Section 2
Project Description

WINCHESTER SOUTH PROJECT
Environmental Impact Statement

WHITEHAVEN COAL

Resource Strategies

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2 PROJECT DESCRIPTION

2.1 PROPOSED DEVELOPMENT

2.1.1 Project Title and Objectives

This EIS has been prepared for the Project (Winchester South Project).

The Project is located approximately 30 km south-east of Moranbah, within the Bowen Basin (Figure 1-1).

The Project provides an opportunity to develop an open cut metallurgical coal mine and associated on-site and off-site infrastructure (e.g. ETL, water supply pipeline, mine access road, etc.) in an existing mining precinct. The open cut mine would produce a mix of products, including metallurgical coal, for use in the steel industry, and thermal coal.

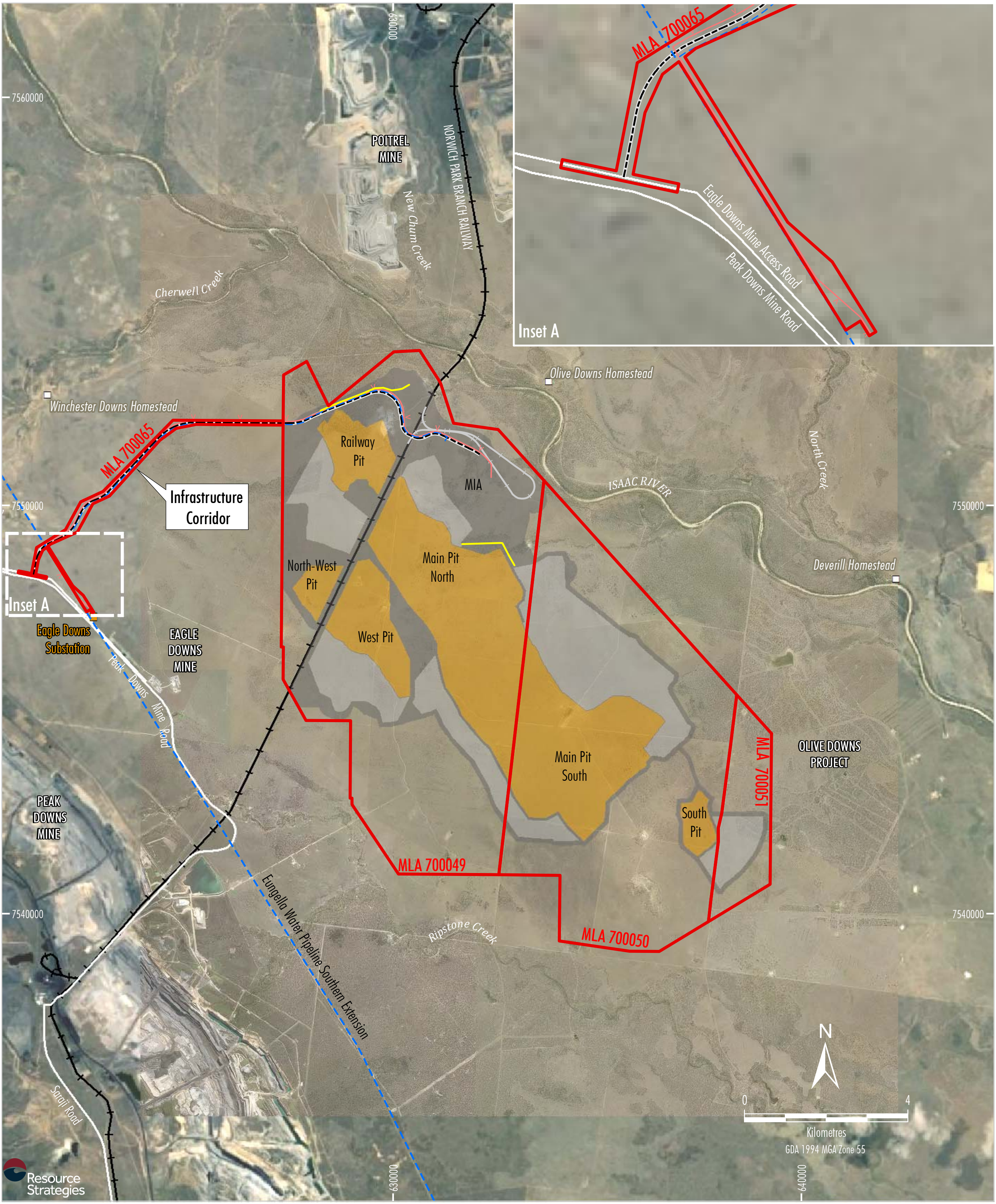
The Project comprises an open cut coal mine and associated infrastructure corridor, including a raw water supply pipeline connecting to the Eungella pipeline network, an ETL and a mine access road.

2.1.2 Project Summary and General Arrangement

Project Summary

The main activities associated with the development of the Project include:

- development and operation of an open cut coal mine within MLA 700049, MLA 700050 and MLA 700051 (Figure 2-1);
- development and operation of an infrastructure corridor within MLA 700065, located outside MDL 183;
- use of open cut mining equipment to extract ROM coal with a current forecast rate of approximately 15 Mtpa (and up to 17 Mtpa);
- a mine life of approximately 30 years;
- placement of waste rock (i.e. overburden and interburden) in out-of-pit waste rock emplacements and within the footprint of the open cut voids;
- construction and operation of the MIA, including a CHPP, ROM pads, workshops, offices, raw and product handling systems, coal processing plant and train load-out facility;
- construction and operation of a Project rail spur and loop to connect the Project to the Norwich Park Branch Railway (Figure 2-1), including product coal stockpiles for loading of product coal to trains for transport to ports;
- progressive rehabilitation of out-of-pit waste rock emplacement areas;
- progressive backfilling and rehabilitation of the mine voids with waste rock behind the advancing open cut mining operations (i.e. in-pit emplacements);
- installation of a raw water supply pipeline;
- construction of a 132 kilovolt (kV)/22 kV electricity switching/substation and 132 kV ETL to connect to the existing regional power network;
- on-site excavation, if suitable, and/or the use of the existing hard rock quarry for construction activities;
- drilling and blasting of competent overburden/waste rock material;
- construction of a mine access road (including associated railway crossing) from the Eagle Downs Mine Access Road, off Peak Downs Mine Road, to the MIA;
- construction and operation of ancillary infrastructure in support of mining, including electricity supply, consumable storage areas and explosives storage facilities;
- connection to the existing telecommunications network;
- co-disposal of coal rejects from the Project CHPP within the footprint of the open cut voids and/or out-of-pit emplacement areas;
- progressive development and augmentation of sediment dams and storage dams, pumps, pipelines and other water management equipment and structures (including up-catchment diversions, drainage channel realignments and levees);
- progressive construction and use of soil stockpile areas, laydown areas and gravel/borrow areas (e.g. for road base and ballast material);
- progressive development of haul roads, light vehicle roads and services;



LEGEND

- Mining Lease Application Boundary
- Eungella Water Pipeline Southern Extension
- Railway
- Substation

Project Component*

- Indicative Infrastructure Area
- Indicative Out-of-pit Waste Rock Emplacement
- Indicative Open Cut Pit Including In-pit Waste Rock Emplacement
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Source: The State of Queensland (2018 - 2020); Whitehaven (2020). Orthophoto: Google Image (2019); Whitehaven (2017).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Project General Arrangement

Figure 2-1

- wastewater and sewage treatment by a sewage treatment plant;
- discharge of excess water off-site in accordance with relevant principles and conditions of the *Model water conditions for coal mines in the Fitzroy basin* (DES, 2013);
- an on-site landfill for the disposal of selected waste streams generated on-site;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

Table 2-1 provides a summary of the key attributes of the Project.

Table 2-1
Summary of Key Project Attributes

Project Component	Summary Description
Project Life	Approximately 30 years. Projected three years of construction, 28 years of mining operations (overlapping with years 2 and 3 of constructions) and one year of final landform shaping.
Mining Method	Open cut mining to a depth of approximately 160 metres below ground level (mbgl).
Resource Recovery	Approximately 353 million tonnes (Mt) of ROM coal from coal seams in the Rangal and Fort Cooper Coal Measures (Leichhardt Seams, Vermont Upper Seam and Vermont Middle Lower Seam).
Annual Extraction	Forecast extraction of approximately 15 Mtpa of ROM coal, with a forecast peak extraction of up to approximately 17 Mtpa of ROM coal from the Project.
Management of Waste Rock and Coal Rejects	Approximately 2,012 million bank cubic metres (Mbcm) of waste rock would be placed in the waste rock emplacement including within the footprint of the open cut void. Co-disposal of CHPP coal reject material from the Project CHPP within waste rock emplacement areas.
Product Transport	Construction and use of train load-out and rail spur infrastructure for the transport of up to approximately 11 Mtpa of product coal by rail to port. An average of three (over the life of the Project) and a maximum of eight loaded train departures per day.
Water Management	On-site water management system comprising water management storages and collection drains, flood levees, up-catchment diversions, sediment control and open cut dewatering.
Water Supply	Mine water supply to be obtained from inflows to open cut areas, processing water re-use and recycling, treated wastewater, rainfall and runoff collection and supplementary raw water supply expected from the Eungella pipeline network and/or surrounding mining operations. Mine water supply may also be obtained from flood harvesting, which would only include flood water taken flowing through site (i.e. surface runoff) during major rainfall events, and would not include take from the Isaac River during flood events.
Electricity Supply	Construction of a 132 kV/22 kV electricity switching/substation and 132 kV ETL to connect to the existing regional power network.
General Infrastructure	A range of supporting infrastructure including an MIA, CHPP and other ancillary infrastructure.
Workforce	During operation, the Project would directly employ approximately 500 personnel[1]. Initial construction activities would require approximately 500 personnel.
Rehabilitation	Progressive rehabilitation of waste rock emplacements and surface disturbance areas. At Project closure, four residual voids would remain in perpetuity.
Operating Hours	Mining, processing and train loading and rail movements on the Project rail spur would occur 24 hours per day, seven days per week.
Estimated Capital Investment Value	Approximately $1 billion.

1 Note: Whitehaven WS is investigating automation of the fleet for the Project. Direct employee numbers include consideration of automation. Employee numbers may increase depending on the extent of automation. This EIS has considered the effect of the extent of automation on employee numbers as part of the impact assessment.

The proposed open cut mining domains are generally aligned from north-west to south-east, and are located on the western side of the Isaac River (Figure 2-1). Open cut mining areas would be developed and rehabilitated in a progressive manner.

Staged mine plans are provided on Figures 2-2 to 2-6, and show progressive development and rehabilitation over the life of the Project. Figure 2-7 shows the progression of the open cut pits over the operational life of the Project.

The extent of the Project open cut mining area, waste rock emplacements and infrastructure areas (i.e. the Project disturbance footprint) is approximately 7,130 hectares (ha).

The MIA would include, but not necessarily be limited to, a CHPP, administration buildings, substation and electricity distribution infrastructure, crib facilities, bathhouse, warehouse, workshops and re-fuelling facilities, communication facilities and other associated amenities. The CHPP would include the coal handling plant, coal processing plant, CHPP workshops and offices and other associated facilities.

Existing local and regional infrastructure would be used to transport product coal via rail to the port for export, including the Goonyella rail system to the Dalrymple Bay Coal Terminal (DBCT) or the Abbot Point Coal Terminal (APCT) (via the Newlands rail system) and/or the Blackwater rail system to the Gladstone coal port.

General Arrangement

Indicative general arrangements for Project Years 2, 5, 9, 19 and 27 of the Project are shown on Figures 2-2 to 2-6.

These indicative general arrangements are based on the planned maximum production and mine progression. The indicative mining layout and sequence may vary to take into account localised geological features, coal market quality and volume requirements, mining economics and Project detailed engineering design.

At the completion of Project mining activities, infrastructure would be decommissioned, where an agreement to retain infrastructure is not in place with relevant stakeholders, and final landform earthworks and revegetation would be undertaken. The final landform and rehabilitation strategy for the Project is described in Section 6.

The detailed mining sequence and rehabilitation program over any given period would be documented in the relevant PRC Plan as required by the EP Act.

2.1.3 Capital Expenditure

The estimated total capital cost for the development of the Project is approximately $1 billion. These development costs also include an allowance for biodiversity offsets, funds for agreements with impacted landholders, funds for a road infrastructure arrangement with the Isaac Regional Council, and funding for impact management and monitoring.

Initial capital to enable commencement of coal processing is estimated at approximately $900 million.

2.1.4 Project Rationale

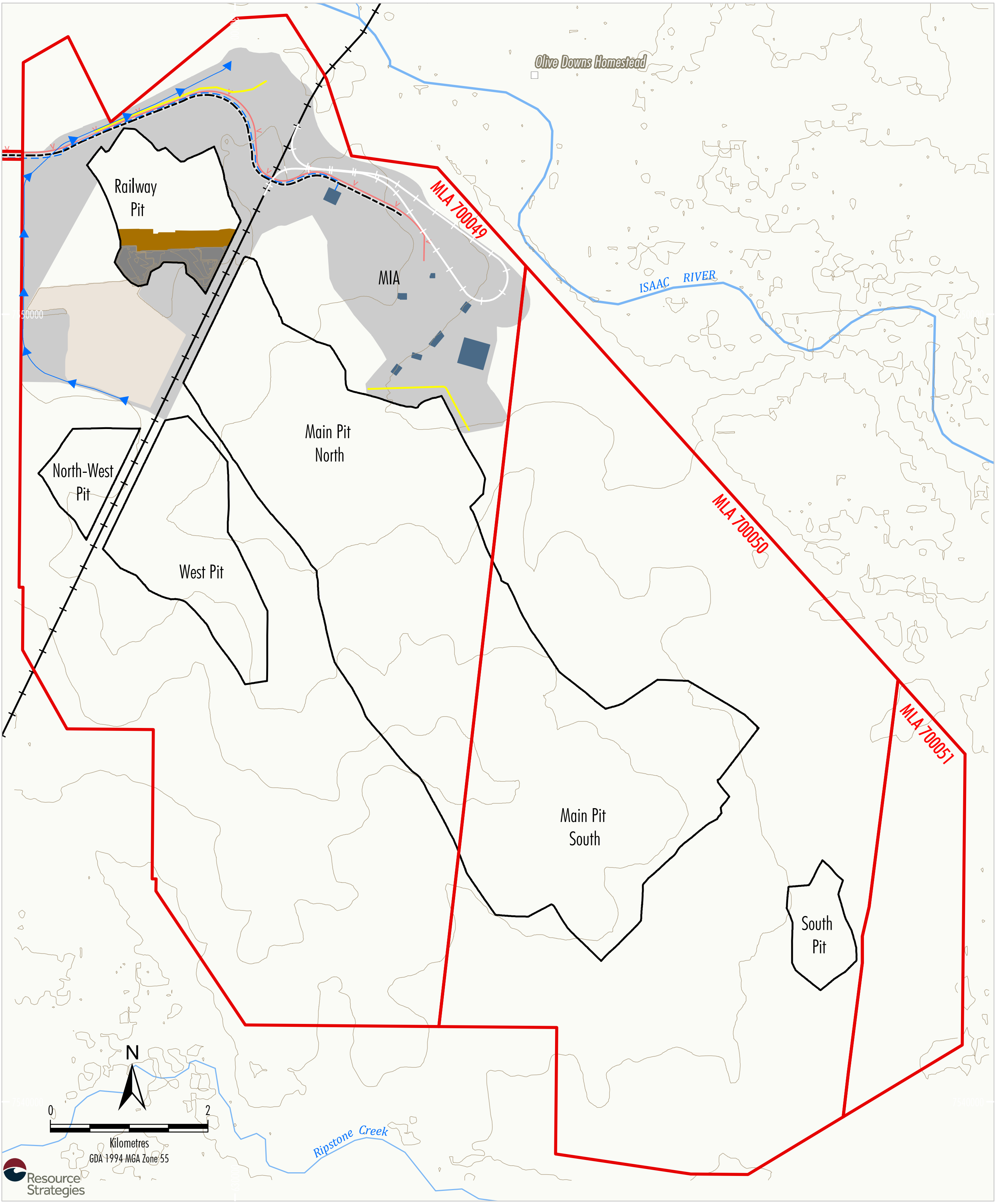
The Project provides an opportunity to develop a greenfield metallurgical coal resource in an existing mining precinct. Products would include metallurgical coal for use in the steel industry and thermal coal for energy production. The Project life would be approximately 30 years, projected to include:

- three years for Project construction activities;
- 28 years for mining operations, forecast to extract approximately 15 Mtpa of ROM coal (and up to 17 Mtpa); and
- one year for final landform shaping.

The demand for high-quality coal has remained strong due to continual industrial growth globally. The development of new coal resources is, therefore, considered to be necessary to achieve continuity of supply to this market.

Due to the high-quality coal resources in the Bowen Basin there are extensive existing mining operations in the region, serviced by well established infrastructure.

The development of the Project will provide significant direct employment opportunities for construction and operational workforces. In addition to the direct employment opportunities associated with the construction and operation of the Project, a significant number of indirect employment opportunities would be supported, through suppliers, contractors, service providers and local businesses, resulting in long-term flow-on social and economic benefits to regional communities.



LEGEND

Mining Lease Application Boundary

Railway

Project Component*

Indicative Infrastructure Area

Indicative Water Storage

Indicative Maximum Extent of Open Cut Pit

Indicative Up-catchment Diversion

Indicative Mine Access Road

Indicative Rail Spur and Loop

Indicative Electricity Transmission Line

Indicative Raw Water Supply Pipeline

Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Mine/Rehabilitation Status

Indicative Advanced Soil Stripping

Indicative Active Mining

Indicative Active Emplacement

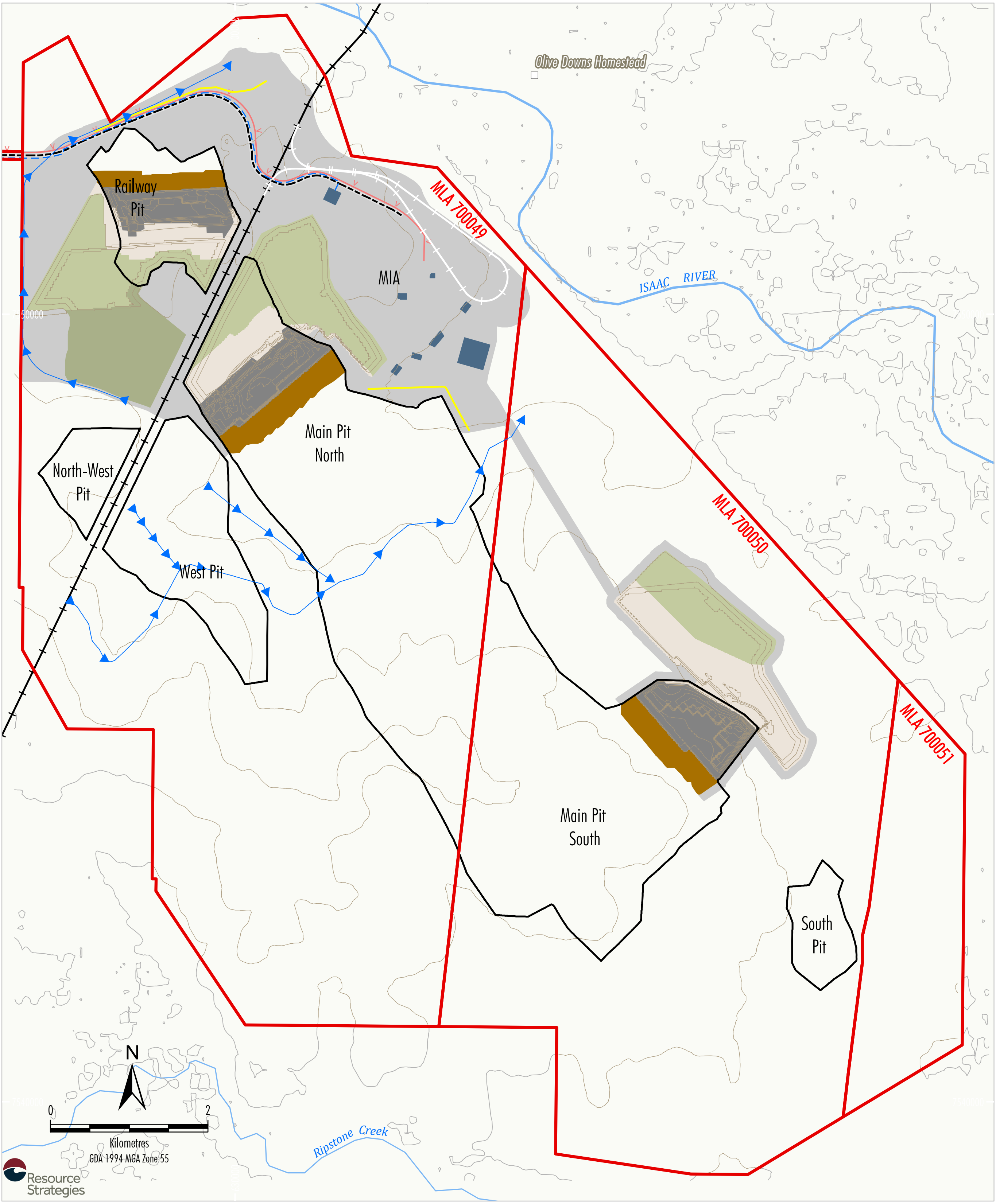
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

General Arrangement - Project Year 2

Figure 2-2



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LEGEND

Mining Lease Application Boundary
Railway

Project Component*

Indicative Infrastructure Area
Indicative Water Storage
Indicative Maximum Extent of Open Cut Pit
Indicative Up-catchment Diversion
Indicative Mine Access Road
Indicative Rail Spur and Loop
Indicative Electricity Transmission Line
Indicative Raw Water Supply Pipeline
Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Mine/Rehabilitation Status

Indicative Advanced Soil Stripping
Indicative Active Mining
Indicative Active Emplacement
Indicative Initial Rehabilitation
Indicative Established Rehabilitation

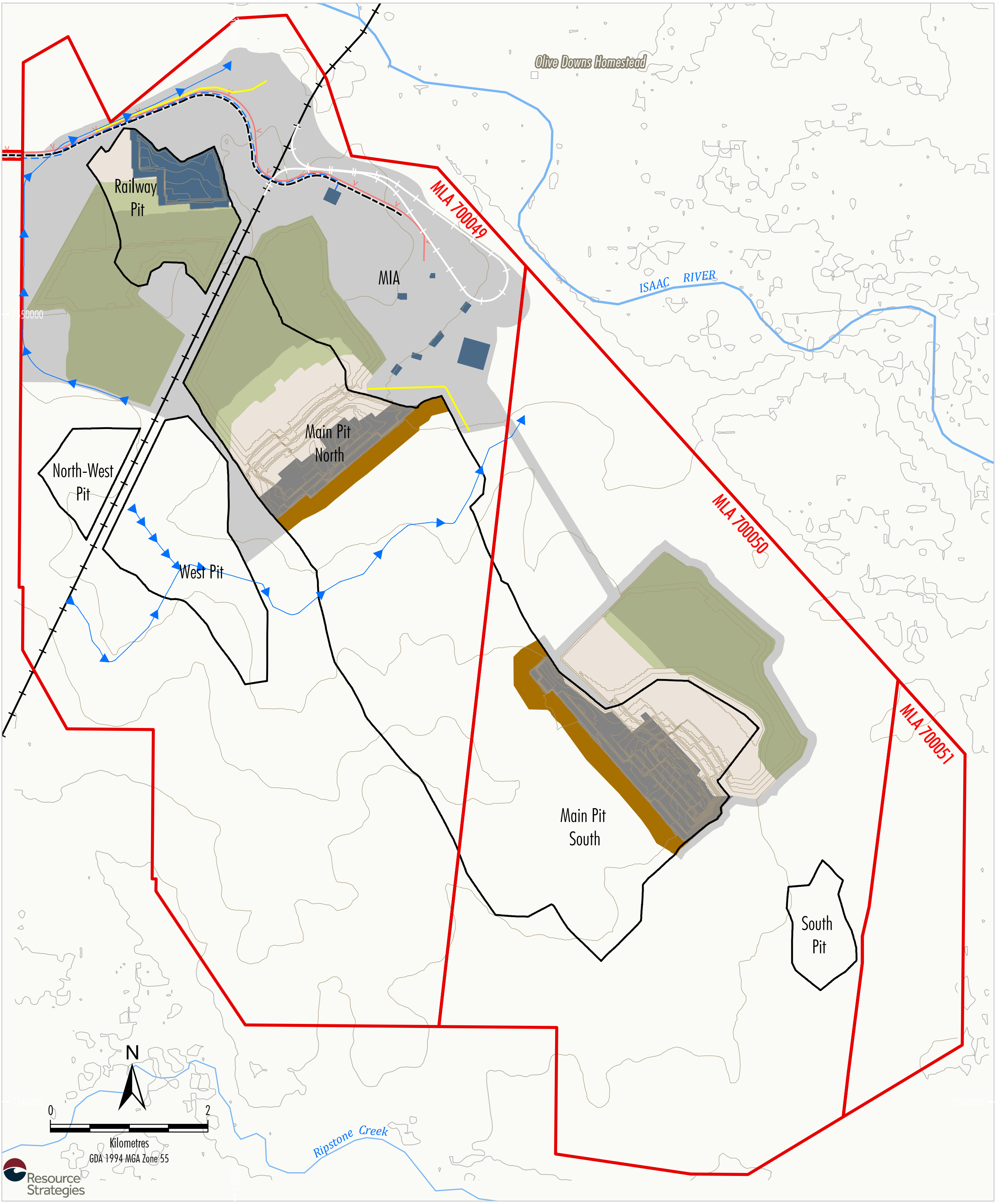
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

General Arrangement - Project Year 5

Figure 2-3



LEGEND

Mining Lease Application Boundary

Railway

Project Component*

- Indicative Infrastructure Area
- Indicative Water Storage
- Indicative Maximum Extent of Open Cut Pit
- Indicative Up-catchment Diversion
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Mine/Rehabilitation Status

- Indicative Advanced Soil Stripping
- Indicative Active Mining
- Indicative Active Emplacement
- Indicative Initial Rehabilitation
- Indicative Established Rehabilitation

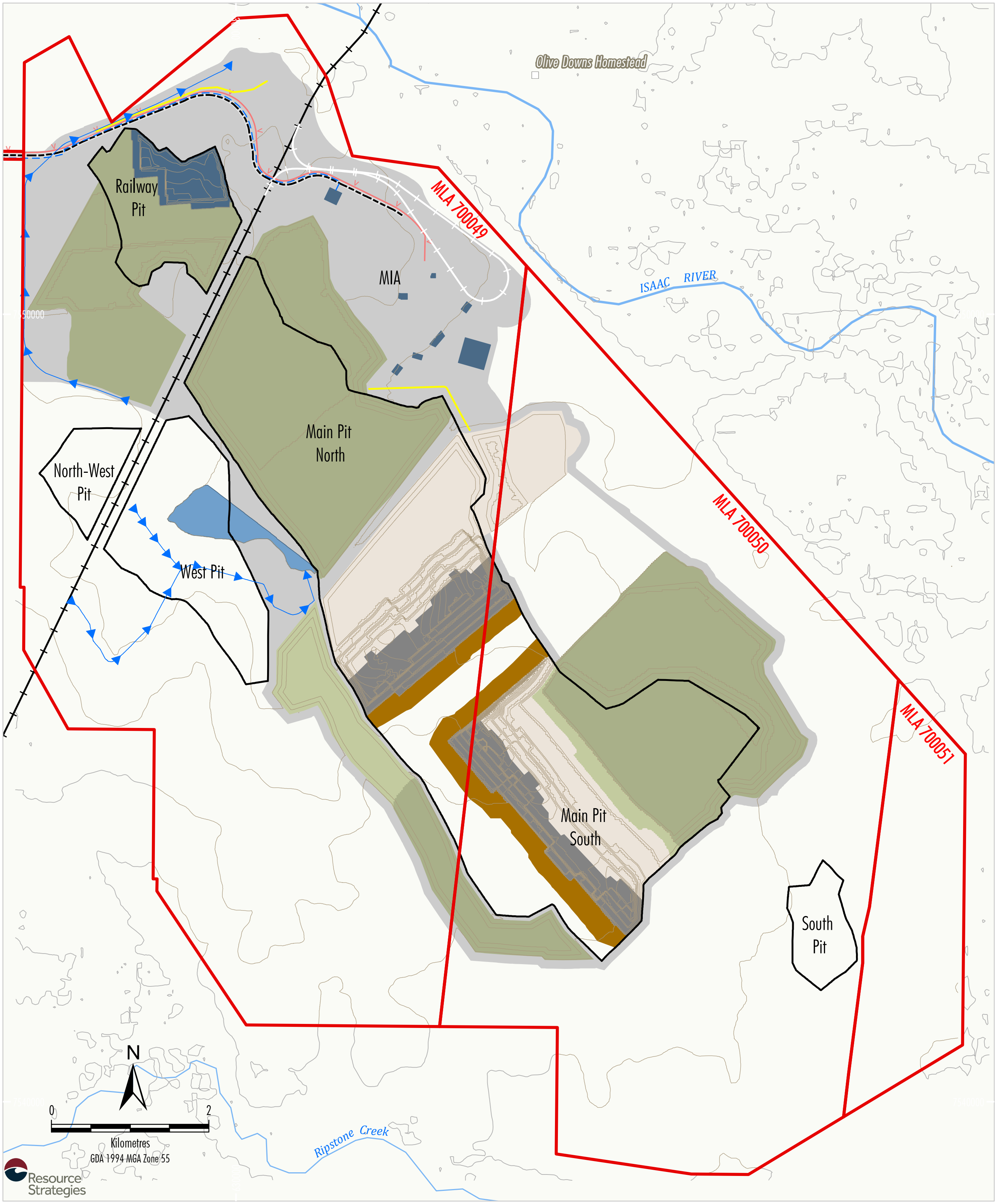
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

