km north west of the BRDAs.* *Native vegetation in State Forest*	*Reduced surface water quality and ecosystem disturbance.* *Reduced vegetation health and potential loss of vegetation in some areas.*	*The construction methods determine the capacity of the embankments to remain stable under a range of conditions during operations. Construction will occur in accordance with the Life of Mine Design Report BRDA 4 – Stage 8 Raise (2024a), Life of Mine Design Report BRDA 5 – Stage 7 Raise (2024b); and the premises CQA Plan.* *The Works Approval Holder provides that these reports demonstrate the embankment raise is compliant with the:* • *Code of Practice for Tailings Storage Facilities (DMIRS);* • *Australian National Committee on Large Dams (ANCOLD);*

Source / Activities	Potential emissions, pollutants, or contaminants of concern	Potential pathway	Potential receptors	Potential impacts	Proposed controls and contingencies
					• *Guidelines on Tailings Dam Planning Design, Australian National Committee on Large Dams (ANCOLD); and* • *Guidelines on Dam Safety Management (ANCOLD, 2003).* *The Design Report BRDA 4 – Stage 8 Raise (2024a) and Design Report BRDA 5 – Stage 7 Raise (2024b) contain an assessment of the Stability of the dams under seismic loading, drained and undrained conditions. The report claims the BRDA 5 when constructed to the above specifications, will meet the minimum factors of safety. Deposition will not commence until these claims have been verified by an independent assessment through a third-party geotechnical assessment of the Design Report and until any critical issues identified through the third party review, are satisfactorily addressed.*
Operations					
Embankment failure (Dam Break)	*Bauxite Residue Slurry water: containing Al_2O_3, Na_2, CO_3, and SO_4*	*Direct discharge and overland flow to nearby land and water*	*Augustus River approximately 2km north west of the BRDAs.* *Native vegetation in State Forest*	*Reduced surface water quality and ecosystem disturbance.* *Reduced vegetation health and potential loss of vegetation in some areas.*	*Management of water within the raise prior to deposition mass being consolidated is through careful management of tailings deposition and supernatant in accordance with the BRDA Operating Maintenance and Surveillance Manual:* • *Daily inspections of BRDAs* • *Delivery mudline fitted with dropper pipe spigots that minimise velocity of deposition;* • *Spigots paced an average of 72 m apart and managed 4-hourly short pours around perimeter embankments to maintain pond around the decant tower;* • *Beach length of approximately 500 m with tailings deposition of 55% solids and a 0.6% degree beach slope;* • *Wet pours of a maximum of 1.1 m at a time; and* • *Use of Amphirollers on wet pours within 72hours of pour until an undrained shear strength of 28 kPa is achieved for each layer.*
Leaks and spills from pipelines, mudlines, pumps and associated infrastructure	*Bauxite residue, and decant water* *Slurry water: containing Al_2O_3, Na_2, CO_3, and SO_4*	*Direct discharge and overland flow to nearby land and water*	*Augustus River approximately 2 km north west of the BRDAs*	*Reduced groundwater quality and impacts to downgradient groundwater users.*	• *Comprehensive and daily monitoring of BRDA's including mudlines delivering bauxite to the BRDA's, decant recovery pipelines and valves;* • *Scheduled maintenance;* • *Incident recording and reporting* • *TARP to identify and respond to issues as they arise;*