General Arrangement - Project Year 9

Figure 2-4



LEGEND

Mining Lease Application Boundary

Railway

Project Component*

- Indicative Infrastructure Area
- Indicative Water Storage
- Indicative Clean Water Storage
- Indicative Maximum Extent of Open Cut Pit
- Indicative Up-catchment Diversion
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Mine/Rehabilitation Status

- Indicative Advanced Soil Stripping
- Indicative Active Mining
- Indicative Active Emplacement
- Indicative Initial Rehabilitation
- Indicative Established Rehabilitation

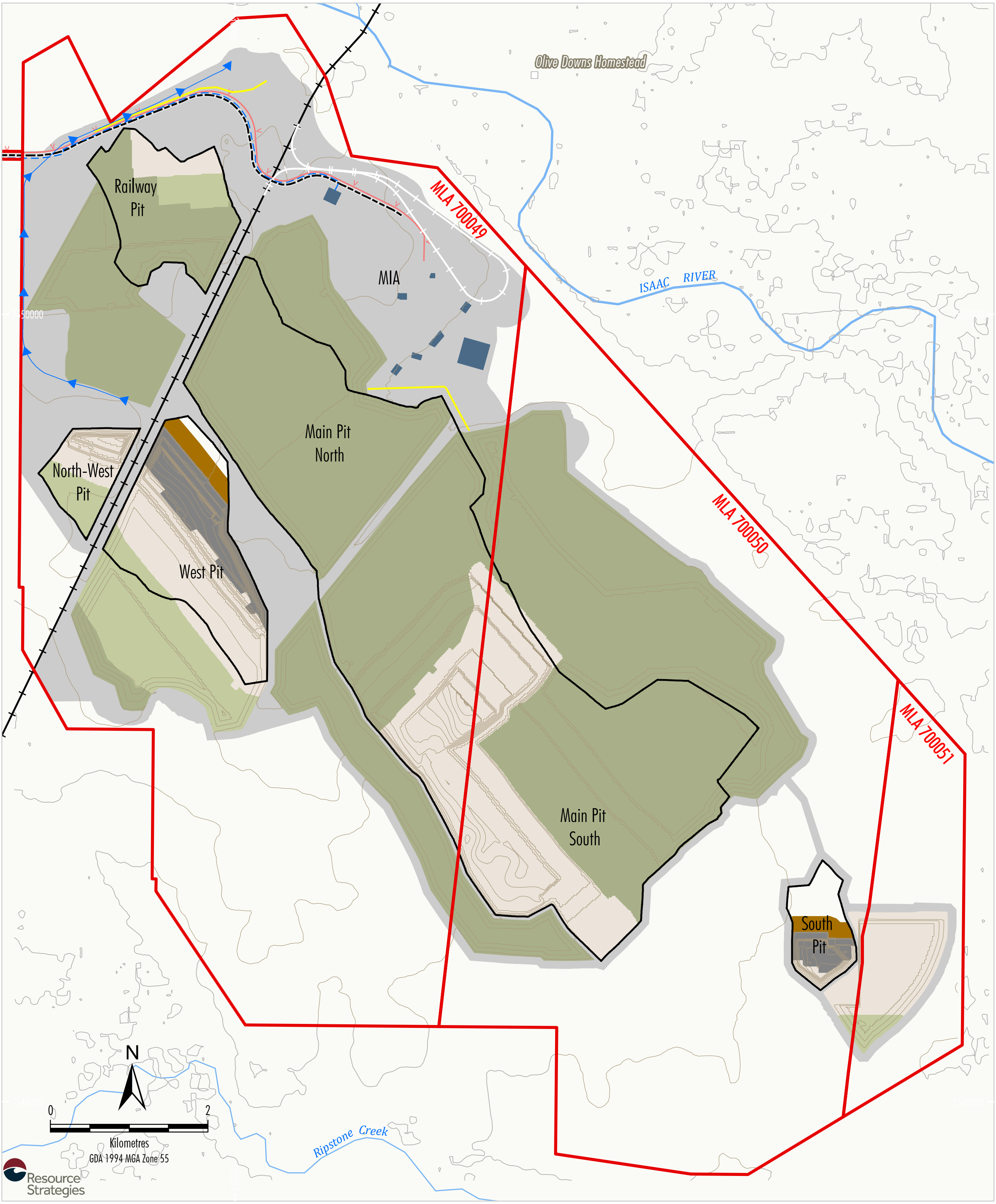
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

General Arrangement - Project Year 19

Figure 2-5



LEGEND

Mining Lease Application Boundary
Railway

Project Component*

Indicative Infrastructure Area
Indicative Water Storage
Indicative Maximum Extent of Open Cut Pit
Indicative Up-catchment Diversion
Indicative Mine Access Road
Indicative Rail Spur and Loop
Indicative Electricity Transmission Line
Indicative Raw Water Supply Pipeline
Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Mine/Rehabilitation Status

Indicative Advanced Soil Stripping
Indicative Active Mining
Indicative Active Emplacement
Indicative Initial Rehabilitation
Indicative Established Rehabilitation

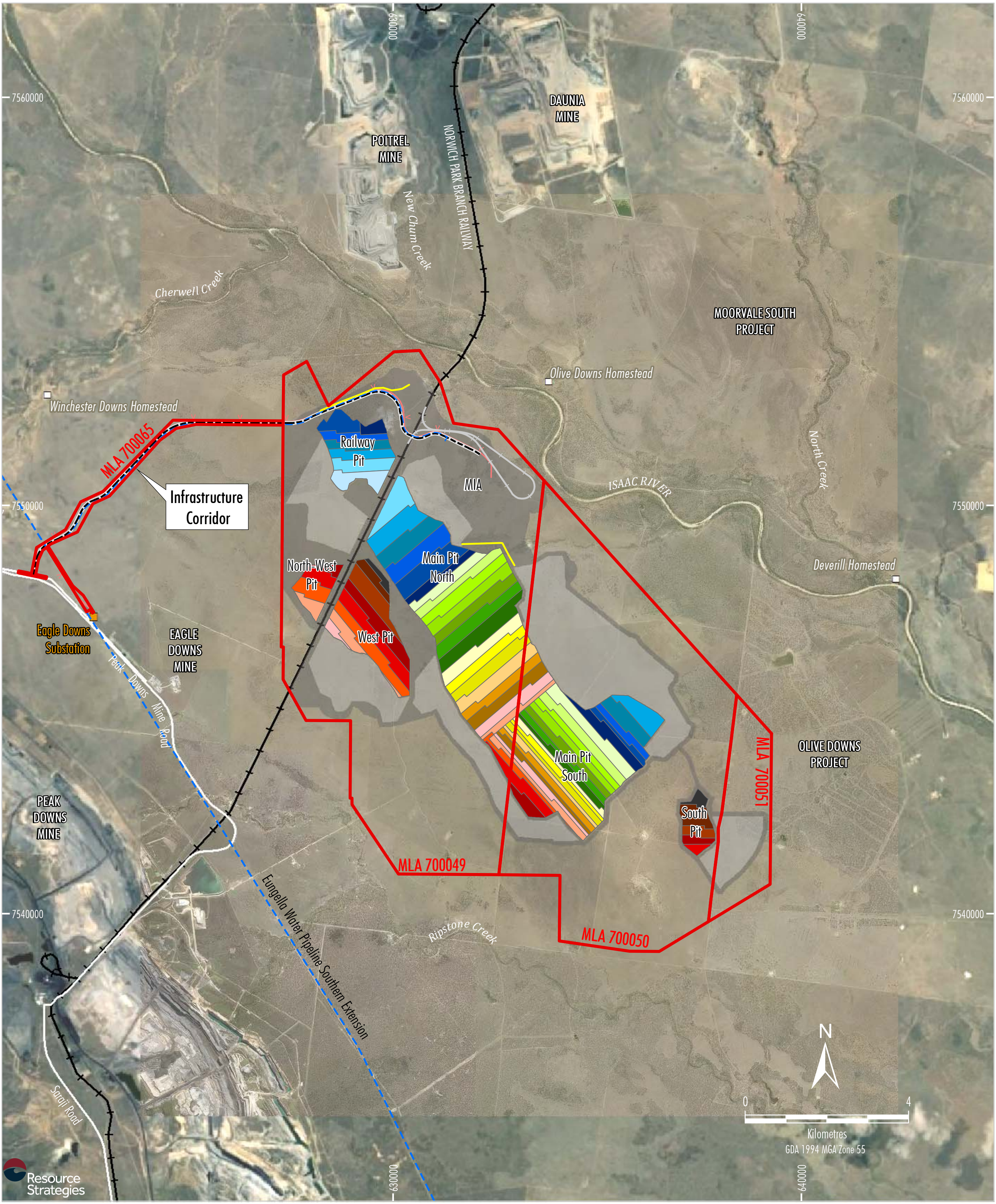
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

General Arrangement - Project Year 27

Figure 2-6



LEGEND
- Mining Lease Application Boundary
- Eungella Water Pipeline Southern Extension
- Railway
- Substation

Project Component*
- Indicative Infrastructure Area
- Indicative Out-of-pit Waste Rock Emplacement
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Indicative Flood Levee

Indicative Mining Sequence
- Year 02
- Year 03
- Year 04
- Year 05
- Year 06
- Year 07
- Year 08
- Year 09
- Year 10
- Year 11
- Year 12
- Year 13
- Year 14
- Year 15
- Year 16
- Year 17
- Year 18
- Year 19
- Year 20
- Year 21
- Year 22
- Year 23
- Year 24
- Year 25
- Year 26
- Year 27
- Year 28
- Year 29

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Indicative Mining Sequence

Figure 2-7

If the Project is not developed, the value that the coal resource would provide to State royalties and Commonwealth tax revenue would be foregone and its contribution to Queensland's growing export industry would not be realised. Further, development of the Project would not sterilise any coal resources that would otherwise be accessed by other mining operations.

Development of the Project may also assist the current and future development of adjacent coal resources by improving accessibility to services and infrastructure (e.g. through the development of the Project rail spur and loop, water pipeline and ETL).

The cost benefit analysis conducted in the Economic Assessment indicates that operation of the Project would have a significant total net benefit to the Queensland community of approximately $756 million in present value terms (Appendix K).

This value is inclusive of estimated costs for environmental externalities and internalisation of environmental management costs by Whitehaven WS (Appendix K).

Alternatives considered for key Project components are described in Section 3.

The Project would include the implementation of mitigation measures, and management (including performance monitoring), to minimise potential impacts on the environment and community (Sections 4 and 5).

A summary of the Project environmental commitments is provided in Section 7.

Whitehaven WS considers that the Project would achieve its objective of developing a high-quality, long-term, metallurgical coal asset due to the location within the Bowen Basin mining region, greenfield nature of the asset, significant size of the coal resource and proximity to existing infrastructure.

2.1.5 Regional and Local Context

Regional Context

The Project is located approximately 30 km south-east of Moranbah and approximately 50 km north of Dysart in the Bowen Basin region of central Queensland, within the Isaac Regional Council LGA (Figure 1-1). The closest city is Mackay, which is located approximately 200 km north-east of the Project. The Project is located:

- within the Brigalow Belt North Bioregion as defined by the *Interim Biogeographic Regionalisation for Australia (IBRA)* (DEE, 2019a) (Figure 2-8);
- within the Fitzroy River Catchment and is subject to the *Water Plan (Fitzroy Basin) 2011* and the Isaac Connors Groundwater Management Area (GMA) (Figure 2-9);
- within the Isaac River floodplain, as defined by the Queensland Floodplain Assessment Overlay (DNRME, 2020a) (Figure 2-10);
- within zones identified and mapped as Regional Landscape and Rural Production Area under the *Mackay, Isaac and Whitsunday Regional Plan* (Department of Local Government and Planning, 2012), and contains three areas mapped as *good quality agricultural land*;
- outside strategic cropping areas mapped as potential Strategic Cropping Land (SCL) under section 10 of the RPI Act (Figure 2-11);
- within the Barada Barna People's Native Title Determination Area (QC2016/007) registered with the National Native Title Tribunal (2019) (Figure 2-12); and
- within the area covered by the Inland Fitzroy and Southern Burdekin Suitability Framework (Department of Natural Resources and Mines [DNRM] and the Department of Science, Information Technology, Innovation and the Arts [DSITIA], 2013).

The Project is not located within an area of regional interest under the RPI Act. Areas of regional interest include priority agricultural areas, priority living areas, strategic cropping areas (formerly SCL) and strategic environmental areas.

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LEGEND

Mining Lease Application Boundary

Brigalow Belt North Bioregion

Source: The State of Queensland (2018 - 2020); Geoscience Australia - Topographical Data 250K (2006).

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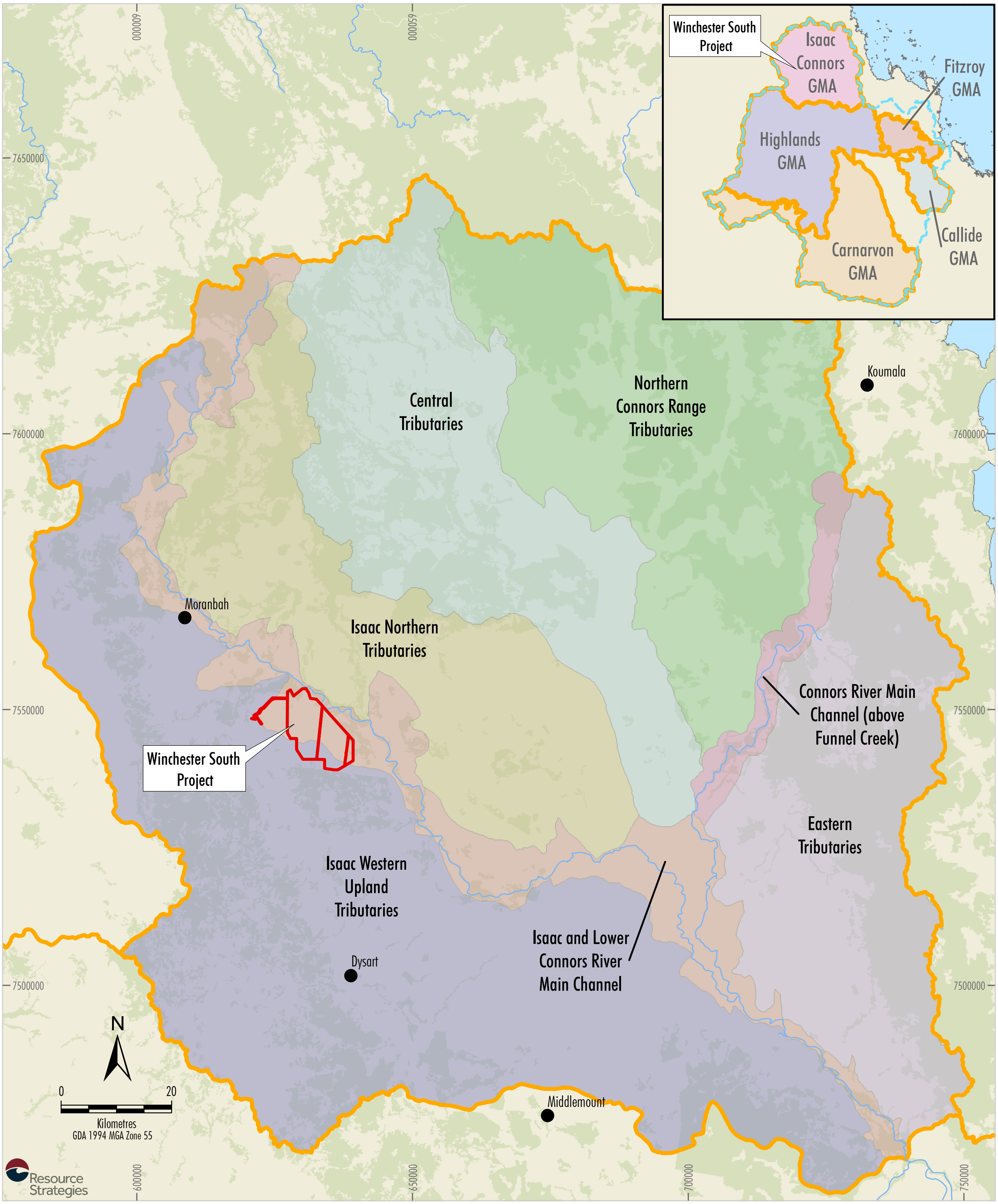
WINCHESTER SOUTH PROJECT

Brigalow Belt North Bioregion

Figure 2-8



LEGEND

- Mining Lease Application Boundary
- Fitzroy Basin Water Plan Area
- Groundwater Management Area
- Watercourse
- Road
- Railway

Sub-catchment Areas of the Isaac Connors GMA

- Central Tributaries
- Connors River Main Channel (above Funnel Creek)
- Eastern Tributaries
- Isaac and Lower Connors River Main Channel
- Isaac Northern Tributaries
- Isaac Western Upland Tributaries
- Northern Connors Range Tributaries

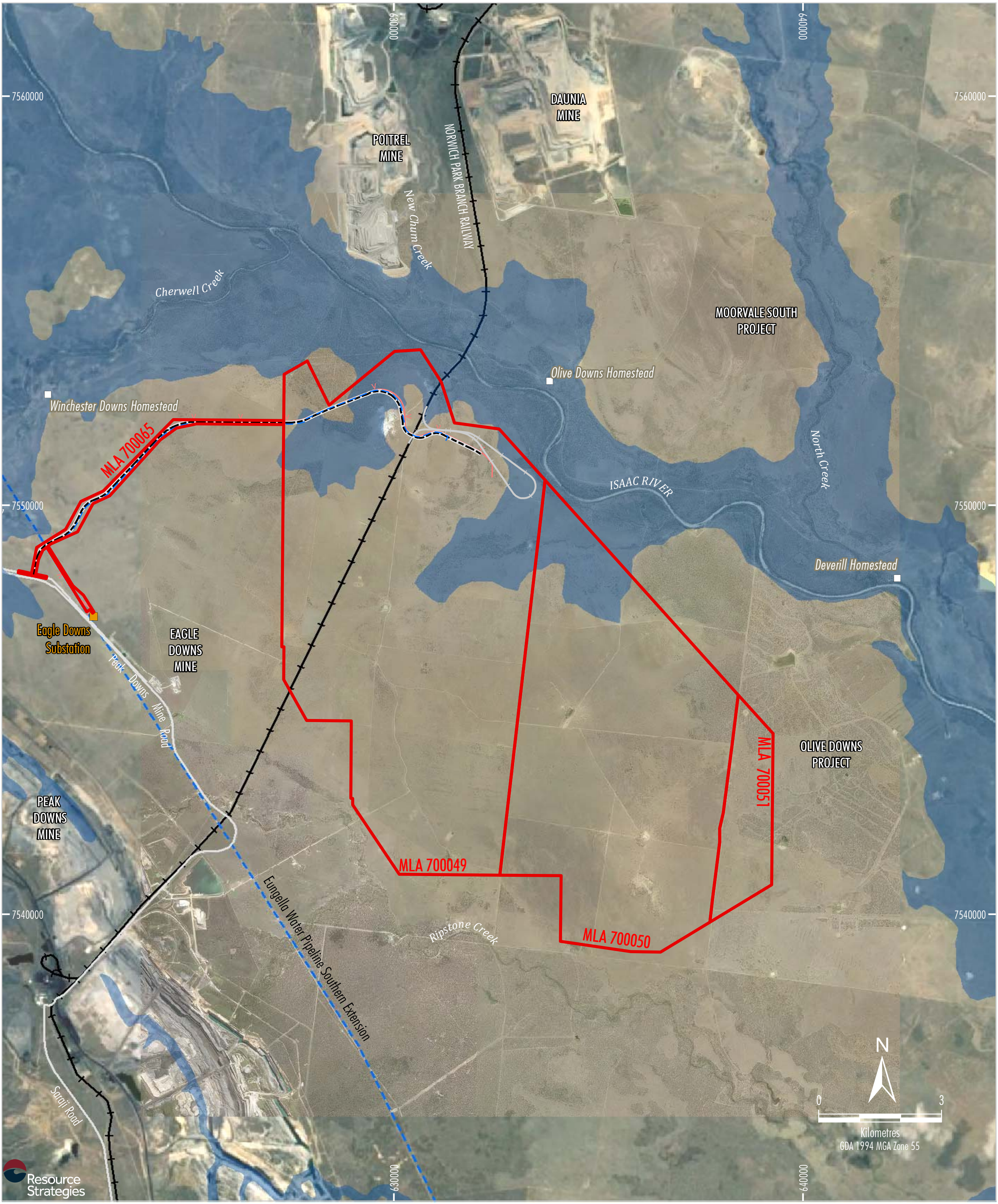
Source: The State of Queensland 2018 - 2020); Geoscience Australia (2018).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Groundwater Management Areas (GMAs) of the Fitzroy Basin - Isaac Connors GMA

Figure 2-9



LEGEND

- Mining Lease Application Boundary
- Queensland Floodplain Assessment Overlay
- Eungella Water Pipeline Southern Extension
- Railway
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Substation

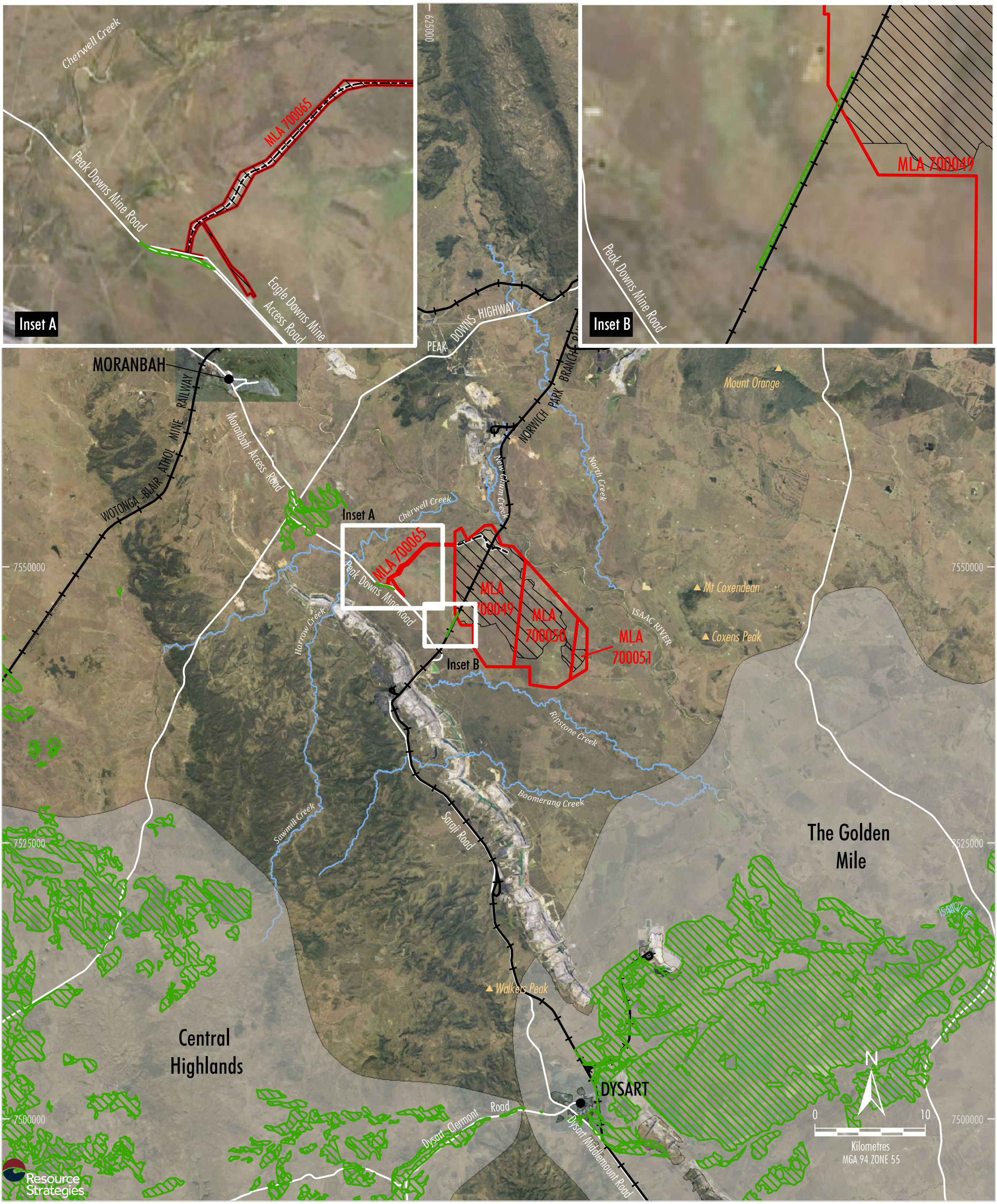
Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Queensland Floodplain Assessment Mapping

Figure 2-10



LEGEND
- Mining Lease Application Boundary
- Indicative Surface Disturbance Extent
- Strategic Cropping Land
- Agricultural Land Audit - Important Agricultural Areas
- Railway

Source: The State of Queensland (2018 - 2020); Whitehaven (2020). Orthophoto: Google Image (2017).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Potential Strategic Cropping Land Trigger Map and Important Agricultural Area Mapping

Figure 2-11

LEGEND

- Mining Lease Application Boundary
- Homestead
- Substation
- Railway
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Eungella Water Pipeline Southern Extension
- Indigenous Land Use Agreement Area*
- Native Title Determined Area (QCD2016/007)

*Note: * The Project Mining Lease Application areas are also contained within the following Indigenous Land Use Agreement Areas (ILUA):*

- *Barada Barna and Ergon Energy (QI2016/008);*
- *Arrow Barada Barna People LNG Project (QI2011/031);*
- *Barada Barna People and Local Government (QI2016/007); and*
- *QGC and Barada Barna (QI2012/062).*

Source: The State of Queensland (2018 - 2020); National Native Title Tribunal (2020); Whitehaven (2020). Orthophoto: Google Image (2019); Whitehaven (2017).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Native Title Determination and Indigenous Land Use Agreement

Figure 2-12

The Project is not located within a declared underground groundwater area under the *Water Regulation 2016*.

The mine access road for the Project would adjoin the Eagle Downs Mine Access Road. The Eagle Downs Mine Access Road runs through a parcel of land (Lot 8 SP277384) owned by the Isaac Regional Council, which has a Community Infrastructure Designation (ID 503) for the "132 kV transmission line route between the Moranbah – Peak Downs Tee – Dysart substations". Similarly, the Project ETL would connect to the 132 kV switching station (Eagle Downs Substation) (Lot 7 SP244492), which is also part of the designation (ID 503). It is not expected that the Project infrastructure corridor (i.e. mine access road, ETL and raw water supply pipeline) would have an impact on the future use of Lot 8 SP27384, the existing alignment of the transmission line between this lot and the Eagle Downs Substation, or the Eagle Downs Substation.

No other sites with a Community Infrastructure Designation (or Designation) under the Planning Act are located within the Project area.

Local Context

The Project is bordered by the Isaac River to the north-east, the Olive Downs Project to the east and south-east, and the Eagle Downs Mine to the west. The Peak Downs and Saraji Mines are located approximately 6 km to the west and approximately 7 km to the south-west, respectively.

Land ownership in the vicinity of the Project is described in Section 2.2.1, and is shown on Figure 2-13.

2.1.6 Interactions with Other Major Projects and/or Developments

The Project is located approximately 30 km south-east of Moranbah, in an existing mining precinct comprising several existing or approved nearby coal mining operations, including (Figure 1-1):

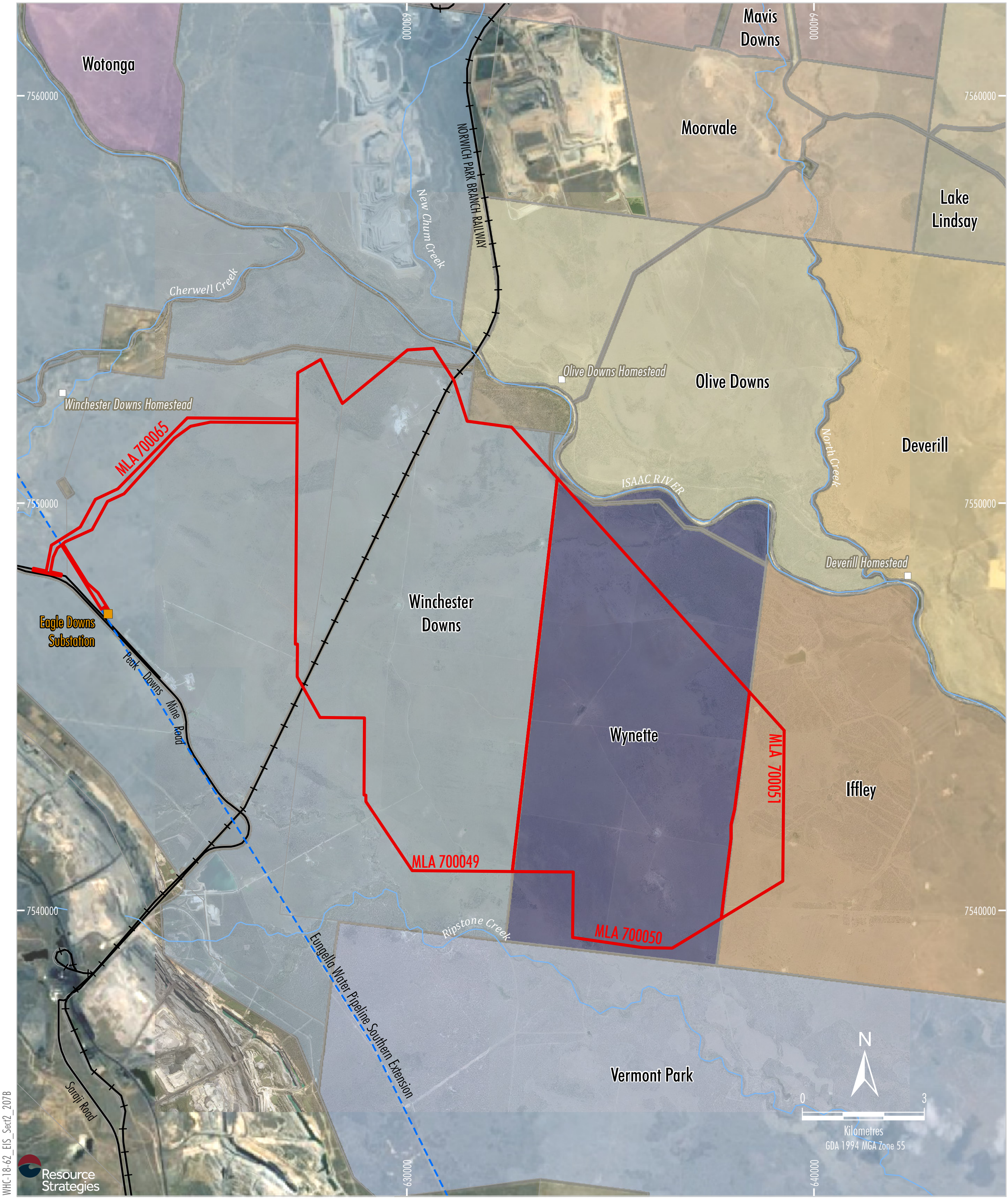
- Olive Downs Project (adjacent to the east and south-east of the Project);
- Eagle Downs Mine (adjacent to the west of the Project);
- Moorvale South Project (approximately 2 km north-east of the Project);
- Peak Downs Mine (approximately 6 km west of the Project);
- Daunia Mine (approximately 7.5 km north of the Project);
- Poitrel Mine (approximately 8 km north of the Project);
- Saraji Mine (approximately 8 km south of the Project);
- Millennium Mine (approximately 10.5 km north of the Project);
- Moranbah South Mine (approximately 13.5 km to the north-west of the Project);
- Isaac Downs Project (approximately 14 km to the north-west of the Project);
- Isaac Plains East Mine (approximately 18.5 km to the north-west of the Project);
- Caval Ridge Mine (approximately 19 km north-west of the Project);
- Carborough Downs Mine (approximately 19 km north-northwest of the Project);
- Moorvale Mine (approximately 19 km north-east of the Project); and
- Lake Vermont Mine (approximately 21 km south-east of the Project).

South32 Eagle Downs Pty Ltd is the holder of Petroleum Lease (PL) 485, which is located adjacent to the Project's western boundary. Currently, Queensland Government (2020) mapping shows that a small section of land within MLA 700049 overlaps PL 485; however, this is due to an error in spatial coordinates.

This error will be corrected once the mining lease application is finalised (i.e. upon grant of the mining lease) and, as such, there would be no overlap between ML 700049 and PL 485.

Land covered by ATP 1103 held by CH4 Pty Ltd (now Arrow) overlaps land within MLA 700049, MLA 700050 and MLA 700051. ATP 1103 is required for Arrow's Bowen Gas Project (Greater Peak Downs development region).

The Bowen Gas Project is a coal seam gas development targeting gas within the coal seams of the Rangal Coal Measures and Moranbah Coal Measures (Arrow, 2014). Gas would be sourced from approximately 4,000 production wells throughout the Bowen Gas Project development regions over the life of the project (up to 40 years) (Arrow, 2014).



LEGEND

- Mining Lease Application Boundary
- Eungella Water Pipeline Southern Extension
- Railway
- Substation

Property

- Deverill
- Iffley
- Lake Lindsay
- Mavis Downs
- Moorvale
- Olive Downs
- Vermont Park
- Wotonga
- Winchester Downs
- Wynette

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

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WINCHESTER SOUTH PROJECT

Tenure - Rural Properties

Figure 2-13

Accordingly, Whitehaven WS has engaged with Arrow in accordance with the requirements of the MERCP Act. Arrow confirmed that Whitehaven WS has "right of way" and will decommission pilot wells located within land covered by the mining lease applications.

Similarly, Whitehaven WS has engaged with South32 and Aquila Resources regarding MLA 700065, as it traverses tenements associated with the Eagle Downs (Underground) Mine.

The existing and operating Central Queensland Gas Pipeline Project is located approximately 20 km to the north-west of the Project.

Depending on the outcomes of technical work, Sunwater is considering constructing further pipelines within the Eungella network. Such development would be outside the scope of this EIS.

Other major projects and developments in the region include (Figure 1-1):

- Isaac River Project (approximately 8 km north-east of the Project);
- Saraji East Mining Lease Project (approximately 19 km south-southeast of the Project);
- Lake Vermont Meadowbrook Project (approximately 4 km south-east of the Project);
- Vulcan Project, located immediately to the east of the Saraji and Peak Downs Mines; and
- Connors River Dam and Pipeline Project (approximately 80 km north-east of the Project).

Exploration projects in the region include Aquila Resources' Eagle Downs South Project (MDL 519) and is located immediately to the south of the Project.

2.1.7 Workforce and Associated Accommodation

Workforce

Employment and other opportunities expected to be generated by the Project include:

- an operational workforce of up to approximately 500 personnel[1];
- a construction workforce in the order of 500 personnel; and
- a decommissioning workforce of approximately 50 personnel (required towards the end of the life of the Project).

In accordance with the SSRC Act, the operational workforce for the Project would not be a 100% FIFO workforce.

The Project's recruitment strategy would provide equitable access to employment opportunities and prioritise local recruitment by applying the following order of priority for recruitment:

1. The 'local' towns of Moranbah, Dysart and Coppabella.
2. Nearby regional communities within a 125 km radius from the Project entrance.
3. The Isaac region as per the Isaac Regional Council LGA.
4. The Mackay Whitsunday region.
5. The State of Queensland.
6. Outside of Queensland.

The operational hours at the Project would be 24 hours a day, seven days a week. Nominal Project start and finish times at full development are anticipated to be as follows, but subject to change:

- Administration Personnel – 7.00 am to 5.00 pm weekdays.
- Mining Operations (Day) Personnel – 5.30 am to 6.00 pm.

[1] Note Whitehaven WS is investigating automation of the fleet for the Project. Direct employee numbers include consideration of automation. Employee numbers may increase depending on the extent of automation. This EIS has considered the effect of the extent of automation on employee numbers as part of the impact assessment.

- Mining Operations (Night) Personnel – 5.30 pm to 6.00 am.

Construction/development activities would generally be undertaken between 6.00 am and 6.00 pm, Monday to Sunday (inclusive). Activities undertaken outside of these hours would include:

- the delivery of materials of which transport is required, by the Queensland Police Service or DTMR, to be undertaken for safety reasons outside the normal construction hours; and
- emergency work to avoid the loss of life, damage to property or to prevent environmental harm.

Operational Workforce Accommodation

Moranbah, Dysart and Coppabella contain a number of accommodation villages, including (Figure 1-1):

- the Morris accommodation centre in Moranbah;
- the Buffel Park accommodation village;
- the Leichhardt accommodation village;
- the Ausco Dysart accommodation village;
- the Civeo accommodation villages in Moranbah, Coppabella and Dysart; and
- the Dysart Staff accommodation village commissioned by the BMA.

The Civeo accommodation village in Moranbah holds over 1,200 rooms (Civeo, 2019a), the Coppabella Civeo village holds over 3,000 rooms (Civeo, 2019b) and the Dysart Civeo village holds over 1,700 rooms (Civeo, 2019c). The Buffel Park accommodation village, approximately 20 km to the south of Moranbah, services a large portion of the workforce from the Caval Ridge Mine, with a capacity of 2,000 rooms (RPS, 2010).

It is expected that the existing accommodation options available in the region would meet the Project's construction and operational workforce requirements.

Whitehaven WS would target a workforce of primarily local and regional personnel, and would be made up of approximately 10% of local (communities of Moranbah, Dysart and Coppabella) and approximately 90% non-local hires. For the purposes of impact assessment, it has been assumed that the workforce would reside in the following locations:

- Moranbah (95% of workforce).
- Dysart (2% of workforce).
- Coppabella (3% of workforce).

Construction Workforce Accommodation

Construction/development activities (e.g. construction of the mine infrastructure, raw water supply pipeline, ETL) generally require a labour force with highly specialised skills, including specialist welders, fitters, electrical contractors, machinery mechanics and construction engineers. It is therefore anticipated that the majority of the construction workforce would be non-local hires.

For the construction workforce, approximately 90% are expected to reside in a local accommodation village. The remaining approximate 10% is expected to reside in the local area (communities of Moranbah, Dysart and Coppabella).

2.1.8 Schedule of Work

Whitehaven WS anticipates that construction activities associated with the Project would commence as soon as practicable after all relevant planning approvals, environmental authority and mining leases (where required) are granted.

Table 2-2 presents the approximate timeframes currently planned for the Project.

The construction phase of the Project is expected to be a period of approximately 36 months (i.e. Year 1 to Year 3).

Table 2-2
Approximate Project Timeframes

Approximate Timeframe	Project Phase
Year 1	Construction commences at the Project (including overburden removal) and external ancillary infrastructure requirements (e.g. water supply pipeline, mine access road, ETL, rail spur and overpass).
Year 2	Construction of the MIA, including workshops and offices, and an on-site CHPP to process ROM coal from the Project. Overburden removal continues and ROM coal extraction commences.
Year 3	Construction of final stage of the CHPP. ROM coal extraction ramps up.
Year 4 – Year 26	ROM coal extraction reaches maximum extraction rate (17 Mtpa).
Year 27 – Year 29	Mining operations ramp down.
Year 30	Mine closure (e.g. decommissioning of infrastructure) and rehabilitation[1].

[1] Note: The main decommissioning phase of the Project, associated with major infrastructure (e.g. CHPP), would occur in Year 30, however decommissioning works would occur throughout the life of the Project (e.g. sediment dams for the Project would be progressively developed and commissioned as mining progresses).

Staged mine plans are provided on Figures 2-2 to 2-6 and show the progressive development and rehabilitation of the open cut mining areas over the life of the Project. The actual timing and sequence may vary to take account of: detailed design, project capital decisions, market conditions and contractor requirements. For example, commencement of open cut mining operations may also occur earlier, should conditions allow for this.

The Project would extract coal over a period of approximately 28 years.

2.2 SITE DESCRIPTION

2.2.1 Tenure

Real Property Descriptions and Land Ownership

A significant block of leasehold land exists to the west of the Project, corresponding with the Saraji and Peak Downs Mines. Additionally, a large area of leasehold land to the north of the Project corresponds with the Poitrel and Millennium Mines.

Land within the Project area and to the east and south is made up of freehold land.

The rural properties in the vicinity of the Project are shown on Figure 2-13, namely the Winchester Downs, Iffley, and Wynette properties. Winchester Downs is privately-owned, Wynette is owned by Whitehaven WS and Iffley is owned by Pembroke.

Tenements

Figure 2-14 shows the mining tenements in the vicinity of the Project. This includes mining lease applications, exploration permits for coal, authorities to prospect, mining leases and petroleum leases.

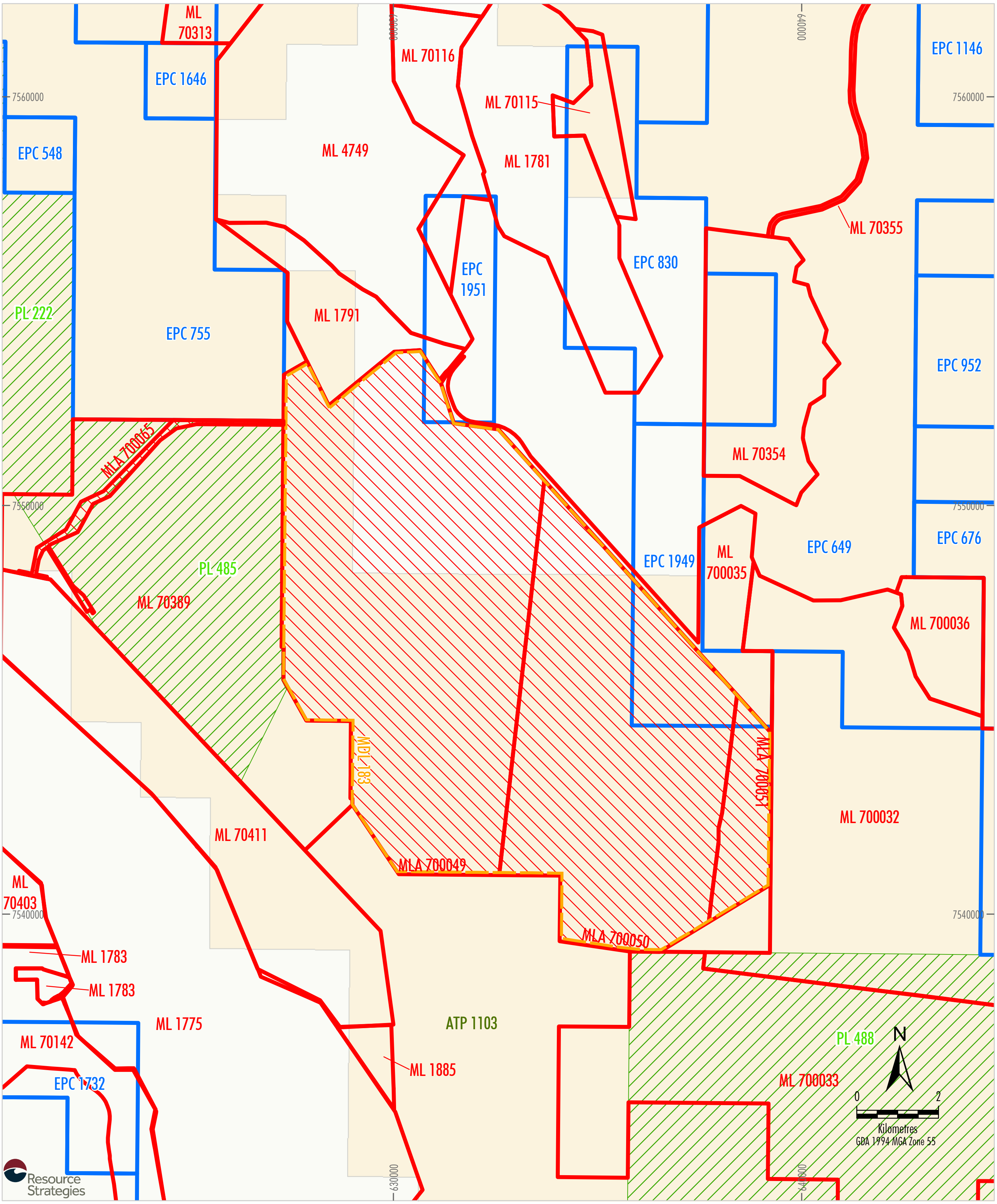
The Project is located within (Figure 2-14):

- MDL 183 and parts of Exploration Permit for Coal (EPC) 1951 and EPC 1949 (MLA 700049, MLA 700050 and MLA 700051); and
- ML 70389 and PL 485 (MLA 700065).

The proposed production mining lease applications for the Project within the above tenements include MLA 700049, MLA 700050 and MLA 700051 (replacing the pre-existing MDL 183) held by Whitehaven WS (Figures 1-2 and 2-1).

The transport mining lease application (MLA 700065), which contains the Project water supply pipeline, ETL and mine access road, is located within ML 70389 and PL 485 (held by South32 Eagle Downs Pty Ltd).

A petroleum tenement (ATP 1103) (held by Arrow) overlaps the Project area.



LEGEND
- Mineral Development Licence (MDL)
- Mining Lease Application Boundary (MLA)
- Mining Lease (ML)
- Exploration Permit for Coal (EPC)
- Petroleum Lease (PL)
- Authority to Prospect (ATP)

Source: The State of Queensland (2018 - 2020).

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Mining and Petroleum Tenements

Figure 2-14

Restricted and Reserve Land

Other than road reserves, two reserves (stock routes) are located in the vicinity of the Project, but outside the Project area (Figure 2-15). These reserves form part of the Barada Barna People Native Title Determination Area (QC2016/007).

Cultural Heritage Management

Whitehaven WS has formed a CHMP agreement with the Barada Barna Aboriginal Corporation. The CHMP describes the assessment of the cultural heritage values within the area, and the development of appropriate management strategies.

The CHMP was approved by the DATSIP pursuant to section 107 of the ACH Act on 31 March 2020.

Forests and Conservation Tenure

There are no forests or nature conservation areas, including National or State Parks, in the Project area or immediate surrounds.

The Dipperu National Park, located approximately 45 km to the north-east of the Project is the closest National Park.

Bundoora State Forest is the closest State Forest and is approximately 70 km to the south-west of the Project. Apsley and Blair Athol State Forests are approximately 95 km and 100 km to the south-west of the Project, respectively.

There are no Ramsar protected wetland sites, nationally important wetland sites, or World Heritage areas within the Project area or vicinity (DAWE, 2020a).

Native Title

The Barada Barna People are the native title holders for the general Project region (Queensland Government, 2020). Investigations indicate that native title has been extinguished over all land within the area of the mining lease applications and the land does not form part of the Barada Barna People's Native Title Determination.

As described above, Whitehaven WS has formed a CHMP with the Barada Barna Aboriginal Corporation.

Whitehaven WS has consulted and collaborated with the Barada Barna People during the EIS process (including during SIA consultation) to identify and implement training and development initiatives, and facilitate and support delivery of a tender readiness program for Indigenous businesses (Section 4.4 and Attachment 4).

Government Infrastructure

The majority of local existing health and education infrastructure are located within the townships of Moranbah and Dysart.

The State-owned roads, Peak Downs Mine Road and Fitzroy Developmental Road are located to the east and west of the Project, respectively.

Agricultural Land Uses

The existing land use for properties in the Project area is predominantly grazing.

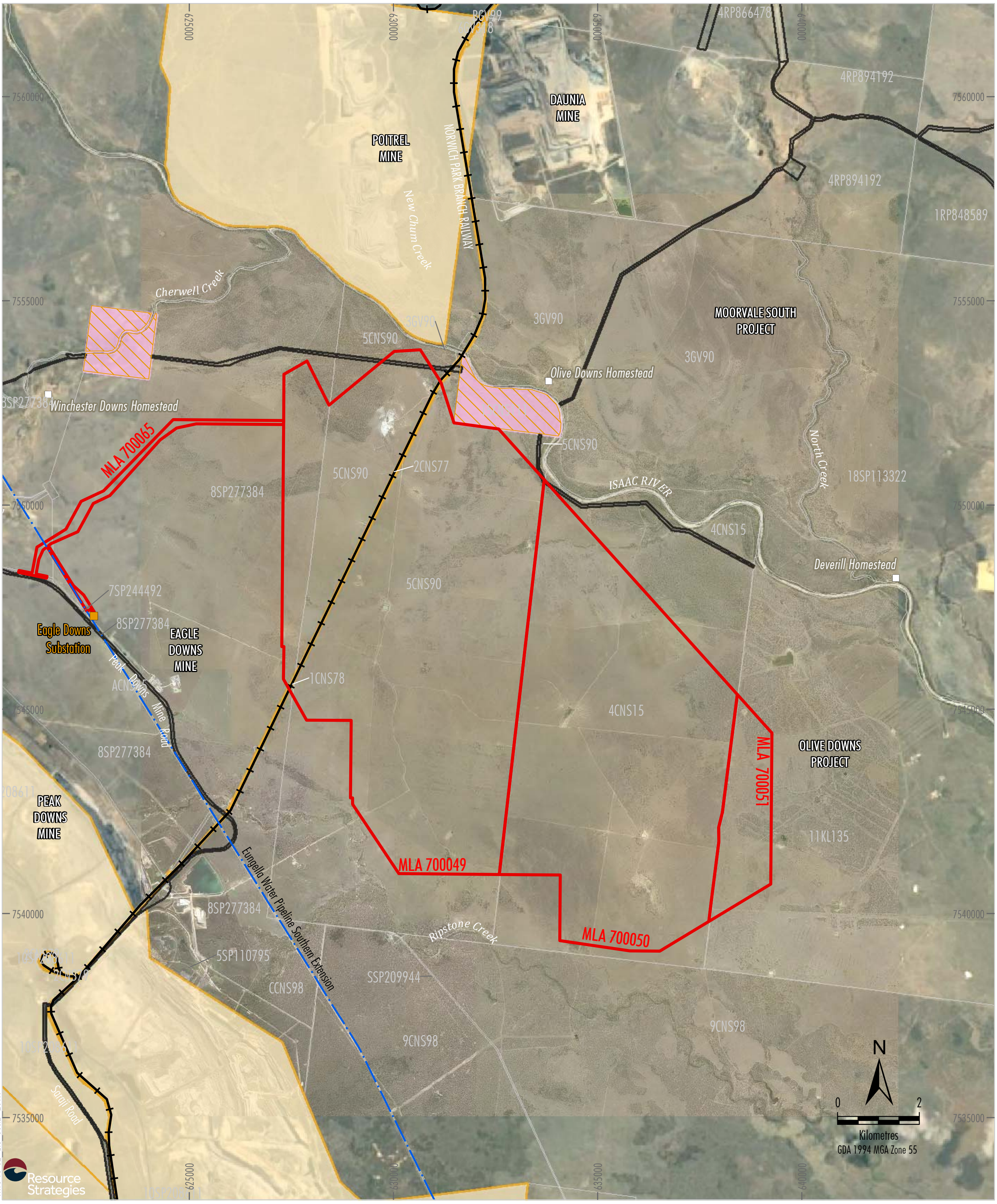
2.2.2 Existing Transport Infrastructure

Road Infrastructure

The major road transport routes in the vicinity of the Project are the Peak Downs Highway, Peak Downs Mine Road, Saraji Road, Moranbah Access Road, Mills Avenue, Eagle Downs Mine Access Road and Winchester Access Road (Figure 2-16).

Peak Downs Highway is a primary access route for access to existing coal mines in the Bowen Basin and provides the primary link between the Whitsunday Coast and the Central West. In the vicinity of the Project, Peak Downs Highway follows a north-east to south-west alignment, and typically has a single travel lane in each direction, with auxiliary turn lanes at major intersections and a posted speed limit of 100 kilometres per hour (km/hr) (Appendix I).

Peak Downs Mine Road, which becomes Saraji Road when it intersects the Saraji Mine, runs roughly north-south, and is approximately 5 km to the west of the Project area. Saraji Road provides a link between Peak Downs Mine Road at Peak Downs Mine and the town of Dysart (Appendix I).



LEGEND

- Mining Lease Application Boundary
- Privately Owned Land
- Eungella Water Pipeline Southern Extension
- Railway
- Substation

State Land

- Travelling Stock Route - Reserve
- Road
- Lands Lease
- Reserve

Source: The State of Queensland (2018 - 2020). Orthophoto: Google (2019); Whitehaven (2017).

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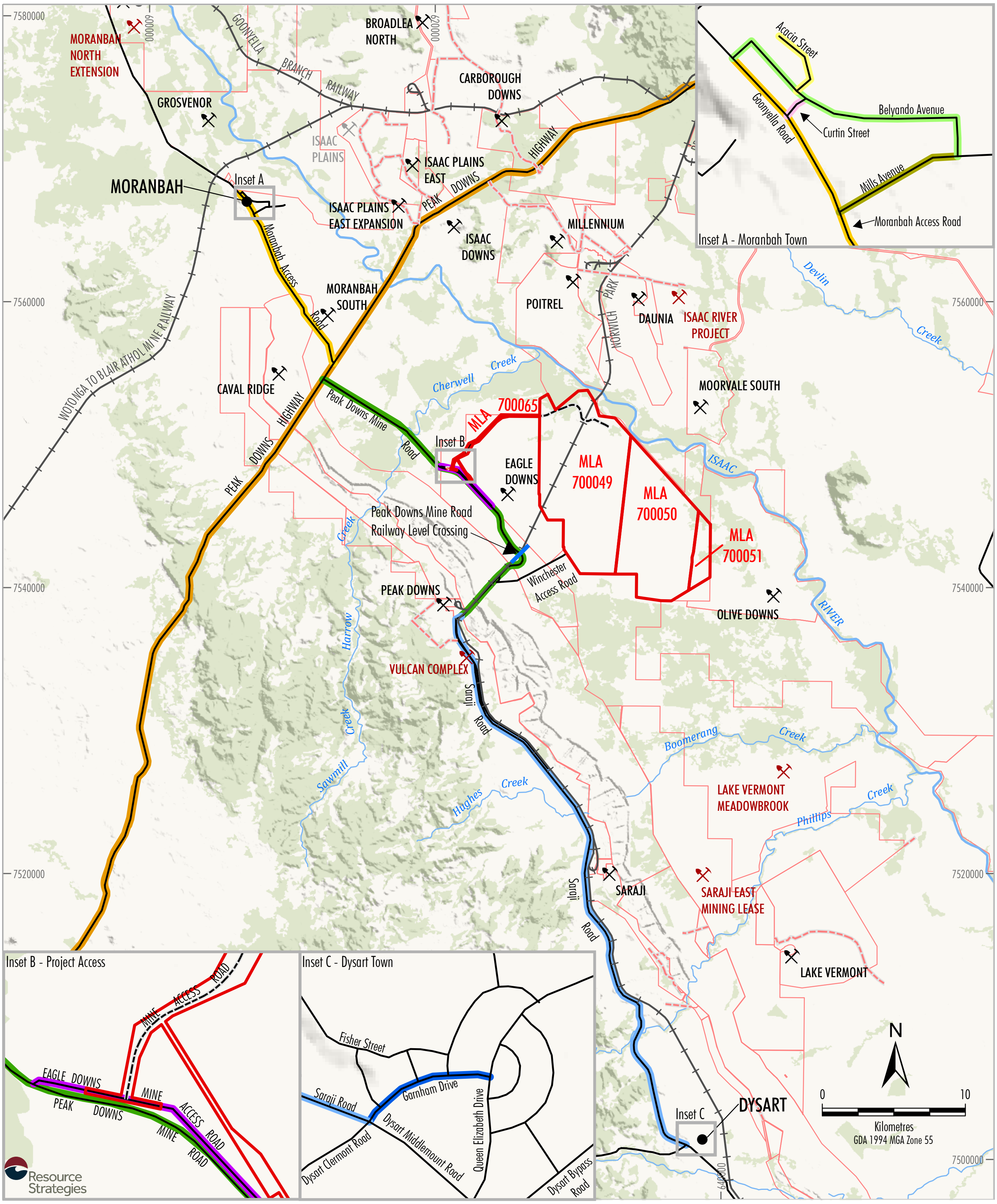
Tenure - State-owned Lands

Figure 2-15



LEGEND

- Mining Lease Application Boundary
- Mining Lease Boundary
- Mining Lease Access Road
- Railway
- Road
- Indicative Mine Access Road
- Peak Downs Mine Road Railway Level Crossing
- Approved/Operating
- Proposed
- Care and Maintenance

Regional

- Eagle Downs Mine Access Road
- Peak Downs Mine Road
- Saraji Road
- Peak Downs Highway
- Moranbah Access Road

Moranbah Local

- Curtin Street
- Belyando Avenue
- Acacia Street
- Mills Avenue

Dysart Local

- Garnham Drive

Source: The State of Queensland (2018 - 2020); TTPP (2019 - 2021). Geoscience Australia (2018).

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WINCHESTER SOUTH PROJECT

Existing Road Network

Figure 2-16

Moranbah Access Road provides the sole vehicular access between Peak Downs Highway and the town of Moranbah. North-east of Moranbah, it continues as Goonyella Road, which provides vehicular access for other existing mining operations (Appendix I).

Mills Avenue is the primary access to the town of Moranbah from Moranbah Access Road.

The mine access road for the Project will join the Eagle Downs Mine Access Road. The Eagle Downs Mine Access Road is a sealed road that provides access to the Eagle Downs Substation and Eagle Downs Mine.

The Project area is currently accessed via an existing private unsealed road that enters the site from the south-west (known as Winchester Access Road).

Winchester Access Road will be used as an access road for initial construction activities for the Project (or until the mine access road is available) and currently provides access to the Winchester Downs and Wynette properties, as well as the Winchester Quarry.

A number of private unsealed roads and tracks are located within the Project area.

There is no public transport access nor walking or cycling-specific infrastructure in the region for travel to and from the Project. Some of the mines in the region operate bus services for their workforce when travelling between the mine and local towns such as Moranbah, which reduces the overall demand for vehicle travel on the road network (Appendix I).