Source / Activities	Potential emissions, pollutants, or contaminants of concern	Potential pathway	Potential receptors	Potential impacts	Proposed controls and contingencies
					• The site is operated as a closed system, contaminated water and leachate from spills is contained within the premises; and • Extensive groundwater and surface monitoring is undertaken to validate effectiveness of controls (under Ministerial Statement 719).
Overtopping of BRDA due to excess loading or heavy rainfall events or both	Bauxite residue, and decant water Slurry water: containing Al_2O_3, Na_2, CO_3, and SO_4	Overland flow, direct discharge to soil, infiltration to groundwater	Augustus River approximately 2km north west of the BRDAs. Native vegetation in State Forest	Reduced surface water quality and ecosystem disturbance. Reduced vegetation health and potential loss of vegetation in some areas.	• Maintenance of operational freeboard of 0.5 m between the tailings at the top of the beach and the embankment crest (inclusive of wave action); • The beach angle over 100 m of beach is 0.6 m; • Only two or three cells are actively used at any one time, may be used in the event of an extreme storm event to temporarily store storm water; • Maximum operating levels are calculated to only be exceeded in a 1:1,000 year annual recurrence interval storm event; • Ability to move contaminated storm water following high rainfall events to other containment infrastructure on site such that a water from an extreme 1: 1000- year annual rainfall incidence 72 hour duration event is completely contained within the premises infrastructure, enabling compliance with the sites "zero discharge" requirements under the Agreement Act; and • TARP to identify and respond to issues as they arise.
Seepage of contaminants through the base of the BRDA liner causing groundwater contamination and mounding	Leachate Slurry water: containing Al_2O_3, Na_2, CO_3, and SO_4	Direct discharge to soil, infiltration to groundwater	Shallow aquifer discharging to FWL and Augustus River	Reduced groundwater quality and impacts to downgradient groundwater users.	• Inspection of underdrain at pipe head dam inflow; • Report any changes • Vacuum pumping to unblock pipes if required; • TARP to identify and respond to issues as they arise; • The site is operated as a closed system, contaminated water and leachate is contained within the premises; and • Extensive groundwater and surface monitoring is undertaken to validate effectiveness of controls (under Ministerial Statement 719).
Contaminated stormwater run off	Mobilisation of stormwater	Overland flow, direct discharge to soil, infiltration to groundwater	Shallow aquifer discharging to Freshwater Lake and Augustus River	Reduced surface water quality and ecosystem disturbance.	• Design such that stormwater that falls on the downstream side of perimeter embankments is diverted to of Gravel lined spoon drains at the toe of embankment leading to rock drops; • The rock drops report to southern diversion dam through southern valley silt trap to the southern arm of the FWL; and • Periodic testing of FWL is undertaken.in accordance with

Source / Activities	Potential emissions, pollutants, or contaminants of concern	Potential pathway	Potential receptors	Potential impacts	Proposed controls and contingencies
					Ministerial Statement 719.
Dry deposition surface	*Dust lift off*	*Air / windborne pathway*	*Nearby vegetation, nearby Augustus River approximately 2 km northwest of the BRDAs*	*Reduced vegetation health and potential loss of vegetation in some areas.*	• *Dust from the BRDA's is managed in accordance with the sites Air Quality and Dust Management Plan – RLA Business Blueprint and includes:* • *Daily visual monitoring of BRDA surface;* • *Dust monitoring stations upstream and downstream to monitor dust lift off;* • *Addition of dust suppression and surface binding agents hydro mulch and Gluon500 to control dust over residue deposition areas according to BRDA annual Dust Management Plan;* • *Use of water carts and sweeping in dry weather;* • *Mechanical ploughing and ripping of BRDA surfaces; and* • *Trigger levels and corrective action response and reporting.*

8 Monitoring and Reporting

Given that the proposed construction networks are covered by the existing Refinery surface water, groundwater and dust monitoring networks, no additional monitoring is proposed in respect to discharges to the environment.

Project inputs, including the use of fuel, lubricants and concrete will be monitored in accordance with existing Worsley procedures to facilitate sustainability reporting.

9 Progressive Closure

BRDA design will incorporate progressive closure planning by integrating the ultimate closure plan within the design, construction and operation activities, and in accordance with learnings identified and trialled during recent raise designs and construction.

The progressive closure approach for future BRDA raises will build off the current BRDA closure approach where the external batter slopes are progressively closed as part of the embankment raising process.

The top surface of the BRDA will be capped when the final design heights are reached as detailed in BRDA Life of Operation Plan Study (LOM, 2020).