Rail Infrastructure

Rail transportation in the region is serviced by the Norwich Park Branch Railway, which runs generally north-south, traversing the western section of the Project (Figure 1-1). This rail line forms part of the Goonyella railway system, which is used to transport coal from the Bowen Basin to the Port of Hay Point's DBCT (Figure 1-2).

The Norwich Park Branch Railway also links the Goonyella railway system to the Newlands and Blackwater railway systems. The Newlands system transports coal from the northern end of the Bowen Basin to the APCT at the Port of Abbot Point, and the Blackwater system transports coal from the southern end of the Bowen Basin to two export terminals at the Port of Gladstone, RG Tanna Coal Terminal (RGTCT) and the Wiggins Island Coal Export Terminal (WICET).

Several existing mines in the region have rail spurs and loops, branching off the Norwich Park Branch Railway (Figure 1-1). The Norwich Park Branch Railway also services several railway stations within the vicinity of the Project.

Several railway stops and junctions for mining operations are located along the Norwich Park Branch Railway immediately north and south of the proposed Project rail spur including (south): Peak Downs Junction; Saraji Junction; Lake Vermont; Norwich Park; Middlemount; German Creek; and Oaky Creek, and (north): Millennium Junction; and Moorvale.

A rail spur is proposed to be developed as part of the adjacent Olive Downs Project, and is proposed to run along the north-eastern boundary of the Project area.

A rail spur and loop to the south-west of the Project was approved as part of the Eagle Downs Project in 2010. Based on the drawings in the 2009 EIS for the Eagle Downs Project, this rail spur and loop is located outside of the Project area.

Port/Sea Infrastructure

The DBCT and the APCT existing port infrastructure are located south-east of Mackay, and approximately 25 km north of Bowen, respectively. Existing port infrastructure at the Gladstone coal ports (RGTCT and WICET) is located east of Gladstone (Figure 1-2).

The existing port infrastructure at the coal ports would be utilised by the Project for the export of product coal. Whitehaven WS understands there is sufficient capacity at these coal ports for the Project.

Whitehaven WS would continue to consult with DBCT, APCT, RGCT and WICET regarding capacity requirements and availability as the Project progresses.

Air Infrastructure

The Mackay Airport is the nearest major regional airport servicing the region.

Other smaller airports located near the Project include:

- Moranbah (approximately 5 km south-east of the township of Moranbah); and
- Middlemount (approximately 1 km north of the township of Middlemount).

The Project workforce will utilise the existing regional air infrastructure as required.

2.2.3 Existing Energy Infrastructure

Electricity supply to the Bowen Basin is provided by Powerlink's 275/132 kV substations at Strathmore, Nebo and Lilyvale. From these substations, the area is supplied from a number of 132 kV substations and Queensland Rail (QR) substations. Energy Queensland further distributes electricity from these substations to local customers (Powerlink, 2012).

Permanent electricity supply for the Project would be provided from the existing regional power network via construction of a 132 kV ETL to the Project from Powerlink's Eagle Downs Substation (Figure 2-1).

2.2.4 Existing Water Infrastructure

Sunwater operates the Eungella pipeline network (part of the Bowen Broken Rivers Scheme), which supplies water from the Eungella Dam (located on the Broken River) to the towns of Collinsville/Scotsville, Glenden and Moranbah, a number of coal mines, the Collinsville Power Station and several irrigated farms downstream of Bowen River Weir (Sunwater, 2019).

The Eungella Water Pipeline Southern Extension network runs generally north-south, approximately 5 km west of the Project. As part of the Project, a raw water supply pipeline would be constructed to the Project from the Eungella pipeline network (Figure 2-1).

Discussions with Sunwater indicate that availability exists within the Eungella network to satisfy the water requirement for the Project. Sunwater has, however, indicated that additional capital works may be required as part of this water solution. This will be scoped further; however, it is outside the scope of this EIS.

2.2.5 Rural Premises, Business Precincts and Public Facilities

The key business precinct that would service the Project workforce and the Project itself is located in Moranbah (Figure 1-1). Other business precincts that would service the Project are located in Dysart, Middlemount and Nebo (Figure 1-1).

Health facilities in the region include hospitals in Moranbah and Dysart, and medical centres in Moranbah, Middlemount, Nebo and Dysart. Potential impacts to health services are described in Appendix C.

Three State schools are located in Moranbah (two primary and one secondary), two in Dysart (one primary and one secondary), and one in Middlemount (merged primary and secondary), Nebo (primary) and Coppabella (primary).

Other public facilities such as libraries, sports facilities, cemeteries, halls, and arts and community centres are located in Moranbah, Dysart, Middlemount and Nebo.

The rural properties in the Project area and surrounds are the Winchester Downs, Iffley, and Wynette properties (Figure 2-13). Winchester Downs is privately-owned, Wynette is owned by Whitehaven WS and Iffley is owned by Pembroke.

Homesteads located in the vicinity of the Project include (Figure 2-13):

- the Winchester Downs Homestead (located approximately 6 km west of the Project, and approximately 2.5 km from the Project infrastructure corridor);
- the Olive Downs Homestead (located approximately 3 km north of the Project); and
- the Deverill Homestead (located approximately 6.5 km east of the Project).

2.2.6 Topography, Landform and Catchments

Topography and Landforms

The Project is bordered by the Isaac River to the north-east and the Olive Downs Project to the east and south-east. The Peak Downs and Saraji Mines are located approximately 6 km to the west and approximately 7 km to the south-west, respectively.

The Project area landscape has an average elevation of approximately 210 metres Australian Height Datum (mAHD) and is generally flat to slightly undulating. The Project area elevation ranges from approximately 185 mAHD in the north-east of the Project to approximately 235 mAHD in the higher areas to the south-west of the Project area (Geoscience Australia, 2019).

A cluster of mountains are located to the east of the Project area (Mount Coxendean, Iffley Mountain and Coxens Peak), range from elevations of 471 mAHD (Mount Coxendean) to 310 mAHD (Iffley Mountain). Possum Hill (located to the west of the Project) and Red Mountain (located to the north of Project) both reach an elevation of 330 mAHD (Figure 2-11).

Further west of the Project area lie the Cherwell and Harrow Ranges, which have elevations of approximately 300 mAHD to 500 mAHD.

Regional Catchment

The Project lies within the Upper Isaac River catchment of the greater Fitzroy Basin (Figure 2-17). The Upper Isaac River catchment has an overall size of 10,125 square kilometres (km^2).

The Isaac River is the main watercourse in the Project surrounds and flows in a north-west to south-east direction near the Project's northern boundary (Figure 2-1).

The Isaac River flows from the southern side of Mount Ewan (north of the Kerlong Range), past Moranbah. The Connors River joins the Isaac River approximately 100 km south-east of the Project. The Isaac River then converges with the Mackenzie River, a further 50 km downstream, before draining to the Coral Sea, south-east of Rockhampton near Port Alma.

The Project does not involve any mining activities or infrastructure in the Isaac River. No diversion of the Isaac River is proposed and therefore *Guideline: Works that interfere with water in a watercourse for a resource activity— watercourse diversions authorised under the Water Act 2000* (DNRME, 2019) is not relevant. Notwithstanding, the principles of DNRME (2019) would be considered as part of the detailed design of the post-mining landform drainage paths.

Local Catchments

Tributaries of the Isaac River in the vicinity of the Project include (Figure 2-1):

- Ripstone Creek, located to the south of the Project;
- New Chum Creek, located to the north of the Project; and
- Cherwell Creek, located to the north-west of the Project.

2.2.7 Geology Features, Exploration History and Coal Resource

Geological Features

The Project lies within the western part of the northern Bowen Basin, which contains sedimentary rocks, including coal measures, of Permian and Triassic age.

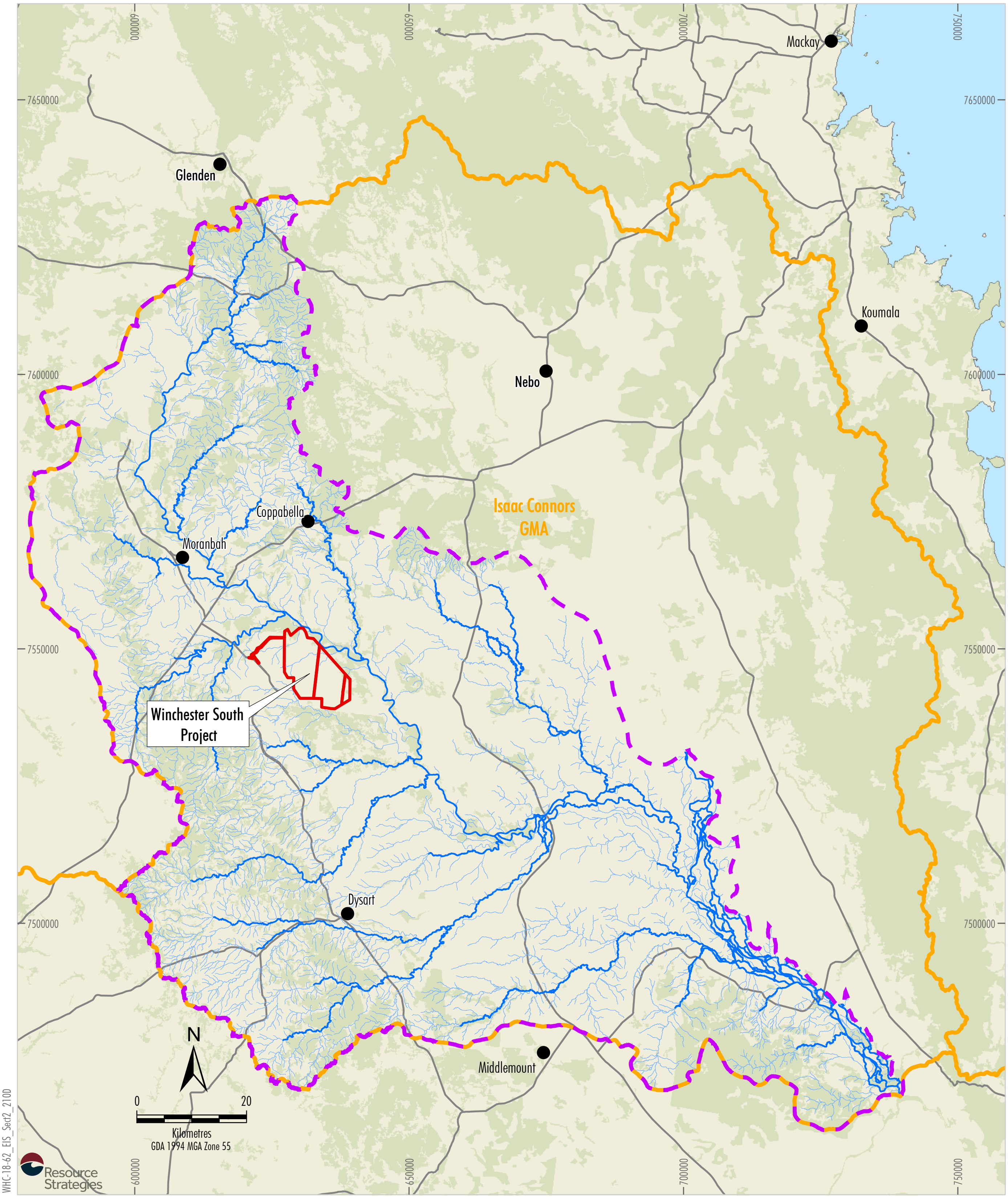
The regional outcrop geology mapping shows the Rangal Coal Measures (overlain by the Triassic Rewan Formation) and the Permian Fair Hill Formation/Fort Cooper Coal Measures and across the Project area (Figure 2-18a). An indicative geological cross-section is presented on Figure 2-18b and a conceptual cross-section of the geology within the Project area is shown on Figure 2-18c.

The target mining area lies within the Winchester Syncline. The Winchester Syncline is the result of a later stage compressional event that created fold structures along north-south trending fold axes. Ongoing compression resulted in the over-steepening of some normal structures, creating high-angle thrusts and additional thrust structures. The major thrust structures appear to be located on anticline axes (Xenith Consulting Pty Ltd [Xenith], 2018).

Geological features identified in the target mining area and surrounds include (Xenith, 2018):

- the Isaac Fault, located to the west, with a throw of approximately 100 m in the centre of the mining area, and a zone of more than 500 m wide in the northern part of the proposed mining area; and
- the Eastern Fault Zone, bounding the mining area to the east, with a maximum throw of more than 150 m in some areas.

The Eastern Fault comprises a set of thrust faults with east side up, and are less continuous than the Isaac Fault. These faults have an echelon-type nature, whereby when one fault decreases in displacement another fault slightly offset from it will be present, and its displacement will increase with distance away from the fault with decreased displacement (Xenith, 2018).



LEGEND
- Mining Lease Application Boundary
- Groundwater Management Area
- Isaac River Sub-catchment Catchment Area
- Minor (Order 1 and 2)
- Major (Order 3 - 8)

Source: The State of Queensland 2018 - 2020); Geoscience Australia (2018).

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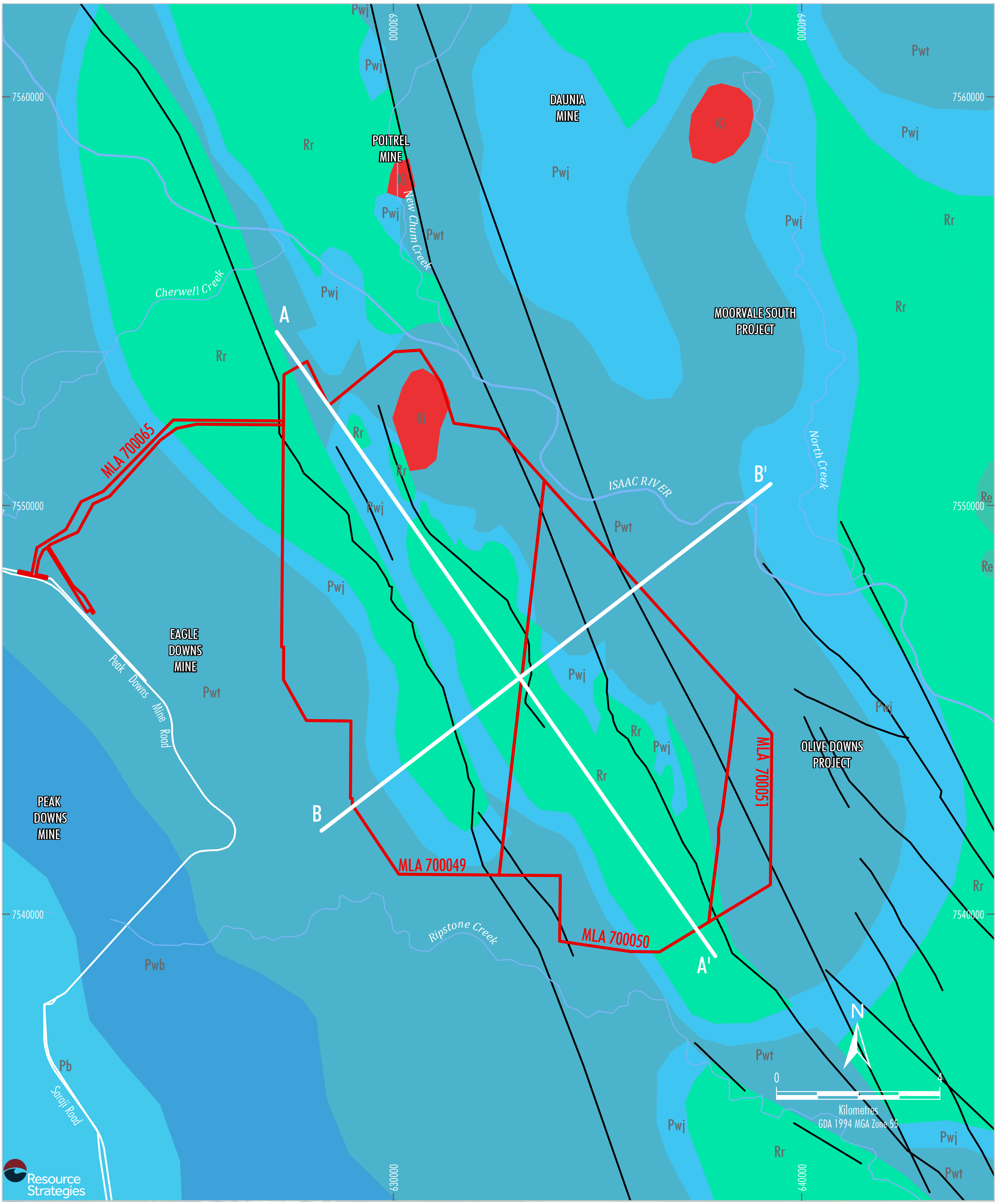
Upper Isaac River Catchment

Figure 2-17



LEGEND

Mining Lease Application Boundary

Modelled Fault

Rock Unit Name

PB	Back Creek Group
RE	Clematis Group
Pwt	Fair Hill Formation, Fort Cooper Coal Measures
Ki	Ki-CQ
Pwb	Moranbah Coal Measures
Pwj	Rangal Coal Measures, Bandanna Formation, Baralaba Coal Measures
Rr	Rewan Group

Source: The State of Queensland (2018 - 2020); SLR (2021).

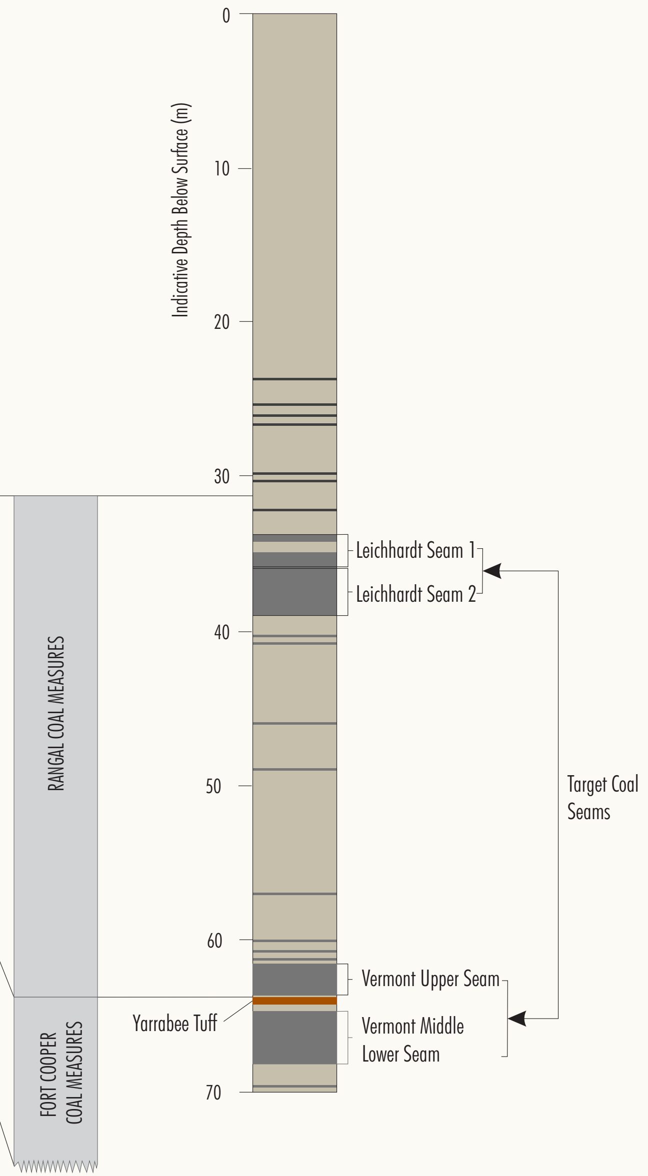
WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Regional Geology

Figure 2-18a

BASIN	PERIOD		GROUP/FORMATION	
BOWEN	TRIASSIC		MIMOSA GROUP	Clematis Group
				Rewan Group
	PERMIAN	LATE	Blackwater Group	Rangal Coal Measures
				Fort Cooper Coal Measures (Fair Hill Formation)
				Moranbah Coal Measures
		EARLY TO MIDDLE	Back Creek Group	



Source: Whitehaven (2020).

Note: Indicative depth only. Coal seam depth varies over the Project area.

WHITEHAVEN COAL

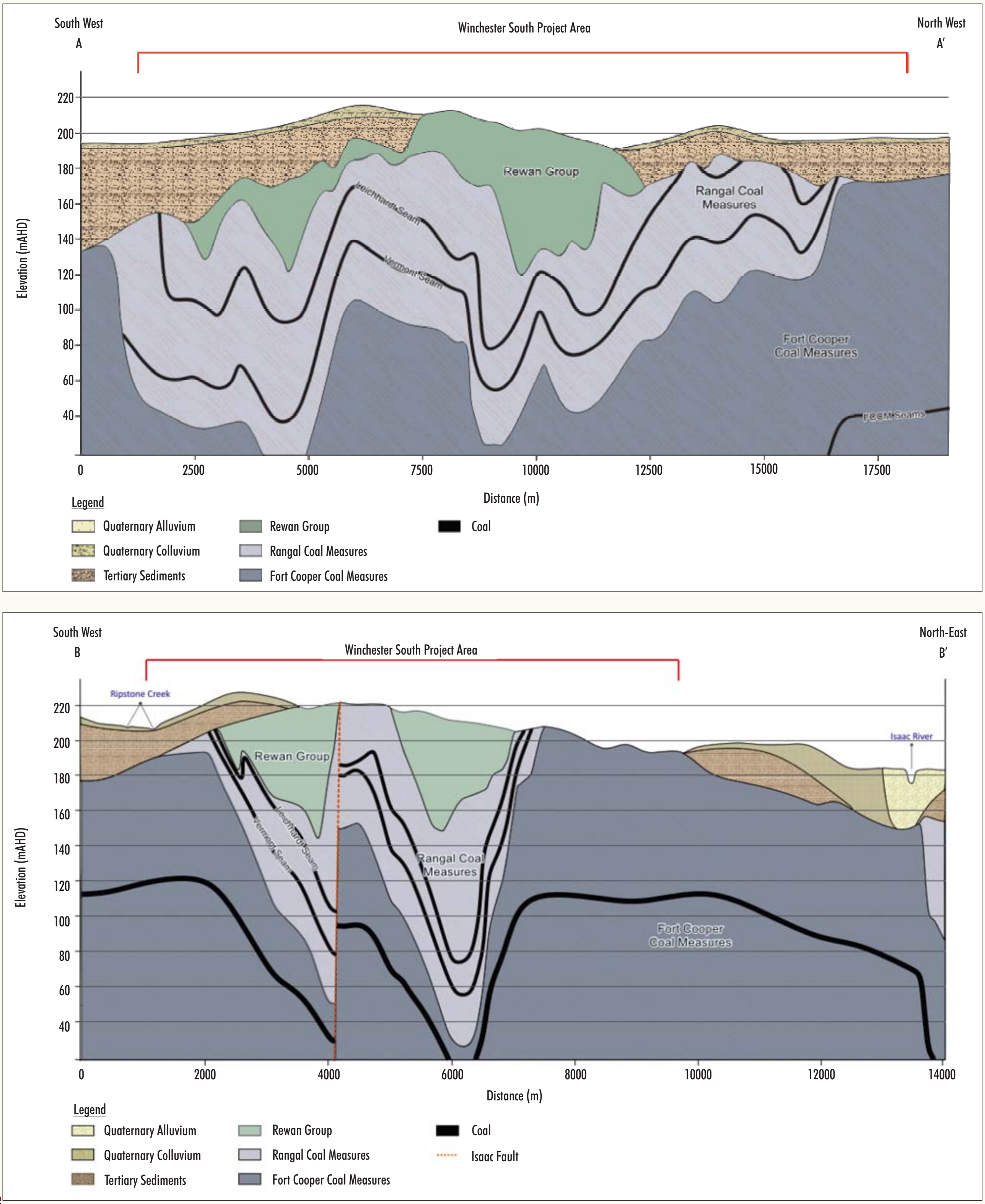
WINCHESTER SOUTH PROJECT

Indicative Stratigraphy of the Project Area

Figure 2-18b

WHC-18-62_EIS_Sect2_003D

Resource Strategies



WHC-18-62_EIS_Sect2_010A

Resource Strategies

Source: SLR (2021).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Regional Geology
-Indicative Cross-sections

Figure 2-18c

Exploration History

Past coal exploration and drilling programs have been undertaken in the Project area and surrounds, including:

- 1960s – Utah Development Company exploration program.
- 1981 and 1982 – BP Coal exploration program comprised a total of 1,032 holes made up of 826 open holes, 138 slim (68 millimetres [mm]) partly cored holes, 42 geotechnical holes, 18 large diameter holes and eight bulk sample holes.
- 2005 – Rio Tinto Coal Australia Pty Limited exploration program comprised a total of 22 holes including 11 chip pilot holes, five partially cored 100 mm holes and six partially cored 200 mm holes.
- 2011 – Rio Tinto Coal Australia Pty Limited exploration program comprised a total of 180 holes, including 107 open holes, 54 partially cored 100 mm holes, nine partially cored 200 mm holes and 10 HQ-3 (63 mm) holes.
- 2013 – drilling program targeting the deeper Moranbah Coal Measures and 2D seismic lines.
- 2014 – drilling program targeting the Moranbah, Rangal and Fort Cooper Coal Measures.

In 2019 and 2020, Whitehaven WS has also conducted exploration programs within the Project area, which comprise of a total of approximately 180 open holes, 25 cored (8 inch) holes and 17 cored holes (4 inch).

Coal Resource

The target coal seams are contained within the Rangal and Fort Cooper Coal Measures within the Late Permian Blackwater Group.

Above the Rangal Coal Measures lies the Rewan Formation, consisting of red-brown mudstones with fine- to coarse-grained greenish lithic sandstones.

The Rangal Coal Measures overlie the Fort Cooper Coal Measures within the Project area. The sequence is characterised by fine- to medium-grained sandstones and siltstones with coal seams at the base.

The Fort Cooper Coal Measures are approximately 350 m thick and contain variable brown to grey carbonaceous siltstone, mudstone and fine-grained sandstone with high ash coal. The top of the sequence is marked by the Yarrabee Tuff, a basin-wide tuffaceous claystone marker interval which separates the Upper Vermont and Vermont Middle Lower Seams.

Figure 2-18b presents the indicative stratigraphy of the Project area, including the target coal seams within the open cut extent, that are as follows:

- the Leichhardt Seams (Leichhardt 1 and Leichhardt 2); and
- the Vermont Seams (Upper and Middle Lower Seams).

Individual coal seams range in thickness from approximately 0.1 m to 4 m. The Project coal seams will deliver a low-medium volatile coking coal product and have a Joint Ore Reserve Committee (JORC) resources of 530 Mt.

2.2.8 Waterways and Watercourses

Waterways

Waterways are defined as '*a river, creek, stream, watercourse, drainage feature or inlet of the sea*' under the Fisheries Act.

Watercourses

Section 5 of the Water Act defines a watercourse as:

> *(1) A **watercourse** is a river, creek or other stream, including a stream in the form of an anabranch or a tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events -*
>
> *(a) in a natural channel, whether artificially modified or not; or*
>
> *(b) in an artificial channel that has changed the course of the stream*
>
> *(2) A **watercourse** includes any of the following located in it –*
>
> *(a) in-stream islands;*
>
> *(b) benches;*
>
> *(c) bars.*
>
> *(3) However, a **watercourse** does not include a drainage feature*
>
> ….

Watercourses as defined by the Water Act, as well as other drainage lines, within the Project area and surrounds are shown on Figure 2-17. Three watercourses, Isaac River, Ripstone Creek and an unnamed watercourse are located within and surrounding the Project area.

Matters of State Environmental Significance

The *State Planning Policy* (Queensland Government, 2017) defines MSES as including:

> …
>
> *(j) waterways that provide for fish passage under the Fisheries Act 1994 (excluding waterways providing for fish passage in an urban area)*
>
> …

Furthermore clause 10 of Schedule 2 of the *Environmental Offsets Regulation 2014* states:

> *(1) Any part of a waterway providing for passage of a fish is a matter of State environmental significance only if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.*
>
> …

The Department of Agriculture, Fisheries and Forestry (DAFF)'s *Queensland Waterways for Waterway Barrier Works* mapping assigns the risk of adverse impact from instream barriers on fish movement to a waterway. Waterways with higher stream orders, lower slopes, higher flow rates, greater numbers of fish present and fish with weaker swimming abilities obtain a higher level of risk (DAFF, 2013a).

The Isaac River and Ripstone Creek are mapped by DAFF (2013a) as being at major risk and high risk of adverse impact (respectively) from waterway barrier works on fish movement.

Drainage lines within the Project area are mapped as being at low to moderate risk of adverse impact from waterway barrier works on fish movement (Appendix E).

Further detail regarding the watercourses and MSES is provided in Section 4.

2.2.9 Soils and Land Use

Soils

GTE (2021) conducted soil and land suitability surveys conducted in accordance with the *Guidelines for Surveying Soil and Land Resources* (McKenzie *et al*., 2008). Soil characteristics and soil profiles have been described in accordance with the *Australian Soil and Land Survey: Field Handbook* (National Committee on Soil and Terrain, 2009) and *Australian Soil and Land Survey: Guidelines for Conducting Surveys* (Gunn *et al.*, 1988).

GTE (2021) also surveyed the three potential infrastructure corridors in accordance with guidance provided in the *Draft for Discussion: Soil Survey Methodology along Linear Features* (Forster, 2011) and *Guidelines for Soil Survey along Linear Features* (Soil Science Australia, 2015). In addition, GTE (2021) has participated in recent discussions with DNRM (now DoR) regarding requirements for soil surveys of linear features.

Soils have been grouped according to their parent material and position in the landscape and classified in accordance with the *Australian Soil Classification* (Isbell, 2016). Soils have also been correlated to soils identified within key regional soil assessments, the major assessment being *Lands of the Isaac-Comet Area, Queensland* (Gunn et al., 1967) (Appendix J).

Collection of soil samples for laboratory analysis was undertaken in line with the Land Suitability Assessment Techniques (LSAT) outlined in the Department of Minerals and Energy (DME) guideline *Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME, 1995) (Appendix J).

GTE (2021) has mapped nine different Australian Soil Classification soil types classified into fifteen soil mapping units (SMUs) across the Project area and surrounds based on 99 detailed sites and 311 observation sites:

- C1-BL – Moderate to deep black clay soils on flat plains with melon hole microrelief.
- C1-BR – Moderate to deep brown clay soils on flat plains with melon hole microrelief.
- C3-BL – Moderate to deep black clay soils on gently undulating plains.

- C3-BR – Moderate to deep brown clay soils on gently undulating plains.
- C4 – Moderate to deep black clay soils on gently undulating plains with linear microrelief.
- C5 – Moderate to deep black clay soils on alluvial plains.
- K1 – Very shallow sandy loams on wide crests.
- R3 – Deep brown sandy to loam soils on flat plains.
- S1 – Brown texture contrast loamy soils on gently undulating plains.
- S3 – Texture contrast loams on clays on flat to gently undulating plains.
- S4 – Deep sandy earths on flat plains.
- T1-B – Texture contrast brown clay soils on gently undulating plains.
- T1-R – Texture contrast brown to red clay soils on wide crests.
- T2 – Texture contrast massive structure clay soils on gently undulating plains.
- T3 – Gradational alkaline silty clay soils on flat plains.

No acid sulfate soils were mapped within the Project area or identified by GTE (Appendix J). The results of the Soils and Land Suitability Assessment are described in further detail in Section 4.10 and Appendix J.

Land Use

The Project is located within the Bowen Basin mining precinct, surrounded by existing and approved mining operations and projects, including Moorvale South Project, Daunia, Poitrel, Isaac Downs Project, Isaac Plains, Eagle Downs, Olive Downs Project, Peak Downs and Saraji. The majority of these are open cut mining operations.

Coal and petroleum (e.g. coal seam gas) mining exploration activities have been conducted within the Project area and surrounds for decades, and continue in the present.

Land within the Project area is used predominantly for cattle grazing, which reflects the land use suitability assessment findings that the majority of the Project area is Class 3, considered to be suitable for grazing but with moderate limitations.

As described in Section 2.1.5, three areas of *good quality agricultural land* as mapped by the *Mackay, Isaac and Whitsunday Regional Plan* (Department of Local Government and Planning, 2012) are within the Project area.

There are no strategic cropping areas mapped within the Project area (extent of disturbance) (Figure 2-11).

2.2.10 Queensland Agricultural Land Audit

The Queensland Agricultural Land Audit (the Audit) was prepared by DAFF in 2013 and is updated annually. The Audit identifies land important to current and future agricultural production and the constraints to agricultural development.

The Audit defines 'important agricultural areas' as (DAFF, 2013b):

> *…land that has all the requirements for agriculture to be successful and sustainable, is part of a critical mass of land with similar characteristics and is strategically significant to the region or the state.*

The Project is not located within an 'important agricultural area'. As described in Section 2.2.9, there are no strategic cropping areas mapped within the Project area (Figure 2-11). The closest strategic cropping area to the Project is located to the west, within 10 m of at its closest point (within the Norwich Park Branch Railway corridor) (Appendix J).

Land within the Project area is predominantly classified as Class C1 (sown pastures requiring ground disturbance for establishment; or native pastures on high fertility soils) and Class C2 (native pastures) agricultural land, considered to be suitable for grazing (Department of Science, Information Technology and Innovation [DSITI] and DNRM, 2015). Parts of the Project area are also considered to be Class A1 (broadacre and horticultural crops) agricultural land, considered to be suitable for crops.

2.2.11 Tourist Destinations and Recreation Sites

There are no tourist destinations or recreation sites in the Project area.

Deliveries for the Project are expected to originate from Moranbah and Mackay. *The Isaac Tourism Strategy 2019-2024* (Isaac Regional Council, 2019) identifies the Moranbah Arts Festival and participating in a mine tour in the Bowen Basin as tourism activities in the region.

Tourism destinations in the Mackay region as identified in the *Mackay Isaac Destination Tourism Plan Review 2019-2022* (Mackay Tourism Limited, 2019) include the Eungella National Park and Cape Hillsborough National Park, which are located approximately 110 km north-east and approximately 150 km north-east of the Project, respectively.

It is not expected that the Project-related deliveries would impact on tourism activities in the vicinity of the Project, as identified in the *Isaac Tourism Strategy 2019-2024* (Isaac Regional Council, 2019) and *Mackay Isaac Destination Tourism Plan Review 2019 -2022* (Mackay Tourism Limited, 2019).

2.3 CLIMATE

Long-term meteorological data for the region are available from nearby Commonwealth Bureau of Meteorology (BoM) meteorological stations (Figure 2-19 and Table 2-3).

The Carfax weather station (34016), located approximately 43 km south-east of the Project (Figure 2-19), provides the most extensive rainfall dataset in the vicinity of the Project.

The Moranbah Water Treatment Plant weather station (34038), located approximately 25 km north-west of the Project (Figure 2-19), provides the most extensive temperature dataset; however, it was decommissioned in 2012 and replaced with the Moranbah Airport weather station (34035) (located approximately 15 km north-west of the Project).

Short-term local records (since mid-2019) are available from the Whitehaven WS on-site weather station (Figure 2-19). The on-site weather station monitors a number of meteorological parameters, including rainfall, temperature, humidity, wind speed and wind direction.

A summary of meteorological parameters in the vicinity of the Project relevant to the environmental studies in this EIS are provided below.

2.3.1 Rainfall

The long-term annual average rainfall recorded at the Carfax weather station (34016) is approximately 616 mm, based on records dating back to 1962 (Table 2-3).

The long-term annual average rainfall recorded at the Moranbah Water Treatment Plant weather station (34038) is approximately 614 mm, based on records from 1972 to 2012 (Table 2-3). This corresponds with the long-term average observed at Carfax weather station (34016).

The annual average rainfall recorded at the Moranbah Airport weather station (34035) is approximately 529 mm, based on records dating back to 2012, indicating that conditions have been drier than those previously recorded at the Moranbah Water Treatment Plant.

2.3.2 Evaporation and Evapotranspiration

Long-term pan evaporation records are available from the now decommissioned Moranbah Water Treatment Plant (34038) meteorological station. Between 1972 and 2012, the station recorded an annual average evaporation of approximately 2,300 mm (Table 2-3). When compared to long-term average rainfall, the rate of evaporation exceeds rainfall on an annual average basis, as well as for all months.

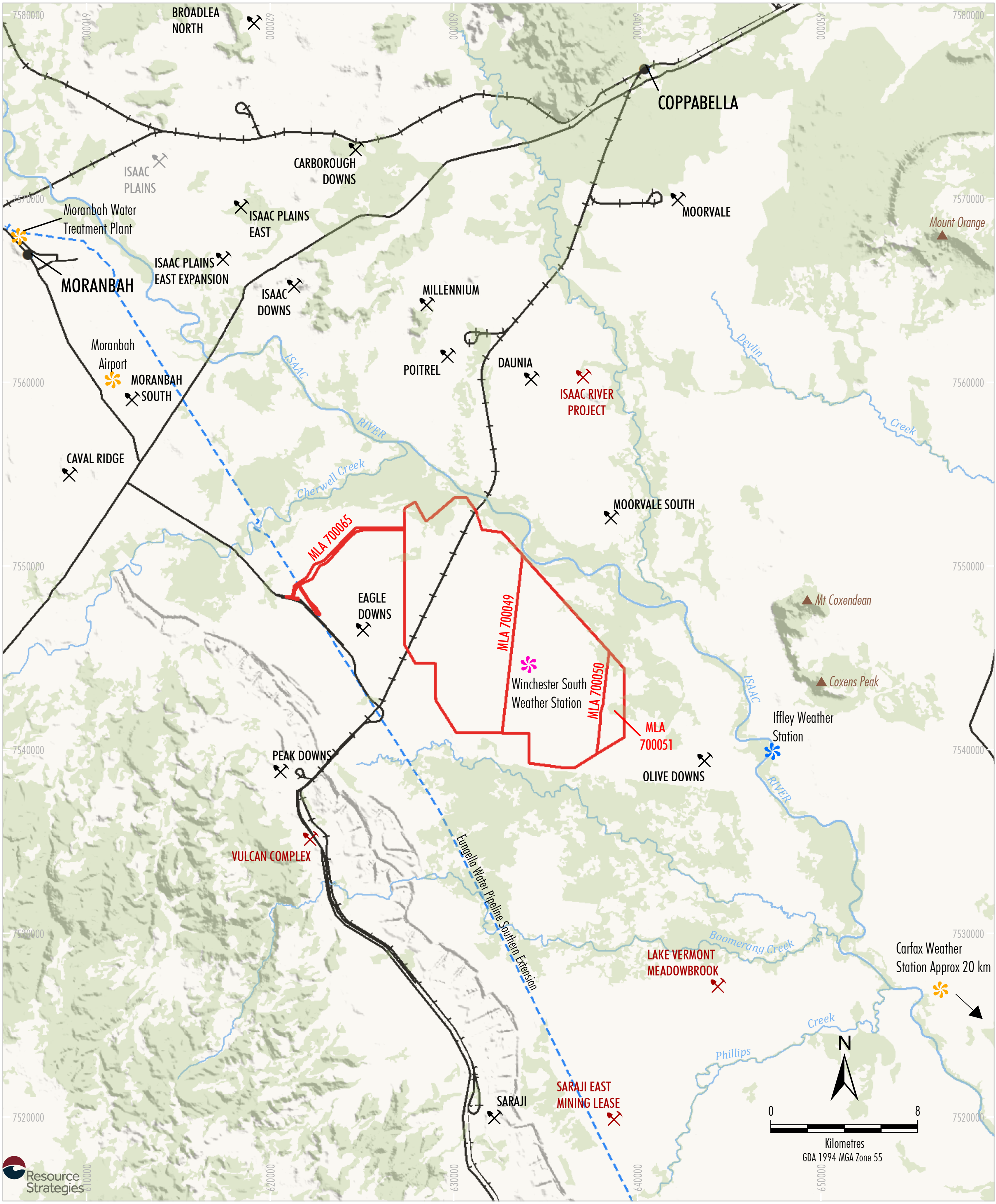
The BoM has mapped average actual evapotranspiration rates (collective term used for the transfer of water from vegetated and un-vegetated land surfaces to the atmosphere) in the vicinity of the Project as approximately 600 mm per year (mm/year) (Appendix A), which is approximately 26% of the measured Class A pan evaporation.

2.3.3 Temperature

The closest BoM meteorological station to the Project with sufficient temperature data is Moranbah Water Treatment Plant (34038); however, as it was decommissioned in 2012 and replaced by the Moranbah Airport meteorological station (34035), this data has also been displayed for reference (BoM, 2020a).

Monthly average daily maximum and minimum temperatures are provided in Table 2-3.

Temperature measurements continue to be recorded at the Whitehaven WS on-site weather station.



LEGEND

- Mining Lease Application Boundary
- On-site Weather Station
- Other Mine-owned Weather Station
- Bureau of Meteorology Weather Station
- Eungella Water Pipeline Southern Extension
- Railway
- Road
- Approved/Operating
- Proposed
- Care and Maintenance

Source: The State of Queensland (2018 - 2020); Whitehaven (2020); BOM (2020).

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WINCHESTER SOUTH PROJECT

Regional Meteorological and Weather Stations

Figure 2-19

Table 2-3
Meteorological Summary – Average Rainfall, Evaporation, Temperature and Humidity

Period of Record	Average Monthly Rainfall (mm)			Average Monthly Pan Evaporation (mm)	Average Temperature (°C) [Minimum – Maximum]		Average Relative Humidity (%) [9.00 am – 3.00 pm]
	Carfax (34016)	Moranbah Airport (34035)	Moranbah Water Treatment Plant (34038)	Moranbah Water Treatment Plant (34038)	Moranbah Airport (34035)	Moranbah Water Treatment Plant (34038)	Moranbah Water Treatment Plant (34038)
	1962 – 2020	2012 – 2020	1972 – 2012	1972 – 2012	2012 – 2020	1986 – 2012	1986 – 2010
January	110.9	86.2	103.8	240.0	20.7 – 36.7	21.9 – 33.8	69 – 43
February	95.3	103.6	100.7	207.2	20.1 – 37.0	21.8 – 33.1	74 – 48
March	62.5	97.7	55.4	210.8	18.8 – 35.2	20.2 – 32.1	70 – 41
April	31.8	26.2	36.4	171.0	14.6 – 31.3	17.6 – 29.5	72 – 43
May	35.6	27.4	34.5	133.3	10.6 – 30.1	14.2 – 26.5	73 – 43
June	28.0	17.3	22.1	105.0	7.8 – 25.8	11.2 – 23.7	73 – 44
July	22.3	29.5	18.0	114.7	5.2 – 26.2	9.9 – 23.7	69 – 39
August	22.5	8.3	25.0	151.9	6.7 – 28.5	11.1 – 25.5	66 – 35
September	18.5	7.4	9.1	198.0	11.1 – 33.2	14.1 – 29.2	60 – 30
October	35.7	24.7	35.7	248.0	13.3 – 34.6	17.6 – 32.3	58 – 31
November	55.3	42.5	69.3	255.0	17.7 – 36.2	19.4 – 33.1	60 – 34
December	95.2	56.5	103.9	263.5	18.8 – 36.3	21.1 – 34.0	64 – 38
Annual Average	**615.9**	**529.3**	**614.2**	**2,300**	**15.1 – 31.3**	**16.7 – 29.7**	**67 – 39**

Source: BoM (2020a).

°C = degrees Celsius.

Note: Totals may not add exactly due to rounding.

2.3.4 Humidity

The closest BoM meteorological station to the Project with recorded humidity data is located at the Moranbah Water Treatment Plant (34038) (BoM, 2020a). Monthly average relative humidity records at 9.00 am and 3.00 pm for the station throughout the recorded period (1986 to 2010) are provided in Table 2-3.

The long-term annual average humidity is 67% at 9.00 am and 39% at 3.00 pm.

Humidity levels continue to be recorded at the Whitehaven WS on-site weather station.

2.3.5 Bushfire Risk

The Project is located within areas mapped as "medium potential bushfire intensity" bushfire hazard (Figure 2-20) (Queensland Government, 2020).

All reasonable and practicable fire prevention measures would be implemented by Whitehaven WS during construction and operation, which may include:

- clearing restrictions;
- controlled grazing;
- restricted vehicle movements;
- the construction and maintenance of fire breaks (if required);
- the use of diesel vehicles;
- prohibition of smoking in fire-prone areas;
- the provision of fire-fighting equipment around the site; and
- the training of staff in the proper use of the fire-fighting equipment.

Bushfire risk has been assessed further in Section 4.13.

2.3.6 Wind Speed and Direction

As part of the Air Quality and Greenhouse Gas Assessment (Appendix H), wind roses showing annual, seasonal and diurnal frequencies of winds at the Project were developed using The Air Pollution Model (TAPM)/CALMET meteorological models.

TAPM was developed and validated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and requires synoptic meteorological information for the region surrounding the Project, which is generated by a global model similar to the large-scale models used to forecast the weather. TAPM resolves local terrain and land use features that may influence local meteorology and generates a meteorological dataset that is representative of site-specific geographic conditions (Appendix H).

The prevailing wind direction for the Project is from the north-east through to the south-east. During the year, winds vary with the seasons, with south-easterlies most frequent during autumn and winter, and north-easterlies most frequent during spring. The highest frequency of winds above 6 metres per second (m/s) occurs during summer, from the east and east-southeast, which are also the most frequent wind directions (Appendix H).

These results are consistent with the annual wind roses from the Moranbah Water Treatment Plant (34038) (BoM, 2020a), which show the highest frequency of wind speeds (approximately 6 m/s) occurring from the east.

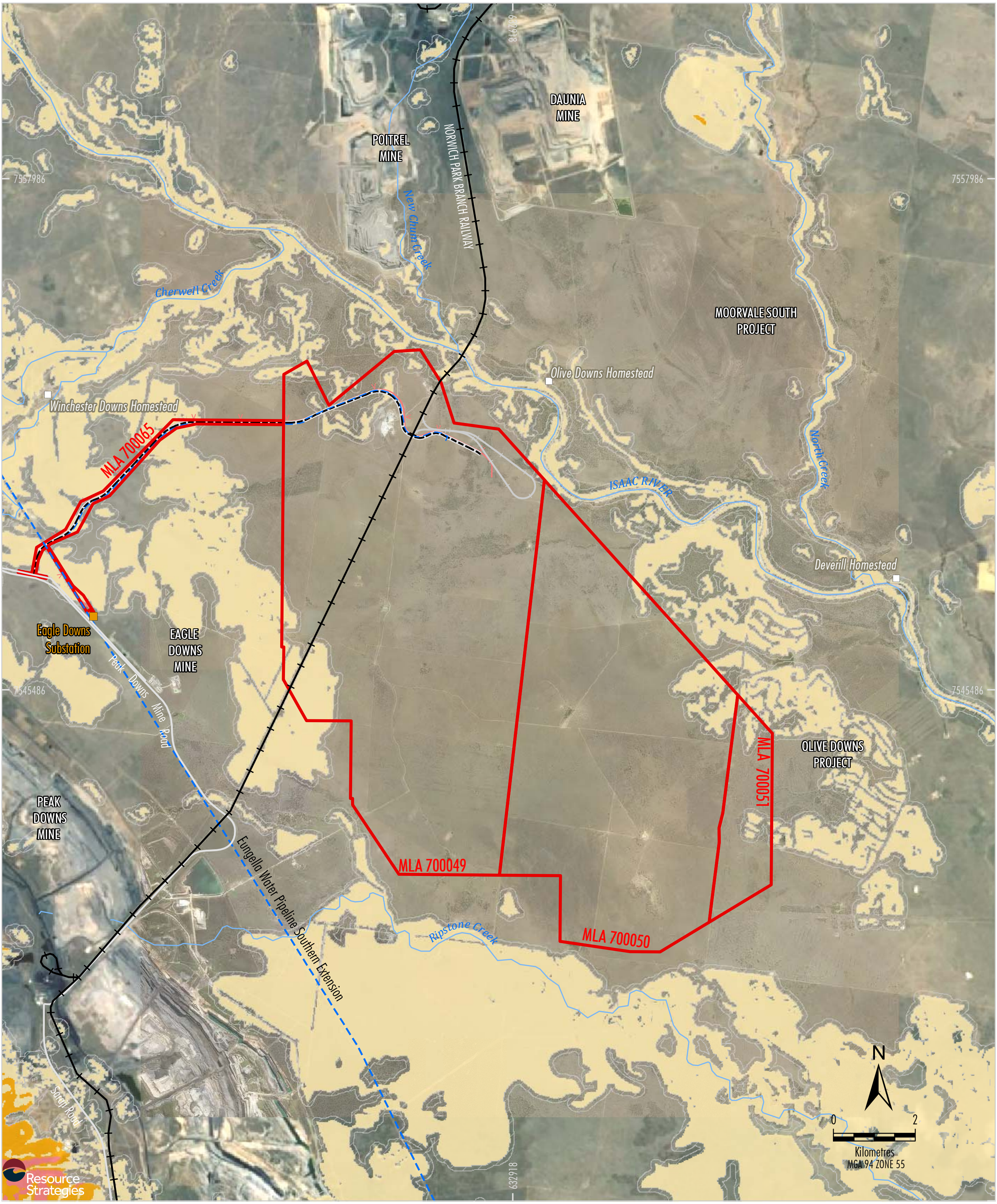
2.3.7 Atmospheric Stability

Atmospheric stability classification is a measure of the stability of the atmosphere. Stability classes range from A class stability, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F class stability, which represents very stable atmospheric conditions that typically occur during light wind conditions at night.

Appendix H describes the predicted annual frequency of stability classes in the Project area using the dataset generated by the TAPM/CALMET meteorological models.

Unstable conditions (classes A to C) are characterised by strong to moderate solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions.

Dispersion processes for the most frequently occurring class D conditions are dominated by mechanical turbulence, generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (classes E and F) (Appendix H).



LEGEND

- Mining Lease Application Boundary
- Railway
- Eungella Water Pipeline Southern Extension
- Road
- Substation
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline

Potential Bush Fire Intensity

- Very High
- High
- Medium
- Potential Impact Buffer

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

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Potential Bush Fire Intensity Mapping

Figure 2-20

2.3.8 Climate Change Projections for Australia and Queensland

Consideration of the potential implications of climate change involves complex interactions between climatic, biophysical, social, economic, institutional and technological processes.

Although understanding of climate change has improved markedly over the past several decades, climate change projections are still subject to uncertainties such as (CSIRO and BoM, 2015):

> *…scenario uncertainty, due to the uncertain future emissions and concentrations of greenhouse gases and aerosols; response uncertainty, resulting from limitations in our understanding of the climate system and its representation in climate models; and natural variability uncertainty, the uncertainty stemming from unperturbed variability in the climate system.*

Climate Change in Australia Technical Report – Projections for Australia's NRM Regions, produced by CSIRO and BoM (2015) provides climate change projections relevant to the Project area.

In Australia, the climate is projected to become warmer and drier.

Climate change may result in changes to rainfall patterns, runoff patterns and river flow. The long-term (2090) climate projections for the Representative Concentration Pathway 4.5 (RCP4.5) climate change scenarios adopted in the Surface Water and Flooding Assessment (Appendix B) to assess impacts on residual void behaviour are presented in Table 2-4.

Table 2-4
Adopted Climate Change Impact Projections

Case[#]	Annual Change in Rainfall	Annual Change in Evapotranspiration
Best Case	-19.8%	6.9%
Maximum Consensus	-10.1%	5.5%
Worst Case	4.4%	7.8%

Source: After Appendix B.

[#] 'Best Case', 'Maximum Consensus' and 'Worst Case' refer to the terms defined in *Climate Change in Australia Technical Report – Projections for Australia's NRM Regions* (CSIRO and BoM, 2015).

The potential implications of climate change to the residual void water balance and on design flood levels are considered in Appendix B.

2.4 CONSTRUCTION

Pre-construction and construction would occur progressively prior to commencement of operations.

The major construction period is forecast to take place in the first 36 months of the Project.

The works would commence as soon practicable after all relevant planning approvals, environmental authority and mining lease applications (where required) are granted.

Construction activities would be based on the development of the following key Project infrastructure:

- MIA (including the CHPP) and mine access road (including an overpass of the Norwich Park Branch Railway);
- rail spur and loop;
- water management infrastructure (including flood protection levees);
- water and electricity supply infrastructure;
- progressive development and augmentation of dams, sumps, pipelines, up-catchment diversions, storages and other water management equipment and structures;
- progressive development of haul roads, light vehicle access roads and services;
- construction and installation of ancillary infrastructure (e.g. electricity distribution infrastructure, explosives storage facilities, consumable storage areas, potable water supply, sewage treatment facilities, site communications, remote crib huts and security);
- replacement and/or upgrades to open cut mining and coal handling and processing machinery; and
- installation or replacement of environmental monitoring equipment.

An indicative list of mobile equipment expected to be required for Project construction activities is included in the Noise and Vibration Assessment (Appendix G).

2.4.1 Mine Access Road

The Project area is currently accessed via an existing private unsealed road that enters the site from the south-west (known as Winchester Access Road).

Access to the MIA (Figure 2-1) would be one of the initial construction activities. Initial access (or until the mine access road is available) to the MIA would be from the existing unsealed access road.

The proposed alignment of the mine access road to the MIA is shown on Figure 2-1. The mine access road would connect to a new intersection with the Eagle Downs Mine Access Road (Figure 2-21). The intersection would be designed and built in accordance with DTMR's guidelines.

The mine access road would travel over the Eagle Downs Mine site and follow a north-east alignment to the MIA. The mine access road would cross the railway via a new overpass; however, the existing level crossing would be utilised during the construction period.

As described in Section 3, the final alignment of the mine access road would minimise impacts to watercourses (e.g. not crossing the Isaac River) and associated potential safety risks (e.g. flooding). The proposed alignment of the mine access road follows a faulted zone within the Eagle Downs Mine site, and would, therefore, experience minimal subsidence from underground workings.

Security gates would be installed between the intersection of the access road with the Eagle Downs Mine Access Road and the entrance to the MIA to prevent inadvertent access to the site. Other fencing (e.g. stock and security fencing) would be installed progressively around selected facilities as required.

Emergency vehicles would not be restricted to using established access roads and tracks.

Norwich Park Branch Railway Overpass

The north-eastern section of the mine access road would cross the Norwich Park Branch Railway.

The Norwich Park Branch Railway overpass would be designed in accordance with relevant DTMR and QR/Aurizon standards.

The overpass would take the form of a concrete bridge structure with appropriate earthworks ramps on either side (Figures 2-22a and 2-22b).

The overpass would be designed to allow passage for both light and heavy vehicles, with suitable safety barrier separation and safety barriers and berms on either side. The overpass would also include services such as the raw water supply pipeline, ETL and a fibre optic cable. The overpass clear spans will also allow for a rail maintenance access track.

Road Realignments and Closure

No existing roads will require realignment or closure. The existing access track to the Winchester Quarry will require reconnection to the proposed mine access road or a suitable alternative.

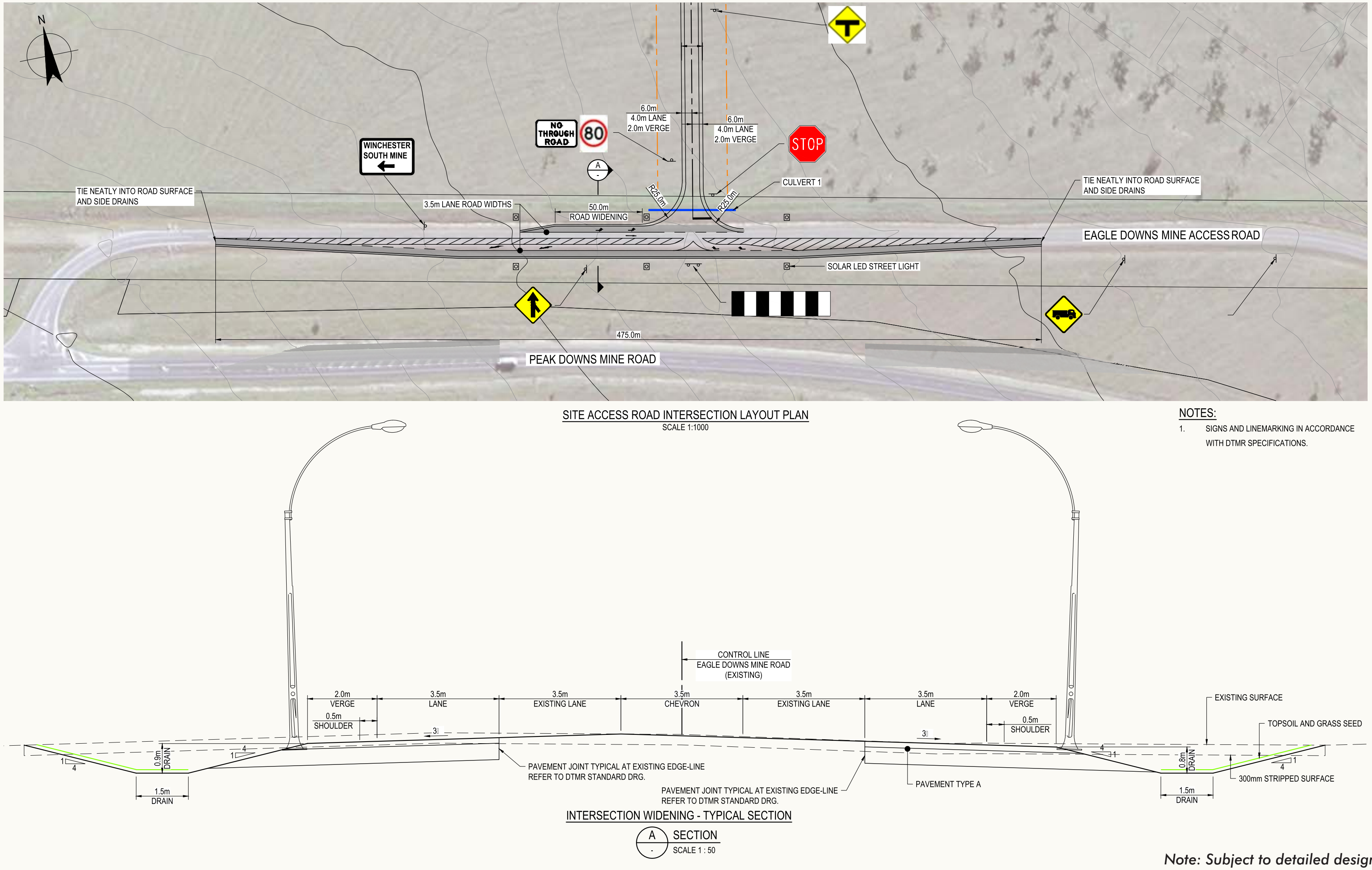
2.4.2 Mine Infrastructure Area

The MIA is proposed to be located to the north-east of the open cut extent, and would be constructed as required during the construction period.