10 Part 10: Siting and Location

10.1 Climate

The Refinery is located in the southwest of WA which has a Mediterranean climate with a predominance of winter rainfall. The average maximum and minimum temperatures generally follow seasonal patterns of cold winters and hot summers. The average temperature during the summer months ranges from 12°C to 32°C and during the winter months ranges between 4°C to 17°C.

The mean monthly rainfall is low in the summer months and increases during the winter months, with rain days varying from six days in December to 21 days in July (ETA, 2020). The maximum monthly rainfall is recorded in July and August. Average rainfall records reflected higher rainfalls in the Refinery when compared to the BBM, which is located further to the east (Mattiske, 2021a).

Prevailing winds are from the east-south-east to south-south-east during summer, and from the west-south-west to west-north-west during the winter months (ETA, 2020). Wind speeds are typically calmer during winter and increase during summer. Average wind speeds generally remained below 10 metres per second (m/s) during both winter and summer, with minimal occurrences of wind speeds exceeding 10 m/s.

10.2 Landscape

The Refinery is located on the Darling Plateau, which developed on the Archean crystalline rocks of the Yilgarn Craton. The Craton is a stable shield area, comprising linear belts of metamorphosed sedimentary and volcanic rocks that have been intruded with granitic rocks (granitoid formation). The Refinery also occurs in the Avon Province spanning the Western Darling Range soil-landscape zones. The Western Darling Range Zone is described as moderately dissected lateritic plateau on granite with deeply incised valleys. Soils are formed in laterite, lateritic colluvium, granite weathered in-situ and gneiss. Soils are formed in laterite colluvium or granite weathered in-situ (Schoknecht et al., 2004).

10.3 Biodiversity

10.3.1 FLORA AND VEGETATION

The Refinery is located within the Jarrah Forest bioregion and Northern Jarrah Forest subregion as described by the Interim Biogeographic Regionalisation for Australia (IBRA). The Northern Jarrah Forest subregion is characterised by Jarrah-Marri forest on laterite gravels, and in the eastern part, by woodlands of Wandoo-Marri on clayey soils (Williams and Mitchell, 2001).

A total of 289 nine species from 54 families and 150 genera have been recorded from flora and vegetation surveys in and around the Refinery. One conservation significant species, *Pultenaea skinneri* (Priority 4), has been historically recorded as occurring within the Refinery based on the database search results. Three conservation significant flora species; *Gastrolobium* sp. Prostrate Boddington (Priority1), *Isopogon* sp. Canning Reservoir and *Senecio leucoglossu*s (Priority 4) have a high likelihood of occurrence, but have not been recorded from surveys (Mattiske, 2021b).

The proposed BRDA raises do not require the clearing of vegetation and therefore will not have an impact to threatened and/or priority flora species or Threatened Ecological Communities.

10.3.2 FAUNA

Numerous fauna surveys have been conducted in and around the Refinery area over the past 20 years with the most recent surveys completed in 2021 (BIOSTAT, 2021).

There are 11 conservation significant species that have either been observed or are highly likely to occur within the Refinery area. These are:

- Forest Red-tailed Black Cockatoo (Vulnerable);
- Baudin's Black Cockatoo (Endangered);
- Carnaby's Black Cockatoo (Endangered);
- Peregrine Falcon (Other specially protected species);
- Blue-billed Duck (Priority 4);
- Rakali (native water rat) (Priority 4);
- Quenda (Priority 4);
- Western Brush Wallaby (Priority 4);
- Brush-tailed Phascogale (Conservation Dependent fauna);
- Western Ringtail Possum (Critically Endangered); and
- Quokka (Vulnerable).

No clearing of vegetation is required for the FY25 BRDA raise program, therefore, no threatened and/or priority fauna or fauna habitat will be disturbed or impacted.