The area for the MIA was chosen as it is located on high ground and provides appropriate clearance from expected blasting operations. Pads for the MIA and CHPP would be formed by cut and fill methods to minimise earthworks.

The MIA would include:

- ROM coal and product coal pads and stockpiles, ROM handling and dumping facilities, product coal stacking and reclaim facilities;
- CHPP incorporating coal handling, reject handling, crushing, screening and washing infrastructure;
- rail spur and loop and train load-out facilities;
- administration, crib room, ablution and first aid facilities;
- emergency management facilities;
- light and heavy vehicle parking and delivery facilities;
- bulk fuel, liquid petroleum gas, lubrication and other hazardous goods storage and handling facilities (including self-bunded storage units and bunded concrete fill-point slabs);



Not to scale.
Note: Subject to detailed design. Indicative only.

WHC-18-62_EIS_Sect2_004B

Resource Strategies

Source: GHD (2020); Whitehaven (2020).

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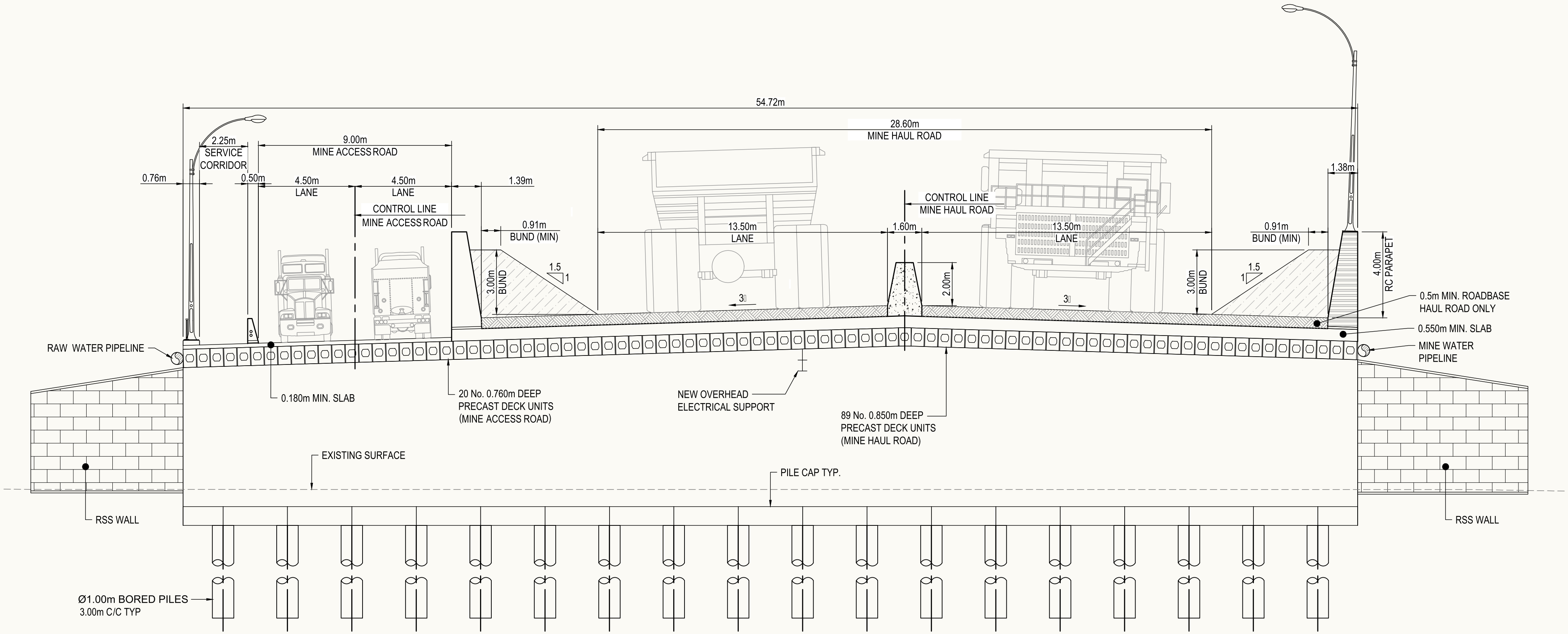
Indicative Mine Access Road Intersection Design

Figure 2-21



WHC-18-62_EIS_Sect2_005B

Resource Strategies

Not to scale.
Note: Subject to detailed design. Indicative only.

Source: GHD (2020); Whitehaven (2020).

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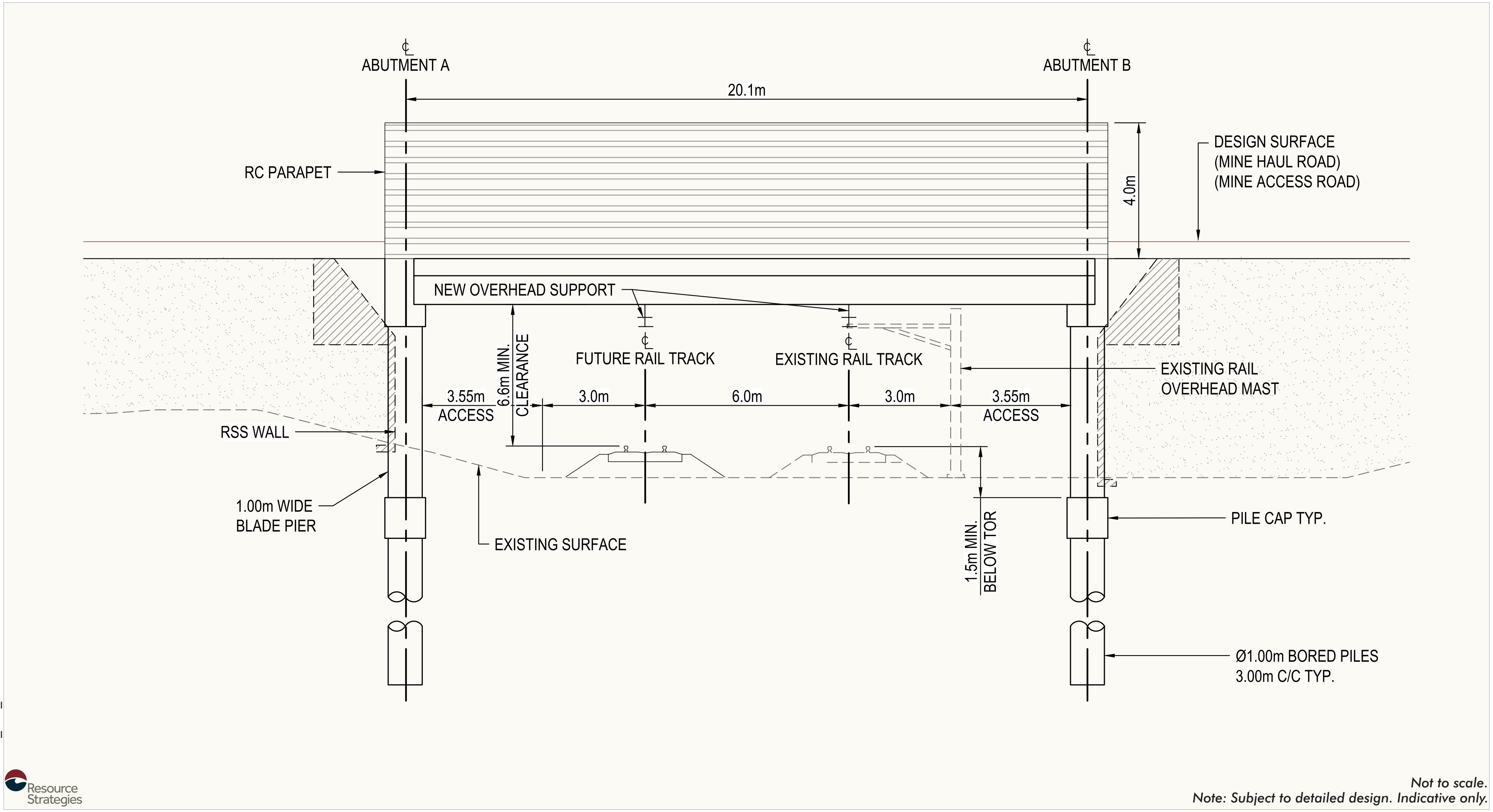
Indicative Norwich Park Branch Railway Overpass Design

Figure 2-22a



Source: GHD (2020); Whitehaven (2020).

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Norwich Park Branch Overpass – Indicative Elevation

Figure 2-22b

- stores, light vehicle and heavy vehicle workshop facilities;
- tyre change and storage facilities;
- communication facilities;
- a laydown and waste management area;
- vehicle wash facilities;
- soil stockpiles;
- light and heavy vehicle roads;
- substation and electricity distribution infrastructure;
- potable water treatment plant;
- sewage treatment plant; and
- other associated minor ancillary infrastructure.

The MIA would generally be constructed within the footprint shown on Figure 2-1.

Construction of the MIA would be undertaken in stages, and augmentations (e.g. additional building floor area, bays, storage tanks) may occur over the life of the Project.

2.4.3 Coal Handling and Processing Plant and ROM Pad

The CHPP would be constructed at the MIA for handling, sizing and select washing of ROM coal at the Project.

It is anticipated that initial construction of the CHPP would take approximately 18 months, followed by a further 12 months for construction of the final stage, with bulk earthworks expected to be completed within the first three months of construction.

A ROM pad for storage of ROM coal prior to processing would also be constructed with associated infrastructure.

Details regarding washing of ROM coal and a conceptual schematic diagram of the CHPP components are provided in Section 2.6.2.

2.4.4 Project Rail Spur and Loop

The Project would include the construction of a rail spur and loop connecting to the Norwich Park Branch Railway with an approximate total rail length of 8 km (Figure 2-1).

Laydown areas would be used during construction of the Project rail spur to store materials and equipment.

The Project rail spur and loop would be fully located within the Project area, on land either owned by, or leased to, Whitehaven WS.

The Project rail spur would have the ability to depart trains to both the north and south, within the existing rail easement.

An unsealed rail service road would also be constructed adjacent to the Project rail spur.

It is anticipated that construction of the Project rail spur and loop would take approximately 12 to 18 months.

Detailed design and construction of the Project rail spur and loop would be undertaken in consultation with Aurizon to minimise impacts on the existing environment in accordance with relevant guidelines, including the *Guide to Development in a Transport Environment: Rail* (DTMR, 2015) and relevant engineering standards.

2.4.5 Water Supply Infrastructure

Raw Water Supply Pipeline

Raw water would be sourced from the Eungella pipeline network. A raw water pipeline (approximately 13 km long) would be constructed to generally follow the mine access road (Figure 2-1) to the MIA, and would be buried in some parts.

As described in Section 3, the final proposed alignment of the raw water supply pipeline was chosen as it connects to the Eungella pipeline network, reducing potential cumulative impacts to the environment (e.g. surface disturbance) due to the Project.

The pipeline would terminate at the Mine Water Dam (MWD) and would supply approximately 3,000 to 4,000 megalitres per year (ML/year) for construction and the initial establishment of operations.

Until such time as the raw water supply pipeline is commissioned, water demands for construction would be met by:

- capture of incidental rainfall and runoff within the Project water management system as it is developed (i.e. stormwater and mine-affected water); and
- a temporary pipeline from the existing Eungella pipeline network.

Whitehaven WS is also investigating water supply options with neighbouring mines in order to supplement the Project's raw water supply requirements.

Potable Water

It is anticipated that potable water supply would be trucked to site during construction. Whitehaven WS proposes to source the trucked potable water from a local potable water supplier until the on-site water treatment facility is operational. It is proposed that the construction of water pipeline and on-site water treatment facility would be completed and commissioned by the end of Year 2 of the Project.

Once the raw water supply pipeline is constructed and commissioned it would be suitable for potable water supply purposes (once treated).

Raw water would be pumped from the Raw Water Dam (RWD) into the water treatment plant located in the MIA to be treated.

The water treatment plant would produce potable water in accordance with the National Health and Medical Research Council's (NHMRC) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy* (NHMRC, 2018), and would be developed in accordance with the Queensland Water Resources Commission (QWRC) *Guidelines for Planning and Design of Urban Water Supply Schemes* (QWRC, 1989) and relevant Australian Standards.

The potable water treatment plant would accommodate a maximum daily volume of approximately 76 kilolitres (kL), and up to approximately 27 ML/year at full development.

Potable water would be stored in potable water tanks with a 180 kL capacity, and would be distributed through a reticulation system to the administration building, workshop, vehicle wash facilities, warehouse and CHPP buildings. Other ancillary buildings outside the water reticulation system (e.g. pit crib huts, first aid rooms) would be stocked via water supply vehicles.

Potable water would be regularly tested to ensure it complies with the *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy* (ADWG) (NHMRC, 2018).

2.4.6 Electricity Supply and Distribution

Electricity for the Project would be provided from Powerlink's existing Eagle Downs Substation, located to the west of the Project. A new 132 kV ETL would be constructed within a corridor between the Eagle Downs Substation and the MIA. The alignment of the proposed ETL is shown on Figure 2-1.

As described in Section 3, the final proposed ETL alignment would result in minimal supply disturbance to other customers and surface disturbance (in close proximity to the Project).

A new 132 kV/22 kV substation would be constructed in the MIA. Power would then be distributed around the site as required for mining and infrastructure, including to site pump stations, by above and below ground 22 kV ETLs.

The maximum electricity demand for the Project when fully operational would be approximately 180,000 megawatt-hours per annum.

Diesel-powered electricity generators and/or solar power units would be used during construction and operational phases, to power other remote power demands on-site (e.g. dewatering pumping sets).

2.4.7 Vegetation Clearing and Soil Stockpiles

Progressive vegetation and soil clearing would be undertaken ahead of the advancing open cut mining operation. Specific vegetation clearance procedures are described in Section 6.

Vegetation clearing required for construction activities would involve clearance for the infrastructure corridor (mine access road, raw water supply pipeline and ETL) and the MIA.

Soil stripping would be undertaken progressively and stockpiling procedures would aim to minimise soil degradation prior to its use for progressive rehabilitation.

Soil stockpile volumes and locations will vary over the life of the Project. The indicative locations of temporary stockpile areas that would be used and then rehabilitated during the Project life are shown on Figures 2-2 to 2-6.

Additional temporary soil stockpiles may be constructed within the approved disturbance area for the Project and/or unused areas of the waste rock emplacements.

Specific soil management, stockpiling and re-application procedures are described in Section 6.

2.4.8 Existing Infrastructure and Easements

The Norwich Park Branch Railway traverses the Project area and has an associated easement/reserve that varies in width but is generally 39 m to 45 m.

As described in Section 2.4.1, an overpass over the railway would be constructed for the Project infrastructure corridor.

Additionally, there is a low voltage ETL alongside, and also crossing over, the Norwich Park Branch Railway. This ETL will need to be relocated (e.g. to within the rail easement) or otherwise realigned as the Project progresses.

The Powerlink easement, located to the west of the Project area, contains the Powerlink ETL (which connects to the Eagle Downs Substation) and the Eungella Water Pipeline Southern Extension. This easement will be intersected by the Project infrastructure corridor.

Other existing infrastructure in the Project area includes, for example, landowner water distribution pipelines and the Winchester Quarry in the northern part of the Project area.

Hard rock would be sourced from the Winchester Quarry, from a similar source within the Project area, or from other quarries in the region for construction activities, in accordance with the respective quarry's licence conditions (Section 2.4.15).

2.4.9 Internal Roads

The Project would involve progressive development of unsealed internal haul roads between the open cut operations, waste emplacements and the ROM pad. Active haul roads would be regularly watered (or applied with dust suppressants) to minimise dust generation potential.

The Norwich Park Branch Railway overpass would be designed to allow a haul road to utilise the overpass to deliver coal from the Railway Pit and North-West Pit to the CHPP.

Mine-authorised light vehicles would utilise the haul roads to access the open cut and other infrastructure. Dedicated internal access roads for light vehicles would also be constructed progressively within the Project mining area as required, and would provide access to other areas, such as the MIA.

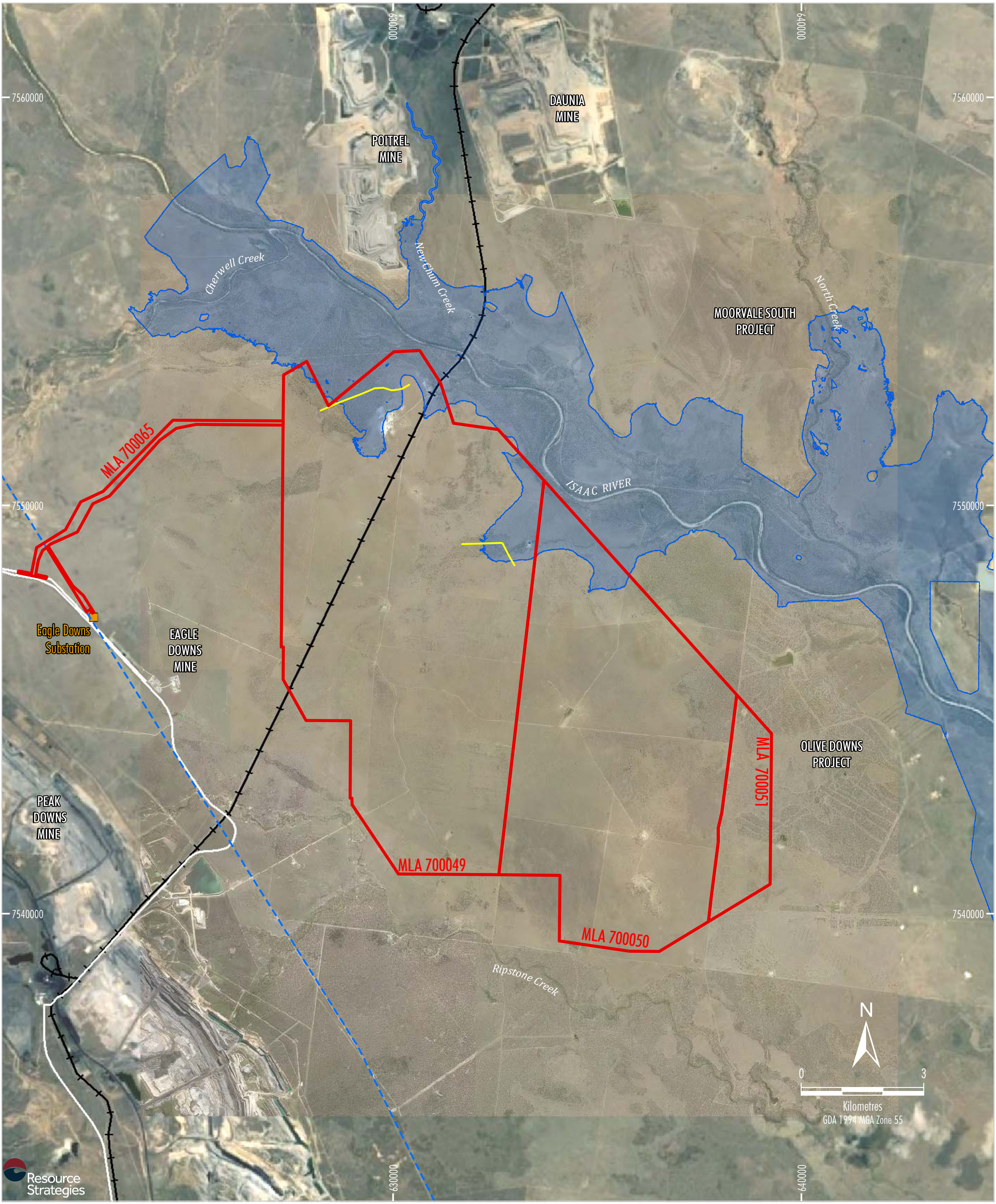
The Project area is currently accessed via Winchester Access Road.

2.4.10 Flood Levees

Temporary flood levees (Figures 2-2 to 2-6) are required to provide immunity for infrastructure and mining operations during a 0.1% Annual Exceedance Probability (AEP) flood event (incorporating cumulative effects from other approved mining operation flood levees), if such an event was to occur during the course of the Project.

Flood modelling of the 0.1% AEP flood event of the Isaac River under existing conditions and approved conditions (including mining operation flood levees from surrounding approved mining projects/operations [e.g. Poitrel Mine, Daunia Mine, Moorvale South Project and Olive Downs Project]) was conducted by WRM. The flood levees would be designed in consideration of the higher flood levels under the existing and approved conditions, shown on Figure 2-23.

The temporary flood levees would be progressively constructed as required to provide protection to Project operations. The flood levees would be constructed to the north of the Railway Pit, and to the north-east of the Main Pit, to prevent inundation of the open cut during operations.



LEGEND

- Mining Lease Application Boundary
- Isaac River 0.1% AEP Flood Extent
- Railway
- Eungella Water Pipeline Southern Extension
- Indicative Flood Levee
- Substation

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

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Existing and Approved Conditions
0.1% AEP Flood Extent of
the Isaac River

Figure 2-23

The flood levees would be designed to a height that would provide protection against the peak flood height associated with a 0.1% AEP flood event. The configuration (i.e. design heights) of the temporary flood levees would vary across the Project depending on the location in the landscape to allow a freeboard of 0.5 m from the 0.1% AEP flood extent.

The width and geometry of the flood levees would be determined during detailed design of the Project. An indicative design of the flood levees is shown on Figure 2-24.

The temporary flood levees located to the north of the Railway Pit and the north-east of the Main Pit, respectively, would be removed once they are no longer required.

2.4.11 Site Up-catchment Water Management Infrastructure

A permanent up-catchment diversion system would be progressively constructed to divert up-catchment runoff around the advancing open cut.

The diversion system would consist of a diversion dam of approximately 1,000 megalitres (ML) capacity, two temporary diversions (one located north of the mine access road, near the Railway Pit, which would be constructed initially and the other further downslope and constructed before operations commence in the Main Pit North) and a permanent eastern diversion. Both temporary diversions would run in an easterly direction and ultimately join a drainage line of the Isaac River.

Once land becomes available, a permanent diversion will be constructed and integrated into the final landform for the Project to allow flows to the Isaac River in perpetuity.

The Project does not involve any mining activities or infrastructure in the Isaac River. No diversion of the Isaac River is proposed and therefore *Guideline: Works that interfere with water in a watercourse for a resource activity— watercourse diversions authorised under the Water Act 2000* (DNRME, 2019) is not relevant. Notwithstanding, the principles of DNRME (2019) would be considered as part of the detailed design of the post-mining landform drainage paths.

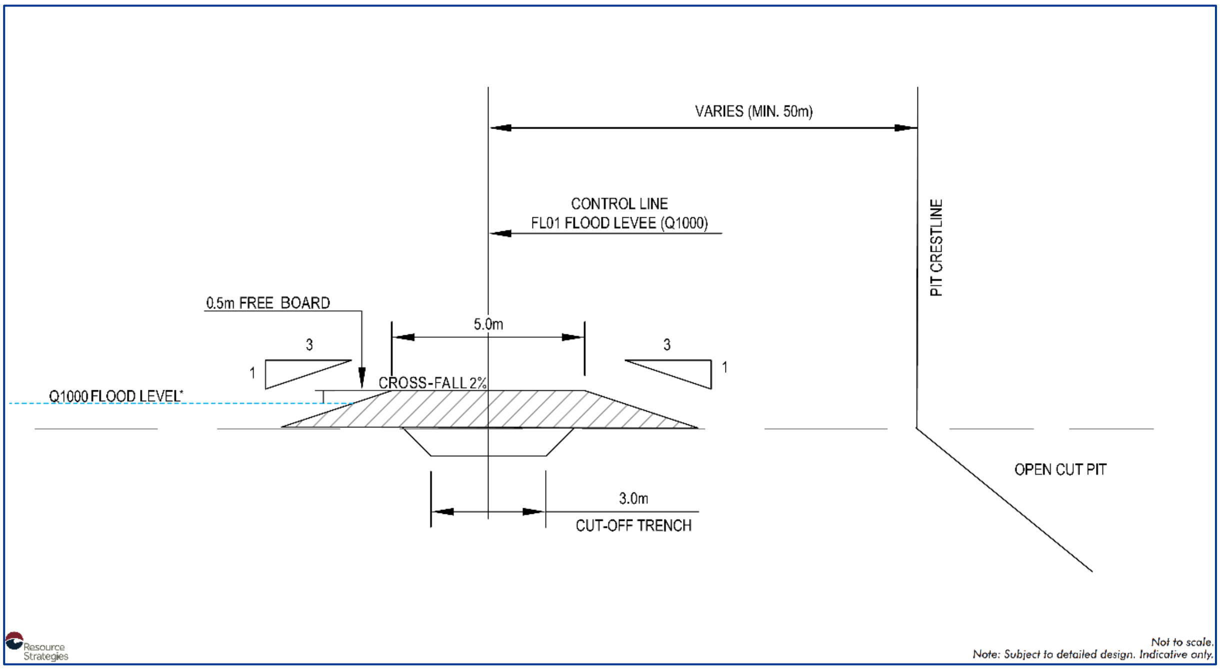


Figure 2-24 Indicative Flood Levee Cross-Section

2.4.12 Train Load-out Facility and Product Coal Stockpiles

The train load-out and product coal stockpile areas would be located adjacent to the rail loop (Figure 2-1).

The product coal stockpiles would accommodate in the order of 800,000 tonnes (t) at full development. The product coal stockpile area would be supported by two product coal conveyors and travelling stackers, and would require the use of dozers during operation to manage the coal stockpile. Coal stockpile size, location and capacity may vary (e.g. capacity increase or decrease) throughout the Project life depending on operational needs.

The train load-out facility would comprise reclaim systems (including a train loading conveyor rated at approximately 5,000 tonnes per hour [tph]), train load-out bin (up to 1,500 t) and coal sampling station for loading of product coal to train wagons to meet rail haulage provider requirements (i.e. no less than 4,000 tph). A control room and motor control centre room would be installed at the train load-out facility.

2.4.13 Explosives Magazines

Explosives magazines would be required for extraction of the resource and would generally be located near mining operations to provide ease of access, and also at an acceptable separation distance from the MIA (including the CHPP). The use of explosives would be in accordance with all licensing requirements.

2.4.14 Earthworks

Earthworks would be required for the Project construction activities to establish infrastructure and provide access to the site. The quantities of earth and rock excavated/relocated for key Project components are provided in Table 2-5.

Table 2-5
Indicative Earthworks Required for Key Project Construction Areas

Project Component	Excavation (m^3)
Mine Access Road	17,000
MIA (including CHPP)	6,000
Water Management Infrastructure	1,200,000

m^3 = cubic metres.

The excavated material resulting from construction activities would be used as construction fill or stockpiled on-site, revegetated and used for future rehabilitation of the site upon decommissioning.

Borrow pits may be developed within the surface development area to provide excavated material for use during construction activities.

2.4.15 Construction Materials

The majority of infrastructure components (e.g. CHPP, package plants, buildings, pipelines, etc.) would be manufactured off-site and transported to site for assembly and installation.

The Project construction period is expected to require approximately 0.6 Mt of road base gravel for construction of the mine access road, internal access/haul roads, rail formation and hardstands. An additional 0.05 Mt of quarried material would be required during this period for drainage aggregate, bedding, rock armour and railway ballast. This material is expected to be sourced at a rate of up to 0.4 Mtpa (over a period of 36 months).

The existing quarry (Section 2.5.8), or a similar source in the Project area/region, would be used to meet Project hard rock requirements, in accordance with the licence conditions for the quarry.

Construction materials for the Project would arrive at the MIA along the proposed Mine Access Road and/or Winchester Access Road off Eagle Down Mine Access Road/Peak Downs Mine Road. Equipment and fuel deliveries are anticipated to come from Moranbah or Mackay (Appendix I), along the Moranbah Access Road and Peak Downs Highway, respectively.

2.4.16 Disturbance Area

The development footprint during the course of the construction period is provided in Table 2-6.

Table 2-6
Approximate Disturbance Areas – Key Project Construction Components

Project Component	Disturbance (ha)
Infrastructure Corridor	135
MIA (and other infrastructure areas)	1,075
Water Management Infrastructure	50

2.5 OPERATION

2.5.1 Hours of Operation

Project mining and rail operations would be conducted up to 24 hours per day, seven days per week.

2.5.2 Mine Life Staging

The progression of mining operations at the Project is shown on Figures 2-2 to 2-7.

In summary, the Project would occur in the following broad mining operation stages:

- Mining Operation Stage 1 – Initial establishment of operations to 15 Mtpa of ROM coal extracted at the Project from mining within the Railway Pit, Main Pit North and Main Pit South. The out-of-pit waste rock emplacements to the west of the Railway Pit and east of Main Pit North would be constructed and partially rehabilitated, with emplacing in the Main Pit South east out-of-pit waste rock emplacement commencing. In-pit emplacement of the Railway Pit, Main Pit North and Main Pit South would also commence.
- Mining Operation Stage 2 – ROM coal extraction of approximately 15 Mtpa (and up to 17 Mtpa) from the Project. Mining within the Railway Pit is completed. The out-of-pit waste rock emplacement to the west of the Railway Pit and the Railway Pit itself would be rehabilitated, with in-pit emplacement of the Main Pit South and Main Pit North continuing with the progression of the open cut. A portion of the Railway Pit would be retained for Project water requirements.
- Mining Operation Stage 3 – Steady ROM coal extraction from the Project. The east out-of-pit waste rock emplacement for Main Pit South would be established and partially rehabilitated. Rehabilitation of the Main Pit North and Main Pit South in-pit emplacement would progressively occur.
- Mining Operation Stage 4 – Establishment of operations in North-West Pit, West Pit and South Pit, with ROM coal extraction steadily declining as mining in the Main Pit North and Main Pit South is completed. Emplacement within the Railway Pit, South Pit, North-West Pit and West Pit would progressively occur. Residual voids would be established in the North-West Pit, West Pit, Main Pit South and South Pit.

The above mining operation stages are based on the indicative mine schedule described in Section 2.5.4, may overlap, and are subject to change in accordance with changes to the mine schedule. They also do not align with the biodiversity offset stages, described in Section 4.5.

2.5.3 Open Cut Extent

The Project includes open cut mining within the Rangal and Fort Cooper Coal Measures. Three main coal seams of the coal measures would be mined, including the Leichhardt Seams, Upper Vermont Seam and Vermont Middle Lower Seam.

Indicatively, the open cut would commence in the Railway Pit and Main Pit North and would develop to the south, with waste rock progressively emplaced behind the advancing open cut face once sufficient space is available. Pit progression and sequencing would be reviewed throughout the life of the Project and revised, if necessary, as part of the PRC Plan process. It is estimated that approximately 353 Mt of ROM coal would be mined over the life of the Project.

2.5.4 Indicative Mining Schedule

An indicative mining schedule for the Project is provided in Table 2-7.

Construction of the Project would commence in Year 1, with first coal expected to be extracted in Year 2[2], during construction activities. With open cut mining expected to occur for approximately 28 years, the Project has a total Project life of 30 years (three years for construction activities and one year for final landform shaping).

[2] Coal extraction may occur earlier, in Year 1.

Table 2-7
Indicative Mining Schedule

Project Year	Project ROM Coal Production (Mt)				Open Cut Waste Rock (Mbcm)	CHPP Coal Rejects (Mtpa)	Product Coal (Mtpa)
	Leichhardt Seams	Upper Vermont Seam	Vermont Middle Lower Seam	Total ROM Coal			
1	-	-	-	-	-	-	-
2	0.04	0.3	0.7	1.0	9.5	0.4	0.6
3	3.1	0.6	1.4	5.0	34.7	1.8	3.3
4	3.1	4.7	5.7	13.5	67.7	5.7	8.3
5	3.1	3.9	8.0	15.0	69.3	6.5	9.1
6	3.1	3.7	10.0	16.7	68.5	7.4	9.9
7	3.8	3.2	8.3	15.3	69.7	6.6	9.2
8	5.6	3.2	8.2	17.0	74.6	7.7	10.0
9	6.1	2.8	6.4	15.4	81.5	6.1	9.8
10	5.0	2.9	8.1	16.0	81.2	6.8	9.7
11	5.9	2.9	7.7	16.4	80.8	6.7	10.3
12	6.8	2.8	6.2	15.8	81.3	6.2	10.1
13	6.1	2.4	6.6	15.1	81.8	6.5	9.2
14	6.9	2.8	5.7	15.4	81.9	6.3	9.6
15	7.5	3.0	6.6	17.0	93.2	7.1	10.5
16	7.8	2.6	6.5	17.0	93.4	7.2	10.4
17	6.3	2.2	6.7	15.2	94.4	6.5	9.2
18	6.5	2.2	5.9	14.6	95.0	6.1	9.0
19	6.6	2.2	5.3	14.1	95.0	6.0	8.5
20	5.5	2.5	5.9	13.9	82.4	5.8	8.6
21	5.4	3.1	7.0	15.5	81.2	6.7	9.4
22	5.8	2.4	5.5	13.6	81.7	5.8	8.3
23	4.7	3.5	7.0	15.3	79.2	6.4	9.5
24	4.3	3.5	4.4	12.2	68.7	5.1	7.5
25	3.8	2.7	2.4	8.9	72.2	3.6	5.6
26	3.4	2.8	1.6	7.8	69.8	3.3	4.8
27	3.0	1.7	0.2	4.9	56.1	2.1	2.9
28	2.5	0.6	0.1	3.2	39.8	0.9	2.4
29	1.9	0.6	0.0	2.5	27.4	0.8	1.8
30	-	-	-	-	-	-	-
Total	**134**	**72**	**148**	**353**	**2,012**	**148**	**217**

Note: The combined total of product coal and coal reject material is greater than total ROM coal due to changes in moisture content (data are presented on an "as received" moisture basis).
Totals may not add exactly due to rounding. ROM extraction rate is based on indicative mining schedule.

The actual timing, mining sequence and annual coal production profile may vary to take account of localised features, coal quality characteristics, detailed mine design, economics, requirements of the coal market, product specification and/or blending requirements and/or adaptive management requirements.

As these requirements are likely to vary over the life of the Project, the development sequence of the open cut and coal extraction rates may also vary.

2.5.5 Mining Sequence, Methods and Equipment

The open cut mining areas for the Project would be mined through conventional truck and shovel mining methods. The open cut mining operational areas would generally include supporting infrastructure such as haul roads, bunding, embankments, soil stockpiles, hardstands and water management structures.

Mining Sequence

Mining operations would generally occur 24 hours per day, seven days per week, with open cut mining activities and general sequence entailing:

- progressive clearing of vegetation occurring on areas required for the mining operation in accordance with prescribed procedures;
- stripping and stockpiling of soil from disturbed areas for storage and reuse in future rehabilitation of the mine landforms in accordance with prescribed procedures;
- pre-stripping of weathered tertiary sediments (e.g. unconsolidated/friable overburden, including clays) using scrapers, excavators and trucks;
- drilling and blasting (using commercial products, with the principal blasting agent being ammonium nitrate fuel oil [ANFO] only to be conducted during the daytime) for fragmentation of competent overburden and interburden as waste rock;
- removal of waste rock and inter-seam partings to expose the underlying coal seams, and placement in out-of-pit waste rock emplacements, or as infill in the mine void behind advancing mining operations, using a combination of dozers, excavators and trucks;
- mining of coal and haulage to the ROM coal handling facilities using a combination of dozers, excavators, loaders and trucks; and
- re-shaping of the waste rock emplacements, re-application of topsoil (or topsoil/subsoil) and revegetation of the final landform surfaces as described in the rehabilitation strategy (Section 6).

Mining Equipment

The mobile equipment used for the Project would vary according to the requirements of the open cut mining operations. It would include a combination of excavators and/or shovels and haul trucks, with a support fleet that includes dozers, graders, front end loaders, drill rigs and water trucks.

An indicative list of major mobile equipment used for impact assessment purposes for the Project is provided in Table 2-8. Mining equipment would be selected as part of the detailed mine design.

Table 2-8
Indicative Operation Fleet

Fleet Item	Type	Quantity[1]
Excavator	310 t	2
Excavator	360 t	3
Excavator	800 t	5
Haul Truck	220 t	27
Haul Truck	300 t	30
Dozer	86 t	6
Dozer	105 t	15
Dozer	100 t	1
Drill Rig	75,000 lb	7
Front End Loader	Komatsu WA1200, 200 t	1
Grader	16 ML	2
Grader	24 ML	4
Water Truck	80 kL	2
Water Tuck	120 kL	5
Service Truck	Komatsu 785, 250 t	4
Service Truck	Cat 773, 130 t	1

1 Note the values shown in this table are indicative only and provide an estimate of the number of units of each equipment that may be present (including equipment that may be under maintenance).

lb = pounds.

2.5.6 Coal Quality

The product coal yield is expected to be approximately 60%.

The majority of product produced by the Project would be metallurgical coal. Depending on variations in coal quality, detailed mine design, mine economics and market volume requirements, metallurgical coal would account for up to 60% of coal products produced.

2.5.7 Coal Mining

Approximately 353 Mt of ROM coal would be mined over the life of the Project.

Coal mining would involve loaders, excavators and/or shovels loading ROM coal into trucks for haulage to the ROM pad at the MIA, via internal haul roads (Section 2.4.2).

ROM coal would be either dumped directly into a ROM hopper feeding the CHPP, or dumped onto a ROM pad, for subsequent rehandling and processing over the life of the mine.

2.5.8 Winchester Quarry

It is proposed that the existing quarry operations will continue (Section 2.9). Whitehaven WS is in discussions with the quarry operator to minimise any interference arising as a result of the operations proceeding in parallel.

2.5.9 Waste Rock Management

Approximately 2,012 Mbcm of waste rock would be mined for the Project (Table 2-1).

The annual volumes of waste rock handled during the life of the Project are provided in Table 2-7.

Waste Rock Emplacement Strategy

Initially, waste rock produced by mining would be placed in out-of-pit waste rock emplacements located adjacent to the open cut mining area (i.e. to establish the highwall emplacements). When sufficient space is created within mined-out areas, subsequent waste rock would be placed within in-pit waste rock emplacements.

Waste rock emplacement areas would be progressively shaped for rehabilitation activities (i.e. final re-contouring, soil placement and revegetation).

Waste Rock Geochemistry

An assessment of the geochemical characteristics of the waste rock associated with the development of the Project is provided in the Geochemistry Assessment prepared by Terrenus (Appendix M). A summary of the findings of the assessment is provided below.

Geochemical tests were conducted on 279 overburden and interburden samples from 11 boreholes distributed across the proposed open cut and adjoining areas. The test work included pH, electrical conductivity (EC), acid base accounting, net acid generation tests, a sodicity assessment, and element enrichment and solubility testwork.

Appendix M concluded that the majority (> 99%) of the overburden and interburden generated from the Project would generally be expected to have a low sulfur content and be non-acid forming (NAF). Overburden and interburden material would typically generate relatively low to moderate salinity surface water runoff and seepage with relatively low soluble metal/metalloid concentrations.

Tertiary waste rock has generally been found unsuitable for construction uses or final landform surfaces (Australian Coal Association Research Program [ACARP], 2004 and 2019).

Whitehaven WS would take reasonable measures to identify and selectively place (or alternatively manage) highly sodic and dispersive waste rock. Where this is not feasible, waste rock landforms would be constructed with short and low (shallow) slopes and progressively rehabilitated to minimise erosion. Where practical, and where competent rock is available, armouring of slopes would be considered.

Where waste rock is used for construction activities, this would be limited (as much as practical) to unweathered Permian sandstone, as this material is more suitable for construction and for use as embankment covering on final landform surfaces.

Regardless of the waste rock type, especially where engineering or geotechnical stability is required, laboratory testing and rehabilitation field trials would be undertaken by Whitehaven WS to determine the propensity for dispersion and erosion, and therefore the appropriate management, of waste rock landforms.

Surface water runoff and seepage from waste rock emplacements, including any rehabilitated areas, would be monitored for 'standard' water quality parameters including, but not limited to, pH, EC, alkalinity, major anions (sulfate and chloride), major cations (sodium, calcium, magnesium and potassium), total dissolved solids (TDS) and a broad suite of soluble metals/metalloids.

With the implementation of the proposed management and mitigation measures, the waste rock poses a low risk of environmental harm.

2.5.10 Coal Reject Management

Approximately 148 Mt of coal rejects would be produced from the processing of ROM coal over the life of the Project.

Coal Reject Geochemistry

Coal rejects (coarse and fine) generated by the processing of ROM coal from the Project (i.e. based on Project coal samples) were assessed as part of the Geochemistry Assessment (Appendix M).

The coarse component of the reject material is typically expected to generate pH-neutral to alkaline, low-salinity surface water runoff and seepage following initial surface exposure. A small proportion of coarse reject samples have been classified as potentially acid forming with low acid-generating capacity (PAF-LC).

Coal Reject Disposal Strategy

Coal rejects from the CHPP would be co-disposed with waste rock. Reject material would be co-disposed in locations such that any runoff or infiltration would report to the Project water management system for mine water (Section 2.7).

Reject material would be periodically sampled during the mine life to confirm geochemical characteristics and to enable the reject disposal strategy to be adjusted as necessary.

2.5.11 Hazardous Materials

An indicative list of hazardous materials and chemicals being used or stored at the Project, during the construction, operational and decommissioning phases of the Project (including the quantity of each substance) is presented in Table 2-9.

Hazardous materials and chemicals used or stored at the Project will be managed in accordance with Queensland and Commonwealth Government legislation and policy requirements, including the removal from site by authorised contractors as required.

2.6 INFRASTRUCTURE REQUIREMENTS

2.6.1 Mine Infrastructure Area

As described in Section 2.4.2, construction of the MIA would commence during the first year of the Project, and would be generally arranged as shown on Figure 2-25.

2.6.2 Coal Handling and Processing

The ROM coal mined during the life of the Project (approximately 353 Mt) would be handled and processed at the CHPP.

The Project processing rate would be determined by the requirements of the coal market, product specification and/or blending requirements.

A description of the operation of the CHPP is provided below and an indicative materials handling flowsheet is shown on Figure 2-26.

Raw Coal Handling

A crushing and screening plant would be located at the ROM hopper. The crushing and screening plant would operate 24 hours a day, seven days a week. ROM coal would be reclaimed from the ROM hopper via a feeder and primary sizer, and conveyed to a secondary sizing station.

Sized coal would be conveyed to a raw coal surge bin or the product coal stockpile (bypass coal).

From the raw coal surge bin, coal would be fed to the coal preparation plant (CPP) for processing.

Table 2-9
Indicative List of Hazardous Substances

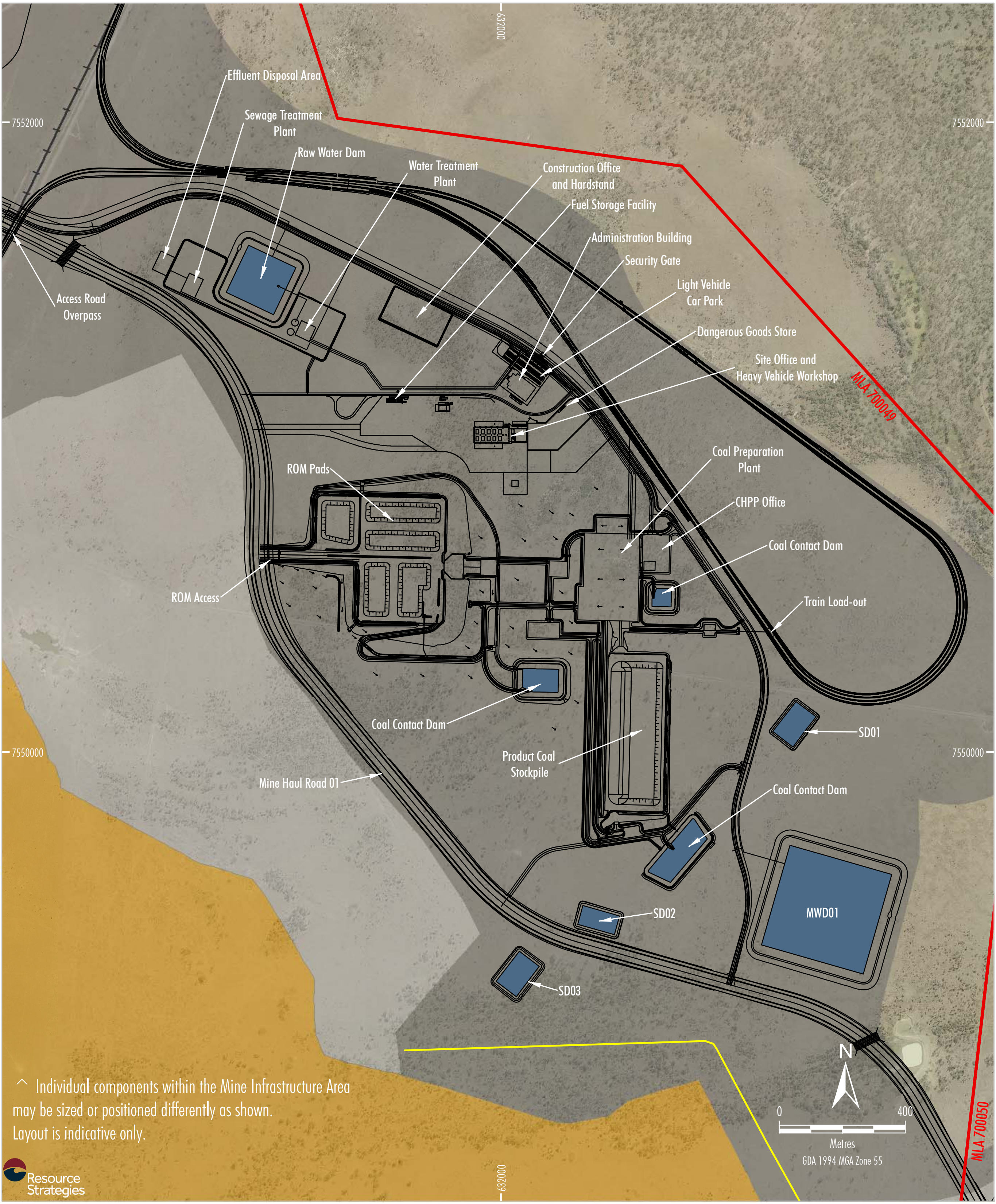
Hazardous Substance	DG Class[1]	UN Number[2]	Packing Group[3]	Maximum Quantity Stored	Maximum Annual Rate of Use	Purpose/Use
Ammonium nitrate	1.1D	0241	N/A	350 t	120,000 t	Mining activities (i.e. blasting).
Acetone	3	1090	II (if quantity stored is > 1 L)	1,000 L	5,000 L	Used as a solvent.
Acetylene	2.1	1001	N/A	100 x 70 kg cylinders	300 x 70 kg cylinders	Welding and cutting.
Chlorine	2.3 (5.1, 8)	1017	N/A	20,000 L	100,000 L	Water treatment.
Diesel oil/fuels	3	1202	III	800,000 L	110 ML	Fuel for mine fleet, vehicles and equipment and use at the CHPP.
Liquefied petroleum gas	2.1	1075	N/A	20 x 50 kg cylinders	40 x 50 kg cylinders	Fuel for forklifts.
Lubricating oils, grease and waste oil	9	3082	III	80,000 L (new oil) 80,000 L (used oil)	630,000 L	Used to lubricate vehicle engine and hydraulic machines.
Methyl isobutyl carbinol	3	2053	III	100,000 kg	600,000 kg	Required at the CHPP.
Oils rags	4.2	1856	N/A	1,000 kg	5,000 kg	Waste product.
Paints	3	1263	I	5,000 L	5,000 L	Paint during construction and operations.
Solvents and thinners (Acetone)	3	1090	II	60,000 kg	800,000 kg	Degreasing agent.

kg = kilogram; L = litre.

1 DG Class – Dangerous Goods Class means the hazard class of the dangerous good as stated in the Australian Dangerous Goods Code.

2 UN numbers – A number that identifies hazardous substances and articles (such as explosives, flammable liquids, toxic substances) within the framework of international transport. UN numbers are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

3 Packing Group – Assigned to dangerous goods (other than Class 1, 2 and 7) according to the degree of risk the goods present (i.e. I [great danger], II [medium danger] and III [minor danger]).



LEGEND

Mining Lease Application Boundary

Railway

Project Component*

- Indicative Infrastructure Area
- Indicative Open Cut Pit Including In-pit Waste Rock Emplacement
- Indicative Out-of-pit Waste Rock Emplacement
- Indicative Water Storage
- Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Source: The State of Queensland (2018 - 2019); Whitehaven (2020). Orthophoto: Whitehaven (2017).

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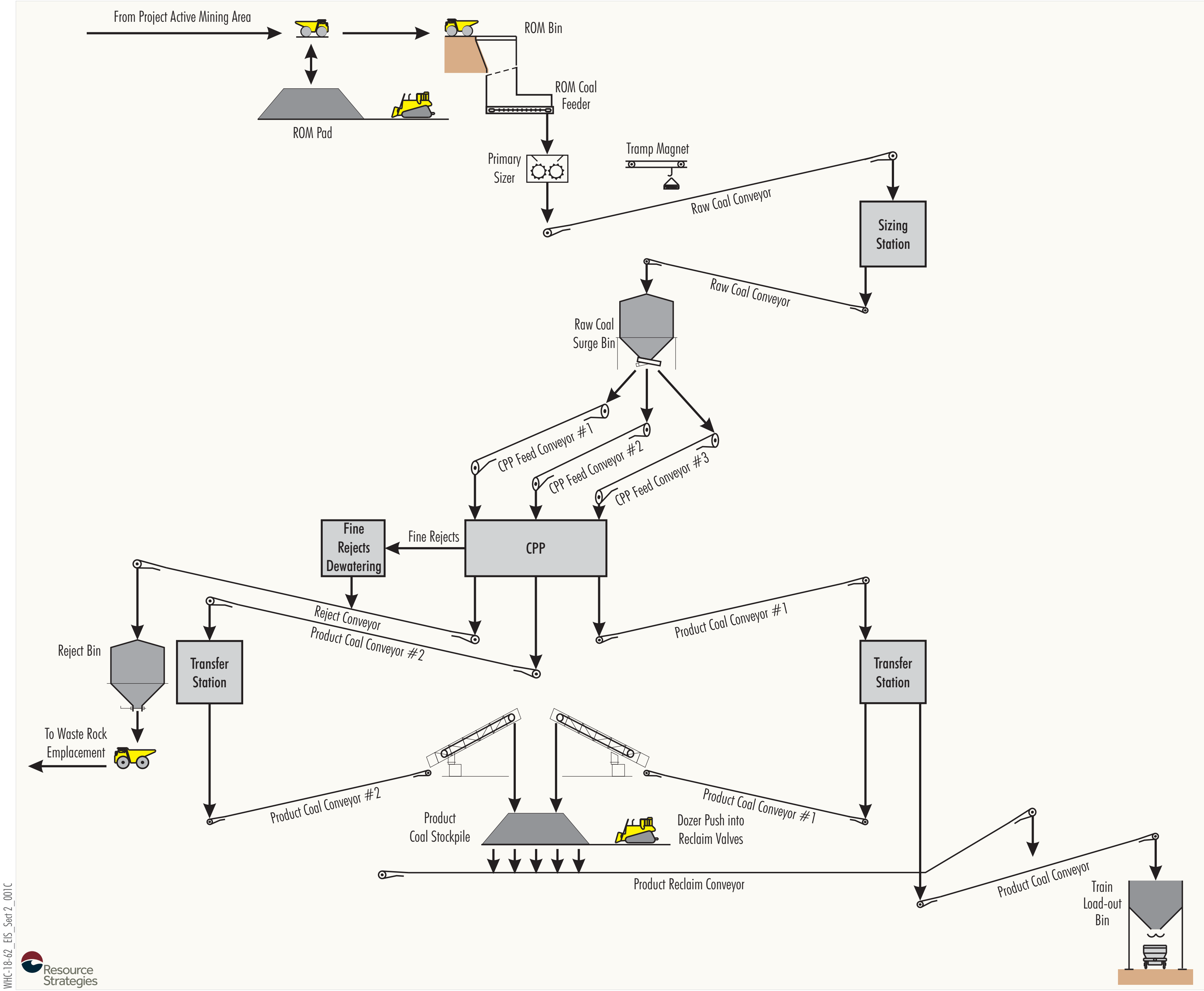
Indicative Mine Infrastructure Area Layout

Figure 2-25



Source: Whitehaven (2020).

WHITEHAVEN COAL

WINCHESTER SOUTH PROJECT

Project CHPP Indicative Materials Handling Flowsheet

Figure 2-26

Coal Preparation Plant

Within the CPP, raw coal would typically undergo wet sizing. The larger fraction would report to the Coarse Coal Circuit and the smaller fraction would report to the Fine Coal Circuit.

Product coal from both circuits would be conveyed to the product coal stockpile.

Reject material from both circuits would be conveyed to the rejects bin and then co-disposed with waste rock (Section 2.8).

Product Coal Handling and Train Load-out

Product coal stockpile infrastructure would include two travelling stackers, dozers, coal valves, reclaim tunnel and associated reclaim conveyors.

Reclaimed product coal would be conveyed to the train load-out bin for rail transportation to port once the train load-out facility and rail spur infrastructure are commissioned.

2.6.3 Transportation

Annual volumes of product coal to be transported by rail would vary over the life of the Project, with a peak product rate of approximately 11 Mtpa. Based on the current capacity of coal trains, an average of six train movements per day would be required (i.e. three arrivals and departures) with a maximum of sixteen train movements per day (i.e. eight arrivals and departures).

Train arrivals and departures would occur 24 hours per day.

Coal capacities of trains may vary over the life of the Project due to progressive rail capacity upgrades and changes to train configurations. Train movements may increase or decrease accordingly.

Once the Project train load-out facility and rail spur are commissioned, product coal would be conveyed to the train load-out facility located at the rail loop.

Product coal would then be loaded onto trains for transportation to port via the Norwich Park Branch Railway to DBCT, APCT or Gladstone coal ports. Whitehaven WS understands there is sufficient capacity at these coal ports for the Project.

2.6.4 Energy Supply

Electricity Supply

As described in Section 2.2.3, electricity supply to the Bowen Basin is provided by Powerlink's 275/132 kV substations at Strathmore, Nebo and Lilyvale. Energy Queensland further distributes electricity from these substations to local customers.

Permanent electricity supply for the Project would be provided from the existing regional power network via construction of a 132 kV ETL from Powerlink's Eagle Downs Substation to an on-site 132 kV/22 kV substation located within the MIA (Section 2.4.6).

The mine access road, ETL, raw water supply pipeline and a fibre optic cable for communications will follow an approximate 100 m wide easement. Within the corridor, the services will have the following approximate individual easements, noting that easements may overlap in some locations:

- Mine access road – 50 m easement.
- Raw water supply pipeline – 10 m easement.
- ETL and fibre optic cable – 40 m easement.

Temporary Supply

As described in Section 2.4.6, diesel-powered electricity generators and/or solar power units would also be used during the construction and operational phases of the Project.

Fuel Supply

Fuel (including diesel) would be transported to the Project by contractors. The transport, storage and handling of fuels (including diesel) at the Project would be undertaken in accordance with relevant legislation and guidelines.

All equipment and vehicle operators would be trained in the safe operation of the equipment (including operating procedures for the refilling and maintenance of fuel storage tanks and mine vehicles) and the relevant emergency response procedures in the event of an incident.

Regular inspection programs would be undertaken to monitor the structural integrity of fuel tanks and bunds.

2.6.5 Telecommunications

High speed telecommunication data services are provided to Moranbah and coal mines in the Bowen Basin via an existing fibre optic network. Connection to the existing fibre optic network would be undertaken for the Project. The fibre optic cable connection would follow the mine access road/ETL alignment.

A wireless connection to Moranbah may also be established.

Communications systems (e.g. radio communication towers) would be integrated at the Project site to provide enhanced communications capacity across the network for the Project.

2.6.6 Sewage

Site wastewater would be treated in a packaged sewage treatment plant, located in the MIA. The plant would be designed to meet a Class C effluent quality for irrigation. The biosolids produced would be stored on-site and collected by a licensed contractor for disposal off-site at a licensed facility.

The sewage treatment plant would be designed and installed in accordance with the Queensland Government guidelines and relevant Australian Standards. Table 2-10 provides the effluent quality for release to land, consistent with the *Guideline – Model mining conditions* (DES, 2017a).

A packaged irrigation system would be used to discharge treated effluent. The irrigation area would be located with Project mining tenements and designed to be located outside the "existing and approved" conditions 0.1% AEP flood extent[3] to minimise the potential for dispersion on-site.

The sewage effluent irrigation areas for the Project would be located outside the mapped extent of the Isaac River alluvium and contained to areas where potential seepage would not report off-site to limit the potential impacts of the sewage effluent irrigation on the surrounding groundwater regime.

The irrigation area would be positioned to optimise exposure to sunlight and wind, increasing the rate of evapotranspiration. Evapotranspiration increases the operational capacity of the irrigation system, minimising the potential for pooling and runoff of irrigation.

Other design parameters to be considered for the design of the irrigation system include selection of an irrigation area with soils that exhibit low potential for erosion and increased drainage capacity. These design parameters would optimise the operation of the irrigation system and reduce the potential for dispersion off-site.

Until the sewage treatment plant is operational, sewage from temporary ablution blocks would be pumped by a licensed contractor and transported to a local council sewage treatment plant. This approach would also be used for other ancillary buildings outside the sewerage system.

Effluent would not be irrigated immediately prior to expected rainfall or if pooling of water was evident at the site, to reduce the potential for runoff contamination. During these periods, effluent would be stored within wet weather storage tanks until such time as irrigation could recommence.

As part of the detailed design phase, modelling will be conducted to confirm the design of the effluent irrigation system and wet weather storage tank capacities, using the Model for Effluent Disposal Using Land Irrigation (MEDLI) software.

[3] Note the "existing and approved" 0.1% AEP flood extent includes the flood levees from surrounding approved mining projects/operations as well as existing conditions, as modelled by WRM and shown on Figure 2-22.

Table 2-10
Sewage Treatment Effluent Quality

Indicator	Unit	Release Limit	Limit Type	Frequency
5-day Biochemical Oxygen Demand (BOD)	mg/L	20	Maximum	Monthly
Total Suspended Solids	mg/L	30	Maximum	Monthly
Nitrogen	mg/L	30	Maximum	Monthly
Phosphorus	mg/L	15	Maximum	Monthly
E-coli	Organisms/100 mL	1,000	Maximum	Monthly
pH	pH units	6.0 – 9.0	Range	Monthly

mg/L = milligrams per litre.
Source: (DES, 2017a).