10.4 Hydrology

10.4.1 SURFACE WATER

The BRDAs are located adjacent to the Harris River Dam Catchment Area, which is classed as a Priority 1 (P1) Public Drinking Water Source Area (PDWSA). The Refinery and BRDAs run along the western boundary of the P1 area but are not located within the proclaimed catchment area. The BRDAs are located in the proclaimed Surface Water Area (Brunswick River and Tributaries) under the *Rights in Water and Irrigation Act 1914* (RIWI Act), specifically in the Leschenault Estuary – Lower Collie Area. The BRDAs also fall within the Collie River Irrigation District which is proclaimed under the RIWI Act (South32, 2022).

The RLA lies within the Augustus River catchment, a tributary of the Brunswick River which is primarily used for agricultural purposes. The FWL at the Refinery was built in 1983 with the primary purpose of supplying fresh water to the Refinery. Surface water is managed through the South32 Water Management Plan (Attachment 8C) and is monitored at the location shown in Figure 6-1.

10.4.2 GROUNDWATER

Three main aquifers have been identified within the vicinity of the Project. These have formed as a result of in-situ weathering of basement rocks and include a shallow aquifer (shallow weathered zone), a lower saprolite aquifer (deep weathered zone) and a fractured bedrock aquifer. Topography influences groundwater levels in all aquifers, with depths ranging from 1-3 m in low-lying areas to 15-40 m in higher areas. Several major watercourses and associated tributaries originating from the east dissect the Darling Plateau. Water quality varies from fresh to saline due to intermittent drainage (South32, 2022).

All aquifers remain localised and no locally significant abstraction from these aquifers is known to occur. Groundwater is managed through the South32 Water Management Plan (Attachment 8C) and is monitored at the locations shown in Figure 6-1.

10.5 Heritage

The Refinery occurs within the Gnaala Karla Booja Agreement Area of the South West Native Title Settlement. The Refinery Area has been subject to numerous targeted Aboriginal heritage surveys (both archaeological and ethnographic) over the life of the Refinery with the most recent in 2020 (Brad Goode & Associates, 2020).

There are 17 archaeological ‘Other Heritage Places’ that have identified within the RLA. These are classified as ‘Stored Data/Not a Site’ heritage places and are predominantly artefact scatters. These sites either have insufficient evidence or information to be assessed under the *Aboriginal Heritage Act 1972* (AHA) or do not meet the criteria for protection as an Aboriginal heritage site under the AHA. Of the 17 ‘Other Heritage Places’ that occur within the RLA, five of these places are located within presently disturbed areas and no longer exist (South32, 2022). The remainder of the sites are no longer considered sites by the Aboriginal Cultural Material Committee.

There will be no impact to Aboriginal Heritage as no additional clearing is required for the FY26-28 BRDA raises.

11 Part 11: Submission of Any Other Relevant Information

11.1 Stakeholder Consultation

Worsley Alumina have informed DWER of the planned raises for FY26-28 and provided them with a presentation outlining the schedule and works program. DWER are awaiting the Works Approval application so that the FY26-28 raises can be assessed.

11.2 Additional Information

The following documents have been provided for further information for the Works Approval application:

- Attachment 8A – Design Report: BRDA 4 Stage 8;
- Attachment 8B – Design Report: BRDA 5 Stage 7;
- Attachment 8C – Water Management Plan;
- Attachment 8D – Air Quality and Dust Management Plan – RLA; and
- Attachment 8E - GISTM Requirement 15.1 Public Disclosure Worsley Alumina.

12 Part 12: Category checklist(s)

12.1 Tailings Storage Facilities

As of February 2023, DWER require applications for tailings storage facilities (TSFs) (new or amended) to be provide the additional supporting forms to be submitted with the Licence and Works Approval application form. The TSF application Category Checklist (IR-F28) is mandatory for all Category 5 prescribed premises that include one or more TSFs. The Category Checklist (tailings storage facility) outlines additional information requirements for the works approval, to:

- construct and operate new TSFs; or
- amend an instrument granted for an existing TSF (i.e. new TSF cells or wall rises or lifts or changes to delivery processes or material characteristics).

The completed Category Checklist (IR-F28) is provided as Attachment 9 of this application.

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