2.7 WATER MANAGEMENT

A detailed description of the Project water management system is provided in the Surface Water and Flooding Assessment prepared by WRM (Appendix B), with design input from Whitehaven WS. The Project water management schematic is shown on Figure 2-27.

The water management system would be progressively developed and augmented as water management requirements change over the life of the Project. Water management infrastructure proposed for the Project includes (Figures 2-2 to 2-6):

- up-catchment diversions and drains, including temporary and permanent realignment of unnamed drainage lines;
- temporary flood levees;
- internal catchment runoff drains;
- water storages dams, including mine-affected water dams (e.g. MWD, CC Dam and ROM Dam), raw water dams (e.g. RWD), clean water dams (e.g. CWD 1 and CWD 2) and pit water dams (e.g. Railway Pit and Main Pit) (Figure 2-28);
- sediment dams;
- pumps, pipelines and other water reticulation equipment;
- discharge points/areas for controlled release of excess water off-site in accordance with relevant principles and conditions of the *Model water conditions for coal mines in the Fitzroy basin* (DES, 2013);
- a package sewage treatment plant and effluent disposal system (e.g. irrigation); and
- a potable water treatment plant.

2.7.1 Water Management Objectives

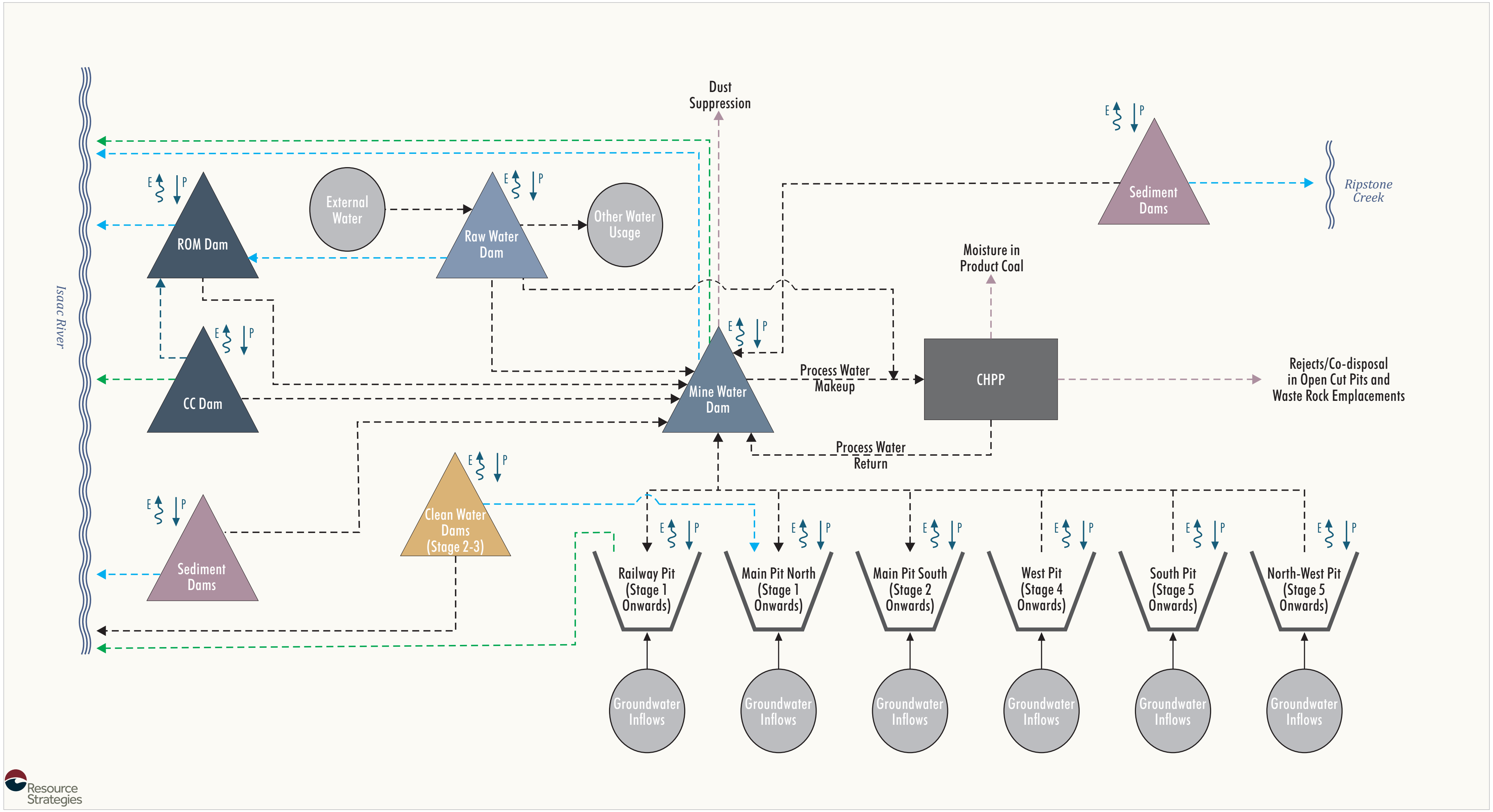
The objective of the site water management system for the Project is to manage all types of water on-site to meet operational, social and environmental objectives.

The two key water management system objectives for the Project (with specific objectives for each water category provided in Appendix B) were:

- minimise mine-affected water accumulation, minimise the risk of uncontrolled discharges and maintain sufficient water for the operation in periods of dry climatic conditions; and
- successfully engage with external stakeholders to be known as a good custodian of society's water resources.

Key principles that would be applied for the Project to meet these objectives include:

- separation of clean, sediment-laden and mine-affected water, within the limitations of operational requirements;
- minimisation of surface disturbance areas, thus minimising the volume of sediment laden and mine-affected water generated by the Project;
- all water storage dams, structures and facilities would be designed, constructed and managed in accordance with the *Manual for assessing consequence categories and hydraulic performance of structures* (DES, 2016a);
- water storage dams that manage mine-affected water would be designed and operated to minimise uncontrolled releases to the receiving environment;



LEGEND
E Evaporation
P Precipitation/Catchment Runoff
Gravity Driven
Pumped/Siphoned
Controlled Release
Overflow
Other Water Flow

Note:
Overflow Direction: Good engineering practice is to include a stabilised spillway as a contingency for dam safety.
This arrow does not indicate that these overflows will occur. The arrow is to show the direction of water flow (by gravity) should the dam water level exceed the dam spillway level.

All dams and pits receive rainfall runoff from their local catchment, and lose water via evaporation.

Railway Pit and Main Pit would be available for storage of mine-affected water from Stage 2 to Stage 4 and Stage 5 onwards, respectively.
The Railway Pit would receive overflow from the Mine Water Dam when it is above its Maximum Operating Volume.

Sediment Dams would be progressively developed and decommissioned as mining progresses.

Source: WRM (2021); Whitehaven (2020).

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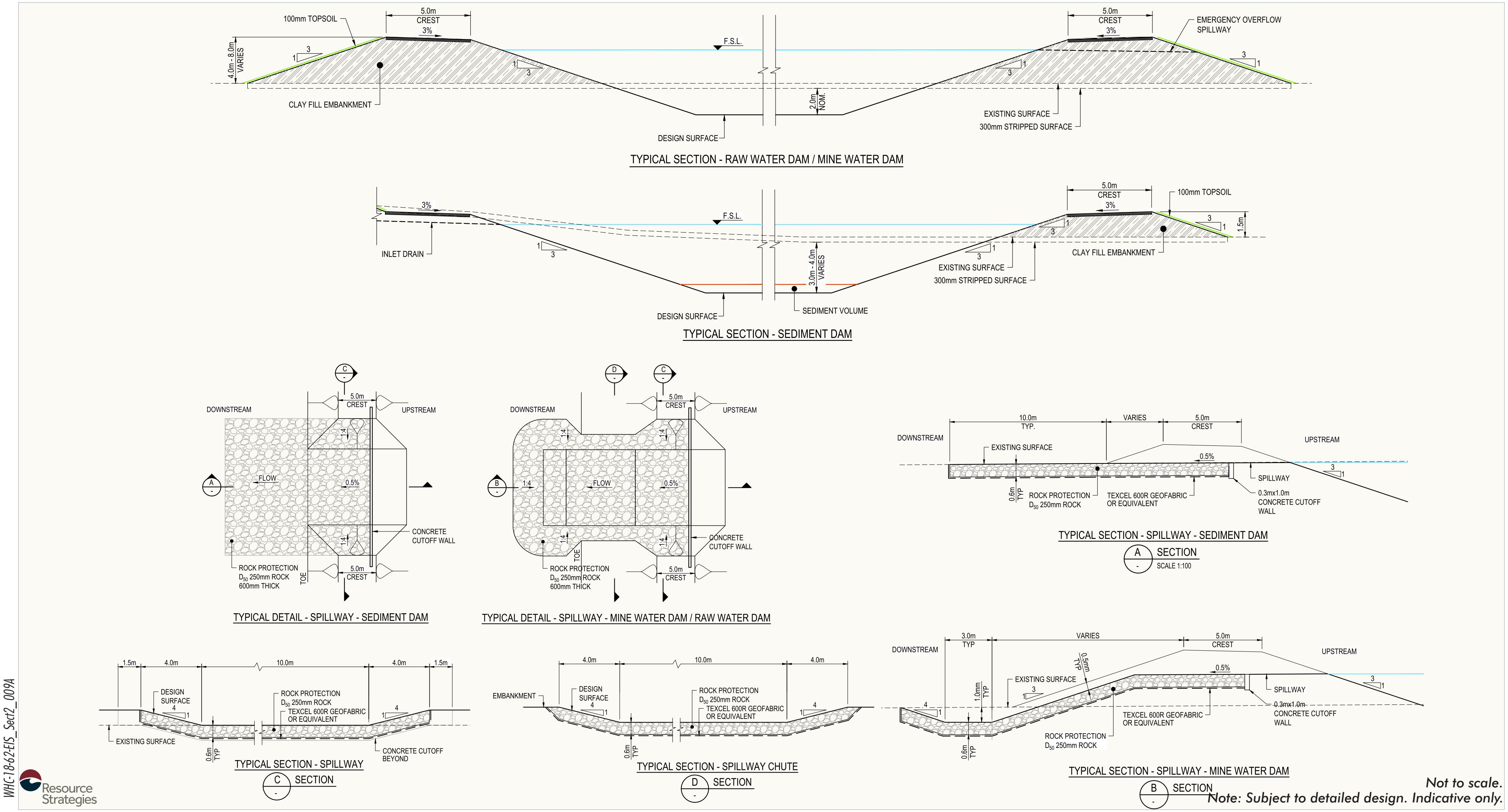
Indicative Water Management Schematic

Figure 2-27



Source: GHD (2020); Whitehaven (2020).

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Indicative Cross-section of Mine Water Dams

Figure 2-28

- water for construction and operational purposes would be preferentially sourced from dedicated on-site water storage dams;
- water collected in water storage dams and sediment dams would be captured and retained for reuse on-site where possible (e.g. dust suppression, CHPP demand) and/or controlled release off-site to the receiving environment in accordance with the *Model water conditions for coal mines in the Fitzroy basin* (DES, 2013);
- surface runoff from rehabilitated waste rock emplacements during operation of the Project would be directed to dedicated sediment dams for settling and release to the receiving environment or to mine-affected water storages for reuse; and
- where feasible, sourcing external water requirements from surrounding mining operations to reduce take from the environment or raw water supplies.

2.7.2 Up-catchment Diversions

The Project has been designed to minimise impacts on regional waterways and drainage paths by diverting flow corridors around surface disturbance areas (Appendix B).

The development of up-catchment diversions allows runoff from undisturbed upslope catchments to flow around the Project disturbance areas, minimising the impact on downstream environment and water users, while also minimising the potential volume of water captured into the mine water management system.

Two up-catchment diversions would be required for the Project, to allow the catchment to drain to a 'watercourse' as defined by the Water Act in the north of the Project and a drainage feature (e.g. considered not to be 'watercourse' as defined by the Water Act). No 'watercourses' or 'waterways' are required to be diverted for the Project.

The Project does not involve any mining activities or infrastructure in the Isaac River. No diversion of the Isaac River is proposed and therefore *Guideline: Works that interfere with water in a watercourse for a resource activity— watercourse diversions authorised under the Water Act 2000* (DNRME, 2019) is not relevant. Notwithstanding, the principles of DNRME (2019) would be considered as part of the detailed design of the post-mining landform drainage paths.

2.7.3 Water Consumption

The water consumption requirements for the Project and water balance of the system fluctuate with climatic conditions, production rates and as the extent of the mining operations change over time. A summary of main operational water demands for the Project (i.e. CHPP water supply and haul road dust suppression) is provided below, as well as the estimated construction water supply requirements.

In addition, water would be required for coal crushing/conveyor dust suppression, supply for potable water treatment plant and other miscellaneous demands, including washdown of mobile equipment and other minor non-potable uses, such as fire-fighting.

Construction Water Supply

It is estimated that use of water during construction would be approximately 500 ML per annum (i.e. approximately 1.4 megalitres per day [ML/day]).

CHPP Water Supply

The CHPP is a net user of water as, during the washing and sizing process, the moisture content of the coarse and fine rejects and coal product material is increased.

The CHPP water demand rate is related directly to the rate of ROM coal feed to the CHPP, and the rate of production and moisture content of the coal product, coarse and fine rejects. The net water demand for the CHPP (i.e. including water recycled on-site) is estimated to be approximately 166 litres per tonne of ROM coal.

Dust Suppression

Water for haul road dust suppression would be sourced from the water storage dams on-site. If required, chemical or other dust suppressants may be used to reduce the amount of water required for dust suppression.

Haul road dust suppression demands were calculated based on estimated haul road lengths, which vary over the life of the Project, predicted daily rainfall and predicted evaporation rates. The estimated average daily dust suppression usage for haul road dust suppression over the life of the Project ranges between 1.7 ML/day to 4.6 ML/day (Appendix B).

A sensitivity analysis for the dust suppressant usage and water usage reduction was performed as part of the Surface Water Assessment (Appendix B).

2.7.4 Groundwater Inflows

Predicted groundwater inflows to each of the open cut pits over the life of the Project are presented in Appendix A and summarised in Table 2-11.

The total groundwater inflows are predicted to peak in Year 8, with approximately 1 ML/day (352 ML per annum) of groundwater inflows to the open cut pits. The average groundwater inflows over the life of the Project are predicted to be approximately 0.5 ML/day (183 ML per annum) (Appendix A).

Table 2-11
Predicted Average Groundwater Inflows

Project Phase	Average Groundwater Inflows (ML/day)
Phase 1	0.6
Phase 2	0.8
Phase 3	0.5
Phase 4	0.1
Phase 5	0.4

Source: Appendices A and B.

Water that accumulates in the open cut pits would be transferred (i.e. dewatered), preferentially, to contained water storages for beneficial use (i.e. dust suppression and/or CHPP water supply).

2.7.5 Sediment Dams

Sediment dams would contain runoff from waste rock emplacements, as well as areas of initial and established rehabilitation. The sediment dams would allow for gravity settling of sediment prior to release off-site.

Sediment dams would be designed based on the *Best Practice Erosion and Sediment Control Guideline* (International Erosion Control Association [IECA], 2018) as described in Appendix B.

Sediment dams would be maintained until such time as vegetation within the catchment of the sediment dams successfully establishes and where runoff has similar water quality characteristics to areas that are undisturbed by mining activities. Sediment dams may be maintained in rehabilitated areas when site water demand requires it.

2.7.6 Controlled Release Strategy

Controlled water release conditions have been developed for potential controlled releases, if required, to the Isaac River, based on the *Guideline – Model mining conditions* (DES, 2017a).

The proposed water release conditions are provided in Table 2-12, based on flow and EC monitoring at the Deverill gauging station on the Isaac River, and the proposed Project controlled release points (RP1, RP2 and RP3).

The proposed controlled releases strategy comprises MWD, CC Dam and Railway Pit water storages, which would have the ability to discharge water to the Isaac River through a gravity pipe or pumping system. There would be three controlled release points for the Project.

Section 10.6.3 of Appendix B (refer to Figure 10.1) provides the locations of the proposed controlled release points for the Project.

An assessment of the dilution ratio of controlled releases to Isaac River flow was undertaken, where the dilution ratio is the daily volume of the Isaac River flow divided by the daily volume of controlled releases to the Isaac River.

The water balance model results show that (Appendix B):

- the minimum dilution ratio would be 407; and
- 50% of release days would have a minimum dilution ratio greater than 5,550.

These dilution ratios are sufficient for controlled releases to have no significant impact on water quality in the Isaac River.

2.7.7 Simulated Performance of the Project Water Management System

A predictive assessment of the performance of the Project water management system (including supply, containment, risk of disruption to mining operations and controlled release volumes) is presented in Appendix B.

The results of the assessment are summarised in Table 2-13 including the predicted external raw water requirements for the Project, water supply sources, water demands and storage volumes for the containment system for a range of different climatic scenarios.

The results presented in Table 2-13 are the average of all model iterations and include wet and dry periods distributed throughout the life of the Project, from Phases 1 to 5.

Key outcomes from the overall water balance are as follows:

- Average annual inflows from rainfall runoff gradually increase between Phase 1 and Phase 5.
- External water requirements are highest in Phase 2 to Phase 4 due to the higher production rates.
- The change in stored volume per phase is small in comparison to the inflow and outflow volumes, therefore the water management system is generally in balance.

Water Supply

Water from external sources is required to meet operational water demands, primarily during extended dry climatic periods and periods of low groundwater inflows.

A key objective of the site water management system is to maximise the reuse of captured runoff and groundwater inflows. Recycling mine-affected water would minimise the volume of water from external sources that is required to satisfy site demands.
As the volume of water captured on-site is highly variable dependent upon climatic conditions and groundwater inflows, external water requirements are likely to vary significantly from year to year.

Table 2-12
Proposed Controlled Release Conditions

Flow Rate	Receiving Water Flow Criteria (Isaac River*)	Maximum Release Rate (Controlled Release Points Combined Flows)	Electrical Conductivity Limit (At Release Point)
Medium	4 m^3/s	0.5 m^3/s	1,000 µS/cm
	10 m^3/s	1.0 m^3/s	1,200 µS/cm
High	50 m^3/s	2.0 m^3/s	4,000 µS/cm
	100 m^3/s	3.0 m^3/s	6,000 µS/cm
Very High	300 m^3/s	5.0 m^3/s	10,000 µS/cm

m^3/s = cubic metres per second; µS/cm = microSiemens per centimetre.
* Deverill Gauging Station.
Source: Appendix B.

Table 2-13
Indicative Average Annual Water Balance for the Project Water Management System

Process	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Average Inflows (ML/year)					
Rainfall Runoff	1,099	1,966	3,271	3,755	3,739
Net Groundwater	203	296	196	28	156
External Water	1,935	2,438	2,161	2,260	1,114
Total Inflows	**3,237**	**4,700**	**5,628**	**6,043**	**5,009**
Average Outflows (ML/year)					
Evaporation	427	550	711	781	837
Dust Suppression	619	848	935	1,503	1,673
Other Water Usage	200	200	200	200	200
Net CHPP Demand	1,699	2,652	2,568	2,345	753
Controlled Releases	0	0	0	0	2
Mine-affected Water Dam Overflows	0	0	0	0	0
Sediment Dam Overflows	292	406	763	1,087	1,268
Clean Water Management System Releases	0	0	361	120	0
Total Outflows	**3,237**	**4,656**	**5,538**	**6,036**	**4,733**

Source: Appendix B.

Note: The difference between the total average inflows and total average outflows is the change in water stored on-site.
Totals may have minor discrepancies due to rounding.

The water balance model results show that external water supply requirements would generally reduce over the life of the Project (Appendix B). The reduction in external water supply requirements is due to the increase in water captured on-site over time and the decrease in production throughput from Phase 2 onwards.

The water balance model results show that there is a greater than 75% probability that the proposed external water supply of 3,800 ML would be sufficient to meet all site demands, in any one year across the life of the Project. Whitehaven WS would source water from either an external water supplier (e.g. Sunwater) via a water supply pipeline or via water sharing with surrounding mining operations.

Containment

To prevent uncontrolled discharges from the mine water storages, maximum operating volumes (MOVs) have been set for the out-of-pit mine-affected water storages. The MOV is the volume at which pumping from the open cut pits to the mine-affected water storages ceases. These limits were included as an operating rule in the OPSIM Model.

The water balance model results show that, based on the MOVs, the combined out-of-pit mine-affected water inventory is generally below the combined capacity of all the mine-affected water dams in Phase 1 (Appendix B). From Phase 2 onwards, there is sufficient water storage capacity due to the availability of in-pit storage (e.g. Railway Pit available from Phases 2 to 4 and Main Pit available from Phase 5).

The water balance model was used to assess the risk of uncontrolled off-site overflows from the mine-affected water management system. The water balance model results indicated there would be no uncontrolled overflows from the mine-affected water management system to the Isaac River for any climatic conditions assessed over the life of the Project (Appendix B).

The water balance model predicted annual controlled release volumes from the mine-affected water dams. Any controlled releases from the Project would be in accordance with the proposed conditions in Table 2-12.

2.7.8 Referable Dams

The proposed design of CWD 1 and CWD 2 (and any other water storage dam for the Project) would not exceed the specified height and storage volume criteria for a dam, that would require a failure impact assessment under section 343 of the *Water Supply (Safety and Reliability) Act 2008* as the proposed heights of CWD 1 and CWD 2 would be less than 10 m.

Further, it is not expected that the public (e.g. two or more people) would be at risk in the event of failure of any water storage dam for the Project and therefore there are no 'referable' dams and *Guideline for failure impact assessment of water dams* (DNRME, 2018b) would not be relevant to the Project.

2.8 WASTE MANAGEMENT

The key waste streams generated by the Project would comprise:

- waste rock (as described in Section 2.5.9);
- coal rejects (as described in Section 2.5.10);
- recyclable and non-recyclable general wastes;
- sewage and wastewater; and
- other wastes from mining and workshop related activities (e.g. used tyres, drill cuttings and waste hydrocarbons).

The management of waste (non-mineral) at the Project would be governed by Queensland legislation, including:

- EP Act;
- EP Regulation;
- WRR Act; and
- *Waste Reduction and Recycling Regulation 2011*.

An underlying principle of all waste management in Queensland is the waste management hierarchy. The waste management hierarchy (the WRR Act), identifies the most to the least-preferred management option, as follows; “*avoid, reduce, reuse, recycle, recover, treat, and dispose*”.

This hierarchy would be used to manage waste at the Project. If waste must be disposed of, Whitehaven WS would do so in a way that prevents or minimises adverse effects on environmental values.

The potential impacts caused by waste streams generated by the Project and proposed mitigation measures are assessed in Section 4.15.

2.9 ENVIRONMENTALLY RELEVANT ACTIVITIES AND NOTIFIABLE ACTIVITIES

The EP Act regulates ERAs, including mining activities, as well as providing for the application for, and assessment and issuing of, an environmental authority for mining activities and enforcement of the conditions of granted authorities.

The environmental authority imposes environmental management conditions on the mining activities undertaken on the relevant mining lease and outlines the environmental management requirements that Whitehaven WS must undertake.

The ERAs under Schedule 2 and Schedule 3 of the EP Regulation proposed to be undertaken as part of the Project are listed in Table 2-14, with corresponding aggregate environmental scores (AES) and thresholds. The Schedule 2 activities are ancillary activities proposed to be carried out as part of the resource activity. The locations and disturbance areas of the ERAs are shown on Figure 2-29.

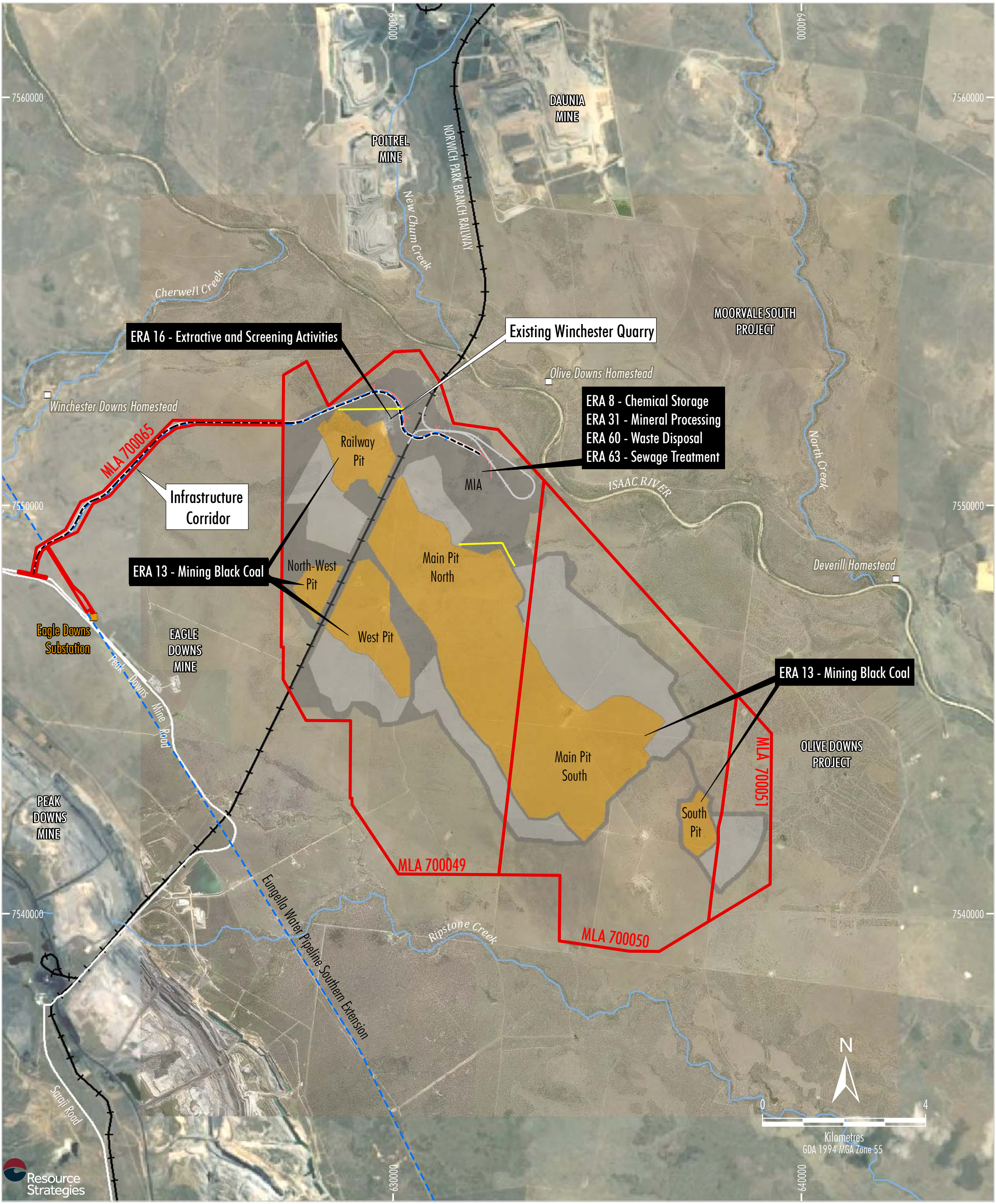
Table 2-14
Environmentally Relevant Activities at the Project

Environmentally Relevant Activity (ERA)		Aggregate Environmental Score (AES)
Schedule 3		
ERA 13 – Mining Black Coal		128
Schedule 2		
ERA 8 – Chemical Storage	Storing more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).	85
ERA 16 – Extractive and Screening Activities	Extracting, other than by dredging, in a year, more than 1,000,000 t.	57
ERA 31 – Mineral Processing	Processing 1,000 t or more of coke in a year.	148
	Processing, in a year, more than 100,000 t of mineral products, other than coke.	280
ERA 60 – Waste Disposal	Operating a facility for disposing of, in a year, more than 200,000 t of waste mentioned in subsection (1)(a).	119
ERA 63 – Sewage Treatment	Operating a sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1,500 EP, if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.	27

EP – equivalent persons.

The environmental authority for the Project would authorise the carrying out of those prescribed ERAs. Proposed land uses that may result in land becoming contaminated are known as "Notifiable Activities" and are listed in Schedule 3 of the EP Act. The following Notifiable Activities are relevant to the Project:

- 1 – Abrasive blasting.
- 7 – Chemical storage (other than petroleum products or oil under item 29).
- 15 – Explosives production or storage.
- 24 – Mine wastes.
- 29 – Petroleum product or oil storage.
- 37 – Waste storage, treatment or disposal.



LEGEND

- Mining Lease Application Boundary
- Eungella Water Pipeline Southern Extension
- Railway
- Substation

Project Component*

- Infrastructure Area
- Open Cut Pit Including In-pit Waste Rock Emplacement
- Out-of-pit Waste Rock Emplacement
- Indicative Mine Access Road
- Indicative Rail Spur and Loop
- Indicative Electricity Transmission Line
- Indicative Raw Water Supply Pipeline
- Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
Orthophoto: Google Image (2019); Whitehaven (2017).

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Indicative Locations of Environmentally Relevant Activities

Figure 2-29